UNIVERSITY OF KWAZULU-NATAL

Exploring technology adoption for business and awareness of the Fourth Industrial Revolution amongst business managers and entrepreneurs in Ndola, Zambia

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A dissertation submitted in fulfilment of the requirements for the degree of Master of Commerce

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2022

DECLARATION

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ACKNOWLEDGEMENTS

This dissertation would not have been possible without the help and support of many people.

I owe my thanks to my supervisor Nigel Chiweshe who never gave up on me and guided me throughout the research process. His support and belief are among the driving forces behind this document.

Great thanks to all the participants from Ndola, Zambia in the central business district who took part in the research process, without them the data collection process could have never been a success.

To my mother and entire family, I am honoured by the support that was rendered during the entire time of my studies, to whom I am grateful to God. To my friends Emmanuel, Kampamba and Dr Matambo. Your constant belief in me that I can do “it” has always been my driving motive and work ethic factor. I appreciate the words of encouragement and actions of support.

Above all, we give thanks to the Highest for affording to me the opportunity to study.

This study would have not been possible without the additional assistance, and I hope that the outcomes reflect the hard work and make a difference to its readers.

ABSTRACT

The Fourth Industrial Revolution (4IR) is believed to have an impact on various sectors across the globe. The disruptive change of the 4IR has impacted business models and the way managers and entrepreneurs can conduct business practices through innovativeness. The study focused on Exploring technology adoption for business and awareness of the Fourth Industrial Revolution amongst business managers and entrepreneurs in Ndola, Zambia. The study adopted a qualitative research method, and the data collection was conducted through semi-structured online interviews. Purposive sampling was used for the selection of participants. The participants were recruited from The Patents and Companies Registration Agency (PACRA) database in Ndola, Zambia. Forty (40) companies spanning sectors such as Logistics, business consultancy, cosmetics, information technology services, secretarial services and tourism took part in the online interviews. The interview transcriptions were analysed using NVivo 12. The study revealed that entrepreneurs and managers are knowledgeable about the 4IR and understand its impact on business, they employ the use of technology in their business's operations. Furthermore, the study's findings revealed that entrepreneurs and managers have the necessary facilities in their organisations that support technology adoption. The research found that based on the perspective of small business managers and entrepreneurs who were participants of the research, there is not much that the government is doing to provide policies of economic growth through technology adoption for business and provision of information on the perceived benefits of the Fourth Industrial Revolution. The research recommends that there is a need for improvement in the government's efforts to play a leading role in the sensitization of the Fourth Industrial Revolution in the country with a particular target towards entrepreneurs as they are drivers of the economy. There is a need for managers and entrepreneurs to play a proactive role in acquiring information on the benefits of the 4IR and prepare for adoption in business through education and training programmes.

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ABBREVIATIONS

4IR	Fourth Industrial revolution
ERP	Enterprise Resource Planning
e-ZAMTIS	Electronic Zambia Transport Information System
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
ICT	Information communication technology
NDP	National Development plan
OECD	Organisation for Economic Co-operation and Development
PACRA	Patents and Companies Registration Agency
RATSA	Road Traffic and Safety Agency
SDG's	Sustainable development goals
SMEs	Small Medium enterprises
TAM	Technology Adoption Model
TOE	Technology Organisation Environment
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of acceptance and use of technology

CHAPTER 1

1 INTRODUCTION

The Fourth Industrial Revolution (4IR) is believed to have an impact on various sectors across the globe (Postelnicu and Câlea 2019). According to the World Economic Forum (2016), the disruptive change of the 4IR has impacted business models and the way managers and entrepreneurs can conduct sustainable business practices through innovativeness.

This study aimed at Exploring technology adoption for business and awareness of the Fourth Industrial Revolution amongst business managers and entrepreneurs in Ndola, Zambia, with a specific focus on how this impacts their various business operations. The research adopted an exploratory study in Zambia, focusing on Ndola. This study seeks to provide insights into the fields of management and entrepreneurship on how managers and entrepreneurs can manage their businesses in an environment that is technologically savvy. The information to be provided is anticipated to generate insights on sustainable business practices that are reliant on technology, and this prepares managers and entrepreneurs for the adoption of the next wave of technology.

The study will provide a background to the research, showing a history of the industrial revolutions and how the 4IR has come to be a new phenomenon. This will be followed by a presentation of findings from previous scholars on how the 4IR has impacted entrepreneurship and small business managers. Thereafter, the background will be used to generate a problem statement for the study to stipulate a knowledge gap.

The subsequent sections will provide the study's research questions which were used to derive the research objectives that followed after. A literature review will proceed to inform the study of the available literature relevant to the study. The theoretical framework will follow to show how the variables are related to the theory of study. The significance of the study shall be provided to present the anticipated contribution to the fields of entrepreneurship. The justification of the study will follow, to show the reason why this study should be conducted. After that, the research methodology, which indicated the procedures or techniques adopted in the collection and analysis of empirical evidence will be discussed. Subsequently, the section on ethical considerations was presented. Lastly the limitations of the study that were encountered by the researcher.

1.2 BACKGROUND OF THE STUDY

Before industrial revolutions, human beings were centred on improvements in automation and connectivity to strengthen productivity. The first industrial revolution relied on water and steam to attain high levels of mechanised production around about 1760. The second industrial revolution emerged in about 1870 and saw the rapid radicalisation of production using electric power for mass production. The third industrial revolution began in about 1950. This revolution was about the introduction of information technology and electronics to automate production. These radicalisations have led to the fourth industrial revolution, which is built upon the third industrial revolution. The 4IR is believed to be bridging the gap between physical, biological, chemical, and technological spheres (Postelnicu and Câlea 2019)

The area of interest in this study is the provision of technology-enabled services that conjoin both the demand for products by customers and the supply of products by the manufacturers. This allows entrepreneurs and managers to be able to monitor and control the flow of products through technology-enhanced platforms (World Economic Forum, 2016).

Bailey (2019) suggested that entrepreneurs need to position themselves to be able to take advantage of the global changes in dropping costs of computing, and robotics, and exploit the availability of the latest manufacturing technology. This is evidenced by the example of the 2015 launching of EG Robotics which was an entrepreneurial initiative aimed at the development of robotics in Egypt. The company has adopted the use of technology to provide a balance in the ecosystem using robotics. This is in the manufacturing industry of Egypt where robots work side by side with humans intending to reduce human labour (Naudé, 2017). Another practical aspect of such an entrepreneurial opportunity enhanced by the 4IR is Farm Drive. A small financial system was established in Kenya that links small farmers to larger financial institutions using technology. Farm Drive acts as a mediator between small scale farmers and large financial institutions. It is an entrepreneurial innovation that wholly relies on technology for operations. Creditworthy farmers access Farm Drive's platform through their mobile phones, alternative data and machines to secure financial assistance in the form of loans (Ekekwe, 2018).

From the information provided entrepreneurs and managers adopt the 4IR on the grounds of creativity and innovation, with the benefits of providing opportunities in various industries that foster entrepreneurial development (Bailey 2019). Therefore, it is in this light that the study was conducted by exploring the entrepreneurial adoption of technology for business in such a

technologically enhanced business environment, and how entrepreneurs and business managers can conduct sustainable business practices.

1.3 PROBLEM STATEMENT

The 4IR in an African context is believed to be enabling entrepreneurs and small business managers with technologically enhanced opportunities, and at the same time making it difficult for the non-technologically braced business owners to conduct business. Such opportunities include restructured business models for providing goods and services to customers Ayentimi and Burgess 2019). Mhlanga (2020) suggests that these disruptions are in favour of innovative competitors who can access the technology platforms for research and development, marketing, and sales. They provide their service with quality and speed for good value. On the consumer, end a shift towards consumer meetings and patterns of buying is also forcing companies to join the bandwagon in their designs, marketing, and service delivery.

The 4IR is drastically altering global labour and production systems, necessitating that job seekers build the skills and competencies required for fast adjusting to the demands of African enterprises and, more broadly, automation. Already, Africa's working population is growing more educated and equipped to grab the possibilities afforded by the 4IR: For example, the proportion of workers with at least a secondary education is expected to rise from 36% in 2010 to 52% by 2030 (Ndung'u and Signe 2020).

According to Oyebanjo and Tengeh (2021) in a study on the interrogation of the challenges and opportunities of the 4IR in a developing county, the authors found that the 4IR also presents challenges to the African context considering the continent is still developing. Some of the identified challenges included; Personnel training in specific areas related to managing digital jobs, Lack of scalability because few entrepreneurs possess the necessary skills to implement Industry 4.0 in their systems and Inadequate funding to begin planning at the various levels of government (national, provincial, and local) for infrastructure and other factors.

The major threats that the 4IR presents include; job-losses, the redundancy of the model of industrialization through attracting Foreign Direct Investment (FDI) based on low-cost labour in assembly manufacturing and the re-shoring of manufacturing to advanced economies (Ayentimi and Burgess 2019). Therefore, entrepreneurs and managers who have not adopted the use of technology in the 4IR are likely to experience challenges and this poses a threat to business operations. Which eventually leads to retarded growth in sales and no competitive advantage.

Many factors exist in Zambia that may limit the 4IR's full potential to be considered beneficial to the country. Zambia, as a developing nation, would have difficulty persuading its citizens

of the long-term advantages of 4IR seeing that the majority of the country still lacks electrification and lack access to a good connection to the internet. Zambia faces challenges in terms of the required skills in the 4IR due to the changing nature of jobs as a result of technological advances. The majority of those who took part in this study understand the 4IR concept and what it entails. Respondents are aware of how the 4IR will alter the demographics of the workforce, as well as the fact that technological innovations require life-long learning. They also understand what motivates Zambians to adopt new technological innovations (Mutanga, Hongoro, Kaggwa, Chavalala, Pitso, Mohlala, and Tshililo 2021).

Therefore, this study seeks to explore technology adoption for business and awareness of the Fourth Industrial Revolution amongst business managers and entrepreneurs in Ndola, Zambia in an attempt to effectively understands the opportunities for adoption of this new wave of technology in the external business environment and to understand if the use of technology in business creates a competitive advantage for technology adopters as perceived by managers and entrepreneurs of Ndola, Zambia. Theoretically, the information that will be gathered from this study will assist the fields of entrepreneurship and small business management by filling in the gap of the benefits that come with the adoption of technology for business in the 4IR.

1.4 RESEARCH OBJECTIVES

1. To explore the Fourth Industrial revolution as perceived by managers and entrepreneurs of Ndola, Zambia.
2. To explore the strategies that managers and entrepreneurs in Ndola, Zambia use to adopt the use of technology for business.
3. To explore which organisational infrastructures managers and entrepreneurs in Ndola, Zambia possess to adopt the technology.
4. To explore the enterprise environmental factors contributing to technology adoption by managers and entrepreneurs in Ndola, Zambia.

1.5 RESEARCH QUESTIONS

1. What is the Fourth Industrial revolution as perceived by managers and entrepreneurs of Ndola, Zambia?
2. What are the strategies that managers and entrepreneurs in Ndola, Zambia use to adopt the use of technology for business?
3. Which organisational infrastructures managers and entrepreneurs in Ndola, Zambia possess to adopt the technology?

4. What are the enterprise environmental factors contributing to technology adoption by managers and entrepreneurs in Ndola, Zambia?

1.6 THEORETICAL FRAMEWORK

The theoretical framework provides the study with a mind map of how variables that are identified have relationships among them. There are different kinds of theories that discuss information technology, however, for this study, the focus is on the theories that enhance technology adoption. This study adopted the technology, organisational environmental framework (TOE). The TOE framework was developed by Tornatzky and Fleischer in 1990. The reason for this choice is because TOE theory involves the enterprise while other theories involve the adoption of technology at the individual levels. This TOE framework encompasses three aspects of an enterprise's context that impact the process in which technology is adopted and implemented. These include the technological, organisational, and environmental aspects (Gui, Fernando, Shaharudin, Mokhtar and Karmawan 2020). The aspect of technology explains the internal and external contexts of the enterprise, while the organisational aspect explains the measures of the organisation such as the size, scope, and managerial structures. The environmental aspect focuses on the area in which the firm is situated and conducts its business such as the industry, the competitors and affiliation with the government (Cruz-Jesus, Pinheiro and Oliveira 2019).

Sin and Sin (2020) in research conducted on technology adoption among small-medium enterprises, employed the TOE frameworks to assess the adoption of Enterprise Resource Planning (ERP) solutions, which proposed that the adoption of these solutions is more inclined towards technology rather than organisational and environmental factors. A study by Sandu and Gide (2018) on TOE factors that influence the adoption of Cloud-based services by SMEs found that the framework provides consistent empirical evidence, a sound theoretical foundation, and appears to be appropriate for explaining the adoption of novel technologies such as cloud-based services.

Previous technology adoption research studies that used a TOE framework in the context of SMEs found that an organization's technological characteristics usually describe IT innovation attributes that affect organizational adoption of IT innovation. According to the findings of the study on the adoption of social commerce by SMEs', perceived utility and security concerns were among the factors of adoption. An individual feel that employing a specific technology will increase her/his performance, and an internet platform is regarded to be unsecure for conducting online transactions and data exchange (Abed, 2020).

TOE framework is an accurate theoretical landscape to investigate digital readiness in technology maintenance and innovation implementation in a technological, organisational and environmental context (Sari & Santoso, 2020).

It is critical to investigate the factors that influence innovation to comprehend the dynamics that drive technological adoption. TOE has been used by researchers to examine a wide range of innovations and technology preparedness ideas at the organizational level. The adoption of numerous information systems associated with subject and technology advancements, such as eCommerce, online shopping, e-business, and ERP have been studied (Muhamad, Mohamad, & Mat Nor 2021).

The results from a study by Nguyen and Luu (2020) on the adoption of technology in the 4IR using the TOE found that perceived development of human resources, perceived on-time delivery, perceived cost savings, perceived improved product quality, and perceived time savings all contribute significantly to perceived usefulness. Adoption intention is heavily influenced by perceived ease of use, business resources, and business environment factors. The perception of improved customer relationships and adoption intentions has a significant impact on the actual adoption of the 4IR SMEs.

For the purpose of this study, the TOE framework was adopted because it is a technology adoption theory that focuses more on the enterprise (Cruz-Jesus et al., 2019). Therefore, it aided in the identification of the working constructs that are to be operationalised and measured. The TOE framework was used as a guide in the generation of the study's research questions based on the components of the framework which include; the Fourth Industrial Revolution (Technology), the entrepreneurs and managers (organisation), and the business environment (environment). The TOE framework applies to the study because it is a theory that focuses on technology adoption among enterprises, therefore as the study seeks to explore technology adoption for business and awareness of the 4IR amongst business managers and entrepreneurs, this framework is applicable because of the three aspects that it possesses. Previous studies similar to this study adopted the framework. The study did not only focus on the organisational level but rather on the environment in which the firms exist while seeking to find out if it is competitive or not, and if technology adoption is an added advantage to doing business.

1.7 SIGNIFICANCE OF THE STUDY

The findings are anticipated to provide insights into the benefits of the 4IR to governments, entrepreneurs and small business managers. According to researchers, the 4IR is believed to be providing opportunities and challenges to managers and entrepreneurs across the globe specifically for most developed countries, those that adopt it shows a good significance in business operations. Entrepreneurs in developing countries of Africa that have adopted the 4IR are demonstrating significance in business growth and benefiting from the opportunities of the 4IR. This will be achieved by generating a body of knowledge around the adoption of technology for business in the 4IR era. Entrepreneurship is believed to be one of the drivers of the growing economies of Zambia therefore the anticipated benefits of the opportunities that the 4IR provides in this field would be of necessity to entrepreneurs and managers. Therefore, this study seeks to explore the technology adoption for business in a technologically enhanced era. The reason is to provide insights to existing managers and entrepreneurs and those that seek to venture into such industries and will rely on technology to conduct business.

Provision of information to governments on playing a leading role in informing the citizens of the benefits of technology adoption for business in the 4IR. Providing information to managers and entrepreneurs on how they can conduct sustainable business practices in a technologically enhanced environment in the 4IR. This will allow the entrepreneurs and managers to be able to sustain their businesses and prepare for the adoption of the next technological wave. This knowledge will not be limited to existing entrepreneurs and managers but will also assist those that wish to venture into entrepreneurship and wholly rely on using technology for operations**.** The anticipated information will allow for the future entrants to be ready and knowledgeable of the transition into the 5^{th} Industrial Revolution (5IR). In that adopters of the 4IR will find it easier to transition to a new wave of technology to come.

1.8 JUSTIFICATION OF STUDY

The 4IR is believed to be providing opportunities and threats to business managers and entrepreneurs. Those that adopt technology show a significant improvement in business operations. Therefore, this study sort to explore the awareness and readiness of technology adoption for business in a technologically enhanced era. The reason is to provide insights to existing business managers and entrepreneurs and those that seek to venture into such industries and plan to use technology to conduct business.

1.9 OVERVIEW OF THE DISSERTATION

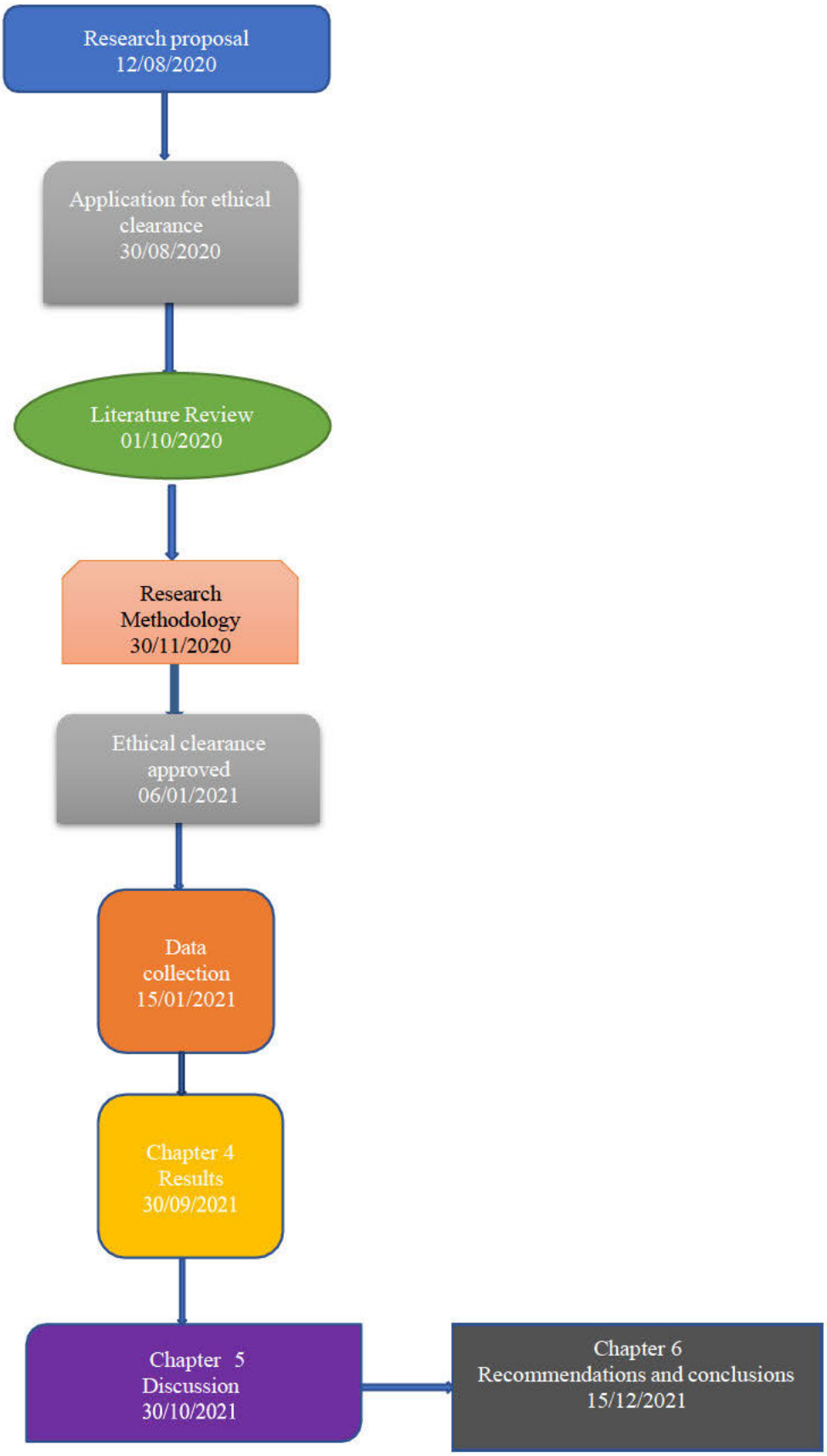
Chapter One has been the introduction chapter of the study. It has introduced the overall study's focus on the managers' and entrepreneurs' awareness and readiness of technology adoption for business in the 4IR. The chapter laid out the history of Industrial Revolutions, provided a background, identified the problem statement and outlined the research questions and research objectives.

The study's research questions were generated from literature and problem statement based on the identified gap. According to Dhir and Gupta (2021) having appropriate research questions is important to a study as it helps in developing aims and objectives. An article by Farayad (2019) on thesis writing indicated that it is useful to have research questions and objectives outlined properly and referred to especially in the conclusion chapter, the reasons for this is to allow the reader to relate to the discussion of the findings. Furthermore, a qualitative study of collaboration of robotics and humans conducted in South Africa incorporated both the research questions and objectives (Ntusi, 2021). Chapter Two is the Literature review. This chapter will review and discuss the concepts surrounding the 4IR and the adoption of the technology business.

Chapter Three will be the research methodology chapter. The focus will be on the research design component, the research approach. Sample and sampling methods; how the participants were chosen and the data collection section. Chapter Four aims to look at the presented results following the analysis of the collected data.

Chapter Five, which is the discussion, will aim at explaining the analyzed data from chapter four, this will be done in line with the information provided in the second chapter in line with the research objectives. Chapter Six is the recommendations and conclusions chapter. It will provide the study's overall conclusions and provide recommendations from the researcher's point of view.

