Cape Peninsula
University of Technology

THE IMPACT OF DISRUPTIVE TECHNOLOGIES ON THE GROWTH AND DEVELOPMENT OF SMALL BUSINESSES IN SOUTH AFRICA

by

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Thesis submitted in fulfilment of the requirements for the degree

Master of Technology: Business Administration (Entrepreneurship)

in the Faculty of Business and Management Sciences

at the Cape Peninsula University of Technology

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District Six, Cape Town

2021

DECLARATION

I, **Mayeadeh Tarr**, declare that the contents of this thesis represent my own unaided work and that the thesis/dissertation has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

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ABSTRACT

The upsurge and convergence of emerging technologies have gained prominence in recent years and have become the main discourse of considerable policy and academic discussions. Such developments have ushered in a new era of technological disruption commonly referred to as the Fourth Industrial Revolution (4IR). While the 4IR is anticipated to have transformative effects on all facets of society, little research has explored the potential impact of 4IR technologies on the development of SMMEs in context of South Africa. Considering its strategic importance, the development of a robust SMME sector will be pivotal in advancing the opportunities of the 4IR.

The central endeavour of the study was to assess the implementation of disruptive technologies on the development and transformation of the SMME sector with a focus on the required skills to thrive in the era of the 4IR. A qualitative exploratory design in tandem with a descriptive design was incorporated to elicit multiple views on the challenges and experiences of adopting a technology-driven business model. Qualitative data was collected through face-to-face semi-structured interviews with thirteen SMMEs. Key outcomes of the study revealed that SMMEs have the potential of becoming early adopters of 4IR/disruptive technologies which are evidenced in their use of technologies such as cloud computing, artificial intelligence, machine learning and blockchain. However, there are several factors such as lack of financial resources, the digital divide, fast-paced technological changes, automation of jobs, lack of support mechanisms and regulatory demands that may potentially inhibit the ability of SMMEs to fully participate in the 4IR. Knowledge of the 4IR and related concepts is also at a nascent stage requiring further clarification and demystification to ensure the successful transition into the 4IR.

Enabling a conducive and thriving environment is crucial to enhance small business participation in a digitally-driven ecosystem. The recommendations for the study are twofold: from an internal perspective, the study proposes the need to develop a comprehensive digital transformation strategy that also looks at deploying agile IT infrastructure and instilling a culture of lifelong learning through investing in human capital. From an external perspective, the study proposes the realignment of SETA programs and the development of an integrated e-Business platform mitigating some of the challenges and difficulties experienced by the SMMEs.

ACKNOWLEDGEMENTS

DEDICATION

I dedicate this thesis to my late mother, Mary F. Tarr

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GLOSSARY OF TERMS

Acronyms	Definitions
4IR	Fourth Industrial Revolution
AI	Artificial intelligence
API	Application programme interface
AR	Augmented reality
AfDB	African Development Bank
BER	Bureau for Economic Research
CAQDAS	Computer-aided qualitative data analysis software
CEO	Chief executive officer
CEO	Chief exponential officer
COEFS	Centre of Excellence in Financial Services
CPS	Cyber-physical systems
CPD	Continuous professional development
CPUT	Cape Peninsula University of Technology
EU	European Union
DSBD	Department of Small Business Development
GDP	Gross Domestic Product
GEM	Global Entrepreneurship Monitor
IFC	International Finance Corporation
IoT	Internet of things
IoS	Internet of services
IT	Information technology
ICT	Information communication technology

KPI	Key performance indicator
MGI	McKinsey Global Institute
NSB	National Small Business Act
PC4IR	The Presidential Commission of the 4IR
R&D	Research and development
SMEs	Small and medium-sized enterprises
SMMEs	Small, medium and micro enterprises
STEM	Science technology engineering and mathematics
VAT	Valued-added tax
WEF	World Economic Forum

CHAPTER ONE
INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

The emergence and the impact of the Fourth Industrial Revolution (4IR), which is also known as the Digital Factory or Industry 4.0, have been widely discussed over the past decade in academia, industry and media (Geissbauer, Vedso & Schrauf, 2016:6; Dewa, Adams, Nyanga & Ganduri, 2018:649). This discussion is predominantly due to technological innovation taking place at an unprecedented speed, disrupting nearly every industry across the globe (COEFS, 2017). Several studies have acknowledged that the shift towards the 4IR began in Germany 2011 and thereafter caused a ripple effect across developed nations such as the United States and Japan (Dewa et al., 2018:649; Morrar, Arman & Mousa, 2017:3; Guoping, Yun & Aizhi, 2017:634). This evidently affirms the hype that surrounds the discourse of Industry 4.0 which is envisaged in certain quarters as a futuristic aspiration to investments and real results (Geissbauer, Vedso & Schrauf, 2016:8; COEFS, 2017). According to Schoeman, Moore, Seedat and Chen (2017:4), the market arising from disruptive technologies such as Artificial Intelligence (AI) is projected to grow beyond $35 billion in value by 2025, doubling the growth rate of the global economy, thus, promising a future whereby Human-Machines work collectively to solve the world's most pressing issues. While the 4IR has the potential to drive social and economic growth across all nations, many discussions surrounding the concept of the 4IR are focused on advanced economies (Ayentimi & Burgess, 2018:1). Currently, little is known of how the advancement of these new technologies will impact SMMEs in the context of developing economies. In view of the foregoing debate, this study constitutes a relatively new area which has emerged from significant changes within the economic landscape due to disruptive technologies and therefore is set within the trajectory of exploring the impact of (4IR) in the development of small, medium and micro enterprises (SMMEs) in South Africa.

At this point in history, the world is at the brink of a new era of development where digital, biological and physical technologies have gradually achieved unparalleled growth across all sectors and are converging greatly (Guoping, Yun & Aizhi, 2017:626). The aforementioned technology categories comprise the three major technological drivers of the 4IR which are poised to drastically transform the way human beings live, work and interact (Guoping et al., 2017:626; Axxys, 2018:2). What makes the 4IR particularly revolutionary is the speed at which the multiple radical changes are occurring simultaneously and transforming the ecosystem (DTI, 2017). For instance, the implementation of various advanced technologies in the manufacturing sector such as AI and

Internet of Things (IoT) enables machines to share information throughout the value chain thus improving the responsiveness to the demands of consumers. In addition, autonomous vehicles, drones and sensors are enabling the precision of agriculture at a speed beyond human capabilities which improves the usage of resources and increases yield (Accenture, 2019). Therefore, it is without doubt that the 4IR will profoundly shape our efforts to promote industrial development (DTI, 2018). Schwab (2015:1) argues that the complexity and scale of this forthcoming era in technology will expose humanity to unknown experiences. One of such could be likened to the current COVID-19 pandemic, which originated in Wuhan province of China and has caused severe social and economic disruptions in people's lives and livelihoods (Iwu, 2021:417).

Regarding COVID-19, its effect is unarguably felt in the adoption of technology across all industries. In an effort to mitigate the spread of COVID-19 virus, lockdown restrictions and stringent safety measures were enforced worldwide (Vargo, Zhu, Benwell & Yan, 2021:13). This resulted in individuals and businesses across the globe adjusting accordingly, leading to an inevitable paradigm shift of physical activities to the online world. In response to these changes, the facilitation and support for remote work, team collaboration and contactless operations accelerated the implementation of technologies associated with the 4IR (Joubert, Ramapathy, Schaefer, 2020:34) The new reality brought by the COVID-19 pandemic will further catalyse the need to embrace digital transformation to adapt and innovate in the era of the 4IR.