1.10 RESEARCH PROCESS



1.11 CONCLUSION

This chapter aimed to introduce the aims and purpose of the study which was done in the provision of a background. This was used to generate a problem statement of the study which was to explore business strategies that managers and entrepreneurs implement to effectively respond to the adoption of this new wave of technology, which included the external business environment of the business in an attempt to understand if the use of technology in business creates a competitive advantage for technology adopters. This was followed by the identification of the research questions and objectives of the study. A theoretical framework was presented to identify how the study is being guided by an existing theory which is the TOE framework. The significance of the study was outlined indicating which fields this study would be beneficial to and indicating how this will be achieved by generating a body of knowledge. Provided information to managers and entrepreneurs on how they can conduct sustainable business practices in a technologically enhanced environment, lastly the overview of the entire study was presented.

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

The study explores the strategic business readiness of managers and entrepreneurs in Ndola, Zambia in response to the Fourth Industrial Revolution. The previous chapter introduced the study. This chapter will review and discuss the concepts surrounding the 4IR and the adoption of technology business. This will be done through the identification of published articles by other researchers on the adoption of technology among entrepreneurs and managers and the identification of gaps that this study will address. Background and history will be presented to aid in the understanding of the 4IR and how it has become to be a phenomenon. This will be followed by how it has had several impacts on different sectors of the globe such as the economy, governments, social impacts and above all businesses. The 4IR era has presented various entities with both opportunities and challenges and this is presented in this chapter on how these can be taken advantage of and hurdled respectively. The study's broad focus is on the concepts of technology adoption and entrepreneurship, and this will also be discussed with a focus on entrepreneurship, specifically in the African context. The Technology Organisation and Environment framework (TOE) is used as a framework for the study and will show how other scholars present this concerning technology adoption among SMEs and other corporate organisations. This will show how corporations and SMEs perceive the 4IR and how entrepreneurs need to approach it to be strategically ready for technology adoption from a business perspective. Lastly, a discussion of the technology adoption among SMEs in Zambia will be presented to understand how they can be strategically ready for the 4IR.

2.2 BACKGROUND HISTORY OF INDUSTRIAL REVOLUTIONS

Before industrial revolutions were documented, human beings focused on improvements in automation and connectivity to strengthen productivity. The first industrial revolution relied on water and steam to attain highly mechanised production levels around about 1760-1850. It began in Europe, where there was a shift from agrarian to urban mechanical production. The mechanized machines included steamships and railways, steam-powered cotton spinners, and the transition from wood to metal (Sutherland, 2020). The second industrial revolution emerged in 1870-1970 and saw the rapid radicalisation of production using electric power for mass production. This shift was led by the United States and saw the introduction of the four-stroke internal combustion engines that were designed and used for air and motor transport (Postelnicu and Câlea 2019). The third industrial revolution began in the 1950s. This revolution was the introduction of information technology and electronics to automate production. These were the advancements in computing and networks, which led to the introduction of innovations through semiconductors, personal mobile devices, photocopying, the internet, and electronic documents (Sutherland, 2020).

These radicalisations led to the fourth industrial revolution; it is built upon the third industrial revolution. The 4IR is believed to be bridging the gap between physical, biological, chemical, and technological spheres (Postelnicu and Câlea 2019). The authors further indicate that it is the potential ability of the 4IR allowing for people to connect through mobile devices, with tremendous processing power, storage capacity, and knowledge access, which are limitless. There are developments in domains like artificial intelligence, robots, the Internet of Things, autonomous cars, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing that will multiply these possibilities.

The 4IR aimed to renovate the work environment by the fusion of biological, physical, and digital units, focusing on remodeling the work environment by the fusion of biological, physical, and digital teams, focusing on organizations and corporate institutions of various sectors. The previous revolutions have all achieved an increase in high productivity and reduced human labour. In multiple ways, the 4IR is not much different from its predecessor. However, there are notable differences, such as electronic and information technology systems. Simultaneously, the third industrial revolution used electronic and Information technology systems, while the 4IR uses cyber-physical techniques as it is equally aimed at changing goods and services by making them more useful. Furthermore, the 4IR allows for the proliferation of

different business models that provide the production and delivery of goods swifter through the collaboration of machines and human labour (Sutherland, 2020).

2.3 IMPACTS OF THE FOURTH INDUSTRIAL REVOLUTION ON VARIOUS GLOBAL SECTORS

Postelnicu and Câlea 2019 propose that the new wave of technology is believed to be having disruptive impacts across the globe in various sectors. This wave has altered how work is conducted in the workplace and people's livelihoods to show how the two correlates with one another. This is evidenced by the vast amount of information that a single individual poses just by the mere fact of having a mobile device. This allows people to communicate more efficiently and faster in a concise space of time.

2.3.1 Economic impacts

Tsekeris (2019) in an article on the challenges of the Fourth Industrial Revolution suggests that technology brought about by advancements through robotics and digital connectivity will have a wide-ranging effect on economies. This is seen through the shift of developed countries' economic activities such as America and Europe, which outsource labour from foreign financial markets and their various centres such as China. An example of this is outsourcing work from India and Pakistan, providing remote related jobs such as software development. This impacts the labour market in the sense that individuals are yet to lose jobs due to connectivity, remote-based jobs, and robotics. It is impacting revenues that are generated through taxes paid by labourers and the labour income.

Poba-Nzaou, Galani, Uwizeyemungu & Ceric (2021) conducted a study about technology at V2.0 and the results showed that 47 % of the advanced economies' jobs are at high risk in the decades to come due to the advancements in robotics and digital connectivity. This, however, affects the labour market in that some jobs will soon become obsolete. There shall be a formation of new workspaces that will require a different set of professionals that need to have the skill set to work with technology (Eberhard, Podio, Alonso, Radovica, Avotina, Peiseniece, and Solé-Pla, 2017). Muntanga et al., (2021) in a study on the implications of the 4IR on mining-dependent countries found that in Zambia specifically in the Copperbelt, the 4IR and new mining technologies will shake labour dynamics in the mining industry.

However, Apostol (2016) in an article on the 4IR and predicting the future to it being reality suggests that to overcome the severity of some of the economic impacts, there is a need to adapt to the technological challenges through education and re-education. This will entail that most higher education institutions should foster technology-based training programs that will

prepare both students and prospective students to participate in technology-based studies to be ready for the technological environment's uncertainties. A study on the implementation of ICT in schools in Zambia found that there is a need for proper resources, policies and support to achieve the education and adoption of ICT in schools (Nyanja and Musonda 2020).

Therefore, it can be understood that the 4IR in the countries that have adopted it, specifically most developed countries are bound to experience economic impacts such as job losses due to the adoption of advanced technologies, however, to combat this there is also need to provide individuals with the skill sets through re-education and this can be an approach that the developing countries can adopt.

2.3.2 Social impacts

Shava and Hofisi (2017) in a study on challenges and opportunities for public administration in the 4IR ascertain that the 4IR will widen the gap of inequality globally and most especially in developing countries predominantly in the African continent. This inequality can be explained through the access to internet-based facilities and technical know-how, as technology is not accessible to every individual across the African continent's developing countries for example Muntanga et al., (2021) in a research on the implications of 4IR in the mining countries found that access to electrification and internet is minimal in the country and only benefits a few. Meanwhile, underdeveloped weaker states are still struggling with the transition from the second and third Industrial Revolutions. The belief is that the perceived benefits of the 4IR will only benefit the elite and those that have access to these facilities. However, to combat such fears and make the 4IR an all-inclusive phenomenon and allow everyone to reap its benefits and opportunities. Governments in Africa, such as South Africa through the Presidential commission program, have embarked on setting up technological hubs and teaching facilities in every province to provide access to every individual (Sutherland,2020).

Tsekeris (2019) in the challenges of the 4IR, suggests that the attributes of the 4IR wholly relying on robotics and digitalization will lead to the dehumanization of some people's socio-economic wellness on the grounds of values, integrity and creativity, innovation, and sensitivity, and finally ethics and reality. The above can destabilize individuals' livelihoods through the fear of job losses due to the implementation of robots in the sectors such as manufacturing. This will impact households' income levels, and income earned will be compromised, which will eventually entail that even leisure and social activities will be brought to a minimum (Shank, DeSanti, and Maninger 2019). However, the skill shortage will create an opportunity for the skilled and able to operate technological machinery, which again

ascertains that there will be a creation of inequality as not all individuals own the necessary skills required (Shava et al., 2017). In a nutshell the access to the internet and the level of development of the adopters of the 4IR need to be ready as they are anticipated social impacts.

2.3.3 Impacts on governments

Roy (2020) in a presentation of what the fourth industrial revolution is, proposed that as the convergence of the physical, biological, and technical spheres continues, the latest technological facilities shall allow citizens to interact with governments. On the other hand, governments shall gain political mileage through the control of populations through the digital organization's surveillance systems and handling. Sutherland (2020) claims that in the light of the 4IR, governments are faced with an enormous burden to recall and align their approach to policy-making matters. This claim is on the ground that the government's ability to make policies is silently undermined due to the availability of competition sources through the distribution and decentralization of power that emerging technologies have brought with it. A study by Mataka and Mungulube (2020) on the Implementation of E-governance at the Road Transport and Safety Agency (RTSA) shows that e-governance provides a means by which service delivery in both private and public institutions is geared toward a more efficient, transparent, accountable and responsive institution. This led to the implementation of the Electronic Zambia Transport Information System (e-ZAMTIS) RTSA.

Therefore, this gives rise to how well the governments can secure the interests of the populations at large. Regulators need to adapt to the evolving environment through a reinvention to understand what it is that they are seeking to control. To achieve this, governments and regulatory agencies need to form collaborative strategies to work hand in hand with business and society.

2.3.4 Impacts on Business

Ślusarczyk (2018) in a study of the 4IR readiness proposes that the 4IR alters production systems and products in their design process, services, and operations. The adoption of this concept presents futuristic consequences for management and jobs by introducing new business models.

Roy (2020) in his conversations with chief executive officers and senior business managers, found that innovation and the speed of the 4IR disruption are tough to understand, and the drivers are very diverse and provide surprises, despite being informed. Technologies that underpin the 4IR are clear evidence that it has an impact on business. The supply side has experienced the introduction of technology platforms that allow for an entirely new way of meeting customers' needs and changing the current value chains. A transition is also occurring

on the demand side because there is growth in the visibility of consumer engagement patterns of consumer behavior. Therefore, organizations are compelled to change the way they design, market, and deliver products and services. The most significant transition trend is developing tech-enhanced platforms that allow for both supply and demand.

2.4 OPPORTUNITIES OF THE FOURTH INDUSTRIAL REVOLUTION

Coleman (2016) claims that 4IR's impact on business and society is highly due to digitalization in business sectors. He further suggests that the introduction of artificial intelligence is closely linked to the improvement of labour efficiency. They shall need to improvise technologies and ultimately create opportunities for those who possess technological skills. Brynjolfsson and McAfee (2015) proposed that companies' managers shall be provided with the new innovative business models that allow minimal scale production that is more efficient and competitive, made possible by less expensive automation and low inputs. Furthermore, this is the appropriate time not to compete with robotic machinery but rather to work to generate collaborative strategies and improve efficiency and reduce human labour. Rossmiller, Lawrence, Clouse, and Looney (2017) proposed that most entrepreneurs' and managers' success can be associated with adopting technology-based systems rather than wholly relying on traditional business operations. Therefore, emphasizing investing in technology skills development for entrepreneurs.

Naudé (2017) in a study on Entrepreneurship, education and the fourth industrial revolution in Africa, proposes that the 4IR encompasses opportunities for African Industrialization. The possibilities include new models of business operations for providing goods and services to consumers. These provide a product in the form of a service, the spreading of a collaborative economy, and digital public services for exports. Naudé (2017) claims that these are among the developing markets in Africa but are probable given Africa's geographical aspect. Furthermore, entrepreneurs and small businesses in Africa may be more competitive and efficient by adopting 4IR technologies.

During the World Economic Forum (2016), it was realized that for governments to reap in this era of the 4IR, they need to embrace digitalization through information and communication technologies (ICT) (Manda & Backhouse., 2017). An example of such an approach in Africa is that of the government of Zambia through the Seventh National Development Plan (7NDP) of 2017 to undertake a policy and legal reform to facilitate and implement the use of ICT across the country to promote a conducive environment of economic growth through ICT among SMEs and entrepreneurs, as they are considered critical drivers of economic development (Mwila & Ngoyi 2019).

2.5 CHALLENGES OF THE FOURTH INDUSTRIAL REVOLUTION

Naudé (2017) suggests that the 4IR is dissimilar from the previous revolutions. Those revolutions experienced the displacement of skilled individuals (Artisans) in high-end manufacturing and replaced them with power looms and placed low skilled workers in engine steam rooms. However, in the 4IR era, there seems to be the replacement of low skilled workers by the higher qualified employees. Therefore, this leads to a critical situation in an economy where highly skilled workers can only participate. This becomes a threat because the world, especially in developing countries, lacks highly qualified individuals. Muntanga et al., (2021) in a study on the implementation of the 4IR technologies in the mines of Zambia suggested that the impact of the 4IR on labour dynamics is inevitable and will be at the expense of jobs. Thus, hundreds of miners that would have worked are replaced by the largest machinery employed - for example, in the new mines in North West Province, Konkola copper mines retrenched more than 1 500 mineworkers as they moved into mechanization.

Nedelkoska and Quintini, G. (2018) institutional report found that an estimation of about 66% of all employment in the developing countries is on the brink of automation. There might be a risk of 50 and 44

% of the current employment being automated in more relatively emerging countries on the African continent.

At the Bloomberg Global Business Forum of 2017, Apple CEO Tim Cook said: "If I were a country leader, my goal would be to monopolize the world's talent." (Fomunyam 2019 p. 278: Leswing 2017). The mission for talent acquisition will lead to a job market that may turn out to be highly segregated. Computers and digitization will replace low skilled and low wage jobs. The high paying jobs will require more skills and will be less likely to be replaced. This increased computerization can lead to an increase in social tensions (Fomunyam 2019). Another addition is the danger of enormous occupation uprooting under the progressing 4IR as there is an assortment of difficulties, for example, online protection, hacking, hazard appraisal, and others (Lambert, 2017). A more elevated level of alert is raised when our lives become broadly associated with different gadgets, from our mobile phones, vehicles, and light changes to our home surveillance cameras and keen speakers. Perhaps the most remarkable pattern in the 2018 consumer gadgets show is that everything is interconnected, and there is no return (Goode, 2018).

Another threat is cybersecurity. Having all systems connected to one network will momentarily increase the level of vulnerability to every given network. With the more connections and

responsibility of connectivity, security systems need to be a top priority (Lambert 2017). Therefore, the 4IR requires more vital and efficient cybersecurity to be able to overcome these threats. Organizations will need to trace and follow up on the risks of essential factors by examining and assessing internal sources, errors caused by humans, disgruntled employees, and sources from outside organizations such as hackers and cyber terrorists (Goode, 2018).

Therefore, the literature provided by other researchers indicates that the 4IR can disrupt the low-income jobs with machinery, however, the higher-paying jobs are also at risk of being shaken and therefore altering the entire labour market across the globe. This calls for the need for the re-skilling of the skilled and others for them to work collaboratively with the new machinery.

2.6 ENTREPRENEURSHIP IN AFRICA

An entrepreneur is an individual seeking creative ways to provide opportunities, through innovation to bring value to customers and their shareholders provided the dynamics in the economic environment change (Dvouletý and Orel 2019). This individual can be seen as the middleman between the capital and labour market to want to convert an idea or invention into a business of success (Chaniago 2020). Entrepreneurship in Africa is differentiated into two platforms, formal and informal entrepreneurship. Sun (2020) found that small-medium enterprises are managed by the sole owners. They exist in the unceremonious sector minimising their chances of growth because they are rarely seeking support from the government and other financial institutions. On the contrary, the formal enterprises in Africa are owned by a group of companies and managed by multinational giants; this situation does not allow for any form of interaction between the two strands of entrepreneurs

Sun (2020) presented that governments do not target indigenous-owned enterprises but instead focused on the state-owned ones. However, unlike these policies other countries such as China have implemented a balancing power system between the governments and entrepreneurs to drive the economy through innovation and entrepreneurship (Mills, 2019).

However, Dvouletý and Orel (2019) argue that despite the relationship between entrepreneurship and growing the economy, makers of policies and governments continuously search for suitable systems that will elicit citizens' entrepreneurial capabilities. It is believed that most of the existing small businesses are not wholly entrepreneurial. With this being the case, most small business owners lack the necessary entrepreneurial traits provided in theory. They, therefore, may not succeed due to competing demands such as skills and resources. Thus,

these individuals' contributions to job creation, economic growth, and tax revenues will be limited.

Eijdenberg and Thompson (2020) in a study on entrepreneurship in sub-Saharan specifically Zambia and Tanzania propose that entrepreneurship's contribution to the economy is determined by the country's level of development. Economies, such as that of Zambia mainly focus on agricultural product production and small-scale manufacturing. Although the self-employment rate is very high, entrepreneurial activities are not based on the creation of new knowledge from innovation, but rather on copycatting existing successful businesses. Further, higher underemployment means that entrepreneurship also remains high. For instance, in Zambia, over 40% of adults are in the process of starting or are already running a new business. Additionally, almost 82% of the Zambian entrepreneurs create employment for others. However, entrepreneurship in these cases is not always based on individual preference, but rather due to limited options.

2.7 ENTREPRENEURSHIP AND TECHNOLOGY

Naudé (2017) believes that entrepreneurship is the biggest driver of the African economy, and therefore, it is essential that policymakers consider the compatibility of 4IR with entrepreneurship. The policymakers need to promote entrepreneurial investigation in an appropriate entrepreneurial eco-system that will help and provide support to all the inefficient firms struggling in the 4IR era. Governments can further consider providing support through entrepreneurial skills and smart governance.

Bailey (2019) proposes that in the African context, countries such as South Africa, Egypt, Kenya, Zambia, and Rwanda are slowly warming up to making policies that support technology-based management and entrepreneurship through the digital transformation of business, governments, and society at large. For example, in South Africa, this can be seen through the presidential commission that began in 1998 with the plan to transform the public service into digital; this policy was implemented and later shown by the government's objective to use information communication and technology (ICT) as a tool for inclusive economic growth. This was manifested in the 2001 e-government policy framework, the 2012 National Development Plan (NDP), and the integrated ICT policy of 2016 (Manda et al.,2017).

A subsequent example is Rwanda's ICT economic development to foster E-Commerce adoption among SMEs. This adoption was done in 2000 when the Rwandan government implemented the ICT policy for growth through a program called the National Information and Communication Infrastructure Program (NICI) (Uwamariya and Loebbecke 2020). Lastly, the

government of Zambia, through its Seventh National development plan (7NDP) of 2017, undertook a policy and legal reform to facilitate and implement the use of ICT (Mwila and Ngoyi 2019).

The majority adopted the phenomenon and are putting in place measures that can enhance sustainable business management for business managers and entrepreneurs to grow their enterprises through technology-enhanced platforms.

A study conducted in South Africa among small-medium enterprises and managers found that there is a need to concentrate more on the latest innovations both theoretically and practically to assess the embracing of technology-related models in the 4IR (Kademeteme and Twinomurinzi, 2019). This showed that small, and medium enterprises do not rely on technology for their business operations but have theoretical knowledge about ICT and technology-based platforms. Most of these managers and entrepreneurs are knowledgeable about the advancements in technology. However, they lack the necessary facilities to prepare and conduct business in such a versatile and dynamic playing field (Kademeteme and Twinomurinzi, 2019).

Bailey (2019) suggested that entrepreneurs need to position themselves to highlight the global changes in dropping costs of computing and robotics and exploit the availability of the latest manufacturing technology.

A practical aspect of such an entrepreneurial opportunity enhanced by the 4IR is Farm Drive. A small financial system was established in Kenya that links small farmers to larger financial institutions using technology. Farm Drive acts as a mediator between small scale farmers and large financial institutions. It is an entrepreneurial innovation that wholly relies on technology for operations. Creditworthy farmers access Farm Drive's platform through their mobile phones, alternative data, and machines to secure financial assistance in the form of loans (Ekekwe, 2017).

Another example is the Implementation of E-governance at the RATSA Ndola Office in Zambia. E-governance has been seen to provide a system for more efficient, transparent, responsible, and responsive service delivery in both corporate and governmental entities. According to a 2019 report in the Zambian Daily Mail, approximately 800,000 new automobiles were registered in 2019, with an estimated 100 vehicles being registered per day. An indicator that great strain is being placed on RTSA services, even though RTSA services have long been centralized in a few places (Mataka & Mungulube 2020).

2.8 TECHNOLOGY ADOPTION

The first use or acceptance of new technology or a new system is referred to as technology adoption. Numerous theories and models, including the technology acceptance model (TAM), the innovation diffusion theory (IDT), the theory of reasoned action (TRA), the Theory of Planned Behaviour (TPB), the technology-organization-environment (TOE), and the unified theory of acceptance and use of technology (UTAUT), help to explain technology adoption (Francisco and Swanson, 2018). Innovative technologies, particularly in the computing discipline, have evolved during the last few decades. As a result, businesses, and organizations rely on technology adoption models and theories to determine whether end users are ready for and accept new technologies. As a result, current technology adoption models and theories must be reviewed to assist business organizations in assessing the readiness and acceptance of these new technologies; otherwise, such initiatives will become obsolete and will no longer support core business processes as intended (Lai, 2017).

Although the adoption of new technology generates opportunities in business by enabling what was previously impossible, it can also cause problems by disrupting the routines and processes of how personnel of a company, such as system users, are accustomed to performing their responsibilities (Sternad, Zabukovšek, Picek, Bobek, Šišovska Klančnik, and Tominc, 2019). Adopted technology is unpredictable, and it may harm an organization in the sense that newly implemented systems may not be used because oftentimes users become accustomed to their old systems and may be hesitant to use the newly adopted system due to the fear of making mistakes (Kankanhalli, 2016). Many studies on technology adoption have sought to identify, predict, and describe variables that influence individuals' and organizations' willingness to embrace and implement technological innovations. As a result, frameworks and conceptual models were created to aid in understanding the relationship between the acceptance behaviour variables.

This study adopted the TOE framework as it involves technology adoption based on the organisation, environment and technology. The reason for this choice is because the study seeks to explore technology adoption from the perspective of the external environment in which the firm exists and the role that the enterprise plays together with existing technology within the firm. Therefore, the TOE is the appropriate framework to guide the study on the grounds of technology adoption (Ali, Shrestha, Osmanaj and Muhammed 2020).

These technology adoption models are briefly described below in the following section:

2.8.1 Technology adoption model

This is a model that suggests that the process of technology adoption is achieved by the end user's perception of technology utility and ease to use, therefore pointing out that the model has two variables that users consider before adopting. A user's attitude toward technology determines the adoption of it and the development of the attitude has mainly alluded to the use and ease of use based on perception (Kamble, Gunasekaran, & Arha, 2019). The limitation of this theory to this study is that it focuses more on individual adoption of technology rather than the enterprise.

2.8.2 Innovation diffusion theory

Innovation diffusion theory can be understood to be innovations that offer benefits, apparent compatibility with current practices and beliefs, minimal complexity, possible trialability, and observability will have a broader and quicker pace of diffusion. As a result, a user's positive behavioural intention to utilize technology is indicated by their perception of technology as a valuable tool that is suitable for their current activities and simple to use (Al-Rahmi, Yahaya, Aldraiweesh, Alamri, Aljarboa, Alturki, and Aljeraiwi, 2019). The limiting factor of this theory to the study is that it focuses more on the adoption of a technology based on the advancement of existing technology.

2.8.3 The theory of reasoned action

The theory of reasoned action is based on social psychology and examines established factors of consciously chosen behaviours like as adoption of a given technology. The theory is asserted that the relative strength of people's attitudes and subjective standards have a direct impact on the degree of their behavioral intentions to do specific activities. The premise that individuals' beliefs about the consequences of a certain activity have a significant impact on their attitudes and perceptions, and hence their desire to conduct that behavior, is a crucial basis of the TRA (Damerji, 2020). The limitation of the theory to this study is that it associates technology adoption based on what technology can provide and technology adoption for the enterprise and the environment in which the firm exists in.

2.8.4 Theory of planned behavior

The TPB is a TRA extension that provides a complete framework for studying consumer behavior. The TPB's immediate antecedent is the intention, which can be decided by consideration of beliefs. The first word is behavioral beliefs, which are defined as the perception of a good or bad consequence as a result of behavioral execution. The second word

is normative beliefs, and the third is control beliefs, which relate to the perception of the presence of circumstances that impact a person's capacity to perform (Lestari, 2019).

2.8.5 The unified theory of acceptance and use of technology

UTAUT is a sophisticated model intended to better understand the elements that drive technology adoption. UTAUT is one of the most widely used frameworks in the field of technology acceptance models. The UTAUT is an abbreviation for the TAM. A variety of theoretical models have been developed and utilized to measure technology acceptability per service. UTAUT is the outcome of eight models working together. The UTAUT incorporates models such as Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Models (TAM), and Motivational Models (MM). The four factors that are direct predictors of acceptance and use behaviour are Social Influence (SI), Effort Expectancy (EE), Facilitating Conditions (FC), and Performance Expectancy (PE) (Gunawan, Sinaga, and WP 2019). The limitation of the UTAUT theory to the study is that it encompasses both the TAM and TRA that both do not focus on the enterprise environment and organisation but rather the individual perceptions and beliefs.

2.9 THE TECHNOLOGY, ORGANIZATION AND ENVIRONMENT FRAMEWORK (TOE)

Tornatzky and Fleischer developed the TOE framework in 1990. The TOE theory involves the enterprise, while other approaches such as the Technology adoption model (TAM) and the idea of planned behaviour (TPB) involve adopting technology at the individual levels. This TOE framework encompasses three aspects of an enterprise's context that impact the process in which technology is adopted and implemented. These include the technological, organisational, and environmental elements (Gui et al., 2020). The aspect of technology explains the internal and external contexts of the enterprise; the organizational part explains the measures of the organisation, such as the size, scope, and organizational structures. The environmental aspect focuses on the range in which the firm is situated and conducts its business. These include the industry, the competitors, and its affiliation with competitors (Cruz-Jesus et al., 2019).

Sin and Sin (2020) in research conducted on technology adoption among small-medium enterprises, employed the TOE frameworks to assess the adoption of ERP solutions, which proposed that the adoption of these is more inclined to technology rather than organizational and environmental factors. Van Zyl, Henning and van der Poll (2020) suggest that firms and SMEs cannot afford to ignore the rapid dynamic changes in technology. Technology adoption is compelling if at all, they seek to create a competitive advantage through intensive adoption

of the technology in the 4IR. Further suggests that technology is a very cardinal source of innovation and is a crucial player in-market success. Small businesses must benefit from the 4IR because they are most businesses in growing the economies around the world.

2.9.1 Technology

Paramita (2019) propose that the technological aspect refers to how the organization perceives the adoption of the 4IR. These benefits are accepting a competitive advantage that technology adoption provides and the managerial understanding of technology adoption through the company's allocation of resources. This resonates with the readiness of the top management and support provision towards technology adoption. Technology readiness is understood to be the level at which an organization or firm can exploit and derive the benefits of technology. The compatibility resonates with the length to which the 4IR is appropriate with the technological infrastructure that the organization holds, such as the culture, values, and practices of work. Technological innovation can quickly be adopted for business if, the organizational culture is in alignment with the costs. Sin and Sin (2020) ascertain that a change in an organization or enterprise is bound to generate resistance. However, if the culture, values, and practices are in sync, then there is a high possibility of achieving innovation through technology adoption. They further suggest that the availability of technological factors, both internal and external such as resources, infrastructure, specialized skills, and technical know-how, present a competitive advantage over rivalries. Therefore, an enterprise that has a complicated but reliable technology and financial backing is more likely to adopt the 4IR for business.

2.9.2 Organization

This aspect of the TOE framework proposes the internal characteristics that enhance the adoption of technology; these internal facets include the management styles, employees, and the kinds of services and products that are provided (Chiu, Chen, and Chen, 2017). Adoption of technology can be studied from an individual level and the organizational level. Most technology readiness from the organization's perspective is believed to be adopted on the ground that they enhance competitiveness and provide maintenance of resources efficiently (Alsheibani, Cheung, and Messom, 2018). In research conducted by Chiu et al. (2017) on the adoption of cloud computing, it was found that technology adoption has a significant likelihood of being adopted if higher-level executives support the initiative. On the contrary, Jere and Ngidi (2020) proposed that for innovation to be achieved and adopted in the organization, management attitudes and behavior's need to be that which disseminate information about technology and designs and make it part of the organizational strategy, placing emphasis on

the importance of creativity to the employees and lastly providing the incentives for creative initiatives. Furthermore, the abundance of resources plays a significant determining role in innovation adoption in the organization. These resources are referring to adequate capital, human resources, and the will to meet the demands that come with it. Financial capital is a prerequisite to support the ongoing costs that are incurred during technological innovation adoption. Therefore, enough money must be available in the organization to reduce financial glitches in the process of adoption and implementation of the tech innovations (Jere and Ngidi 2020).

2.9.3 Environment

The environmental aspect of the TOE comprises the industry in which the enterprise or organization is in and the kind of structure of this industry. Does the sector display the presence or absence of technology service provision? The existence of firms that are more dominant in the industry often tends to impact smaller firms. Factors from outside the firm exert an impact on the decision to use technology both directly and indirectly. Technology factors, including relative advantage, and compatibility can positively influence new technology adoption. Competitive pressure and government regulatory issues are the main environmental factors that can affect innovation adoption (Usman, Ahmad and Zakaria 2019)

Jere and Ngidi (2020) propose that pressure from competitors, social-cultural issues, support from the government, and the firm's technological infrastructure all play an impactive role in adoption. In an attempt to understand mobile marketing technology adoption among South African SMEs, the authors further describe the firm's environment to be at the center (macro) area that an organisation carries out its business and consists of competitors and the governments. Identifying the top managerial team's support, the size of the organisation, some external pressure and competition as cardinal determinants of technology adoption among SMEs'. AlSharji, Ahmad and Bakar (2018), in a study of social media adoption among SMEs proposed that one relevant factor is the threat of losing a competition or competition intensity. Adoption of innovation enables a firm to alter its industry structure, meaning that it will change the competitive rules, generate a new non-existent game, and create new ways to outperform the competitors. These propositions are not restricted to social media adoption but can also be applied to technology adoption and be used to define organizational strategies that will allow a firm to respond to competition.

The TOE framework will assist the study in attaining the objectives based on the 3 factors that the theory involves. The 4IR and technology adoption is anticipated to provide a competitive advantage to technology adopters in business and present opportunities to early adopters

therefore the adoption of the TOE framework will assist in the creation of a benchmark on which to answer the research questions of this study.

2.10 SMALL-MEDIUM ENTERPRISE PERCEPTIONS OF THE FOURTH INDUSTRIAL REVOLUTION

SMEs have various characteristics and sizes. However, they are much smaller than large enterprise organisations, and this can be used as one key aspect when considering their readiness, perceptions, and practices towards the 4IR. SMEs have fewer resources and minimal managerial experience in technologies, the involvement of top management in operations, and less focus on strategically oriented activities (Stentoft, Jensen, Philipsen and Haug, 2019).

Scholars such as Bakhshi, Downing, Osborne and Schneider (2017) argue that about the 4IR, less emphasis is placed on SMEs' interest in the application of the 4IR technologies, showing that larger organizations have more inclinations toward the 4IR rendering them ready. Interestingly there is a very low readiness and adoption of the 4IR among SMEs compared to larger organisations. However, the current state of 4IR adoption among SMEs is likely to progress over the coming years as practical aspects are being put in place by larger organizations and as more innovative SMEs begin to adopt the technologies for operations.
Stentoft et al. (2019) suggest that the 4IR barriers minimize the SMEs' preparedness and readiness; however, this does not show any significant correlation with the practice of 4IR for business. Therefore, the barriers act as an inhibitor but do not impact the practical utility of the technology. Furthermore, the drivers of the 4IR foster the SMEs to use technology, partly by maximizing their readiness through motivation, competence, and organizational support. The low degree of enthusiasm among SMEs may indicate an existing potential for innovative business models that can be explored provided the 4IR is adopted. SMEs are more focused on operational activities that are reliant on business development activities. Therefore, other SMEs may perceive the adoption of 4IR to be presenting more potential benefits due to the mere focus of their daily enterprise operations. In contrast, others will be skeptical about the adoption because they still doubt the perceived benefits, which reduce their overall readiness.
McKinsey (2017) in a study about ‘A future that works: Automation, employment and productivity shows that most SMEs are fully aware and ready to adopt the 4IR for business.’ Policymakers such as the governments at the national level must provide support by increasing the knowledge lead that will ultimately provide awareness of the practical application pull on the opportunities that come with the technology adoption push.

2.11 TECHNOLOGY ADOPTION OF SMEs IN AFRICA

Ogujiuba and Boshoff (2020) in a study conducted in post-apartheid South Africa on entrepreneurial sustainability found that governments across the world are promoting SMEs to adopt technology for business and South Africa shows the majority of SMEs are confident and ready to embrace technology due to the benefits that the technology provides. Despite the skills deficit that exist among black-owned enterprises and business, the government of South Africa through the presidential commission has set up programmes that foster the education of business owners about technology use. This support that the governments provide comes at national and regional levels, providing skill upgrades and capacity building.

The results from a study on organisational adoption of technology specifically SMEs show that technology adoption is significantly influenced by the level of compatibility, with most business owners offering that they seek to assess the opportunities that the technology provides. This is through the assessment of technology and compatibility with the firm's existing systems, highlighting the need to integrate technology into the enterprise. Otherwise, they would be reluctant to adopt it (Molinillo et al., 2017). Another critical factor for technology adoption is the perceived relative advantage; enterprises use technology if only they see the performance gap and need to explore business opportunities. The results from a study showed that firms have a broad spectrum of adopting technology if at all, it fosters the performance enhancement and inter-firm exchange and participation in the supply chain. An example of this is the vivid communication between SMEs and the South African Revenue Authority (SARS) (Mudzamba 2019).

The government of Cameroon and other development agencies in the country have been promoting the adoption of technology among SMEs, to increase the growth of the economy in a country with low income. This is because SMEs are seen to be the drivers of the country's economic growth. A study found that the adoption of technology in the country is slow and is a primary limitation. This is because communities that are poor wholly rely on communication through word of mouth and face to face, therefore for entrepreneurs and business owners to attain the technology adoption and it is accepted in these communities, they need to use telecentres (Ntwoku, Negash and Meso, 2017).

2.12 TECHNOLOGY ADOPTION BY SMEs

SMEs can explore the global market opportunities faster and more effectively. Technology adoption allows for enterprises to be more competitive, therefore allowing SMEs to improve their operational efficiency and foster business growth. Technology adoption further allows larger organizations to be able to minimize the processing of information and communication costs that are incurred by management, making managers be able to monitor a larger number of employees (Molinillo and Japutra 2017)

Research conducted by Ezzaouia and Bulchand-Gidumal (2020) on technology adoption in the hotel industry using a TOE framework among small businesses found that there is a substantial difference between adopters and non-adopter enterprises: the adopters consider that technology adoption provides higher benefits, less financial costs, increased technological competence, more government pressure, and less industrial pressure than non- adopters.

Molinoli et al.,2017 suggest that the adoption of technology by SMEs in the United Kingdom is most influenced by technological and organizational factors rather than environmental factors. This follows an adoption model designed to see how SMEs adopt the enterprise application systems such as Enterprise Resource Planning (ERP), and e-procurement. They further argue, however, that the possibility to adopt these applications is greater when perceived by the management's support and largely reliant on organizational readiness. To also explore the factors that have an influence on technology adoption using the TOE framework Ezzaouia and Bulchand-Gidumal (2020) used the use of enterprise application systems among SMEs to predict technology adoption. The results showed that the TOE model is a crucial predictor in the adoption of enterprise application systems due to its factors (Technology, Organisation and Environment) among SMEs'. Another study by Cruz-Jesus et al., (2019) of SMEs' adoption of cloud computing found that the adoption of the TOE is based on the influence of relative advantage over competitors, innovativeness, supplier efforts, market scope, top management support and compatibility. However, the researchers disagree and did not find any evidence that the pressure from competition plays a massive role in technology adoption but rather allude it entirely to the TOE framework.

2.13 TECHNOLOGY ADOPTION AMONG SMES IN ZAMBIA

Theories of economics suggest that the diffusion of technology has a significant impact on the growth of the economy and development. The vast changes have a considerable effect on economic progress (Tang and Konde, 2020). Zambia like most of most African countries is categorised to be a developing country with most of its sectors still growing. Therefore, Zambia, as an emerging economy, has decided to implement policies that support economic growth through the 7th National Development Plan with a focus on social-economic development and the uses of technology (Mwila et al., 2019). The government based this on the fact that SMEs account for 60-70 % of economic growth in developing countries according to the Organization for Economic Co-operation and Development (OECD) (OECD, 2017). A study conducted by Tang and Konde (2020), on the different uses of technology among SMEs in Zambia shows that firm characteristics have a huge bearing on the influence of three factors of technology used for business these include: network and information access, transaction and online purchases, and business in house operations.

With regards to technology readiness, Zambia adopted the national technology policy in the year 2007 and is focused on a set vision of being transformed into a knowledge-based society and economical support through consistent pervasive access to technology by individuals of the country by the year 2030. Access to technology for both rural and urban areas has improved over the past 10 years and this is due to market liberalization. Service provision is competitive among 3 technology giants Zamtel, Airtel and MTN the coverage provision and quality have driven down prices. However, SMEs in Zambia face a huge barrier to accessing and increasing the use of technology. Zambia ranked 116th out of 139 countries in the latest technology report (World Economic Forum, 2016). Prices of mobile broadband and fixed broadband maintain a high in comparison to other top performing countries in Africa. Therefore, in the context of business, technology use among entrepreneurs and large firms tends to vary significantly (ITU, 2017).

Tang et al, (2020) in their research on technology adoption in Zambia suggest that there is a need to redefine the uses of technology given the drastic changes and its uncertainty. Giving an example of e-commerce in Zambia among SMEs', they noted that it is seen to be a more complex use of technology rather than a portal of access to information and communication. However, the availability of wide-reaching user-friendly e-commerce platforms in Zambia has allowed for the carrying out of online transactions a lesser complicated activity among SMEs and entrepreneurs rather than the management of a personal website for online information

provision. Furthermore, the search for information utility requires more speciality and skills for sophisticated business intelligence systems and at the same time the implementation of external third-party software for internal business operations such as accounting and sales. In this light, the authors suggest a distinction between basic and complicated use of technology is more determined by the type of use of technology and its alignment to the enterprise or firm's business strategic plans.

The significance of entrepreneurial enterprises in creating jobs and fostering economic growth, makers of policies need to improve the infrastructure and services that promote technology use among SMEs with a focus on firms that have attributes that are of improving national priorities (Mwila et al, 2017). For example, the transactions made online, and interaction is more significant to firms whose objective is growth-oriented. Tang et al., (2020) argue that the promotion of the use of technology in such a way as online payments, and direct sales to customers and suppliers may equally favor growth-oriented SMEs and other firms. In Zambia specifically, these efforts can be seen through the cashless payments introduced such as the e-voucher payment system between farmers and input suppliers (Paymal,2018), as well as the Zambia national Farmers union that makes use of online platforms for transportation and pricing in the market for the commodities. These services have aided in the reduction of costs, risks and improvement of value chain efficiency.

The above entails that SMEs are reluctant to adopt technology if they are not growth-oriented and their objectives are not aligned with national priorities in Zambia. However, in an attempt to foster technology use and prepare entrepreneurial readiness for adoption, efforts are devoted to developing awareness and improving security to grow trust in SMEs and build confidence in the broader business. The initial E-commerce Expo held in 2018 in Zambia served to be an example however the expo seemed to only have targeted larger firms other than smaller firms such as entrepreneurial enterprises. Therefore, to enhance readiness and adoption of technology for small firms' policymakers need to provide awareness programs similar to those of larger firms.

2.14 CONCLUSION

In this chapter, the 4IR as a phenomenon was reviewed from a global perspective. The focus was on entrepreneurs and managers and how they have adopted the use of technology. This was discussed on the grounds of technology adoption for business, as research shows that adopters are presented with opportunities for both managers and entrepreneurs. The chapter briefly explained the industrial revolutions and how the 4IR became a phenomenon.

The 4IR effects are different in sectors of the globe with both threats and opportunities which were discussed in this chapter highlighting some of the risks of job losses in the manufacturing industries as human labour is being replaced with robots, but this threat is being combated through the collaboration of human effort and robotics with an attempt to reduce human labour and increase production. Therefore, allowing for skilled individuals to operate and work side by side with Artificial intelligence. Scholars argue that this is the perfect time to work collaboratively with robotics.

The chapter discussed the opportunities and challenges of the 4IR highlighting how the adoption of technology influences business operations and when used as a tool for competitive advantage. For this study, detailed interest was focused on entrepreneurs and managers and the adoption of technology for business. Scholars proposed a correlation between technology and entrepreneurship existed. Therefore, there is a need to position themselves in a place that will allow for technology adoption to benefit from the opportunities that the 4IR presents. Alteration of business models that provides a competitive edge over new entrants. To explore the opportunities that the 4IR presents for business among entrepreneurs and managers the study adopted the TOE framework to seek to explore the correlation further and gain a deeper understanding. The chapter provided a brief description of the other technology adoption theories and indicated why the TOE is the most suitable for this study.

Most entrepreneurs in Africa are slowly warming up to the notion and adoption of technology for management and entrepreneurship. This is evidenced in the inclusion of technology-based learning and adoption strategies by government policies across most African Countries. Therefore, scholars suggested that to exhaust the opportunities of the 4IR, managers and entrepreneurs need to consider the alignment of the business and operations with the 4IR technologies to benefit from the opportunities of that technology presents and overall have a competitive advantage through innovative ways of provision of goods and services.

CHAPTER 3 RESEARCH METHODOLOGY

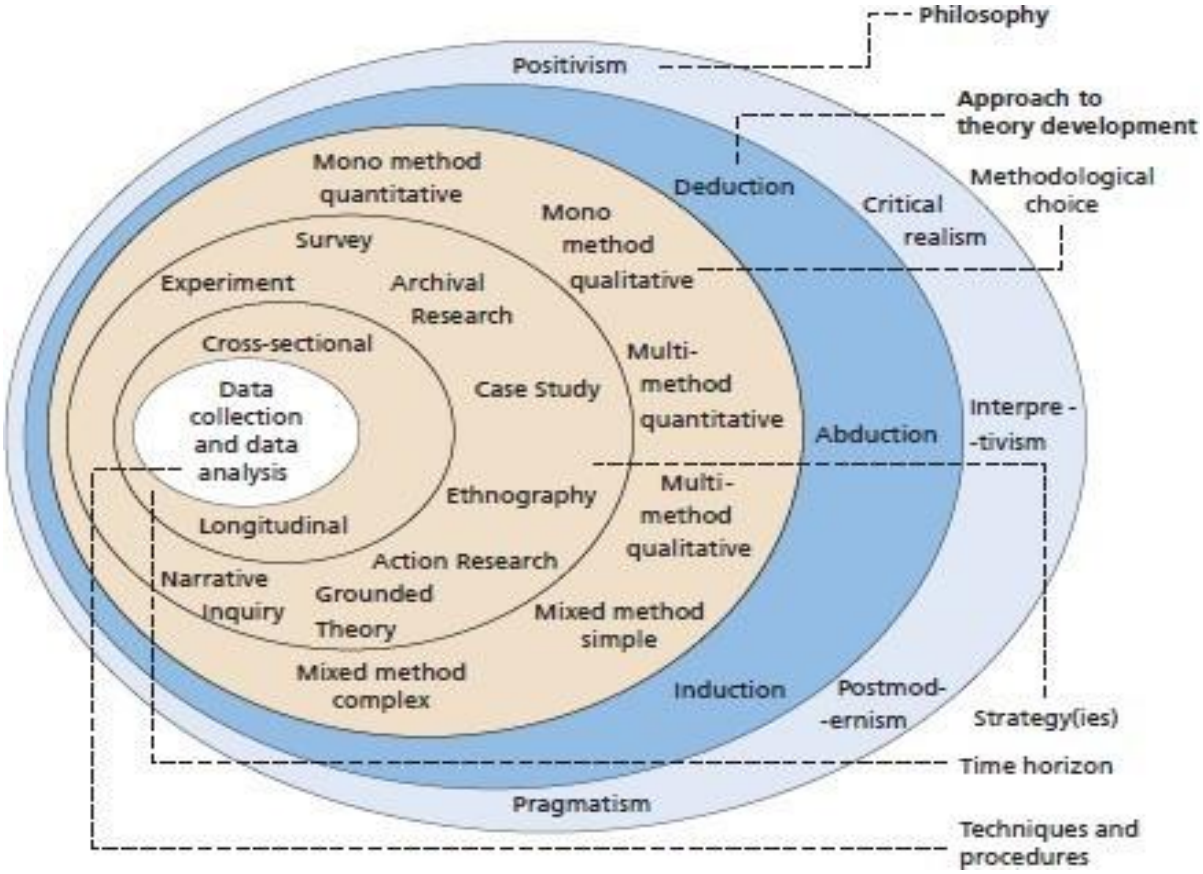
3.1 INTRODUCTION

The previous chapter presented the literature around the broad topic of study. This chapter presents the research methodology that was used to execute the study. The chapter set out by defining a research methodology and the research onion framework that guided this study as adopted by (Saunders, Lewis & Thornhill, 2016). The research onion provided the research philosophy, the research approach, the research methods, the sampling methods and strategies. It further on identifies the methods and strategies suitable for the study as per the research questions and objectives. The various data collection methods were presented, and the researcher identified the instruments and justified the reasons for the selected methods based on the nature of the study. The researcher outlined the steps involved in the data analysis process in line with the research methods. The researcher further discussed the techniques used in the data quality control and the ethical clearance guidelines that were followed.