The twenty-first century is advancing towards an economy that is predominantly driven by technology and information, hence the need for entrepreneurs to recognise and forecast technologically innovative opportunities in this new development era is paramount in order to remain relevant and competitive (Venter et al., 2015). Nieman and Nieuwenhuizen (2014:41) concur with this assertion in noting that the use of appropriate technology is an important factor within the development of a successful competitive advantage. However, SMMEs are slow or hesitant in adopting technology into their business operations due to numerous challenges (Chube, 2015:1).

Despite the growing body of literature on the 4IR, empirical evidence analysing the potential impact disruptive technologies will have on development of the small business sector in South Africa is limited in literature. The available literature surrounding the discourse of the 4IR and its impact is mainly focused on advanced economies in the Global North, mostly providing a holistic framework of the overall development trends, and thus leaving a gap for research to explore the 4IR in South Africa. In addition, current literature specifically in the South African context is limited to Science, Technology, Engineering and Mathematics (STEM) related industries namely

manufacturing, mining, agriculture and IT which again leaves room to explore other sectors that are under-researched. Although various studies have greatly emphasised the need to increase investment in technical and STEM skills (Naude, 2017:16; World Economic Forum (WEF), 2017), little is known about the required basic digital skills that can assist small businesses to participate and thrive in a technology driven ecosystem. Therefore, the current study seeks to provide a set of guidelines that can be used as a catalyst to guide the implementation of 4IR particularly on South Africa's SMMEs. The study also aims to provide a fresh insight from a multi-sectoral perspective in relation to the impact of SMMEs development. The key findings of the study should propose pragmatic solutions to enhance digital participation amongst small businesses in South Africa.

1.2 Clarification of basic terms and concepts

The terms and concepts used in the current study are listed as follows: 4IR, disruptive technologies, technological innovation, ICT, and SMMEs.

1.2.1 Industry 4.0

Industry 4.0, a concept which originated in Germany, describes the current global trend of automation and data-sharing technologies within the manufacturing sphere. It is driven by disruptive technologies such as Cyber-Physical Systems, 3D printing, AI, IoT, cloud and cognitive computing as well as nanotechnology (Hermann, Pentek & Otto, 2016:5). Industry 4.0 is generally known as 4IR.

1.2.2 Disruptive technologies

According to Darji, Mkwanazi and Njisane (2016:2), disruptive technologies are 'new technologies that significantly alter the way business and industries operate.' The introduction of disruptive technologies may compel traditional businesses in every industry to alter their business models or likely face the risk of losing market share and becoming irrelevant (Darji et al., 2016:2).

1.2.3 Technological innovation

Technological innovation is considered as an extended innovation concept. While innovation is a defined concept, it generally has a broad interpretation and numerous understandings for academics and entrepreneurs. Pednekar (2015:186) defines technological innovation as a 'technical change or the adoption of new processes and technology.'

1.2.4 SMMEs

While the importance of SMMEs as catalysts of economic growth has been widely acknowledged,

there is no uniformly agreed upon definition of SMMEs, as it varies from country to country (WRSETfA, 2014:6) due to factors which include turnover, value of assets, number of employees and ownership (Dhanah, 2016:17). In the South African context, Dhanah (2016:17) defines an SMME as any business that employs fewer than two hundred and fifty employees and has turnover of less than five million rand annually, fixed assets of less than two million and an owner who is directly engaged in the management of the business.

1.2.5 Information and Communications Technologies (ICTs)

Asabere and Enguah (2012:62) broadly define ICTs as the tools, 'facilities, processes and equipment that afford the required environment with the physical infrastructure and the services for transmission, processing, storing and distribution of information in all forms including voice, text, data, graphics and videos.'

1.3 Problem statement

The advent, conceptualisation and operationalisation of the different eras of industrial change, often referred to as industrial revolutions, have usually resulted in global shifts in economic growth, increased productivity and advanced welfare, mostly in countries in the Global North that have been primed to leverage the benefits of these industrial disruptions (Ayentimi & Burgess, 2018). This trend, potentially linked to the wealth distribution within these developed countries which were at the forefront of these industrial revolutions, has more often than not been inequitably distributed at a global level especially in relation to countries in the Global South (Morrar et al., 2017:2). South Africa, as a developing economy, has a longstanding history of inequality alongside other socio-economic issues which have often posed a threat and acted as a hindrance towards the unleashing of the economic potential of the country. Additionally, the key performance indicators (KPIs) of South Africa are unsatisfactory. According to Statistics South Africa (StatsSA, 2019), South Africa was projected to see 0.7% in economic growth in 2019, a figure which posed a challenge for any prospects of economic expansion. In the context of the 4IR, the adoption of disruptive technologies is highlighted as representing the next wave that will impinge on the growth of global economic ecosystems. Afolayan (2014:4) however asserts that, although SMMEs have been identified as drivers of economic growth and development, South African entities lack sufficient knowledge of the potential of new technology and thus have been reluctant to adopt technological innovations.

In an already uncertain global economy, the 4IR is expected to have even more disruptive impacts on all industries, especially in developing and underdeveloped economies that currently experience difficulty keeping abreast with the rate of innovation and technological advancement

(DTI, 2018). In relation to South Africa, the current available discourse seems to indicate that the 4IR offers few clearly defined opportunities and even introduces significant challenges to SMMEs. In addition, new patterns of consumer behaviour are forcing businesses to reshape their business models (Guoping et al., 2017:94). In the absence of extensive empirical enquiry that details disruptive technologies and the leverages they portend for the development of SMMEs in the developing context, the current enquiry is intended to ascertain the impact of the adoption of disruptive technologies within the SMME sector in South Africa.

1.4 Aim of the study

The primary aim of the study was to assess the impact of disruptive technologies on the growth and development of SMMEs in order to determine the required skills that will assist the small business sector to thrive and compete in a technology-driven ecosystem. Achieving the aforementioned aim of the study necessitates the following research questions:

1.5 Research objectives

The specific research objectives of the current study are to:
● Determine the impact of new disruptive technologies on the transformation of South Africa's small business sector and driving entrepreneurship growth.
● Determine the required skills for SMMEs to thrive in the Fourth Industrial Revolution.
● Determine the perceptions of small businesses with regard to embracing the 4IR.
● Make recommendations to policymakers based on the key findings of the study that could provide home-grown innovative solutions to enhance small business participation in the growing digital economy.

1.6 Research questions

● What is the impact of new disruptive technologies on the transformation of South Africa's small business sector?
● What are the skills required for SMMEs to thrive in the 4IR?
● What are the perceptions of small businesses embracing the 4IR?
● What new policy guidelines can be implemented to develop home-grown innovative solutions to enhance small business participation in the growing digital economy?

1.7 The significance of the study

Technological innovation is evolving rapidly and transforming the entire employment landscape. It has been noted that disruptive technologies have the potential to create a 35 billion dollar market

by 2025 (Schoeman et al., 2017:4). Although South Africa is still in the infant stages of this technological era and faces myriad structural and cultural hurdles which may inhibit businesses from completely integrating disruptive technologies into the economy (Schoeman et al., 2017:20), there is some potential to leverage the opportunities presented in the 4IR. This study draws attention to the fact that the development of entrepreneurship and small businesses is an important component to pioneer the 4IR which can place South Africa at the forefront of disruptive innovation. SMMEs are widely recognised for their unique role in job creation and economic growth. Owing to the high unemployment coupled with a low economic growth and the deplorable levels of poverty in South Africa, SMMEs become a crucial solution (Nieman & Nieuwenhuizen, 2014:24). Therefore, promoting digital skills within the small business sector will not only achieve economic prosperity but also help ameliorate the socio-economic distress of South Africa.

This study is motivated by the fact that limited research has been carried out in the area of assessing the impact of disruptive technologies within the small business sector, specifically in Cape Town. Although many reports have documented the economic potential and social risks of the 4IR, little is known of how the interactions with these technologies affect the sustainability of SMMEs. As a result, the study aims to fill existing gaps in literature by providing a fresh local perspective on the benefits of adopting disruptive technologies. This study advances knowledge and insight into effectively implementing new disruptive technologies in business models and gaining the required skills needed to thrive in the 4IR. Furthermore, the current study seeks to assist policymakers and industry experts to develop home-grown innovative solutions to enhance small business participation in the growing digital economy. Top government officials have recently promoted the need for 4IR, although there is a lack of tangible policies or programmes that support their mandate (Dewa et al., 2018:662). Thus, the study's key findings contribute to the body of knowledge on the impact of the 4IR on small business in developing countries and help formulate strategic initiatives for the small business sector. The results of this study are focused on developing pragmatic digital and technological solutions to overcome the barriers faced by the small business owners.

1.8 Methodology

The current study was undertaken by making use of qualitative methods of data collection. Durrheim (2011) states that pursuing qualitative research methods gives researchers the ability to investigate selected issues in depth, openness, and detail, as they seek to identify and comprehend the categories of information emerging from the data, and the data that is obtained from quantitative methods are mostly applied in broad and generalisable comparisons.

1.8.1 Research design

According to Maree (2016:72), a research design is 'a plan or strategy that changes from the underlying philosophical assumptions to specifying the data-gathering methods to be used and data-analysis to be done.' The choice of research design is based on the nature and the extent to which the data is collected for the research (Maree, 2016:72). The current study incorporated a qualitative methodology due to the information required and primarily made use of semi-structured interviews to collect data. According to Berg and Lune (2012:3), qualitative research is a type of approach that involves gathering highly detailed information and answers regarding how and when a certain phenomenon occurs. The reason behind incorporating a qualitative approach is the ability to provide 'complex textual descriptions' of how individuals experience a given research issue (Mack, Woodsong, MacQueen, Guest & Namey, 2005:1). This method will help interpret and comprehend the complexity of assessing disruptive technologies within the growth and development of SMMEs and provide an in-depth understanding of the challenges they face regarding adopting a technology-driven business model.

1.8.2 Study area

This research focused on the City of Cape Town in South Africa. In terms of municipal structures, the economy of Cape Town is considered the second-largest among municipalities in South Africa as well one of the most significant contributors to national employment (EPIC, 2016). Over the years, the city has become a national leader in business and has developed a thriving knowledge economy that offers numerous opportunities for investment (Global African Network (GAN), 2019). In addition, Cape Town has been listed as South Africa's most entrepreneurial city with an early-stage entrepreneurial activity about 190% higher than the national average in South Africa (UCT Graduate School of Business (GSB), 2008). The industries that have been noted to contribute to Cape Town's economic performance and reflect a high comparative advantage relative to South Africa as whole are fishing, manufacturing, finance and insurance (EPIC, 2016).

1.8.3 Survey population

The survey population for the current study comprised owners or managers of small, medium, and micro businesses operating within the tourism, retail, and financial sectors. The aforementioned are among the key sectors that significantly contribute to the growth of the South African economy (EPIC, 2016) and currently lack empirical evidence in the area of digital disruption. The study focused on SMMEs that employ fewer than two hundred and fifty people and have an annual turnover not exceeding 80 million rand.

1.8.4 Methods and tools of data collection

1.8.4.1 Primary data sources

Primary data refers to first-hand information gathered for analysis purposes. Sources of primary data usually include surveys, observations, questionnaires and interviews (Ajayi, 2017:2). For the purpose of the study, the main primary data collection instrument was semi-structured interviews conducted with selected SMMEs, from various sectors in Cape Town. According to Afolayan (2014:11), semi-structured interviews have the potential to provide a rich form of data and in-depth exploration.

1.8.4.2 Secondary data sources

Polonsky and Waller (2011:134) define secondary data as information collected, compiled and published by others for their own purpose. The researcher consulted secondary sources in order to provide an in-depth understanding of the background to the study as well as identifying existing gaps within literature. The secondary data regarding the 4IR, disruptive technologies, technological innovation and the use of technology within SMMEs was sourced from academic journals, online publications, and scientific magazines that look at this phenomenon surrounding the impact of the 4IR on small businesses.

1.9 Sampling method

Sampling is defined as the process in which the researcher selects an ideal number of units to represent the survey population. The intention is to observe and analyse the population to deduce behavioural patterns within a chosen populace (Bhattacherjee, 2012:65). In other words, Bhattacherjee (2012:65) points out that sampling involves selecting a suitable sample size that represents the survey population as the financial costs and enormity of selecting an entire population within a certain framework is impractical.

There are two sampling method categories which comprise probability methods and non-probability methods. Probability methods involve elements of random selection whereas non-probability methods are dependent on the subjective judgement of the researcher (Maree, 2016:192). The study employed a non-probability purposive sampling technique as it is based on the knowledge of the population. The SMMEs were purposively selected based on their location, annual turnover, number of employees and the number of years of operation. The interviews were conducted with selected participants from the population and an interview schedule was prepared and distributed prior to the data collection times to allow the participant to get familiarised with the data collection tool and information required from them.

1.10 Method of data analysis

Data analysis is the process of summarising collected data. It involves interpreting the data gathered through analytical and logical reasoning in order to establish patterns, relationships and to apply statistical techniques (University of Pretoria, 2019). The purpose of data analysis in qualitative research is to discover the essence of the phenomenon by reducing the amount of the accumulated data to a manageable size in order to search for emerging patterns and themes as well as applying the appropriate statistical technique (Maree, 2016: 120; Nyikana, 2013:23). The qualitative data were analysed using ATLAS.ti data analysis software. ATLAS.ti is considered amongst the most appropriate software systems for analysing qualitative data in a wide variety of disciplines. This program allowed the researcher to uncover and systematically analyse complex phenomena hidden in the data from the interview transcripts and as a result, the researcher was able to unearth existing gaps within current literature.

1.11 Delineation of the study

The study was limited to thirteen SMMEs situated within Cape Town, in the Western Cape Province, South Africa. The reason for the chosen geographical location is its close proximity to the researcher. The study is restricted as it is based on thirteen SMMEs that operate in the retail, tourism and financial sectors within Cape Town. A larger sample of the aforementioned sectors would have been more optimal as technological innovation is disrupting nearly every industry globally (COEFS, 2017).