3.2 RESEARCH METHODOLOGY

A research methodology is an orderly method used by a researcher to investigate a research problem (Khotari, 2017). The research processes that the researcher used for this study were guided by Saunders' research onion framework. A research framework is a description that outlines and describes all the layers to use during a research process (Saunders et al, 2016). The research onion consists of six layers: the research philosophy, research approach, research of these layers was used in the study and will further be explained. Methods, research strategies, research time horizon, research techniques and procedures. Each of these layers was used in the study and will be further explained. In the figure 3.1 on the next page.

Figure 3. 1 Research onion



3.3 THE NATURE OF THE STUDY

There exist three kinds of research types exploratory, explanatory and descriptive. Exploratory research is a study in which minimal knowledge about a phenomenon is available for investigation. In contrast, the descriptive analysis seeks to describe the concepts made available in the field of interest to the researcher. Explanatory research aims to test if the ideas or variables have a causal effect on one another (Saunders et al.,2016).

The nature of this study was exploratory as the researcher sought to explore the aspects of technology adoption among entrepreneurs and managers, and how they are making use of technology for business operations. The information available based on the literature shows that technology adoption is a slowly growing trend therefore this study sort to gather more information to discover relationships that exist between technology and business. According to Hair, Page, and Brunsveld (2019) in essentials of business research methods, they allude that exploratory studies are suitable for high innovative technological industries, the research does not only discover new relationships but also seeks to address the applied business needs.

According to Sekaran and Bougie (2016), the main objective of an exploratory study is to generate a deeper understanding of the situation provided there is limited to no information readily available. This

research does not seek to bring together conclusive results but aims to explore the research problem in depth (Saunders et al., 2016). Exploratory research is the first step that forms the core of more conclusive research as it tends to attend to arising problems that have little or no previous research done (Khotari, 2017). The exploratory research design aided the researcher in exploring technology adoption for business among entrepreneurs and managers of Ndola Zambia in the Fourth Industrial Revolution era.

3.4 THE RESEARCH PHILOSOPHY

The research philosophy (research paradigm) is a system of beliefs and assumptions on developing knowledge. Research philosophy entails the detailed research processes in developing proficiency in a field (Saunders et al., 2016). A research paradigm describes the world's view through the lens of beliefs and philosophical assumptions about the nature of social reality. These are assumptions that are encountered in realities during the process of the research (Ontology), the speculation about knowledge from humans (Epistemology) and the premise of personal beliefs, values and how they can affect your research (Axiology). These three assumptions have a bearing on the process of the study, the methodology and the interpretation of findings research in general (Burrell and Morgan 2017).

There are various philosophical approaches in research; however, in the business and management fields, the focus is only on five (5) methods: Interpretivism, critical realism, positivism, pragmatism, and postmodernism (Saunders et al., 2016).

3.4.1 Positivism

A positivist approach is wholly based on realism, believing that the world is accurate and that many can be discovered about the realities (Walliman, 2017). Positivism displays the philosophical stance of natural scientists and details the use of observing the social reality to generate laws of generalisation and replicating their research. Positivists emphasise scientific methods to produce clean data and non-human influenced facts for interpretation (Sunders et al., 2016). According to positivists, the world revolves around the laws of cause and effect that can be understood and distinguished with scientific approaches. They use deductive reasoning and propose theories that can be tested by a research design with objective measures. The central aspect is to observe and manipulate to establish the cause and effect relationship. This approach is viewed as a quantitative approach (Sekaran and Bougie, 2016).

3.4.2 Interpretivism

This approach relies on ideas, emphasising that the world exists, and people view it differently (Walliman, 2017). Interpretivism criticises positivism based on objective truth but instead has an opposite view that the world is mentally and fundamentally constructed. Therefore,

interpretivism seeks to understand the rules that govern the people and how they try to make sense of the world through the investigation of the happenings in people's minds. This argument is based on the belief that people are from different cultural backgrounds and perceive the world differently (Sekaran et al., 2016). Interpretivist research aims to generate a new and profound understanding for interpretation of the social world in context. Given business and managers, this can be understood as researchers seeking new perspectives from employees at the various organisational levels, and interpretivism is often used for qualitative research approaches (Saunders et al., 2016).

3.4.3 Critical realism

This approach can explain the world's experiences and what is seen on the grounds of the structures that shape the observed events. Critical realism is based on reasoning critically (Walliman, 2016). Critical realism exists as a mere intermediary viewpoint between the positivist and interpretive approaches. The essential realists can understand the world with certainty. Their perspectives argue that measuring feelings and attitudes is often subjective, and data collection is flawed (Sekaran et al., 2016). Therefore, critical realism is used to describe a boundary between natural and social worlds; researchers need to use the triangulation process to yield better results during the investigation of a subject. Critical realism is often used to approach mixed methods studies (Saunders et al., 2016).

3.4.4 Postmodernism

This approach emphasises the purpose of language and authority, seeking the accepted ways of thought and providing communication to various marginalised views. It is characterised by insolence towards the social world with the current historical development, with the belief that there does not exist an abstract way of establishing what is the "right" or "true" form of the description of the world, as there is no social hierarchy other than that which is given through languages (Saunders et al.,2016). Researchers of postmodernism seek to explore and expose the relations of authority by dominant realities. The goal is to change the currently established ways of thinking and give way to the suppressed and marginalised ways of knowing that have been ultimately excluded (Walliman, 2016). The postmodernism approach is often seen as appropriate for qualitative study (Saunders et al., 2016).

3.4.5 Pragmatism

This is a philosophical approach that appraises the beliefs and theories on the grounds of accomplishing the theoretical application (Sekaran et al., 2016). Pragmatic research begins with a problem to find practical solutions that will provide information for future practice. The focus

on pragmatics is more on the beneficial outcome than abstract distinctions (Walliman, 2016). Pragmatists emphasise the relations between practice and theory; researchers who generally use this approach are associated with quantitative and qualitative studies (Saunders et al., 2016). To select an appropriate research philosophy for this study, several factors were taken into consideration. These may include but are not limited to the nature of reality, knowledge systems, ethical principles, literature, and the characteristics and beliefs of the interpretive philosophy. Interpretivism was adopted for this research in that the study aims to provide insights on how to understand and interpret the social world in the context of technology adoption for business. Considering the current study, the researcher seeks to explore and understand managers' and entrepreneurs' adoption of technology for business in the 4IR. This was achieved by attempting to interpret how business is conducted in the era of technology adoption from the standpoint of entrepreneurs and managers. This inquest comes in through the findings that adopting technology for business, research shows that the 4IR creates opportunities and presents a competitive advantage to those that embrace the technology (Postelnicu and Câlea 2019).

3.5 RESEARCH APPROACH

The research approach is the second layer of the research onion. The research approach comprises the procedures and plans that detail data collection methods, analysis, and interpretation (Saunders et al.,2016). The research onion identifies the three main approaches, and these are deductive, inductive and abductive approaches.

3.5.1 Deduction

A deductive approach can be understood as inferring from the general aspect and narrowing it down to a more specific law (Walliman, 2016). This approach uses a theory(available) to test a hypothesis (typical). This is narrowed down through observations and later analysis for research purposes, ultimately providing room to accept or reject the original theory, therefore being called the theory testing approach (Sekaran and Bougie, 2016). This approach is often used in quantitative studies (Saunders et al., 2016).

3.5.2 Induction

This approach functions conversely by inferring from the specific to a more general aspect by assessing the latter and making conclusions (Sekaran et al., 2016). In this approach, data collected is used to discover phenomena, establish themes, and develop a conceptual

framework (Saunders et al., 2016). This approach is often used in qualitative studies and is referred to as theory generation and building (Walliman, 2016).

3.5.3 Abduction

This approach does not rely on general to specific or specific to available but instead on moving from general to particular and vice versa. This entails that adoption of this approach requires the use of both deductive and inductive approaches. Abduction commences with the help of observation to explain the observation findings in the simplest terms (Saunders et al., 2016). Abductive techniques are used to explore phenomena through data collection, identification of themes and location of a conceptual framework that is used to test the sub sequentially data collected, this is also called theory modification or generation as it may also seek to incorporate existing theory if needed be (Sekaran and Bougie 2016).

A research approach is critical to the research process as it significantly impacts the research design. Therefore, it is essential to select this carefully. By making inferences from the minimal to the majority through generalisation. The collected data was used to build on the existing theory of technology adoption being able to create opportunities for managers and entrepreneurs in the 4IR.

3.6 RESEARCH METHODS

The third layer in the research onion is the methodology approach. There are three most used research methods. These are quantitative, qualitative, and mixed methods approach (Saunders et al.,2016).

3.6.1 Quantitative method

Sekaran et al. (2016) suggest that quantitative research approaches are used to test pre-existing claims by examining the relationship among the variables. The variables are often calculated on an instrument, and the results are later analysed using statistics. Creswell and Creswell (2017) define a quantitative approach as wholly relying on numeric data and numbers in the data collection process that is then interpreted in descriptive statistics in response to research questions. The quantitative approach design aims to summarise the information about the studied phenomena and later generalise it to the entire population (Rahman, 2016). A quantitative study is associated with the adoption of positivism and a deductive approach. The employment of a single data collection technique like a questionnaire with corresponding

quantitative analytical procedures (mono method) or using more than one data collection technique (multi-method quantitative study) (Saunders et al.,2016).

3.6.2 Qualitative method

Creswell and Creswell (2017) define a qualitative approach as an approach implemented to comprehend a group or individual and why they ascribe to a phenomenon. Sekaran et al. (2016) assert that the qualitative data approach involves collecting data in the form of words; these include notes collected from interviews, responses from questions, recordings, articles and the internet. This data can be collected both from primary and secondary sources. The qualitative data analysis is done to determine the compelling interpretations from the large amount of data collected. This approach is used with the interpretivism philosophy and inductive methods. Researchers often use single data collection techniques, like structured interviews. This is known as a mono-method in qualitative studies. They can use more than one collection technique, known as the multi-method qualitative study (Saunders et al., 2016).

3.6.3 Mixed method

According to Creswell and Creswell (2017), the mixed-methods approach is an inquiry that uses the collection of qualitative and quantitative data and further integrates them to explain a specific theoretical framework that either of the two cannot explain sufficiently alone. The data collection process in this approach is collected in two separate phases. The qualitative data is quantified to explain the responses collected and inform the quantitative data (Creswell et al., 2017). The mixed-methods approach often uses critical realism or pragmatic philosophical approaches and may use either deductive, abductive or inductive approaches to developing a theory. These combinations are called complex mixed methods (Saunders et al.,2016).

The choice of methodology is characterised by different factors such as the nature of research and the research problem (Creswell et al.,2016). This study adopted a qualitative method, precisely a mono qualitative approach to research. The reason for this choice is that the study context is centred around a constantly evolving phenomenon and there is a need to gather information for further understanding to clarify the relationship between patterns and themes (Hair et al., 2019). According to research by Suhartanto and Leo (2018) in which the researchers aimed to understand the small business resistance to technology adoption. The results showed that the use of qualitative methods for data collection is suitable as they seek to gather more

insights into the research context, furthermore, it is appropriate in that they adopted a technology adoption framework. With regards to this study, the process was selected to explore the technology adoption for business in the 4IR and determine the opportunities that the adoption of technology for business presents to managers and entrepreneurs.

3.7 STUDY SITE

The study was conducted in Ndola, in the Copperbelt province of Zambia. The choice of these sites is that the town has diverse entrepreneurial activities and currently, entrepreneurship is among the growth drivers of the Zambian economy**.** According to the Ndola Chamber of Commerce (2019), Ndola is the largest city on the Copperbelt and holds the highest number of small business enterprises**.**

3.8 SAMPLING DESIGN

Sampling is the procedure in which samples are selected from the population to represent the entire population (Sekaran et al., 2016). The sampling design process comprises clearly defining the target population, selecting a sampling frame, selecting the research method and establishing the sample size (Hair et al., 2016).

3.8.1 Target population

Target population can be understood to be a group of people that are to be used to conduct a research on and draw conclusions from (Khotari,2017). It is critical to understand the people, geographical location and demography of the selection. Therefore, the researcher carefully selects the target population to reduce the cost of research and save time (Sekaran et al.,2016). It is critical to consider the research objectives and the problem when selecting the study's target population (Hair et al., 2016). Additional factors to be considered are practical aspects such as participants' availability, the amount of knowledge that the researcher has on the topic, access to the participants and the time frame of the study. This study's target population includes managers and entrepreneurs from Ndola in the Copperbelt province. According to the Patents of Registration Companies Agency (PACRA), there are a total of 7895 registered entities in Ndola (PACRA,2020).

3.8.2 Sampling frame

The sampling frame is a list that includes all the elements in the target population range on which the sample size is ultimately generated (Hair et al.,2016). The sampling frame of this research was extracted from PACRA database that showed a list of 7895 companies that were

registered.

3.8.3 Data saturation

Saturation is defined as a point in which no additional data is extracted from the participants in a qualitative study and therefore rendering what has already been collected redundant. This often occurs in an investigation when the researcher employs interviews as a method of data collection (Fusch and Ness 2015). According to Weller, Vickers, Bernard, Blackburn, Borgatti, Gravlee, & Johnson (2018) saturation can be reached when there are no new insights provided by participants. They further point out that the objective of qualitative research is not to gather all the data available but rather to collect the necessary themes and ideas. Saturation is practical to non-probability sampling, which is mainly used in qualitative research. This is a cardinal aspect as it is an indicator of data validity and can be used as criteria to measure the quality of the study (Hennink and Kaiser, 2020)

No particular figure to be placed on interviews in a qualitative study would indicate that saturation can be reached. Fusch et al., (2015). Guest, Bunce, & Johnson, (2006) found that saturation was reached between seven (7) to twelve (12) interviews with the most needed themes and ideas present between interviews one (1) and six (6), to further strengthen this justification of these findings these concurred with those of Namey, Guest, McKenna and Chen (2016). They established that saturation was reached between eight (8) and sixteen (16) interviews in their study.

Instead, a data collector may take what they can be dependent on the needed ideas and themes (Hennink et al., 2020). Fusch et al. (2015) emphasise that for saturation to be reached, the interview questions need to be structured the same for every Participantand, to an extent, may involve participants that would not be measured.

Many factors affect the sample size in a qualitative study. These include the design of the research, the traits in the target population, the analysis approach and the resources available (Hennink, Kaiser, & Marconi, 2017). Nonetheless, the most common and recommended offer by researchers and scholars is saturation. Saturation is further used as a pointer to operative sample size (Morse, 2015).

Regarding this study, the researcher reached a point of no new ideas and information being added after conducting 23 interviews, in which the data became more repetitive. Therefore, it

was noticed that saturation would be used to generate the required codes, themes, and ideas for data analysis. However, to further check for saturation and more clarity, another data set consisting of 17 participants was interviewed and this equally did not yield any new information, this was yet another indication that saturation was reached and therefore the study incorporated a total of 40 participants. The reason for adding an extra 17 participants is because, the initial set identified the cardinal pertinent themes and codes for the study, however for this study that was not enough to conclude that saturation had been reached therefore the addition of another 17 participants. Hennink and Kaiser (2017), in a study of code saturation and meaning saturation to establish how many interviews are enough in qualitative research based on themes and ideas, found that saturation was reached after conducting at least nine (9) interviews which contributed approximately 53% of the new codes and themes required, with an additional two interviews leading to the 75%.

3.8.4 Sample size

It is believed that both the sample design and the sample size are cardinal for generalizability to the population. The sample size is defined as the number of participants planned to take part in the study (Sekaran et al., 2016). However, in qualitative studies, it is difficult to establish the actual number of participants required at the beginning of the study based on the principle of theoretical saturation which entails that: sampling can continue until no new information is emerging from the data set available which means that no new insights or emerging information can be extracted from the cases available (Sekaran et al.,2016). Emmel (2015) in research on calculating sample size in qualitative research indicated that themes can be constructed earlier, and their occurrence may be known as the analysis continues. It is not only the availability of the themes, codes and their frequency that impacts saturation but most significantly the fullness of data that has been extracted from an issue that underwrites the understanding of it.

Guest, Namey and Chen (2020) in a study on assessing thematic saturation in qualitative research, suggested that in qualitative research, the most widely used concept for evaluating sample sizes is data saturation. Therefore, for the determination of the sample size of this study, the principle of data saturation was applied. Saturation was realised after the interviewing of 23 participants, it was at this point that the researcher decided to include the 23 participants as the actual sample size. To confirm the non-generation of new information, an additional 17 participants were interviewed, and this did not provide new information. However, the participants were equally included in the sample size bringing the total number to 40.

3.9 SAMPLING METHODS

Sampling is the procedure in which samples are selected from the population to represent the entire research process (Sekaran et al., 2016). There are two sampling designs, and these are probability and non-probability sampling. Non-probability sampling is a process in which not all the items in the population have the possibility of being included in the sample. With this design, the researcher purposively selects the samples (Khotari, 2017).

3.9.1 Non-Probability sampling

Non-Probability sampling is understood to be a design in which every sample element of the population has a chance of being selected. Probability sampling can either be unrestricted (simple random sampling) or restricted (complex random sampling) (Sekaran et al., 2016). In the selection process of the sampling method, the researcher needs to consider the research objectives, the nature of the research and the availability of resources (Hair et al., 2016). Probability random sampling has various techniques to select the sample from the target population (Sekaran et al., 2016).

3.9.1.1 Simple random sampling

This method allows for every element of the population to have a chance of being selected for the sample of participants. The probability of a component being chosen is 1; therefore, it is known that every single element possesses an equal chance of being selected (Hair et al., 2016)

3.9.1.2 Systematic sampling

This is a sampling technique that incorporates sampling samples at intervals from the frame of models. The total number of elements is assigned with a unique code in numbers (1 -10) to achieve sampling. Each time a given number, for example, five picked the element, is selected until the total required sample size is attained (Saunders et al., 2016).

3.9.1.3 Cluster sampling

This sampling technique is like stratified sampling but different in that the target population is divided into groups (clusters) based on the natural occurrence of groupings such as the geographical areas of the population (Sekaran et al., 2016). The sampling frame is the total number of clusters rather than a single list of individuals from the population. This technique often results in samples representing the population in incomplete totality (Saunders et al., 2016).

3.9.1.4 Multistage sampling

This technique is also referred to as multistage cluster sampling. Like cluster sampling, it allows for the division of groups based on geographical location but is not limited to these groups. It is often used to combat the challenges that are encountered with geographically dispersed populations. It relies on various sampling frames, and therefore it is cardinal that all these groups are available during the sampling process (Saunders et al., 2016).

3.9.1.5 Stratified random sampling

This technique is also called random modification sampling. In this technique, the population is divided into groups of significant strata based on the attributes. A random sample is selected systematically or randomly from the divided groups (Saunders et al., 2016). The division of the population allows for the sample being collected to have more representation. This can be ensured that each stratum has an equal number in the final sample (Sekaran et al., 2016).

3.9.1.6 Proportionate or disproportionate stratified random sampling

Once the population has been stratified, the selection of samples can either be proportionate or disproportionate; this is done through simple or systematic random sampling. The representation of the stratum to the sample from the population can either be equal or unequal. Researchers can choose either disproportionate or proportionate stratified random sampling (Sekaran et al., 2016).

3.9.1.7 Purposive sampling

In this kind of sampling, the researcher chooses the samples that are credible for the study deliberately to attain the information required (Khotari, 2017). In this kind of sampling, the selected samples are chosen with the aim that will be representing the entire population that they are being selected from. Therefore, there is a careful selection of the participants in this process (Sekaran et al., 2016). According to the objectives and nature of this study, the researcher adopted non-probability sampling, specifically purposive sampling. This method was selected because the researcher had the criteria of specific participants that were selected to provide information that was confined to the purpose of the study (Sekaran et al., 2016).

3.9.1.8 Inclusion and exclusion criteria

Inclusion criteria can be understood to be the main features in the target population in which the researcher uses these key features to answer the research questions of the study (McKenzie, Brennan, Ryan, Thomson, Johnston and Thomas, 2019). The inclusion criteria may include gender, age and location of the potential participants. The exclusion criteria on the other hand are the key features that the anticipated participants of the study that fall under the inclusion

criteria but present a high chance of altering the outcome of the study into being unfavourable McKenzie et al., (2019). These may include features such as gender and age of participants but may be excluded due to issues of availability due to comorbidities and missed scheduled appointments for the data collection process which may lead to bias. Therefore, it is important that researchers identify the appropriate inclusion and exclusion criteria when designing the study but also need to understand how these will affect the credibility of the study (Patino and Ferreira, 2018).

According to Connelly (2020) in a paper on inclusion and exclusion criteria, the author indicates that during the research process the researchers involve the inclusion and exclusion criteria to establish the key features of the subjects in the study. This is important as it aids in the generation of high-quality research. The choice and decision of the criteria are based on the critical balance of the study is strong and the findings are generalized to the entire population.