1.12 Ethical considerations

Saunders, Lewis and Thornhill (2009:183-184) point out that researchers must consider ethical considerations and possible dilemmas throughout the research. In this context, ethical consideration can be defined as 'appropriateness of your behaviour in relation to the right of those who become the subject of your work or are affected by it' (Saunders et al., 2009:184). The researcher sought authorisation and approval from the Faculty Research Ethics Committee (FREC) of the Faculty of Business and Management Sciences (FBMS) at Cape Peninsula University of Technology (CPUT) by submitting research instruments. In order to comply with ethical considerations in conducting research, the identities and particulars of the selected SMMEs were not disclosed. While it is common practice to request written consent, verbal consent is deemed appropriate for this current study as the strength of qualitative research frequently lies in the informality of the communication and the interactive nature of the research process (Maree, 2016:44). Strict confidentiality and anonymity were assured verbally as well as in a letter of consent from Cape Peninsula University of Technology (CPUT) to the participants. In addition, the purpose and significance of the study were clearly specified before commencing the interviews. This process assisted in establishing a trusting relationship with the participants that enabled an

environment where participants were comfortable to provide open and honest responses during the interview. The researcher meticulously explained and emphasised that feedback provided during the course of the interview would remain confidential and pseudonyms would be used for the participants. An ethical clearance certificate (2019FOBREC715) was obtained from the CPUT Higher Degrees Committee (HDC) to ensure the protection of the participants. By obtaining ethical approval, the researcher demonstrated the adherence to ethical standards of the current study (University College London, 2016).

1.13 Structure of the study

The thesis reflects the practical development of the research, which is summarised and presented in six chapters as follows:

1.13.1 Chapter One

This chapter serves as a general introduction to the study and includes an exposition of its motivation. The background to the research problem statement is presented and the research objectives and questions are formulated. A description of the methodological considerations is discussed. The significance of the study is clarified, and the ethical considerations are conveyed. In addition, this chapter provides the delineation of the study.

1.13.2 Chapter Two

This chapter provides a theoretical framework, within which the conceptualisation of the 4IR and various elements pertaining to the objectives of the study are formulated and discussed. This chapter also reviews existing literature within the domain of entrepreneurship, small business development and the 4IR. The intention is to determine the extent to which the discourse of the 4IR has evolved and to uncover existing gaps that necessitate further research. These will be synchronized with the objectives of the research as previously outlined.

1.13.3 Chapter Three

Chapter Three provides an overview of the adopted research design and methodology. This chapter outlines the processes and procedures that were implemented in undertaking the study which describes the study areas, the survey population, the sample size, the design and administration of the interviews and lastly, the approach to data analysis.

1.13.4 Chapter Four

This chapter undertakes a review of the data gathered by analysing, presenting and discussing the results obtained from the semi-structured interviews with reference to the conceptual

constructs given and the literature reviewed.

1.13.5 Chapter Five

This final chapter summarises the conclusions arrived at in the preceding chapters. Specific attention is focused on the research questions as well as examining whether the objectives of the study have been accomplished. Furthermore, challenges encountered are highlighted, while implementable recommendations and suggestions for areas that require further research are proposed.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The proliferation of emerging technologies has drastically transformed the economic landscape over the past decade (Rahman, Hamid & Chin, 2017). Globalisation and digitization have brought about immense changes which have contributed to the way businesses operate and compete at a global level. The new technological wave is anticipated to have a major impact on businesses and society as a whole, ranging from increased productivity and new business models to the demand for specialised skills. This presents an opportunity for small businesses to become early adopters of the 4IR through the exploitation of new and disruptive technologies. This chapter involves a review of existing literature on the origin and background of 4IR and related concepts. It also aims to determine the extent to which the discourse of the 4IR has evolved and the impact thereof on small business development, with a focus on the South African SMME ecosystem.

2.2 The concept of Industry 4.0

The advent and conceptualisation of Industry 4.0 originated in Germany (Dewa et al., 2018:650; Morrar et al., 2017:11; Rojko, 2017:78; Stentoft, Jensen, Philipsen & Haug, 2019:5156). 'Industrie 4.0' emerged as a strategic initiative of the German Federal Government that was adopted as an integral part of the 'High-Tech Strategy 2020 Action Plan' in November 2011 (Kagerman, Wahlster & Helbig, 2013:77). A group of representatives from various fields such as academia, business and politics initially promoted Industry 4.0 as an approach to strengthen the German competitiveness of the manufacturing industry. Thereafter, an 'Industrie 4.0' Working Group was established to further recommend on the implementation of the Industry 4.0 initiative (Guoping et al., 2017:626; Hermann, Pentek & Otto, 2015:5). The overarching objective of the initiative was to essentially secure and expand Germany's leading global position in the manufacturing industry (European Commission, 2017) through the promotion of the IoT and IoS technologies (Larsson & Nilsson, 2019:4).

According to Rojko (2017:80) and Zhou et al. (2016:2147), Germany is recognised for possessing one of the most competitive manufacturing industries in the world and is positioned as a global leader in the manufacturing equipment sector. Their ability to successfully deploy information communication technologies (ICT) to manage complex industrial process at various geographic locations has long been attributed to their competitiveness. In this context, Industry 4.0 can be considered as an effort towards maintaining their global market leadership through the provision

of smart manufacturing technologies. Germany is therefore considered to be exceptionally well placed to harness the potential of this particular new form of industrialisation (Kagerman et al., 2013). Similar initiatives regarding the Industry 4.0 phenomenon have been widely adopted by other leading industrial nations under terms such as 'Industrial Internet' and 'Advanced Manufacturing' in the USA and 'Made in China 2025' (Institute for Security & Development Policy, 2018). The common element amongst these various terms and concepts as highlighted by Deloitte (2014) is the awareness of traditional manufacturing and production processes undergoing digital transformation.