For this study, the inclusion criteria were based on three aspects specifically the Geographic's, demographics and occupations (position of the participant) of the potential participants from the population. The geographic location for inclusion was entities that are operating within Ndola Zambia, the demographic aspect included the gender which comprised both male and female as well as the age of the participants, is that only 18 years and older were included in the study. On the occupational aspect, the inclusion criteria were that of managers, entrepreneur's directors, founders and co-founders of the targeted entities operating within Ndola. The exclusion criteria that were used by the investigator were that of excluding entities that qualified in the inclusion criteria such as geographical location but do not operate in Ndola anymore.

3.10 DATA GATHERING DESIGN

Data gathering is an essential part of the research. It is the outline of the data collection process, which involves the methods to be used by the researcher.

3.10.1 Data gathering methods

The study utilised both primary and secondary data. The secondary data is understood to be data collected from published and unpublished work of other scholars (Khotari, 2017). This data was gathered from articles, books and internet sources; the secondary data allowed for the formation of the background of this study.

Primary data is data that is collected directly from the source by the researcher. This data is collected through various methods, including interviews, observations, and questionnaires (Sekaran et al., 2016).

Questionnaires can be defined as a set of preformulated questions intended to extract participants' responses to questions of interest. There are different kinds of questionnaires that can be used. These are online, mailed and personally administered questionnaires. Online questionnaires are generated through a website and sent to the participants through a link requesting them to participate. Mailed questions are questionnaires that wholly rely upon paper and pencil and are often mailed to the participants' mailbox physically (Sekaran et al., 2016) Observation is another method of data collection that is understood to be arranging, recording, watching, and interpreting events. Observations occur based on four dimensions which include: control (are the observations being conducted in the natural environment), the observer being a part of the group being observed, structure and concealment (whether the observer is aware that they are being kept). Interviews are a set of guiding questions between two or more people to extract information for participants (Gold, 2017). They often exist in two forms which are structured and unstructured. (Sekaran et al., 2016).

Online data collection is a process of collecting data online and remotely with or without the researcher's involvement through the use of the internet. It has been a growing method over the past years. There are various ways in which data can be collected online and these include online interviews, online questionnaires, online forums, blogs and social media sites such as Facebook and Twitter through the use of survey questionnaires. Online data collection turns out to be relatively cheap and possesses the ability to target a large number of samples covering a large geographical area. There is also increased anonymity. However, there are also

limitations to online data collection which include the: increased rate of non-responsiveness, the impossibility of clarity of the responses from the participants and biases in selection (Salvador, Alves, Rodrigues, & Oliveira 2020).

This study adopted interviews as a method of data collection. These interviews were semi-structured and there were conducted online/remotely. The collection of data was done electronically through Zoom video and WhatsApp Audio calls. The reason for this choice is that online interviews were the most speedy and efficient option that was less costly and convenient. Health and safety played a key role in the selection of this method, as the country and world were experiencing a global pandemic the COVID-19, therefore no contact interviews were allowed by the research ethics committee at the lockdown stage when this research was conducted. This was done during the level 4 hard lockdown in which no international travels were allowed both land and flight among countries.

3.10.2 Instrument design

There is no single standard interview design that exists. This is because each design is constructed based on the structure of the interview, how it will be delivered, collected and the amount of contact between the researcher and the participants (Saunders et al., 2016). Interviews can be conducted physically and remotely/electronically through video conferencing and calls to the participants (Walliman, 2017). The study was restricted to Ndola. However, due to the Covid-19 pandemic, the interviews were conducted remotely/electronically with the selected research participants. The interviews allowed the researcher to get a deeper understanding of the participants and enabled them to reach participants who were not physically unavailable in their places of work (Sekaran et al., 2016). The instrument design was guided by the contents of the literature review specifically the TOE framework. The literature review revealed what the 4IR is based on the findings of other authors with similar studies, this guided the generation of the interview questions of section B (See APPENDIX D). Each of the three aspects of the TOE framework which include technology, organization and environment were used as a guide for the generation of questions for sections C, D and E of the instrument design (See APPENDIX D). Section C focused on the technology aspect, each of the interview question made reference to technology based on the TOE framework, as the literature review and research from previous authors showed that technology is used as a tool for business operations, is found to be impacting various business sectors, is used for opportunity creation and therefore creating a competitive advantage for technology adopters. Section D in the same vein involved questions generated from the organizational aspect of the TOE framework as the literature review showed that, the

organization plays a role in technology adoption, the kind facilities found within a firm and the human resource aspect specifically the technological know-how. Section E focused on the environmental aspect as adopted from the TOE framework. The literature review showed that the environment in which the business exists aids in the adoption of technology among potential adopters, the nature of business and competition from other entities and the roles of policy makers. These were what guided the generation of the interview questions.

The interview consisted of semi-structured questions to extract the response to the use of technology for business and the adoption of technologies in the fourth industrial revolution among entrepreneurs and managers Ndola. A sample of the interview of the study is available in APPENDIX D. The discussion is comprised of four areas outlined below as guided by the TOE framework.

Section A: This section entailed the collection of demographic data for the participants.

Section B: This section aimed to collect information about the Fourth Industrial Revolution among entrepreneurs and managers of small businesses.

Section C: This section aimed to explore how managers and entrepreneurs adopt the use of technology for business.

Section D: This section explores the organisational infrastructure that managers and entrepreneurs possess to aid technology adoption.

Section E: This section intended on exploring the enterprise environmental factors that contribute to technology adoption.

3.10.3 Data gathering process

The data collection process was conducted through Zoom and WhatsApp audio calls. The researcher cross-checked the provided database to select the appropriate participants for the study based on the inclusion criteria identified. Every single entry was double-checked before being selected to be part of the study. Once identified the potential Participant would be contacted and invited via email and WhatsApp audio calls with the contact information that was provided by the PACRA. The identified potential participants were selected based on the inclusion criteria in section 3.9.18. Each one of them was selected based on the purpose and nature of the study. An informed consent document was shared via email entailing the information of the study and why it is being conducted. Once the participants agreed and signed a meeting was scheduled based on the suitable time and availability of the participants. The interviews were conducted and lasted between 10-20 minutes. According to Poncette, Spies, Mosch, Schieler, Weber-Carstens, Krampe and Balzer (2019) the median interview length in a study they conducted was 13 minutes. Another qualitative study conducted by Pu, Moyle, and

Jones (2020) indicated that the interview length was between 5-20 minutes in length. A study by Krouwel Jolly and Greenfield (2019) in a comparison of interview lengths found that there is a variation in duration based various factors. The proceedings of the interviews were recorded for transcription purposes from audio to word format using Microsoft word which generated a total of 120 pages. The entire data collection process was conducted for a period of 7 months from 15th January to July 2021.

3.11 DATA QUALITY CONTROL

The researcher made use of structured interviews to collect data, the interviews were recorded and transcribed to ensure the trustworthiness of the study. Trustworthiness of the study can be understood to be the measure of rigor and degree to which the confidence of the data, interpretation and methods used to attain the quality of the study. Four standards are used to achieve trustworthiness in a qualitative study, and these comprise credibility, dependability, confirmability and transferability (Conelly, 2016). For this study, the researcher adopted only two criteria: credibility and dependability to ascertain the trustworthiness of the study. The two can be compared to validity and reliability in a quantitative study respectively (Amankwaa, 2016).

3.11.1 Credibility

According to Hammarberg, Kirkman, and Lacey (2016) in a study of when to use qualitative research they define credibility as the conditions for estimating the true value or internal validity of qualitative research, a qualitative study is credible when the results are enough to describe the context and can be realised and relatable to those that share the same experience. Some of the techniques used to attain credibility are long interactions with participants, length periods of observation if that applies to the study and checking for members to ensure the right people are included (Conelly, 2016).

For this study to attain credibility the researcher adopted a technique of prolonged engagement. The researcher engaged with the participants persistently during the interview process to allow participants to respond to questions in various ways without imposing a standard. This was done on each question and the participants were allowed enough time to respond to questions to the best of their knowledge and ability. Furthermore, the researcher adopted another technique of member checking, upon the completion of the transcription of each interview. The responses from the participants, details and information of the demographics were checked to ensure that the right participants were interviewed. Furthermore, to ensure credibility the data gathering process was prolonged over a period of 7 months. This was to ensure that the right

individuals suitable for the research had been targeted and recruited to ensure that correct information was attained, these approaches adopted were guided by the need to ensure that the instrument and data collected is valid (Amankwaa, 2016).

3.11.2 Dependability

This is defined as the ability in which research can demonstrate both accuracy and evaluation of the findings and interpretations of the conclusion extracted from the data. Dependability is carried out when a researcher that is not part of the study conducts interviews to ensure that the results and findings are accurate (Amankwaa, 2016). Dependability is analogous to reliability in a quantitative study but with the point that the conditions of the stability may vary with the nature of the study (Conelly, 2016).

Therefore, dependability is used to ensure that work that has been repeated in the same environment is more likely to produce the same results or follow a certain sort of pattern. For this study, the researcher conducted the online interview process with another data set to ensure that the data collection instrument can measure what it is intended to measure. To conduct the dependability the researcher engaged adopted the technique of Audit inquiry. This is a process in which an external individual that is not part of the research conducts examination procedures and results of the study (Amankwaa, 2016). The researcher requested another researcher that is not part of the study to examine the findings and the procedures conducted in the data gathering process to establish the trustworthiness of the findings. The reason for doing this was to estimate the finding and interpretations supported by the data collected.

3.12 DATA ANALYSIS

Data analysis is the process that comprises editing, coding, and transforming raw data into more meaningful information (Sekaran et al.,2016). The data analysed aims at creating valid inferences from a large amount of data collected. Collected data can be rich, and a lot but not all of it is used for the research purpose; therefore, the researcher only focused on the relevant data (Cresswell, 2017). Various techniques are available for sorting data, and these are matching patterns, building an explanation, time series analysis, logic models, and cross-case synthesis. Software programmes such as Nvivo 12 are used to code, sort and save time on this data (Saunders et al.,2016). It is cardinal that the data collected can be readable and analysable; therefore, the researcher needs to read and understand the data to interpret the findings thoroughly.

Thematic analysis is a technique used to analyse data qualitatively; it is achieved using content

and themes. This process consists of three phases: the preparation phase. In this step, the researcher collects the data that is relevant to the research. In the organisation phase, the researcher seeks to manage the themes and codes to be used for categorisation. There are various kinds of code to use for the thematic analysis, such as Participantcharacteristic code, Participantperspective code, relationship code, and conceptual code (Vaismoradi, Jones, Turunen & Snelgrove, 2016).

3.12.1 Preparing the data

The researcher transcribed the data that was recorded in audio format during the interview with the participants. The audio format data was transcribed to word format using Microsoft Office 2016. The audio recordings were played and the responses from each Participant based on each question were written down in Microsoft Word this process was repeated three times to ensure that the right words were written down.

The audio recordings were listened to carefully during the process to ensure that the right words were written down. The transcripts were thoroughly checked to make sure that the right information was captured. The transcribed interview transcripts were organised based on the Participant number and each one of them was imported one by one into Nvivo 12 for coding and thematic analysis (Saldaña, 2015).

3.12.2 Analysing the data

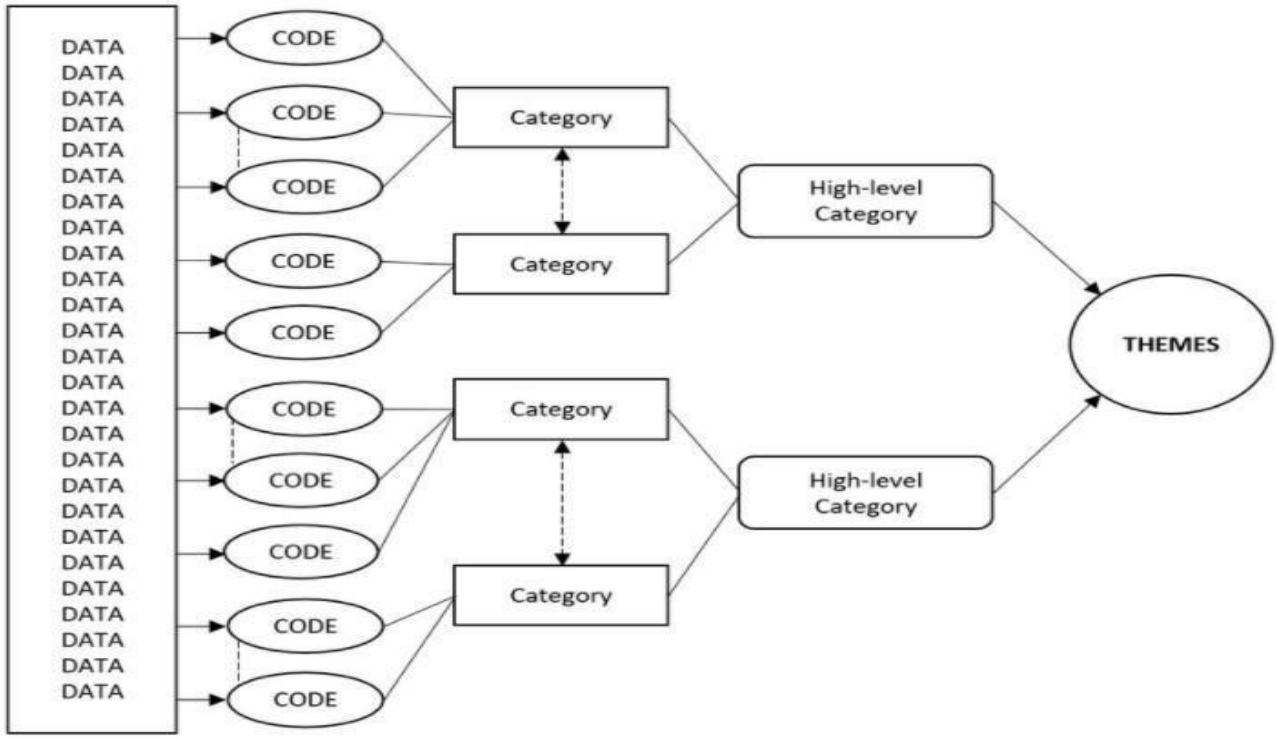
The data gathered from the interviews were coded using in vivo coding in Nvivo 12. According to (Saldaña, 2015). In vivo coding employs the use of words or phrases found in qualitative data. Codes from the interview transcripts were categorized and analysed to create themes, which translated the meaning of the study's research questions. The four research questions were maintained by the data collected and analysed from the interview transcripts. A code in qualitative is a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data (Saldaña 2015.p1). whilst a category combines and arranges comparable codes based on certain shared criteria; a high-level category categorises numerous categories to discover an emergent theme. Unlike a category or a code, a theme is a phrase or a word that describes what a piece of data is about (Saldaña, 2015).

For this study, codes were used to provide forthright labels to the data in an attempt to identify the ideas and the patterns within the large chunks of data. The categories on the other hand were used to group similar codes. They assisted with the organisation and grouping of similar codes into categories based on the shared attributes. Categories were the inception of the

identification of patterns and recognition of themes in the data. The themes, therefore, described participants' responses and contributed to the answering of the research questions of the study.

The thematic analysis approach outlined in Saldaña (2015) was the guide to analysing the data collected in the study. Saldaña proposed discovering codes in the data, classifying similar codes, and using the high-level categorization of those categories to build wider themes pertinent to the inquiry. A simplified illustration of Saldañas' thematic analysis approach is indicated below (see figure 3.2).

Figure 3 2 Saladana approach of thematic analysis



The purpose of the thematic analysis in this study is to identify the themes which interpreted the meaning in the data that is affiliated with the research questions of the study. Based on the Saldaña approach of thematic analysis, the study adopted the four steps in the process of analysing data. The steps followed were: (1) identification of codes in the data, (2) creating the categories of codes, and developing high-level categories, (3) reviewing high-level categories and using them to generate themes and (4) applying emerged themes to research questions of the study.

3.12.2 Steps in data analysis

3.12.2.1 Identification of codes in the data

The first step in the data analysis process was the coding of the interview transcripts. The process began by capturing the responses from the participants onto Nvivo files and then reading each of the responses based on the interview questions separately. This was then followed by the identification of similar responses to come up with code names. Thereafter the responses were placed into their respective codes. The created codes were carefully combined, reviewed, and revised to generate a list of codes from the interview transcripts. The coded data or labels were then put together to set up categories (Sekaran et al., 2016). The generated codes were revealed in the findings chapter.

3.12.1.2 Creating the categories of codes and developing high-level categories

The subsequent step was the identification of the common attributes among the codes to form categories, it entailed the arrangement of data reducing it to units to form categories. The main purpose of this step was to develop sensible high level-categories from the coded data. The categories were created based on the responses from the particular research question for example all the participants responses from interview question 1 of section B were categorized under the code 4IR knowledge as depicted in figure 3.12.1.2 above. This was done for all the other interview questions.

3.12.2.3 Reviewing high-level categories and using them to generate themes

In this step, the high-level categories were reviewed to ensure the correct responses where categorized, and this aided in the creation of themes. A query was conducted on Nvivo 12 specifically a word frequency on each of the codes/categories and this was used entirely in this step to reflect the patterns and concepts in the high-level categories, and this enabled the identification of the themes.

3.12.2.4 Applying emerged themes to research questions of the study

This step involved the application of the identified relevant themes to answering the research

questions of the study. To attain this final step the word cloud was used to identify the most occurring word in which a node preview was conducted on Nvivo 12 to identify the responses from the participants to present the findings from the participants based on the interview questions.

3.13 ETHICAL CONSIDERATIONS

The researcher applied for ethical clearance to conduct the study and it was granted as shown in Appendix A.

3.14 CONCLUSION

This chapter aimed to provide a discussion of the research process and research methods employed in this research study. A qualitative approach was used to collect data through online interviews conducted via Zoom and WhatsApp Audio. A non-Probability sampling method was used specifically purposive sampling for the selection of participants. The data quality control measures included credibility and Dependability. The data analysis process was outlined with the indication that the processes employed the use of Nvivo 12.

CHAPTER 4 FINDINGS

4.1 INTRODUCTION

The previous chapter presented the research methods used in the study to answer the research questions and fulfil the objectives of the study. The purpose of this chapter is to present the findings of the analysed data gathered for the study. The participants of the study were entrepreneurs and managers of business enterprises in Ndola, Zambia. These participants were selected based on the inclusion criteria which consisted of geographical, demographic and occupational (position of the participant) aspects. This chapter provides a presentation of analysed data through thematic analysis, to understand what the participants responded to base on the research questions and research objectives due to the nature of the study. The chapter will be set out with a presentation of demographic data. This will then be followed by a presentation of themes based on the four research objectives. The data was extracted from interviews in an audio format, and it was later transcribed into word format using Microsoft Word. This data was analysed with Nvivo 12 which necessitated the data analysis process, and this was displayed using a word cloud to indicate how responses are linked to the themes. Lastly, the conclusion of the chapter will be presented.

4.2 PRESENTATION OF INTERVIEW RESULTS

The findings from the results were presented based on the objectives of the study. Codes were generated in NVIVO 12, and a word frequency was performed to identify the patterns in responses and establish the themes. Word clouds were created to identify the most frequently used words by the participants, and this was used to create themes to interpret the finding.

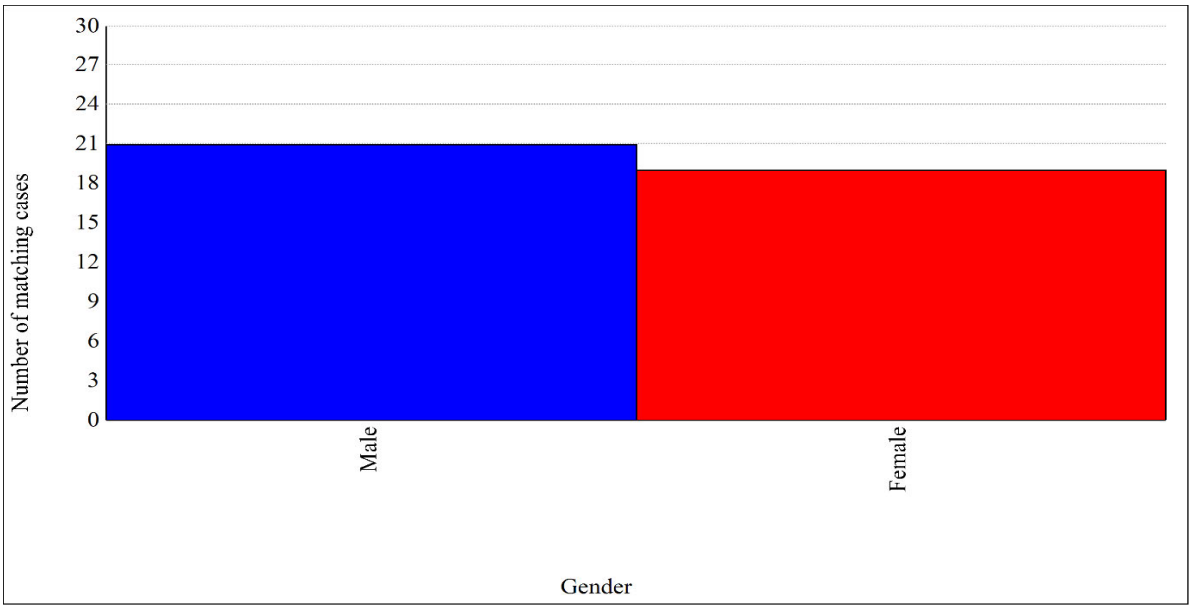
4.3 DEMOGRAPHIC DATA

The total number of participants in this study was 40. The participants form a combination of managers and entrepreneurs of all the entities included in the study. The entrepreneurial aspect consisted of founders, co-founders, owners, co-owners and directors of entities established within Ndola whilst the managerial aspect consisted of individuals that are managing the existing entrepreneurial ventures, and these are managers and assistant managers.