Since the inception of the German government's High-Tech strategy, Industry 4.0 has become a widely discussed topic in academia and industry. (Masood & Sonntag, 2020:2; Hermann et al., 2015:3; Rojko, 2017:80;). Industry 4.0, also known as the 4IR (Santos, Charrua-Santos & Lima, 2018), refers to the next developmental stage of digitisation and automation of the entire industrial value chain process (Deloitte, 2014) which is increasingly geared towards meeting personalised customer requirements (Vaidya, Ambad & Bhosle, 2018:3). It is built on three preceding industrial revolutions (Morrar et al., 2017:13; Piccarozzi, Aquilani & Gatti 2018:1) which came about as a consequence of mechanisation, electricity and IT as depicted in Figure 2.1 that follows.
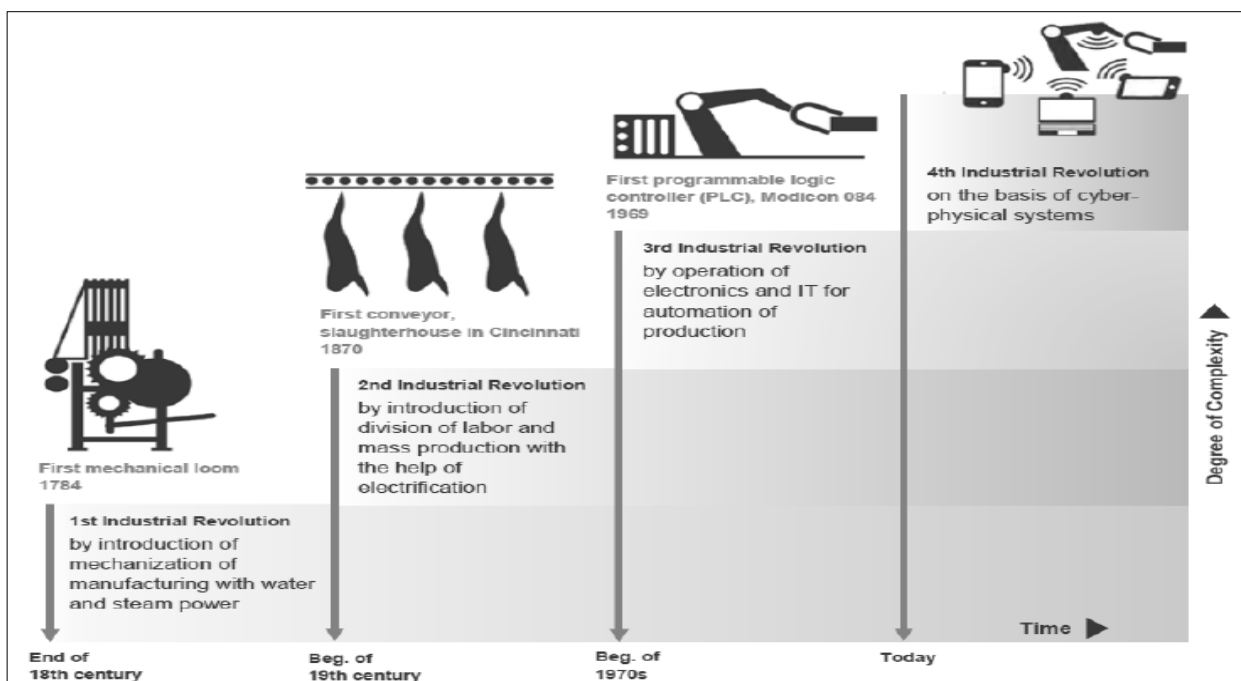
Figure 2.1: The four stages of the Industrial Revolutions
Source: Adapted from Kaggerman et al., 2013:13

The upsurge and integration of innovative technologies such as IoT and IoS into the industrial value chains ushered in the 4IR (Dewa et al., 2018:650; Kagerman et al., 2013:5; Hermann et al.,

2015:9;). Furthermore, Zhou et al. (2016:2147) state that the concept of Industry 4.0 is embedded in the integration of ICTs and manufacturing technologies which are reliant on developing cyber-physical systems (CPS) to achieve more digitalised and intelligent manufacturing. Pereira and Romero (2017:1207) expand on Zhou et al. (2016) in stating that the emerging concept of Industry 4.0 is 'an umbrella term for a new industrial paradigm that embraces a set of future industrial developments regarding CPS, IoT, IoS, Robotics, Big Data, Cloud Manufacturing and Augmented Reality (AR).' This new industrial paradigm will merge the virtual and physical worlds through CPS allowing the enhancement of productivity and efficiency for businesses leveraging on the advancements of Industry 4.0. Haseeb, Hussin, Slusarczyk and Jermsittiparsert (2019:1) and Miśkiewicz and Wolniak (2020:2) are in agreement that the essence of Industry 4.0 is to obtain an advanced level of operational efficiency and effectiveness including an increased level of automation.

Despite the increasing interest and discussions pertaining to the Industry 4.0 discourse, there is no universally agreed-upon definition (Pereira & Romero, 2017:1209; Lee et al., 2018:2) This is mainly due to the topic being relatively new and conceptual (Fonseca, 2018:388; Futcher, 2018:4; Yeni-letsoko & Pillay, 2019:538). Numerous definitions, terminologies and equivalents have been proposed in extant literature; however, the concept remains non-consensual amongst scholars (Piccarozzi et al., 2018: 10; Koze, 2019:30). Drath and Horch (2014:1) contend that the manifold definitions have raised more confusion than clarification. As such, Hermann et al. (2015:5) took it upon themselves to address this gap in literature by identifying six design principles as a framework for businesses to implement Industry 4.0 scenarios.

The abovementioned drivers demonstrate the potential of Industry 4.0 to contribute to competitiveness and productivity of a country. The Made in China initiative suggests that developing countries such as South Africa too can also become early adopters of the trend of Industry 4.0, thus increasing their global competitiveness (Deloitte, 2014). The ensuing sections of the study will consider the potential impact of the recent technological wave on South Africa, specifically in relation to small business development.

2.3 Background to the Fourth Industrial Revolution (4IR)

It is considered that the world is presently on the cusp of a new industrial revolution that will radically transform the way individuals live, work and interact with one another (World Economic Forum (WEF), 2016). This new industrial revolution is dubbed as the 4IR which is a term coined by Klaus Schwab, the founder and executive chairman of the World Economic Forum (WEF) (Xu et al., 2018:90; Mabotja, 2018:21) to describe the convergence of the digital, physical and

biological worlds. The 4IR emerged in the 21st century and is marked by ground-breaking changes such as ubiquitous mobile internet, smaller, stronger and low-cost sensors, AI, and machine learning, to name a few (Lee et al., 2018:2).

The term 'revolution' denotes abrupt and radical change (Schwab, 2016:6). Throughout human history, there have been periods of such abrupt and radical change, whereby new breakthroughs in technology have ushered significant non-linear change of massive economic and social proportions (Asian Development Bank (ADB), 2017; WEF, 2017b). The emergence of the 4IR is one such period wherein deep and transformative changes abound.

The 4IR is the fourth major industrial era since the first Industrial Revolution occurred in the 18th century and is characterised by a combination of disruptive technologies that blur the line between digital (IoT, blockchain, cloud), physical (self-driving cars, robotics, 3D printing) and biological (genetic modification) spheres, which are collectively known as CPS (Guoping et al., 2017; Koze, 2019:30; Schwab, 2016:627; WEF, 2018b). Emerging technological breakthroughs in several fields consisting of robotics, AI, nanotechnology, 3D printing, the IoT and fully autonomous vehicles are some of the characteristics of the 4IR.

Every industrial revolution brought with it benefits and challenges to the socio-economic landscape of countries that have experienced such transformation (Morrar et al., 2017:1). Most scholars are of the opinion that these significant technological breakthroughs have triggered the four stages of industrial revolution leading to radical changes in the structure as well as the organisation of production. For instance, Great Britain led the First Industrial Revolution and introduced hydraulic and steam machines to factories. The Second Industrial Revolution revolved around the separation of components and the assembly of products through the development of electricity. The Third Industrial Revolution presented the wide application of electronic and information technology that has been used to automate production (Guoping et al., 2017:627; Morrar et al, 2017:1; WEF, 2018b). Today we are on the brink of the 4IR which is building on the 3rd Revolution and it is anticipated that the implementation of emerging technologies will have a disruptive effect on businesses, government and society (Klaus, 2016:13; Manda & Dhaou, 2019: 244).

Schwab (2015:1; 2016:9) strongly believes that the 4IR is not simply a prolongation of the Third Industrial Revolution, but instead the advent of a fourth and distinct one. He substantiates this claim on the basis of three factors, namely the velocity, scope and systems impact. In comparison to its predecessors, the 4IR is evolving exponentially as opposed to a linear pace. Secondly the breadth and depth of these technological advancements are transforming entire systems across

companies, industries and society at large. And finally, the 4IR is disrupting virtually every industry across the globe. This demonstrates, as Maisiri and van Dyk, (2019:135) point out, that the 4IR and its disruptive effects are extensively felt at all levels and therefore require a comprehensive response to deal with the impact.

It is worth noting that the discourse on the 4IR does not come without its own controversies. Several authors have raised scepticism regarding the existence of the 4IR and have asked whether, as Lee et al. (2018:2) put it, 'Is there a revolution worth being called the Fourth Industrial Revolution?' In a similar vein as the Industry 4.0 trend, there is also no consensus upon the definition of the 4IR. Some academics argue that the 4IR phenomenon has been reinforced by over-ambitious marketing or created by consulting companies (Drath & Horch, 2014:1; Lee et al., 2018:7). Goldschmit (2017) highlights various arguments from authors who perceive the 4IR as nothing but perpetuation of the Third Industrial Revolution (Rifkin, 2016) and a 'yearning for historical familiarity' (Garbee, 2016). Goldschmit (2017:22) further points out that Schwab's (2016) notion of a new industrial revolution is largely based on the term Industry 4.0. Rifkin (2016) is also of the opinion that the emerging technologies Schwab (2016) claims to underpin the existence of the 4IR are not completely new and have long existed. However, Drarth and Horch (2014:4) contend that the novelty within the 4IR is not the development of new technologies but rather the amalgamation of various technologies.The study is therefore in agreement with Schwab's (2015) and presumes that the 4IR has already taken place.The following discussion provides a brief analysis of the potential impact of the 4IR on businesses, government and people.

2.3.1 Impact on business

According to Schwab (2015:5), there is evidence across all industries that the current technologies underpinning the 4IR are having a huge impact on businesses. The advancements of the 4IR are compelling businesses to re-examine the way they operate and interact with consumers. From a supply side perspective, many industries are witnessing a range of emerging technologies creating entirely innovative ways of serving existing needs, thus significantly disrupting existing value chain within every industry. (South Africa, 2018). Disruption is also the product of agile, creative competitors who have access to global digital platforms for research and development (R&D), marketing, sales and distribution channels, which can push out well-established incumbents more rapidly than ever by enhancing the quality, speed or price at which value is provided (EY, 2017).

On the demand side, the individuals presently benefiting from the technological advancements of the 4IR are mainly consumers who have the means of access to affordable services. Increasing transparency, consumer interaction and new consumer behaviour trends are compelling

companies to adapt the manner in which they design, market and deliver products and services. These major shifts in customer behaviour are redefining and disrupting traditional boundaries. Today's customers are digitally-empowered and are gradually becoming the epicentre of the digital economy (Deloitte, 2019; Morrar et al., 2017:4; Schwab, 2016:54).

One of the key trends that have emerged from the 4IR is the development of technology-enabled platforms which combine demand and supply to create new ways of consuming goods and services. This has brought forth the 'sharing' or 'on demand' economy such as Uber and Airbnb through the deployment of people, assets and data relying on mobile technology (Schwab, 2016:3; WEF, 2018)

Based on the above factors it will be paramount for businesses to comprehend the ever-changing environment, question their operating teams' assumptions, and continuously and relentlessly innovate both their systems and their processes.

2.3.2 Impact on government

Due to the digital, physical and biological domains increasingly converging, the development of new technologies and technology-enabled platforms will enable citizens to engage and voice their concerns to government, coordinate their efforts as well as avoid the supervision of public authorities (Xu et al., 2018:91). As a model user of ICT, government will now have a bigger responsibility to deliver digitally-enabled services to their citizens. They will gradually face pressure to adapt their existing approach to public engagement and policy-making, as their main position in policy-making reduces. This will be a result of new sources of competition as well as redistribution and decentralization of power made possible by new technologies (South Africa, 2018). The ability of government systems, including public authorities, to adapt to the ever-changing environment will ultimately determine their survival. Failure to evolve will leave governments behind. By embracing agile governance, regulators must thus constantly adapt to a new, rapidly changing environment and reinvent themselves in order to truly understand what it is that they are regulating. Governments and regulatory agencies will need to work closely with businesses and civil society in order to do so (Klaus, 2015:6).

2.3.3 Impact on people

Lastly, the Fourth Industrial Revolution will transform not only what we as individuals do, but also our sense of identity. Our identity and related problems will be affected as follows: our sense of privacy, our ideas of ownership, our consumption patterns, the time we devote to work and recreation, and how we develop our careers, improve our talents, meet individuals, and nurture

relationships will be impact by the 4IR (AfDB, 2019:3; EY, 2017). It is already altering our health and leading to a 'quantified' self, and may lead to human augmentation sooner than we think. Schwab (2015:5) further states that data privacy has also become one of the biggest individual obstacles brought by new information technologies. The discussions concerning fundamental issues such as the lack of control over our data in our inner lives will only escalate in the upcoming years.

2.4 Disruptive technologies in context of 4IR

The terms disruptive technologies or disruptive innovation (sometimes used interchangeably) have recently been important topics of discussion, particularly due to the exponential growth of technological innovation as well as the rapid shift in consumer demands. While the definition of disruptive technologies varies in the existing literature, most scholars frequently cite the original concept that was initially proposed by Christensen (1997) in his book *The Innovators' Dilemma* (Li et al., 2010:743). Disruptive technologies, as coined by Clayton Christensen, can be defined as new technologies that significantly transform the manner in which businesses and industries operate. In other words, for an innovation to be truly disruptive, it must have the potential of creating entirely new markets through the introduction of a unique product or service. It can also be described as a process whereby a product or service alters an existing market through introducing simple, convenient and affordable alternatives (Christensen et al., 2000:2). As opposed to disruptive technologies, sustaining technologies improve the performance of an existing technology by adding incremental improvements (Rahman et al., 2017:112).

With the advancement of new and exponential technologies, the discussion on disruptive technologies has gained much attention. Central to the 4IR discourse are the technologies underpinning this new technological revolution and the implications of these technologies on business models and the future workforce. According to Bongomin et al. (2019:2) and Seet et al. (2018:11), technological innovation is perceived as a key driver of sustainable economic development along with productivity growth. Previously, technological innovation has always been associated with work and employment; however, this is not pertinent to the 4IR. The amalgamation of various emerging technologies blurring the lines between the physical, digital and biological domains is anticipated to result in rapid and immense disruption to all industries relating to the demand for jobs and skills. These technologies amongst others have been identified by WEF (2016) and McKinsey Global Institute (MGI, 2013) as having the potential to disrupt virtually every industry across the globe.