4.3.1 GENDER OF PARTICIPANTS

Out of the 40 participants 19 were female and 21 were male. This information is presented in the figure below. These findings are presented in Figure 4.1 below:

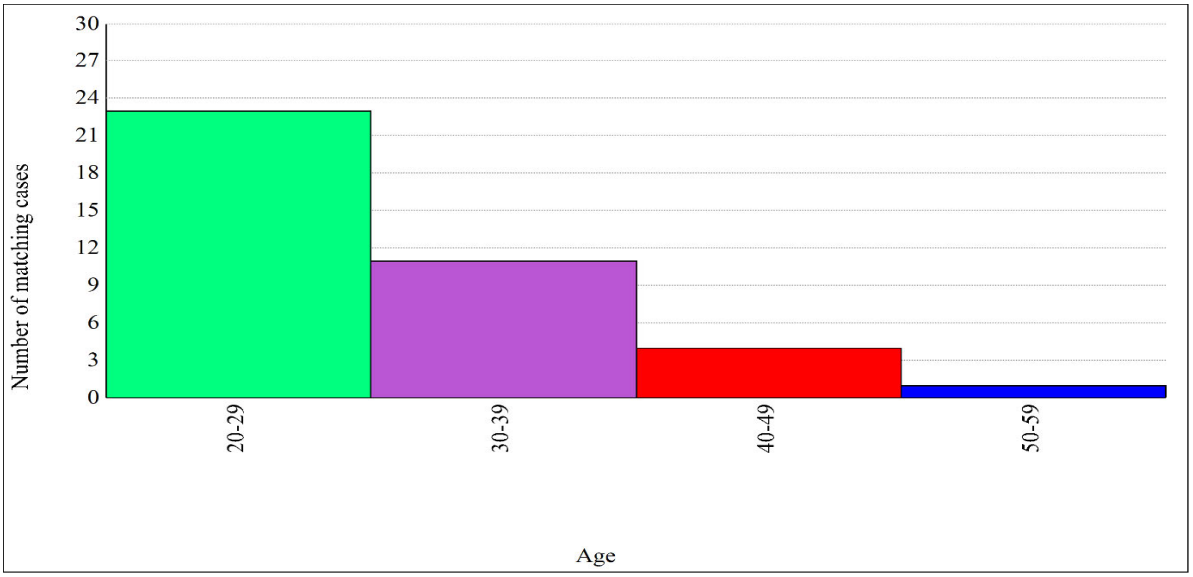
Figure 4. 1 Gender of participants



4.3.2 AGE OF PARTICIPANTS

The study results revealed that the majority of the participants were in the 20-29 group with a total number of 23 participants. This was followed by the 30-39 age group with a total of 11, the 40-49 age group and the 50-59 age group with totals of 4 and 1 respectively. These findings are presented in Figure 4.2 below:

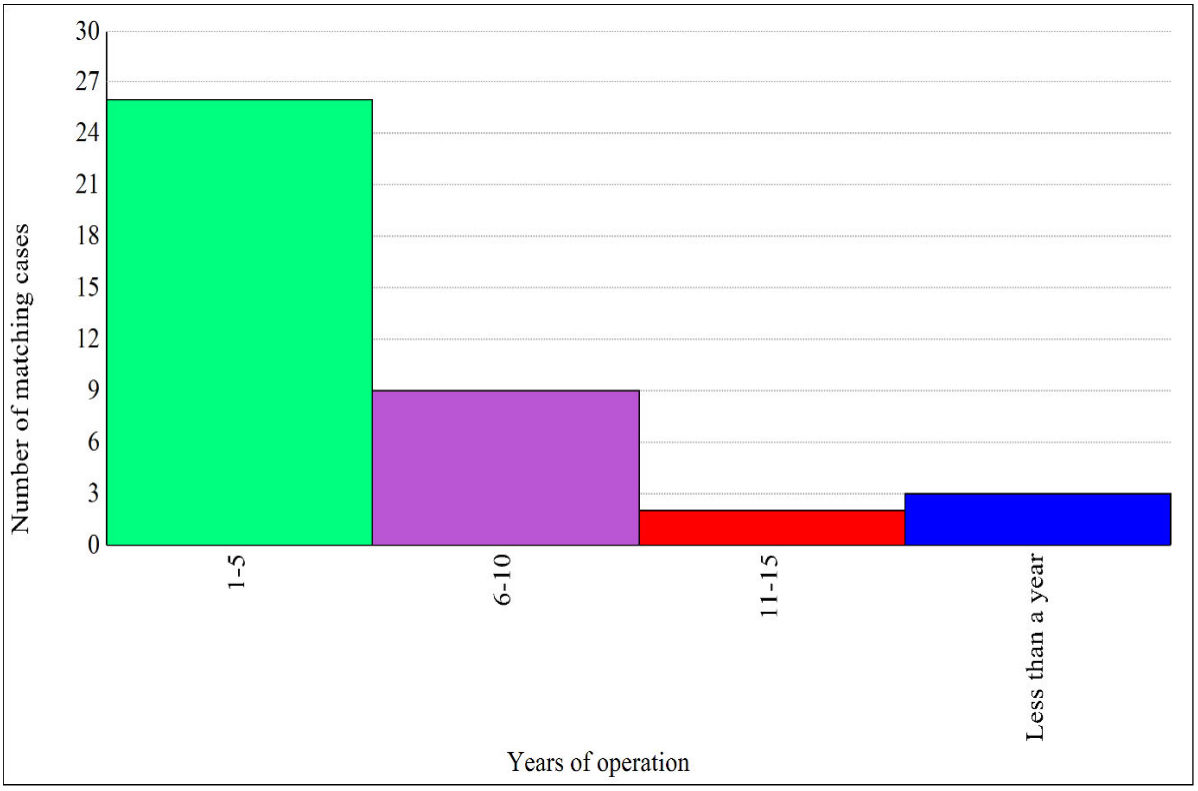
Figure 4. 2 Age of participants



4.3.3 YEARS OF OPERATION

The results show that the majority of the participants' entities have existed for 1-5 years, and this accounted for a total of 26 participants. The following group of participants which is 6-10 years consisted of 9 participants. The category of 11-15 and those that have been operating for less than a year consisted of 2 and 3 participants respectively. These results are presented in Figure 4.3 below:

Figure 4. 3 participants years of operations



4.4 RESEARCH QUESTION 1. WHAT IS THE FOURTH INDUSTRIAL REVOLUTION AS PERCEIVED BY MANAGERS AND ENTREPRENEURS OF NDOLA, ZAMBIA

4.4.1 THEME 1 TECHNOLOGY

Code 1 4IR Knowledge

The researcher wanted to find out if all the entrepreneurs and managers were aware of 4IR and its impacts on various business sectors. The word cloud presented below revealed that the most frequently occurring word was technology.

Figure 4. 4 Theme 1 Technology

The majority of the participants responded to the question on knowledge of the 4IR, according to the word cloud the word technology was the most frequently used word, therefore, it was generated as the theme under the objective Knowledge of the 4IR and the participants provided the following responses.

The responses from the participants were as follows:

A Co-founder (Participant10) responded that the 4IR is the use of computer technology that helps with business operations and has its impacts on business the response was as follows:

> *"The use of computer technology is to enhance business operations and the Fourth industrial revolution has affected the business sector".*

Participant 39 who is a CEO responded that the 4IR is a technology-based era indicating that:

> **"***This is an era of technology that allows for the use of technology to do things."*

A director (Participant27) reported that 4IR is a wave of technology that has affected the business sector and indicated that:

> *"This is a wave of technology that has been adopted in various business sectors such as manufacturing, entrepreneurship and education".*

Participant 24 a CEO of small business responded that the 4IR is a development in the technology sphere and the response was as follows:

> *"The 4IR is the development in the technological sector that employs the use of machines and robotics ".*

Participant 11 who is a CEO of a business responded that the 4IR is an era of technology that encompasses digitalisation, and the response was:

"This is a new technological era that extends digitalisation in different ways".

A director (Participant14) indicated that the 4IR is affiliated with globalisation and the commercial sector is enabled by technology and digitalisation the response was that:

"This is the globalisation of the commercial sector through the linkages enabled by technology and digitalization".

Participant 21 CEO of a small business responded by pointing out that the 4IR is a shift in means of production from mechanical to technological and involves the use of Artificial intelligence (AI) the response was as follows:

"The fourth Industrial is a shift from the use of mechanical means of production to more technological. This is the development in the technology sector that employs the use of Artificial intelligence (AI) and machinery that can carry out work that is conducted by other people".

A manager (Participant38) of an enterprise response was centered around the improvements of the 4IR in comparison to previous revolutions in previous years the response was:

"This is a transition of industries to a more technological base in comparison to the previous years. The evolution of technology from the way things were done like Manual computation to digital capturing of information making use of the internet and telecommunications systems".

Participant 19 a director of an IT small business responded and referred to the partnerships that exist between the public and private sectors the response was:

"This is the situation in which both private-public sectors come to accept that the this is level at which technology has reached now and there is a need to embrace it in their operations".

A manager (Participant 3) responded based on means of production and shift from mechanical means indicating the impact on motor vehicles, the response was:

*"This is a new wave of technology that has seen the evolution of the industrial age use of machinery industries such as motor vehicles, transitioning into the technological phase"***.**

Overall, the findings of the study reveal that the participants are aware of the Fourth Industrial Revolution and understand the revolution being a digital and technological era that employs the use of computers and machines to carry out work more efficiently.

4.4.2 THEME 2 INDUSTRY

Code 2 sectors impacted

The objective of the researcher was to find which sectors the 4IR has impacted. A word frequency was performed to establish the most frequently words used.

Figure 4. 5 Theme 2 Industry

The word cloud in the figure above indicates that industry was the most frequently used word under the objective of knowledge of the 4IR and this was used to create the theme industry. The majority of the participants gave their responses based on this theme.

Participant3 a manager of a business pointed out that with time all industries will be impacted by the 4IR and further mentioned that the COVID-19 pandemic has played a role. The response was as follows:

> *"With the availability of technology, it was a matter of time for all industries to have been impacted and the covid-19 has played a major role".*

An assistant manager (Participant 13) mentioned that various industries have been impacted and gave an example of computer use in the company:

> *"There is a variety of industries that have been impacted by the use of technology, most firms are not doing any paperwork but opt to do things digitally with computers".*

A Co-owner of a business (Participant 15) indicated that technology has impacted various sectors differently and made an example of marketing indicating that:

In the media industry, the traditional way of advertising as it seems to social media has taken over.

On the contrary, Participant14 a director indicated that there is a level of lack of conversancy regarding digitalisation and this poses a challenge the response was as follows:

> *Not everyone is conversant with the ordeal of digitalization, some of the challenges faced by (our) company are the doing of online taxation on behalf of the clients. There is an*

aspect of ignorance that creates a challenge in most industries due to the lack of technical knowledge.

The rest which was the majority of the participants pointed out that the following sectors have been impacted:

The manufacturing, retail trading with the example of Amazon having no people working in stores, as well as day to day trade such as e-commerce.

Agriculture, Manufacturing industry, Mining, NGO'S, education, tourism, banking, finance, logistics, and retail trading.

The findings of the theme industry revealed that the 4IR has impacted various business sectors and industries these include mining, tourism, banking, business consultancy, retail trading, and media. It has brought about different ways of conducting business and is proving to be more efficient, most entities are now doing less paperwork but more digital and these are some of the impacts of technology in various industries. However, due to a lack of conversancy of the 4IR technologies, this becomes a challenge for most industries due to a lack of technical knowledge.

4.4.3 THEME 3 BUSINESS

Code 3 impacts on business

The main aim of the researcher was to get insights into how managers and entrepreneurs understand the impacts of the 4IR on business. A word frequency was conducted, and a word cloud was presented as seen in Figure 4.6 below.

Figure 4. 6 Theme 3 Business

According to the word cloud, the words business and technology were the most frequently used words by the participants in the study. It was established that the two words were used in the responses, however business was the most occurring based on the frequency summary. Therefore, a theme (Business) was derived from the word cloud. Based on the business theme the responses from the participants were as follows:

A founder (Participant 1) of a small business in Ndola pointed out that 4IR technologies affect the environment and lead to impacts on business, the response from the Participant was as follows:

> *The 4IR harms climate change. This leads to adverse effects on power supply generated from Hydro plants, therefore affecting various businesses.*

A business Co-founder (Participant 10) mentioned that the 4IR impacts are seen through the change in how business is conducted among people and made an example of online money transfers in business to business (B2B) transactions which have led to the decongestion of banks, the response was as follows:

> *"The introduction of e-transactions has made a huge impact on business. The easy transfer of money among people in business has reduced time to head to the banks and stand in long queues".*

One participant's response was centered around 4IR embracement in the business sector and referred to investing, however the sourcing of finances is a huge challenge specifically for small businesses the response extracted was:

Most of the businesses have been trying to shift and bend towards the new technologies that have come about, to embrace the 4IR fully there is a need to invest. Access to loans is a huge challenge, especially for small businesses.

One Participant referred to the use of technology for business and indicated that it reduces workload and increases efficiency. The participants further indicated that people need to attain technical skills to be able to work with the new technologies, the response was:

Most organisations that support the use of technology in business experience an aspect of reducing paperwork in the firm. However due to the lack of information most people have seen the need to bring themselves up to speed with technology and learn the most technical skills.

Participant 16 a manager in Ndola indicated that technology has impacted the business sector and most specific countries with low GDP making it difficult for them to manufacture products locally but resort to importing. The response was:

"Technology has impacted business operations and seen the drop in the countries with low Gross Domestic Product (GDP) and for countries that are struggling economically, this is due to importing of goods and the buying power of the currency. The availability of products and the ability or inability to produce local products".

A director (Participant 18) pointed out that the impacts of technology could be both positive and negative and would allow for the collaboration of the private and public sectors and provided an example of communication, the response was:

"The impacts could be positive or negative. It will help in the collaboration between the public and private sector: For example is the ease of communication through strong telecoms. Some platforms have been created specifically for entrepreneurship".

A manager (Participant 19) provided a response on the aspect of positive embracement of technology and provided an example of its impact on the shift of marketing and further indicated the area in which Zambia is lacking, the provided response was:

"Positive embracement of technology will help many business owners to achieve their goals in various businesses e.g., Marketing and sales can be done online as the traditional way of marketing and business is phasing out, these are areas that Zambia is lacking".

Participants 25 and 6 managers and directors respectively responded and referred to how not adopting technology for business would be a negative impact, the participants made mentioned decentralisation and efficiency and made an example of one Zambian government department that is not efficient and other companies, the responses were:

"The failure to embrace technology can be considered to be a negative impact, it can be noticed that work that is supposed to be done in an Hour could last up to 48 hours. E.g., the National registration department takes longer to process the certificates, this is due to centralised technology-based systems".

"The impacts of the 4IR on business have led to the efficient provision of products and services. But looking at Zambia the situation is different in that some businesses and companies have not adopted the use of technology for business. There is a need to introduce good working machinery that will enhance service delivery in various sectors".

A CEO (Participant 26) of a business in Ndola participants mentioned that there is a need to diversify business activities and provide educational programmes and training about technology for business, especially for entrepreneurship, the response was:

"The aim is for the business to diversify into humanitarian activities and set up an orphanage that will expose children to the use of technology and entrepreneurship".

A manager (Participant 3) of a business indicated that the impact of the 4IR on business is all dependent on the type of business and provided an example of how it has impacted their business in their particular industry, the response provided was:

"It depends on the type of business. Concerning the hospitality industry, they (we)see bookings being done online before arrival. With the 4IR people make use of apps and make bookings online".

Overall, the findings from the theme business indicated that the participants are knowledgeable of the impacts of the 4IR on business, they indicated that the 4IR technologies play a role in the business operations and are an essential tool for the growth of an entity. The participants further indicated the various ways in which they employ the use of technology in their firms.

4.4.4 THEME 4 COMPANY

Code 4 Readiness of 4IR

The researcher aimed to understand the steps that managers and entrepreneurs are taking in readiness for the 4IR. A word frequency was performed on the node readiness of the 4IR in NVIVO 12 and Company and technology appeared to be the most frequently used words as depicted in the figure below. The majority of the participants responded to the question and their responses were as follows.

Figure 4. 7 Theme 4 Company

An assistant manager (Participant 13) of a business in Ndola indicated that their firm has taken the necessary steps in the readiness of the 4IR and currently employs computers and the internet for business operations, the response provided was:

> *"The company has put in place the necessary facilities such as internet and computers that allow for the daily operations of the business incorporation with technology".*

Two participants 14 and 26 Co-founder and director within Ndola, indicated that in an attempt to adopt technology there is a need for the training of employees and further indicated that the firm is planning on going digital the responses from the participants were:

> *"There are efforts in trying to make all the employees be up to standard with technological knowledge of all the operations involved in the company. We are currently planning on going digital through the incorporation of a company website and the use of Facebook and WhatsApp for marketing and the provision of information about our services".*

Another director (Participant 25) of a local business based in Ndola mentioned that:

> *"The company has embarked on the training of staff members to become technologically Savvy. As a manager, I engage in participating and perusing short courses that the knowledge is passed onto the employees"***.**

A founder of a business (Participant 4) in Ndola in the Hospitality sector referred to the operations in the firm and indicated how they use booking applications for clients the response was:

> *"The company has moved to more booking apps; in terms of accounting, we make use of accounting packages on mobile devices and computers".*

A director (Participant 14) of a business in Ndola indicated that the employees in the company are being informed about technology and the response from the Participant was:

"I have ensured that all the staff know e-technology to capture a good market base".

Participant 33 a Co-owner of a business gave feedback indicating that the firm is making use of online platforms to showcase the products and services, the response from the Participant was:

> *The company has adopted technology by putting the products and services onto social media platforms".*

A manager (Participant 34) indicated that there is a need for the organisation to learn the necessary skills for technology use in the company and further provide training to employees as this is a necessary human resource, in the instance where there are no skilled personnel, the company will have to resort to outsourcing, the response from the Participant was:

> *"The entity needs to learn how to use technology and employ skilled human resources. The company is engaged in networking with people that have these technological savvy skills. In the instance where these people can't be accessed the company will need to outsource".*

Participant 35 a managing director mentioned that in an attempt to prepare for the 4IR and technology the company has embarked on the investment of the technology-related machinery, the provided response was:

> *There has been an investment into more technological-based machinery, and the company is going digital through its operations.*

Participants 19 and 2, a director and CEO referred to the operation involved in the company because there are Information Technology entities, the responses were:

> *"As an IT company (we) are engaging the companies that we provide services to in preparation for cloud storage, in that they need to make use of the cloud to store their information. This is being done through data collaboration, and data management that's where the company is. The cloud infrastructure is the way forward at the moment.*

There have been introduced services that require remote access to our services such as the end desk".

Participant2 a director further participants indicated that the company has diversified into the multimedia industry and is using videos to make use in providing awareness about the services provided, the response was as follows:

"There has been the transition into multimedia through the creation of videos of awareness of the company".

A manager (Participant7) of a business within Ndola responded that one of the sectors considered to have improved is the banking sector and these are part of the entities clients (banks). the participants indicated that they target them with the provision of information the response was:

"*The banking sector has also improved we are also in contact with the banks to provide information of what we are providing".*

Two participants 29 and 9 CEO and Co-founder respectively responded by mentioning that they have invested in research about technology in an attempt to teach and train the workers and build the necessary technical know-how, the response from the participants was as follows:

"The company is taken the initiative to invest in research to teach and train the workers on how to use technology and build technical know-how".

A director (Participant 40) reported that:

"The work staff have been trained to use computers other than manual writing".

Participant 18 a director made a reference to training workers and employees and indicated that there is a need for orientation, the response was as follows:

"Through Orientation of workers to ensure that they are braced with what's happening in the external environment of the organisation and allow for efficiency in the workplace".

Overall, the participants indicated that they are taking the necessary steps in their various sectors and entities to prepare for the 4IR. The results show that there is a need to train and provide information to employees in various firms for them to understand the benefits of technology use for business. Other participants indicated that they have implemented the use of technology through the use of technology-based apps, computers and social media platforms.

4.5 RESEARCH QUESTION 2. WHAT ARE THE STRATEGIES THAT MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA USE TO ADOPT THE USE OF TECHNOLOGY FOR BUSINESS?

4.5.1 THEME 5: TECHNOLOGY

Code 5 Technology for business

The researcher wanted to find out the strategies that managers and entrepreneurs use for the adoption of technology for business. The results from the word frequency search are presented in the word cloud in Figure 4.8 below.

Figure 4. 8 Theme 5 Technology

According to the word cloud the words Technology and Business appeared to have been the most used by the participants, the summary of responses showed that the words were used in the same sentences as participants' responses, however, the word technology had more count than business, therefore, this was used as the theme of the objective. The results from the participants of the study are as follows:

Participant1 a director of a small business in Ndola, reported that technology is an important aspect of business and that companies that do not adopt technology cannot thrive, the response from the Participant was as follows:

> *"Without technology, most companies can't thrive. This was a clear indication that technology is an essential part of business operation in the 4IR era".*

An entity CEO (Participant 11) reported and identified that technology is an essential driver of business growth, and the response was:

> *"Technology is a huge driver of business growth, and it also improves operations through efficiency".*

To further emphasise the importance of technology two other participants referred to a company not thriving and work efficiency respectively.

Participant 14 a CEO reported that:

"With everything being digital, a business will not thrive if they do not include technology devices and technology for business".

Another Participant 36 a director mentioned that:

"Technology makes working and producing results in business within a short space of time with minimal effort".

Participant 11 a CEO indicated that technology is a huge driver of growth and is an essential part of business operations the response provided was:

"Technology is a huge driver of business growth, and it also improves operations".

An assistant manager (Participant 13) of a small business indicated that technology can be used as a tool that drives the operations in a firm the response provided was:

"It can be used as a tool to stock and control products, it can also necessitate the purchasing of goods without having to step out and head to the supplier".

A director of administration (Participant 31) referred to the use of technology for business and pointed machinery and the use of Artificial Intelligence, the response Participant was:

"The recent trends that have been noticed such as the latest software upgrades, Artificial intelligence (AI), Machine learning and Data mining are being embraced into business because technology is allowing firms to conduct business smarter and faster".

Participant 18 a director of a small business responded on how they employ the use of technology in their various entities in an attempt to adopt technology for business and the responses were as follows:

"*The auditioning of people virtually rather than having them come to the venue".*

A CEO (Participant 30) of a small marketing firm reported that:

"For marketing purposes, when creating a marketing plan indicating that there are software packages that they employ to market their products".

Participant 10 Co-founder of a small business mentioned that:

... They (we) stick to using social media to promote the business. The Participant makes use of technology to reach a larger target market in a shorter space of time due to the number of people using social media platforms.

Two other participants 36 and 2 CEO and directors mentioned individually that technology promotes efficient work in business and makes the processes shorter the responses from the two participants are as follows:

"Primarily the use of technology for business promote effectiveness in business".

make business processes shorter and business can be conducted in real-time.