Furthermore, as previously stated, the MGI has identified twelve areas which demonstrate the

biggest economic impact as well as the potential for disruption by 2025. These technologies range from mobile internet, AI, IoT, to advanced robotics, genomics and energy storage (see Figure 2.2). These key technologies were selected based on four criteria which include exponential pace of technological change, broad potential scope of impact, high economic affected value and the potential for disruptive economic impact (Manyika et al., 2013:2). Similarly, the WEF (2016) has recognised nine disruptive technologies (see Figure 2.3) that are blurring the boundaries between the physical, digital and biological spheres as well as building on and amplifying one another.

Mobile Internet	Increasingly inexpensive and capable mobile computing devices and Internet connectivity
Automation of knowledge work	Intelligent software systems that can perform knowledge work tasks involving unstructured commands and subtle judgments
The Internet of Things	Networks of low-cost sensors and actuators for data collection, monitoring, decision making, and process optimization
Cloud technology	Use of computer hardware and software resources delivered over a network or the Internet, often as a service
Advanced robotics	Increasingly capable robots with enhanced senses, dexterity, and intelligence used to automate tasks or augment humans
Autonomous and near-autonomous vehicles	Vehicles that can navigate and operate with reduced or no human intervention
Next-generation genomics	Fast, low-cost gene sequencing, advanced big data analytics, and synthetic biology ("writing" DNA)
Energy storage	Devices or systems that store energy for later use, including batteries
3D printing	Additive manufacturing techniques to create objects by printing layers of material based on digital models
Advanced materials	Materials designed to have superior characteristics (e.g., strength, weight, conductivity) or functionality
Advanced oil and gas exploration and recovery	Exploration and recovery techniques that make extraction of unconventional oil and gas economical
Renewable energy	Generation of electricity from renewable sources with reduced harmful climate impact

SOURCE: McKinsey Global Institute analysis

Figure 2.2: Twelve potentially economically disruptive technologies

Source: Adapted from Manyika et al., 2013:4

TECHNOLOGICAL DRIVERS OF CHANGE

Driver of change	Rated as top trend	Expected timeframe	Definition
Mobile internet and cloud technology	**34%**	2015–2017	The mobile internet has applications across business and the public sector, enabling more efficient delivery of services and opportunities to increase workforce productivity. With cloud technology, applications can be delivered with minimal or no local software or processing power, enabling the rapid spread of internet-based service models.
Advances in computing power and Big Data	**26%**	2015–2017	Realizing the full potential of technological advances will require having in place the systems and capabilities to make sense of the unprecedented flood of data these innovations will generate.
New energy supplies and technologies	**22%**	2015–2017	New energy supplies and technologies, such as renewables and hydraulic fracturing (fracking), are shaking up the global energy landscape and disrupting powerful players at least as much as yesterday's oil price crises did, with profound and complicated geopolitical and environmental repercussions.
The Internet of Things	**14%**	2015–2017	The use of remote sensors, communications, and processing power in industrial equipment and everyday objects will unleash an enormous amount of data and the opportunity to see patterns and design systems on a scale never before possible.
Crowdsourcing, the sharing economy and peer-to-peer platforms	**12%**	Impact felt already	With peer-to-peer platforms, companies and individuals can do things that previously required large-scale organizations. In some cases the talent and resources that companies can connect to, through activities such as crowdsourcing, may become more important than the in-house resources they own.
Advanced robotics and autonomous transport	**9%**	2018–2020	Advanced robots with enhanced senses, dexterity, and intelligence can be more practical than human labour in manufacturing, as well as in a growing number of service jobs, such as cleaning and maintenance. Moreover, it is now possible to create cars, trucks, aircraft, and boats that are completely or partly autonomous, which could revolutionize transportation, if regulations allow, as early as 2020.
Artificial intelligence and machine learning	**7%**	2018–2020	Advances in artificial intelligence, machine learning, and natural user interfaces (e.g. voice recognition) are making it possible to automate knowledge-worker tasks that have long been regarded as impossible or impractical for machines to perform.
Advanced manufacturing and 3D printing	**6%**	2015–2017	A range of technological advances in manufacturing technology promises a new wave of productivity. For example, 3D printing (building objects layer-by-layer from a digital master design file) allows on-demand production, which has far-ranging implications for global supply chains and production networks.
Advanced materials, biotechnology and genomics	**6%**	2018–2020	Technological advances in material and life sciences have many innovative industry applications. Recent breakthroughs in genetics could have profound impacts on medicine and agriculture. Similarly, the manufacture of synthetic molecules via bio-process engineering will be critical to pharmaceuticals, plastics and polymers, biofuels, and other new materials and industrial processes.

Figure 2.3: Nine technological drivers by World Economic Forum

Source: Adapted from WEF, 2016

2.5 Relevance of 4IR to developing countries

To date, most of the available literature pertaining to the 4IR and its disruptive effects are based on developed and advanced economies that are already at the forefront of implementing policies and strategies to deal with the impending changes brought by the 4IR (Ayentimi & Burgess, 2018:2; 4IRSA, 2018). The likes of Germany, USA and Japan have adopted public polices based on the implementation of 4IR in their respective countries (Asghar, Rextina, Ahmed & Tamimy, 2020; Bongomin et al., 2019:2). Historically, Africa has been unable to benefit and leverage the opportunities of previous industrial revolutions, resulting in a weakening position compared to their international competitors (African Development Bank, 2019:13). As a result, the advancements of the 4IR create an additional layer of complexity in tandem with the difficulty of developing and implementing industrial policies that stimulate productivity and inclusive growth. The complexity brought by the 4IR is based on two opposing factors: firstly, Africa has the potential to leapfrog towards a more digital- and service-based model by seizing the opportunities presented by the 4IR. However, on the other hand, Africa may find it more challenging to increasingly industrialise since automation could lead to African countries losing their low labour cost advantage as well as several socio-economic and infrastructural factors (WEF, 2017a). Although the adoption of 4IR technologies poses several challenges for the African continent, Menon and Fink (2019:35) share a similar view as the aforementioned report and state that the 4IR innovations will offer tremendous benefits, such as empowering small and medium-sized enterprises (SMEs) as well as providing opportunities for developing countries to leapfrog traditional ways of development. Urgent policy reform is therefore needed to boost productivity and economic growth amongst African countries.

Furthermore, there are other comparative advantages and risks to consider when assessing the relevance of the 4IR to developing countries such as Africa. According to the African Development Report (2016), Africa is the world's largest continent in terms of its 54 countries and is also the second largest, and most populous continent worldwide. On the global map, it remains a central region with substantial natural resources, including human capital, in comparison to any region of the world. Economic growth in numerous African countries has been subdued over the recent years, which is largely due to prolonged low commodity prices and reduced growth in advanced and developing economies akin to China (International Monetary Fund (IMF), 2019; World Bank, 2013). This comes after a decade of continued Gross Domestic Product (GDP) growth at about 5%. However, this situation can be used as a catalyst to reform and economically diversify. Given Africa's demographics, the young and rising population of the continent offers an unprecedented