Participant 21 CEO of a business reported that technology in business has reduced the need for real estate due to remote working enabled by technology through various platforms, the response from the Participant was as follows:

> *"With the introduction of virtual/remote meetings now there has been a reduction in the demand for real estate because people can manage to carry out their meetings anywhere, therefore technology has opened up a new sector for example the exponential growth of zoom in the past years. Google has also taken an adaptive approach, especially during the covid-19 pandemic. The above mentioned have seen a shift towards technology adoption for business".*

Participant 27 a manager of a business reported on the use of technology to improve the business in the tourism industry and the response was as follows:

> *"Technology has improved the way of conducting business in the tourism industry in that there is high availability of information that can be accessed on the web through the website and social media".*

One of the participants a manager (Participant 34) reported that the sole purpose of business is to make a profit and use technology as a tool in solving technology-related problems more efficiently. The Participant further provided an example of how technology can be used as a tool to solve problems in branding, the response from the Participant was as follows:

> *"The purpose of any business is profit, by using technology in business as a tool to solve problems more efficiently. E.g., in Branding there is a need to understand the mission and vision of the business, therefore using technology should assist in the growth of clientele and growing a market base, therefore, technology will play a role in portraying what kind of services a firm provides".*

The objective aimed to establish the strategies that managers and entrepreneurs employ to enhance technology adoption for business. Overall, the results exposed that there are not any particular strategies being employed however the results exposed that the participants recognise technology adoption is essential for business and indicated that technology is a tool in business that would allow a business to thrive as it allows for efficient operations in various firms. Furthermore, the results show that managers and entrepreneurs use technology for business in their various entities.

4.6 RESEARCH QUESTION 3. WHICH ORGANISATIONAL INFRASTRUCTURES DO MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA POSSESS TO ADOPT THE TECHNOLOGY?

4.6.1 THEME 6: INTERNET

Code 6 Systems for technology adoption

The goal of the objective was to determine how technology adoption in the workplace is attained, what some of the necessary facilities are and how the management of technology infrastructure in the organisation can foster technology adoption for business. A word frequency search is presented in Figure 4.9

Figure 4. 9 Theme 6 Internet

According to the word cloud presented above the word, the internet was the most used word, this word was identified as the theme for the objective relating to organisational infrastructure that managers and entrepreneurs possess for technology adoption. Below is a presentation of some of the responses from the participants based on the identified theme:

Participant 15 a Co-owner of a business indicated that: Technology adoption in the organisation is important in that it necessitates the efficient operation of the organisation.

"This is a tool that can be used for efficient operations in an organisation".

Participant36 a director of a small business within Ndola listed out the necessary technological facilities that allow for technology adoption the response was:

"Networked Computers, the internet, and Mobile devices allow transactions and communications when away from the laptop".

Another Participant 37 Co-owner indicated that:

"Reliable internet, skilled human resources, servers, and the appropriate equipment".

A director (Participant 18) indicated how technology infrastructure is used in the organisation to allow clients to store data on the cloud and responded with the following:

"We provide technology-related solutions to clients. We position infrastructure in an organisation which readily available to migrate to the cloud. E.g., We can control the virtual infrastructure that is provided by VM Technologies. We can link companies that have huge data to link it to larger data centres with the origination for data security".

Participants 11 and 19 CEO and director respectively, reported that the importance of having trained employees in the organisation is necessary for technology adoption in the organisation. Participant11 reported that:

"The training of employees and workers on the knowledge of 4IR. The organisation needs to educate the employees about the benefits and use of technology. This will be a cardinal human resource".

Participant 19 reported that:

"Recruitment of IT specialists, and currently undergoing training on how he will affect the necessary technology adoption".

Participant 2 a CEO responded on the aspect of management of technology in the organisation and its importance:

"The management of technology in the organisation helps with communication which is key in the business infrastructure sector".

Participant 21 pointed out the necessary facilities in an organisation that support technology adoption, and these included:

"Effective infrastructure systems such as the appropriate servers that will be able to run your work and everything that is being uploaded onto the cloud needs to be secured, for example implementing firewalls".

A director of a small business Participant1 indicated that:

"Connectivity for supporting technology adoptions optic fibre, therefore it is imperative that optic fibre is acquired by most organisations. It needs to be available in readiness for technology adoption. Furthermore, Cell phone devices, laptops, desktop computers, alarm systems, access control, Hardware, good and strong internet, updated latest computers, laptops are essentially necessary".

Participant 29 a manager indicated the inefficiencies in technology departments specifically those that are government-related and reported that:

"In the Zambian context, there is an issue of the lack of equipment in the IT department especially the government offices including the lack of qualified staff. If not, there is only one individual and once there is a problem there is delayed operation of the departments".

"Management of staff that are qualified for the particular departments. There is no clear dictation of roles based on skills and qualifications".

"This would entail the keeping of software updates and ensuring that all the subscriptions are paid for. The people that operate the systems should know how to make use of it. There is the use of new improved software and the training of clientele on how they can maximise their business services through the use of technology and provision of training's.

Overall, the results exposed that strong reliable internet, computers, servers and skilled individuals with technological skills are among essential requirements for technology adoption for business in the organisation.

4.7 RESEARCH QUESTION 4. WHAT ARE THE ENTERPRISE ENVIRONMENTAL FACTORS CONTRIBUTING TO TECHNOLOGY ADOPTION BY MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA?

4.7.1 THEME 7: GOVERNMENT.

Code 7 Environment aspects for technology adoption

One of the objectives of the study was to establish the external environmental factors that foster technology adoption among managers and entrepreneurs in their entities. A word frequency was performed, and a word cloud is presented as seen in figure 4.10

Figure 4. 10 Theme 7 Government

According to the word cloud presented above the words, government and Technology were the most used. Based on the summary response of the results it was established that the words were mentioned in the same sentences from the responses of the participants of the study, however, the government appeared to have been more frequently used word therefore it was identified as and used as the theme of the objective. The response from some of the study participants based on this theme is presented below.

Participants gave feedback regarding the efforts that the government is doing to create an environment that is technologically aware of the benefits of the 4IR.

Participant 1 a director of a small business in Ndola reported as follows:

> *"The Zambian government is doing much they have a programme running that is called E-government that is linking government departments to provide services to people in a more efficient way for example Road licencing and fines have E-platforms".*

A manager (Participant 27) of a business in hospitality responded and indicated that:

> *"The government needs to invest in more technology centred programmes as the benefits are quite a number of them".*

Another Participant a director (Participant 19) mentioned that:

> *"The government is informing the nation through newspapers, Tv Programmes and booklets and brochures available at most government offices".*

Participant 23 a manager indicated that not much attention has been given to this issue:

"The government needs to inform the people to be aware of the benefits of the 4IR, however, this is not practised in the country as the government has not paid much attention to this issue".

An assistant manager of a small business in Ndola indicated how the Zambian government is making efforts and mentioned that:

"The government is trying to ensure that technology is adopted in the country and that there is a transition from analogue to digital. So that everyone has an idea of the benefits of technology. In the schools, the government has introduced ITC subjects and even children can tell what a computer is, they will reach a point wherein in Zambia there will be no need to walk into stores to make purchases but rather do all that online".

A CEO of a small business Participant 30 reported that:

"Not entirely sure what efforts the Zambian government is taking. The Zambian Government adopts policies that support technology adoption for economic growth".

Another Participant a director of a business in Ndola mentioned stating that:

"The government does not do much to inform the nation. There was an introduction of Sustainable development goals (SDGs) in 2007 but none of that was implemented following the change of governments".

A Co-owner (Participant 37) of a small business in Ndola said that:

The government does little to let the nation know about the benefits of the 4IR.

A director (Participant19) indicated that:

"The government has not been in the forefront in informing the benefits of technology, the private sector is the one that is in the lead".

Participant 26 a Co-owner of a small business in Ndola reported that technology adoption has challenges and may have an impact on the environment through waste disposal. The response was:

"Technology also comes with its challenges, embracing technologies of modern equipment which produces waste that would have an impact on the environment. E.g., in the beverage industry previously, there was the use of bottled drinks made out of glass now there has been a transition into the use of plastic bottles, and there has not been enough sensitisation of the disposal of plastic bottles. And also provide facilities for disposal. In Zambia, it can be noticed that this is causing an environmental hazard as the drainage system is clogged with plastic".

Participant 19 a CEO indicated that the anticipation of 5G might have adverse effects on the environment and mentioned the following.

> *"There are adverse effects with the anticipated arrival of 5G though the research is not conclusive, it might affect the environment in terms of global warming. And also, to set up the infrastructure the land needs to be cleared and which will take down the trees. Tapping into new ways will affect wild animals".*

A CEO (Participant 2) reported on the disposal of old machinery and alluded that this has an impact on the environment through pollution of the land. The responses were:

> *"However, on the contrary, the discarding of the old equipment may seem to be non-biodegradable, and this may lead to the pollution of the environment through waste mismanagement".*

One Participant indicated that the Zambian government is trying to communicate with citizens in an attempt to spread the word on environmental management through the Ministry of Environment Management. The responses were:

> *"The government of Zambia through the ministry of the environment are doing its best towards environmental management and is fostering through TV and Radio adverts. The government has implemented a few things that have allowed most departments to be working online. E.g., Police systems RTSA and PACRA".*

Overall, the results revealed that the Zambian government is making minimal efforts in providing information regarding the benefits of 4IR and technology adoption for business among entrepreneurs and managers, but rather the private sector is taking the lead. However, the results showed that the private sector is at the forefront of the implementation of technology adoption for business. The Zambian government on the other hand has provided a few departments that work online, and these include Police systems, RTSA and PACRA.

4.8 CONCLUSION

This chapter aimed to provide a presentation of the analysed data from the online interviews conducted by the researcher. The participants were managers and entrepreneurs in Ndola, Zambia. The captured data was transcribed from audio to word format and later loaded onto Nvivo 12. The software was used to analyse the raw data using word text frequency. Seven themes were generated using word clouds. Each theme was presented based on the objectives of the study. The results from objective 1 show that show managers and entrepreneurs are aware of the 4IR the results further show that there is a need to train and provide information to employees in various firms for them to understand the benefits of technology use for business. The objective 2 findings also showed that technology is a necessary tool for business as it aids with functions and operations in various entities. The results from objective 3 also indicated that the internet, computers, and trained employees are among the requirements within a firm that allows for technology adoption. From objective 4 based on the perspective of small business managers and entrepreneurs of Ndola, it was found that the Zambian government is not doing much to create an environment that fosters for technology adoption. The next chapter will provide an in-depth theoretical discussion of the findings presented in this chapter and this will be a comparison with information and research from other scholars and authors in an attempt to attest, refute and provide new insights.

CHAPTER 5 DISCUSSION

5.1 INTRODUCTION

The previous chapter presented the findings of the study from the analysed data that was presented based on the four objectives of the study. The results from objective 1 show that show managers and entrepreneurs are aware of the 4IR and own knowledge and necessary technical skills that foster technology adoption for business. The objective 2 findings also showed that technology is a necessary tool for business as it aids with functions and operations in various entities. The results from objective 3 also indicated that the internet, computers, and trained employees are among the requirements within a firm that allows for technology adoption. From objective 4 it was found that the Zambian government is not doing much to create an environment that fosters fort technology adoption. This chapter aims to provide a theoretical discussion of the results of the study on the topic "Exploring technology adoption for business and awareness of the Fourth Industrial Revolution amongst business managers and entrepreneurs in Ndola, Zambia". The reason for the discussion of the findings is that it is critical to understand what has been found in the study and connect it with previous research presented in the literature review chapter. This is in an attempt to accept, refute and present any new findings that have been identified in the previous chapters. This chapter will set out by providing a discussion of the findings by presenting a discussion of each objective in line with the findings from the previous chapter which will be analysed with information from the literature review chapter. This will be done for each one of the four objectives to provide a clear understanding of what the results mean. This will then be followed by a chapter conclusion. The results will be discussed in line with the four objectives of the study.

5.2 OBJECTIVE OF THE STUDY

The objective of the study was to explore the technology awareness and business readiness of managers and entrepreneurs in the 4IR era. The study made use of a qualitative method and data was collected using telephone interviews.

5.3 Objective 1: TO EXPLORE THE FOURTH INDUSTRIAL REVOLUTION AS PERCEIVED BY MANAGERS AND ENTREPRENEURS OF NDOLA ZAMBIA

The main focus of this objective was to explore the knowledge that managers and entrepreneurs have on the 4IR, the sectors that it has impacted, its impacts on business and the managers' and entrepreneurs' readiness towards the 4IR.

5.3.1 Technology, industry, business and company.

The research revealed that the Fourth Industrial Revolution is a wave of technology that has undergone a transition from mechanical means of production to a more digital phase through the evolution of industrialization. The results show that the 4IR is a technological phase that requires both the private and public sectors to embrace and partner to benefit from the opportunities that 4IR presents. The study further revealed that the 4IR is a wave in which computer technology is used in various business sectors for operations. To side with these findings from the study Coleman (2016) claims that 4IR's impact on business and society is highly due to digitalization in business sectors. The researcher further suggests that the introduction of Artificial Intelligence is closely linked to the improvement of labour efficiency. The study also revealed that the 4IR is an era in which there is a shift from manual computation to a more digital way of capturing information through the use of the internet and telecommunications systems. To further support this revelation Rossmiller, Lawrence, Clouse, and Looney (2017) in a study on disaster recovery in a small business context proposed that most entrepreneurs' and managers' success can be associated with adopting technology-based systems for business rather than wholly relying on traditional business operations. Therefore, emphasizing investing in technology skills development for entrepreneurs. These results correspond with the findings of a study by Sutherland (2020) "The Fourth Industrial Revolution–The Case of South Africa" in which the author proposes that: The 4IR allows for the proliferation of different business models that provides the production and delivery of goods swifter through the collaboration of machines and human labour. To support the study of Sutherland, Schwab (2015) in an article on what the 4IR is and how to respond to it mentioned that 4IR allows for people to connect through mobile

devices, with tremendous processing power, storage capacity, and knowledge access, are limitless, therefore the developments in domains like artificial intelligence, robots, the Internet of Things, autonomous cars, 3-D printing, nanotechnology, biotechnology, materials science, energy storage, and quantum computing will multiply these possibilities.

5.4 Objective 2. TO EXPLORE THE STRATEGIES THAT MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA USE TO ADOPT THE USE OF TECHNOLOGY FOR BUSINESS

This objective aimed to determine the strategies that managers and entrepreneurs are putting into place in their various entities in an attempt to adopt technology for business.

5.4.1 Technology

The results revealed that entrepreneurs and managers make use of technology in their various entities, however, this objective was not addressed by the research results. But the study revealed that managers and entrepreneurs use technology for business in their operations. The study revealed that in the 4IR era technology adoption for business is imperative and therefore entities that have not adopted technology for business cannot thrive as technology is a driver of business growth and also improves operations through efficiency. To support this result Coleman (2016) found that 4IR's impacts on business and society are highly due to digitalisation in business sectors. The author further suggests that the introduction of Artificial Intelligence is closely linked to the improvement of labour efficiency. Furthermore, Brynjolfsson and McAfee (2015) proposed that companies' managers shall be provided with the new innovative business models that allow minimal scale production that is more efficient and competitive, made possible by less expensive automation and low inputs.

The results also revealed that most entities have adopted the use of technology and make use of it in their day-to-day business operations such as marketing, advertisements and promotions through the use of social media platforms such as Facebook. Other operations are conducted remotely through technology-related business platforms such as Zoom and Skype. To support these Molinillo and Japutra (2017) technology adoption allows for enterprises to be more competitive, therefore allowing SMEs to improve their operational efficiency and fostering business growth. Technology adoption further allows larger organizations to be able to minimize the processing of information and communication costs that are incurred by management, making managers be able to monitor a larger number of employees Molinillo and Japutra (2017). This is similar to the result that was found in the research revealing that

technology is a tool that can be used to solve problems in business in a more efficient manner an example of branding was given in a marketing industry indicating that branding there is a need to understand the mission and vision of the business, therefore using technology should assist in the growth of clientele and growing a market base, therefore, technology will play a role in portraying the kind of services that a firm provides.

The research revealed that social media technologies are used to promote the business and reach a larger target market in a very short space of time, this is since there is an increasing number of social media users, primarily technology for business promotes effectiveness and business are conducted in real-time. This entails that the adoption of technology is based on the perceived benefits and opportunities that technology provides to the adopter. To support this finding Naudé (2017) proposes that the 4IR technologies encompass opportunities for African Industrialization. The possibilities include new models of business operations providing goods and services to consumers on a large scale and faster, Furthermore, entrepreneurs and small businesses in Africa may be more competitive and efficient by adopting 4IR technologies. Sin and Sin (2020) in research conducted on technology adoption among small-medium enterprises, employed the TOE frameworks to assess the adoption of ERP solutions and found that the adoption of these is more inclined to technology rather than organisational and environmental factors.

Therefore, overall, the study revealed that there are no particular strategies that managers and entrepreneurs of Ndola, Zambia employ to adopt technology for business. However, the results revealed that they use technology in their various entities for business operations, this is because of the perceived benefits of technology. Furthermore, technology being a tool to be used as tool for opportunity creation and competitive advantage over rival firms. To concur with this finding the study by Molinilo (2017) on organizational adoption of digital information and technology found that the results from a study on organisational adoption of technology specifically SMEs show that technology adoption is significantly influenced by the level of compatibility, with most business owners offering that they seek to assess the opportunities that the technology provides, through the assessment of technology and compatibility with the firm's existing systems, highlighting the need to integrate technology into the enterprise. Otherwise, they would be reluctant to adopt it.

5.5 Objective 3. TO EXPLORE WHICH ORGANISATIONAL INFRASTRUCTURES MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA POSSESS TO ADOPT THE TECHNOLOGY

This objective aimed to ascertain the necessary facilities such as the internet, computers and skilled individuals that an entity employs to foster technology adoption for business from the perspective of managers and entrepreneurs. How they manage their infrastructure in their various entities as well as the anticipated facilities based on the knowledge that they may intend to employ.

5.5.1 Internet

The study found that technology adoption in the organisation is important in that it necessitates the efficient operation of organisations, to support this exposition Alsheibani, Cheung, and Messom, (2018) points out that most technology readiness from the organisation's perspective is believed to be adopted on the ground that technology enhances competitiveness and provide maintenance of resources efficiently. This is similar to the findings the results from a study by Molinilo and Juptra (2017) on organisational adoption of technology specifically among SMEs revealed that technology adoption is significantly influenced by the level of compatibility, with most business owners offering that they seek to assess the opportunities that the technology provides. This is through the assessment of technology and compatibility with the firm's existing systems, highlighting the need to integrate technology into the enterprise. Otherwise, they would be reluctant to adopt it.

However, on the contrary, Jere and Ngidi (2020) propose that innovation be achieved and adopted in the organisation. Management attitudes and behaviors need to be those that disseminate information about technology and designs and make it part of the organizational strategy, placing emphasis on the importance of creativity to the employees and providing incentives for creative initiatives. These study results are similar to the author's proposition in that they revealed that it is important to have trained employees in the organisation as this will enhance technology adoption. The organisation needs to educate the employees about the benefits and use of technology as this will be a cardinal human resource.

The study revealed that the management of technology infrastructure in the organisation is key for communication specifically in the business sector. Effective infrastructure systems such as the appropriate servers that can run work and everything that is being uploaded onto the cloud need to be secured for example through implementing firewalls, however, the study shows that this cannot be attained unless there is the recruitment of information technology

specialists. Jere and Ngidi (2020) support this finding and indicates that the abundance of resources plays a significant determining role in technology adoption in the organization. These resources are referring to adequate capital, human resources, and the will to meet the demands that come with it. The study showed that for an organisation or an entity to attain the management of technology there is a need to have qualified individuals with the appropriate skill set. Furthermore, the results also revealed that for technology adoption to be achieved there is a need for supporting connectivity structures such as optic fibre, cell phone devices, desktop computers, alarm systems, access control, hardware, good and strong internet, updated latest computers and laptops. The listed structures are essential and need to be available in readiness for technology adoption for business.

The study also discovered some inefficiencies as perceived by managers and entrepreneurs these included: the lack of equipment and tech-savvy employees in the IT departments especially the government offices including the lack of qualified staff. Pointing out that few individuals are qualified for technology-related problems and once there is a problem there is delayed operation of the department.

5.6 Objective 4. TO EXPLORE THE ENTERPRISE ENVIRONMENTAL FACTORS CONTRIBUTING TO TECHNOLOGY ADOPTION BY MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA

The fourth objective aimed to explore the external enterprise environmental aspects that foster technology adoption among managers and entrepreneurs of Ndola in the era of the 4IR.

5.6.1 Government

Cruz- Jesus, Pinheiro and Oliveira (2019) in a study on technology adoption for business, indicated that the environmental aspect focuses on the area in which the firm is situated and conducts its business such as the industry, the competitors, and affiliation with the government (Cruz- Jesus et al., 2019). The study found that the government is trying to ensure that technology is adopted in the country and that there is a transition from analogue to digital-based on the perspective of entrepreneurs and managers of Ndola Zambia. The aim is for everyone to have an idea of the benefits of technology. In the schools, the government has introduced ITC subjects and even children are aware of computers as this is part of their curriculum. Research by Gono, Harindranath, and Özcan, (2016) on the adoption and impact of ICT in South African SMEs found that competitive pressure and government regulatory issues are the main environmental factors that can affect technology adoption. However, the study did not side with this finding and rather revealed that the government is not providing the necessary information that will foster technology adoption for business specifically among small to medium enterprises, indicating that there is not much being done to provide information about the benefits of the 4IR. The study further revealed that the government has implemented a few programs that have allowed most departments to be working online for example Police systems, RTSA and PACRA. To support these findings Tang & Konde (2020) in their research on technology adoption in Zambia suggest that there is a need to redefine the uses of technology given the drastic changes and its uncertainty. Giving an example of e- commerce in Zambia among SMEs,' they noted that it is seen to be a more complex use of technology rather than a portal of access to information and communication.

5.7 CONCLUSION

This chapter aimed to provide a discussion of the findings from the previous chapter in unification with international, regional and local literature. This was to back or reject the results of the technology adoption for business in the 4IR. The discussion was done on each of the four objectives of the study. The findings indicate that managers and entrepreneurs are aware of the 4IR in the discussion of objective one it was identified that this sides with previous studies conducted by other researchers, the second objective of the study aimed at identifying the strategies of technology adoption, however, the results show that there is no particular strategy that has been adopted. But rather the study found that the managers and entrepreneurs are slowly adopting technology for business and employing it for various entities for operations. The third objective aimed at establishing the necessary facilities for technology adoption. The discussion of the results found that there are concerns about technologically skilled individuals in the country and that there is need for more training. This was a new insight that was revealed and was not identified in previous research. The fourth objective aimed at understanding the external environmental factors that foster technology adoption. The discussion found that despite the government having put in place objectives to attain development goals technologically based on the national development plan of 2007, the perspective of small business managers and entrepreneurs is that government is making minimal efforts to foster an environment for technology adoption in various sectors. The next Chapter, which is Chapter 6 will provide the conclusions, identify the limitations of the study and provide recommendations and future research insights.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter aims to provide conclusions and recommendations of the study in response to the research questions based on the research objectives. The study sought to explore technology adoption for business among entrepreneurs and managers of Ndola, Zambia in the Fourth Industrial Revolution. Previous research studies have found that the Fourth Industrial Revolution (4IR) has impacted various sectors including business. The fourth industrial revolution technologies have altered the way business is conducted and has led to more efficient operations. The study agrees with these findings but also highlighted that for technology adoption to be achieved in business there is a need to have the necessary facilities such as reliable internet, computers, and skilled individuals that are tech-savvy. Furthermore, the study also found that the Zambian government is making minimal efforts in informing the country about the benefits of 4IR technologies for business. The chapter will begin with providing conclusions of the study based on each research question depicting how it was met, partially or not met at all identifying specifically wherein the study it occurred. This will be followed by recommendations based on each research question and then lastly the limitations that were encountered during the entire process of the study.

6.2 CONCLUSIONS

The study aimed at exploring technology adoption for business and awareness of the Fourth Industrial Revolution amongst business managers and entrepreneurs in Ndola, Zambia. The conclusions provided are based on the key findings in line with the research objectives in response to the research questions of the study. According to the results and discussions the following conclusions can be made based on the research questions of the study.

6.2.1 WHAT IS THE FOURTH INDUSTRIAL REVOLUTION AS PERCEIVED BY MANAGERS AND ENTREPRENEURS OF NDOLA, ZAMBIA?

6.2.1.1 Research objective 1. To explore what the Fourth Industrial Revolution is as perceived by managers and entrepreneurs.

The results from question 1 section B (refer to APPENDIX D) revealed that managers and entrepreneurs are aware and Knowledgeable of the 4IR and understand the revolution being a digital and technological revolution that employs the use of computers and machines to carry out work more efficiently, furthermore, the results also indicated that the 4IR is a shift from the use of mechanical means of production to more technological. Based on the response from the interview it can therefore be concluded that managers and entrepreneurs of Ndola, Zambia are aware of the 4IR.

The answers to question 2 (see APPENDIX D) revealed that managers and entrepreneurs can identify some of the sectors that have been impacted by the 4IR. Several sectors have been impacted by the 4IR based on the responses from participants in the interview, some of the identified sectors and industries include mining, tourism, banking, business consultancy, retail trading, and media.

The findings from question 3 (see APPENDIX D) indicated that the participants are knowledgeable of the impacts of the 4IR on business, they pointed out that the 4IR technologies play a role in the business operations and are an essential tool growth of an entity. Therefore, based on this finding it can be concluded that managers and entrepreneurs are aware of the impacts of the 4IR on business.

The results from question 4 (see APPENDIX D) show that the participants indicated that they are taking the necessary steps in their various sectors and entities to prepare for the 4IR. The results show that there is a need to train and provide information to employees in various firms for them to understand the benefits of technology use for business. Other participants

indicated that they have implemented the use of technology through the use of technology-based apps, computers and social media platforms.

The above findings are an indication that the results are in line with the literature review and therefore it is evident that the objective has been addressed. Managers and entrepreneurs are aware of the 4IR and demonstrated that the 4IR has impacted various business sectors finally the managers and entrepreneurs have implemented the use of technology in their various businesses through the use of technology-based apps computers and social media platforms.

6.2.2 WHAT ARE THE STRATEGIES THAT MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA USE TO ADOPT THE USE OF TECHNOLOGY FOR BUSINESS?

6.2.2.1 Research objective 2. To explore the strategies that managers and entrepreneurs in Ndola, Zambia use to adopt the use of technology for business.

The results from question 1 section C (refer to APPENDIX D) exposed that the participants recognise technology adoption is essential for business and it can be used as a tool in business that would allow a business to operate efficiently and promote business growth. The availability of information on websites in the tourism industry provides an improved way of conducting business. Furthermore, it was identified that technology allows firms to thrive in the business environment. Therefore, it can be concluded that managers and entrepreneurs understand the use of technology for business.

The findings from question 2 section C (refer to APPENDIX D) indicated that the majority of entrepreneurs and managers make use of technology in various ways such as monitoring stock and purchasing products online. They use marketing software packages to market their products as well as social media promotion to reach a larger target market. Therefore, based on the findings, it can be concluded that managers and entrepreneurs are using technology for business in their various entities.

The results from question 3 section C (see APPENDIX D) indicated that technology can be used as a tool for job creation through the auditioning of individuals remotely rather than having to be in contact with and at a workplace. Therefore, it can also be concluded that technology is being used as a tool to create employment opportunities.

The findings from question 4 section C (see APPENDIX D) revealed that technology can be used for competitive advantage through the provision of information about products on social media platforms, therefore, reaching new markets. The responses also revealed that the

introduction of virtual meetings allows for the ability to conduct meetings anywhere without being in a particular place. Therefore, it can be concluded that these benefits for business operation allow for adopters to have a competitive advantage over rival firms.

Overall, the findings from objective 2 found that Ndola's entrepreneurs and managers do not employ any specific tactics to adopt technology for business, which could be due to a delay in the adoption of technology in businesses that rely only on technology for operations. Therefore, it can be concluded that they are not particular strategies that are adopted by managers and entrepreneurs of Ndola, Zambia. However, according to the study, some entrepreneurs and managers are aware of the advantages of using technology in their businesses and use it in their various entities for operations. According to the research, this need arose because technology is expected to further assist efficient operations and improve business operations through the high availability of information accessible via the web. According to the study, technology can be used as a tool in business to shorten business processes, and social media platforms have revolutionized how advertising and brand marketing are done. The study discovered that applications such as Facebook and WhatsApp are used to showcase firm catalogues and provide information about the products and services offered; these findings have been presented in a discussion of the findings chapter, which is chapter 5.

6.2.3 WHAT ORGANISATIONAL INFRASTRUCTURES DO MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA POSSESS TO ADOPT THE TECHNOLOGY?

6.2.3.1 To explore which organisational infrastructures managers and entrepreneurs in Ndola, Zambia possess to adopt the technology

The findings from question 1 section D (see APPENDIX D) results from the findings chapter exposed that strong reliable internet, computer and servers are among essential requirements for technology adoption for business in the organisation. Furthermore, the study also revealed training employees and workers on the knowledge of the 4IR would be a cardinal human resource. It can be concluded that the managers and entrepreneurs understand what is required for the adoption of technology within a firm.

The results from question 2 section D (see APPENDIX D) identified the following as efforts that firms are technology adoption firms to provide training to employees and provide

information on the benefits of technology in the business. Another identified result based on the research question is the recruitment of IT specialists and the provision of training on how to affect the necessary technology adoption. With the above identifications, it can be concluded that managers and entrepreneurs are making efforts to attempt to adopt technology for business in their entities.

The findings from question 3 section D (see APPENDIX D) revealed that there is the provision of infrastructure that is ready to migrate into the cloud and the use of online servers to protect client information through the implementation of firewalls. Connectivity for supporting adoption such as optic fiber is imperative that potential adopters acquire it. Other than cell phones, access control, hardware and strong internet are among the essentials. Based on the findings identified it can be concluded that managers and entrepreneurs understand the necessary systems that support technology.

The results from question 4 section D (see APPENDIX D) revealed descriptions of the management of technology based on the perspective of managers and entrepreneurs. The management of technology in the organisation is to assist with communication which happens to be key in the business infrastructure sector. Another aspect identified was that of ensuring that all the software packages are updated and paid for. However, it was also identified that in the government and local departments there is a lack of key equipment, qualified staff and no clear indication of roles. This has a major role in delayed operations. From the responses, it can be concluded that the participants are aware of some of the means of the management of technology infrastructure.

The indicated findings show that the objective was met, and the managers and entrepreneurs understand what is required for the adoption of technology within a firm, and are making efforts to attempt to adopt technology for business in their entities. They also demonstrated and indicted the necessary systems that support technology adoption within a firm. Lastly it was identified that managers and entrepreneurs are aware of some of the means of the management of technology infrastructure.

6.2.4 WHAT ARE THE ENTERPRISE ENVIRONMENTAL FACTORS CONTRIBUTING TO TECHNOLOGY ADOPTION BY MANAGERS AND ENTREPRENEURS IN NDOLA, ZAMBIA?

6.2.4.1 To explore the enterprise environmental factors contributing to technology adoption by managers and entrepreneurs in Ndola, Zambia.

The results from question 1 section E (see APPENDIX D) the study identified that the government is making efforts to inform the nation about the benefits of technology adoption for business through newspapers, TV programmes and booklets provided at most government offices. But on the contrary, the findings also revealed that the government needs to inform the people to be aware of the benefits of the 4IR, but this is not practiced in the county as the government has not paid much attention to this issue. Therefore, it can be concluded that based on the responses provided by the manager and entrepreneurs of Ndola, the Zambian government has played a role in informing the people about technology adoption but has not paid much attention to informing the people about the benefits of the 4IR.

The findings from question 2 section E (see APPENDIX D) it was revealed that they are not knowledgeable of any policies that have been implemented to support the economic growth through the use of technology for business. Therefore, it can be concluded that the participants are not knowledgeable.

The results from question 4 section E (see APPENDIX D) revealed that the 4IR could have environmental impacts and the following was identified based on the question paused. Technology comes with its challenges and the embracing of modern equipment which produces waste would have an impact on the environment. The setting up of technology infrastructure \requires for land to be cleared and this would affect the nature of the clearing of land which has an effect on global warming. Therefore, based on the responses it can be concluded that managers and entrepreneurs perceive that technology has an impact on the environment. The research aimed to establish the factors that exist outside the firms of managers and entrepreneurs that foster technology adoption for business. The results revealed that the Zambian government is making minimal efforts in providing information regarding the benefits of 4IR and technology adoption for business among entrepreneurs and managers, but rather the private sector is taking the lead. The results also showed that there are inefficiencies such as lack of skilled individuals, stable access to the internet and management of technology in Zambian Government departments specifically those that are technology-related, and this influences service delivery due to delays. However, the results did reveal

that the private

sector is at the forefront of the implementation of technology adoption for business. The Zambian government on the other hand has provided a few departments that work online, and these include Police systems, Road Traffic and Safety Agency (RTSA) and the patents and company registration agency (PACRA). The overall conclusion is that the objective was not met because the external environment does not foster technology adoption as perceived by the participating managers and entrepreneurs. They presented that from the perspective there are minimal government efforts. These findings were presented in the findings chapter and to allude to these conclusions the literature indicates the necessary environmental factors that are necessary for technology adoption for business outside the firm.

6.3 LIMITATIONS OF THE STUDY

Limitations of the study are issues that were encountered during the research process and the researcher acknowledges that these issues can introduce weakness in the study therefore they were considering minimising this. However, despite the limitations presented, the insights obtained are of value. The following is the key limitation experienced by the researcher:

6.3.1 **Limitation 1**

The key limitation of the study was the lack of generalisability of the findings; however, the findings provide critical insights.

6.3.2 **Limitation 2**

The research was only limited to Ndola and no other parts of the country therefore the results from the study cannot be generalized to other parts of the country

6.3.3 **Limitation 3**

The inability to travel due to the COVID-19 pandemic lockdown restrictions during the Level 4 played a huge role in limiting the study as the interviews were planned to be conducted face-face. However, this was not possible due to travel restrictions, the study would have been completed earlier than expected if the interviews had been conducted face-to-face.

6.3.4 **Limitation 4**

The study was limited due to the lack of resources during the data collection process as there was no funding provided therefore the researcher had to make use of personal limited resources to conduct the data collection process which was done using online platforms that required reliable and stable internet.

6.4 RECOMMENDATIONS

The recommendations are made based on the results of the findings of the research. These are recommendations provided by the researcher towards managers and entrepreneurs as well as policymakers:

1. Managers and entrepreneurs should make it mandatory to improve technical knowledge and stay up to date with technological trends. This can be achieved through the utilization of the internet as multiple platforms provide necessary sources of information.
2. The results show that the government is playing a minimal role in 4IR sensitization therefore individuals must take up the responsibility and educate, train and provide information to employees. This will be of great benefit to firms as employees will understand the value of using technology for business operations.
3. The Zambian government needs to adopt policies that promote economic growth through the use of technology for business, this will create an environment where technology is ready for the adoption of the 4IR technologies.
4. The policymakers need to foster an environment that will change the technology landscape in the country by making it mandatory that technology is made accessible to every individual across the country regardless of their location.
5. There is a need to include technology-related studies in schools from as low as primary as this will enable the creation of a next generation that is technologically savvy. The efforts that are currently in place are the bare minimum.
6. The government needs to implement programs that are tailored for small-medium enterprises that will provide technology-based training on how technology can be used as a tool for business operations.
7. Firms that are already existing need to ensure that they constantly make improvements in their operations as the 4IR is a wave that will eventually lead to the next revolution therefore there is a need to stay informed with the trends specifically in the business sector. This would also entail staying updated with the latest machinery and equipment.
8. To foster adoption there is a need for firms to provide training to employees and provide information on the benefits of technology in the business.

6.5 FUTURE RESEARCH

The research aimed at exploring technology adoption for business in the 4IR. The results revealed that managers and entrepreneurs are aware of the 4IR and do employ the use of technology for business in their various entities. However, it was revealed that the government is not playing a leading role in informing the nation about the benefits of the 4IR. Therefore, it is imperative that future research looks into researching on this revelation.

Another aspect that needs to be looked into is the national technology adoption progress with a broader focus on the entire commercial sector. The study also attempted to understand technology adoption using the Technology organisation and environment (TOE) framework however it would be important to employ other technology adoption models as the TOE focuses on 3 aspects whilst multiple factors can contribute to technology adoption. This is also to further explore and deepen the understanding of technology adoption and provide greater insights.

6.6 OVERALL CONCLUSION

Based on research the 4IR is believed to have an impact on various sectors across the globe. According to the World Economic Forum 2016, the disruptive change of the 4IR has impacted business models and the way managers and entrepreneurs can conduct sustainable business practices through innovativeness.

Entrepreneurship is perceived to be a driver of economies and employment in most countries. Therefore, technology adoption for business operations is cardinal, especially in a technological era such as the 4IR. The study aimed at exploring the opportunities that technology adoption for business provides to managers and entrepreneurs. Therefore, the findings of the study are important to existing entrepreneurs and managers, governments, institutions of higher learning and individuals that seek to venture into the field of entrepreneurship.

The findings revealed that managers and entrepreneurs of Ndola, Zambia are aware and knowledgeable of the 4IR and understand the revolution being a digital and technological revolution that employs the use of computers and machines to carry out work more efficiently, furthermore, the results also indicated that the 4IR is a shift from the use of mechanical means of production to more technological. The findings also revealed that there are various sectors

that have been impacted by the 4IR, furthermore was the fact that managers and entrepreneurs employ the use of technology in their various entities as they pointed out that the 4IR technologies play a role in the business operations and are an essential tool growth of an entity.

The results also exposed that technology adoption is essential for business and it can be used as a tool in business that would allow a business to operate efficiently and promote business growth. It can also be used as tool for opportunity creation and competitive advantage for adopters through the provision of information in an attempt to enter new markets. However, to achieve the above there is a need for organisations to own certain internal infrastructure. The results from the study showed that strong reliable internet, computer and servers are among essential requirements for technology adoption for business in the organisation, Furthermore, the study also revealed training of employees and workers on the knowledge of the 4IR would be a cardinal human resource in the entity as it will aid in the management of technology in the organisation to assist with efficient communication which happens to be key in the business sector.

The external environment in which the entities exist also plays a critical role in technology adoption for business. The findings from the study revealed that the government is making efforts to inform the nation about the benefits of technology adoption for business through newspapers, TV programs and booklets provided at most government offices. The manager and entrepreneurs of Ndola revealed that the Zambian government has played a role in informing the people about technology adoption but has not paid much attention to informing the people on the benefits of the 4IR, this also sides with the results that there are not any policies that have been implemented to support the economic growth through the use of technology for business. Lastly, the study revealed that the setting up of technology infrastructure requires land to be cleared and this would have an effect on nature as the clearing of land has impacts on the ozone layer leading to global warming.

6.7 CONCLUSION

The study set out to explore technology adoption for business among entrepreneurs and managers of Ndola Zambia in the Fourth Industrial Revolution. The study, therefore, found that managers and entrepreneurs are knowledgeable about the 4IR, they demonstrated an understanding of technology adoption for business and how some entities employ technology. It was found that certain necessary facilities are relevant for technology adoption in the firms with internet and training of employees being the most prominent. According to the perception of managers and entrepreneurs of Ndola, the government of Zambia needs to play a leading role in the sensitization of technology adoption specifically among small-medium enterprises as technology is a tool that allows business growth when used for operations and allows for economic growth. This chapter identified the four research objectives that were used in the study and made overall conclusions on each objective based on the research findings and literature. The limitations of the study were also presented to point out what could have led to the study experiencing weaknesses. Recommendations from the researcher have also been provided and this is followed by the suggestion that can be taken for future research based on what was being identified in the process of the study.

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APPENDIX A. ETHICAL CLEARANCE LETTERS

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

06 January 2021

Mr Mukonkola Mwale (213573382)
School of Management, IT & Governance
Pietermaritzburg Campus

Dear Mr Mwale,

Protocol reference number: HSSREC/00002216/2020
Project title: Exploring the business strategic readiness of entrepreneurs and managers of Ndola Zambia to the Fourth Industrial Revolution
Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 25 November 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 07 January 2022.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Professor Dipane Hlalele (Chair)

/ms

Humanities and Social Sciences Research Ethics Committee
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 8350/4557/3587 **Email:** hssrec@ukzn.ac.za **Website:** http://research.ukzn.ac.za/Research-Ethics
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

APPENDIX B. ETHICAL CLEARANCE LETTER 2 AMENDED

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

24 May 2022

Mukonkola Mwale (213573382)
School Of Man Info Tech & Gov
Pietermaritzburg Campus

Dear M Mwale,

Protocol reference number: HSSREC/00002216/2020
Project title: Exploring the business strategic readiness of entrepreneurs and managers of Ndola Zambia to the Fourth Industrial Revolution.
Amended title: Exploring technology adoption for business among entrepreneurs and managers of Ndola Zambia in the Fourth Industrial Revolution era

Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 20 May 2022 has now been approved as follows:

- Change in title

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

Best wishes for the successful completion of your research protocol.

Yours faithfully

[redacted]

.....
Professor Dipane Hlalele (Chair)

/dd

APPENDIX C. ETHICAL CLEARANCE LETTER 3 AMENDED

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

15 September 2022

Mukonkola Mwale (213573382)
School of Management, IT & Governance
Pietermaritzburg Campus

Dear M Mwale,

Protocol reference number: HSSREC/00002216/2020
Original title: Exploring the business strategic readiness of entrepreneurs and managers of Ndola Zambia to the Fourth Industrial Revolution.
Previous amended title: Exploring technology adoption for business among entrepreneurs and managers of Ndola Zambia in the Fourth Industrial Revolution era
Current amended title: Exploring technology adoption for business and awareness of the Fourth Industrial Revolution amongst business managers and entrepreneurs in Ndola, Zambia

Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 08 September 2022 has now been approved as follows:

- Change in title

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

Best wishes for the successful completion of your research protocol.

Yours faithfully

[redacted]

.....
Professor Dipane Hlalele (Chair)

/ms

APPENDIX D. INTERVIEW GUIDE

INTERVIEW SCHEDULE

SECTION A

DEMOGRAPHIC DATA

1. Name of the company

   _____

2. Years of operation

   _____

3. Position of participants

   _____

4. Age

   _____

6. Qualification of participants

   _____

7. Nature of business

   _____

SECTION B

ENTREPRENEURS AND MANAGERS KNOWLEDGE OF THE FOURTH INDUSTRIAL REVOLUTION.

1. In your understanding, describe the Fourth Industrial revolution.

   _____

2. What are some of the sectors that you can consider impacted by the Fourth Industrial Revolution?

   _____

   _____

3. Based on experience or knowledge, what are some of the Fourth Industrial Revolution's impacts on business?

   _____

   _____

   _____

4. What are the steps that your organisation has taken in readiness of the Fourth Industrial revolution?

_____
_____
_____

SECTION C

ENTREPRENEURS AND MANAGERS PERCEPTIONS OF TECHNOLOGY ADOPTION FOR BUSINESS.

1. In your opinion, provide an understanding of the use of technology for business.

_____
_____

2. How does your organisation employ the use of technology?

_____

3. In your opinion, how you would use technology for business to create opportunities?

_____
_____
_____

4. Explain how you would use technology in your organisation to stay competitive in your Industry?

_____
_____
_____

SECTION D

ORGANISATIONAL INFRASTRUCTURE FOR TECHNOLOGY ADOPTION

1. In your own opinion, please state what you consider to be the necessary facilities within an organisation that support technology adoption?

_____
_____
_____

2. State your organisational efforts towards technology adoption?

_____
_____
_____

3. In your opinion, state the technology systems that an organisation would use to support technology adoption.

_____
_____
_____

4. How would you describe the management of technology infrastructure within the organisation?

_____
_____
_____

SECTION E

ENVIRONMENTAL ASPECTS SURROUNDING THE ADOPTION OF TECHNOLOGY FOR BUSINESS.

1. In your opinion, please state the government's efforts to inform the nation about the benefits of the Fourth Industrial Revolution.

   _____
   _____
   _____

2. State some of the government's policies surrounding economic growth by using technology for business.

   _____
   _____
   _____

3. In your understanding, please state some of the legal aspects surrounding the use of technology for business.

   _____
   _____
   _____

4. In your opinion, state how the use of technology would have an impact on the environment?

   _____
   _____
   _____