economic potential to promote rapid growth (Ayentimi & Burgess, 2018:2). For instance, in accordance with a report conducted by WEF (2017), sub-Saharan Africa is considered the world's youngest region as more than half of its population is under the age of 25. The WEF (2017) has also estimated that the sub-Saharan Africa region will be home to a quarter of this young population by 2030. Capitalising on this demographic opportunity can potentially unleash new economic opportunities through future industries and labour markets.
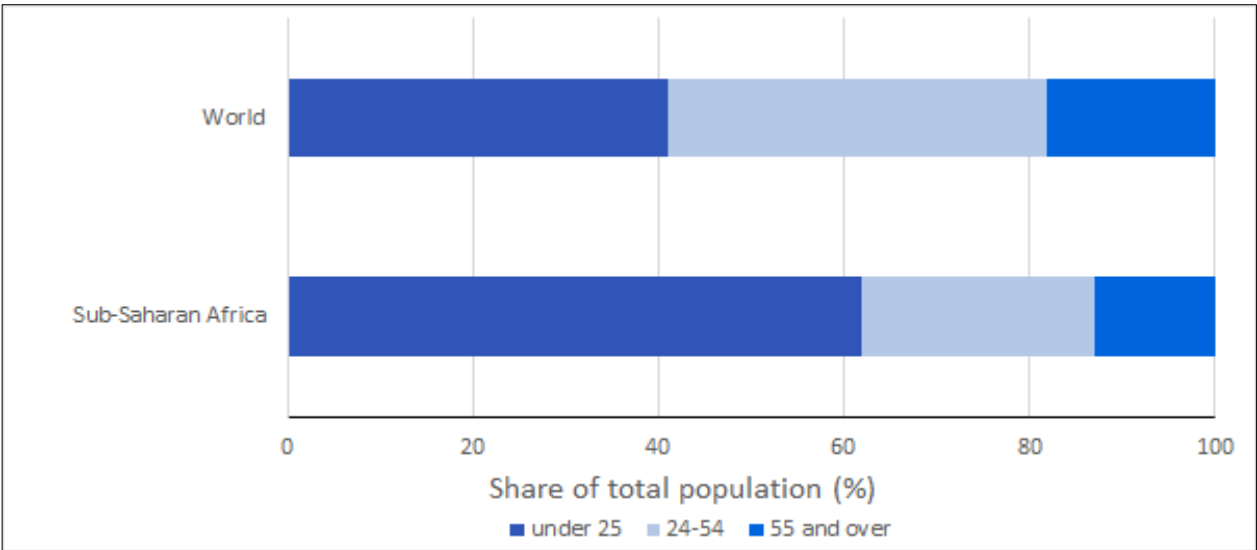
Figure 2.4: Population distribution by age (WEF, 2017b)

However, the WEF (2017) notes that presently the sub-Saharan region is far from optimizing its human capital potential and thus inadequately prepared for the imminent disruptions to the workforce. As a result, this has also raised concerns regarding the potential impact of the 4IR technologies on jobs on the continent due to the existing rife unemployment and skills shortages. From a technological perspective, it has been projected that 41% of all employment activities in South Africa are at risk of automation, similarly '44% in Ethiopia, 46% in Nigeria, 48% in Mauritius, 52% in Kenya and 53% in Angola (WEF, 2017b).' Conversely, relatively lower wages and slower implementation of technology is likely to moderate these impacts.

2.5.1 Adoption of 4IR technologies in South Africa

The WEF (2018) has created a data-driven readiness framework to evaluate the extent to which countries are well positioned to shape or capitalise on the disruptive nature of future productions. Readiness is considered as the ability of a country to leverage future production opportunities and alleviate risks and challenges, as well as resilience and agility in response to future shocks. Within this context, it is understood as the maturity of a country to adopt 4IR paradigms. The assessment framework comprises two components namely structure of production or as WEF (2018) clarifies,

a country's baseline production and drivers of production. The drivers of production are various key enablers including technology and innovation, human capital, institutional framework, and investments amongst others, as shown in Figure 2.5. These key enablers are utilised to position a country to leverage the 4IR through the transformation of production systems.
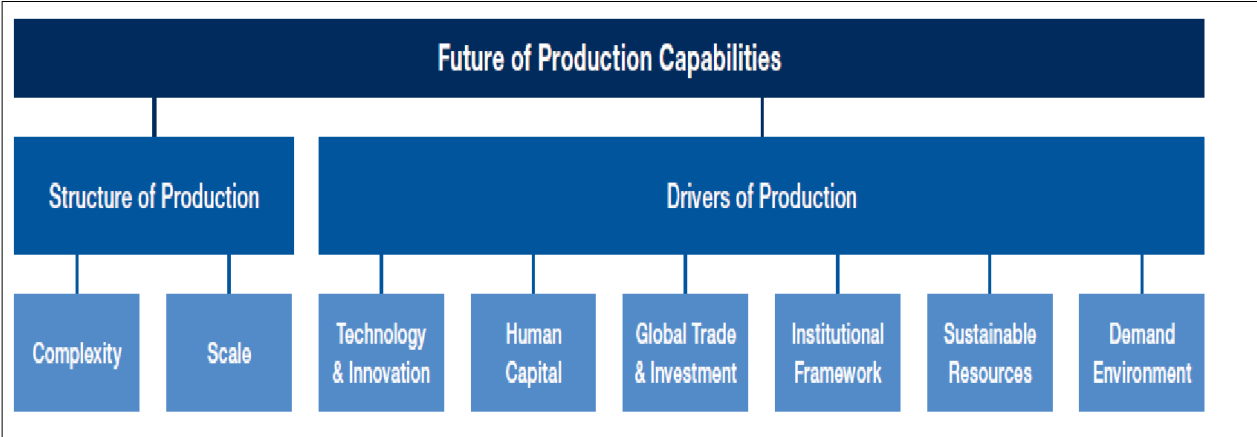
Figure 2.5: Readiness Diagnostic Model Framework
Source: Adapted from WEF, 2018a

The countries and economies that formed part of the report were either classified as the following: 1) High Potential – Limited current product base, however positioned well for the future; 2) Leading – Strong current base, however positioned well for the future; 3) Nascent – Limited current production, and at risk for the future and 4) Legacy – Strong current production, yet at risk for the future. Most African countries were reported to have low levels of readiness across both components of the readiness model framework. However, amongst the African counterparts, South Africa was ranked with the strongest structure of production in Africa. Even though South Africa was grouped with the nascent countries (see Figure 2.6), the 4IR technological paradigms provide an opportunity for South Africa to potentially leapfrog established economies as it is not necessarily weighed down by legacy production systems. One of the comparative advantages attributed to South Africa's competitiveness and readiness for the 4IR is its ability to innovate, as it is deemed to have a robust innovative and entrepreneurial culture supported by a sophisticated financial sector. While the financial and other business service sectors have by far been the largest contributors to the GDP of South Africa (South Africa, 2020) the mining and agriculture sectors have historically remained at the core of economic development and job creation, particularly for unskilled workers. Despite the significant decline in their contribution to GDP, the South African government recognises mining and agriculture as part of key economic sectors in advancing its 4IR initiatives (Bureau for Food and Agri Policy (BFAP), 2015; South Africa, 2020).

Conversely, South Africa's performance in terms of human capital is still regarded as the most pressing challenge in preparing for the 4IR due to a shortage of STEM-related positions such as engineers and scientists in addition to digital skills. The report proposes that South Africa urgently needs to improve its institutional framework in order to respond successfully to impending changes as well as to provide a stable policy environment.
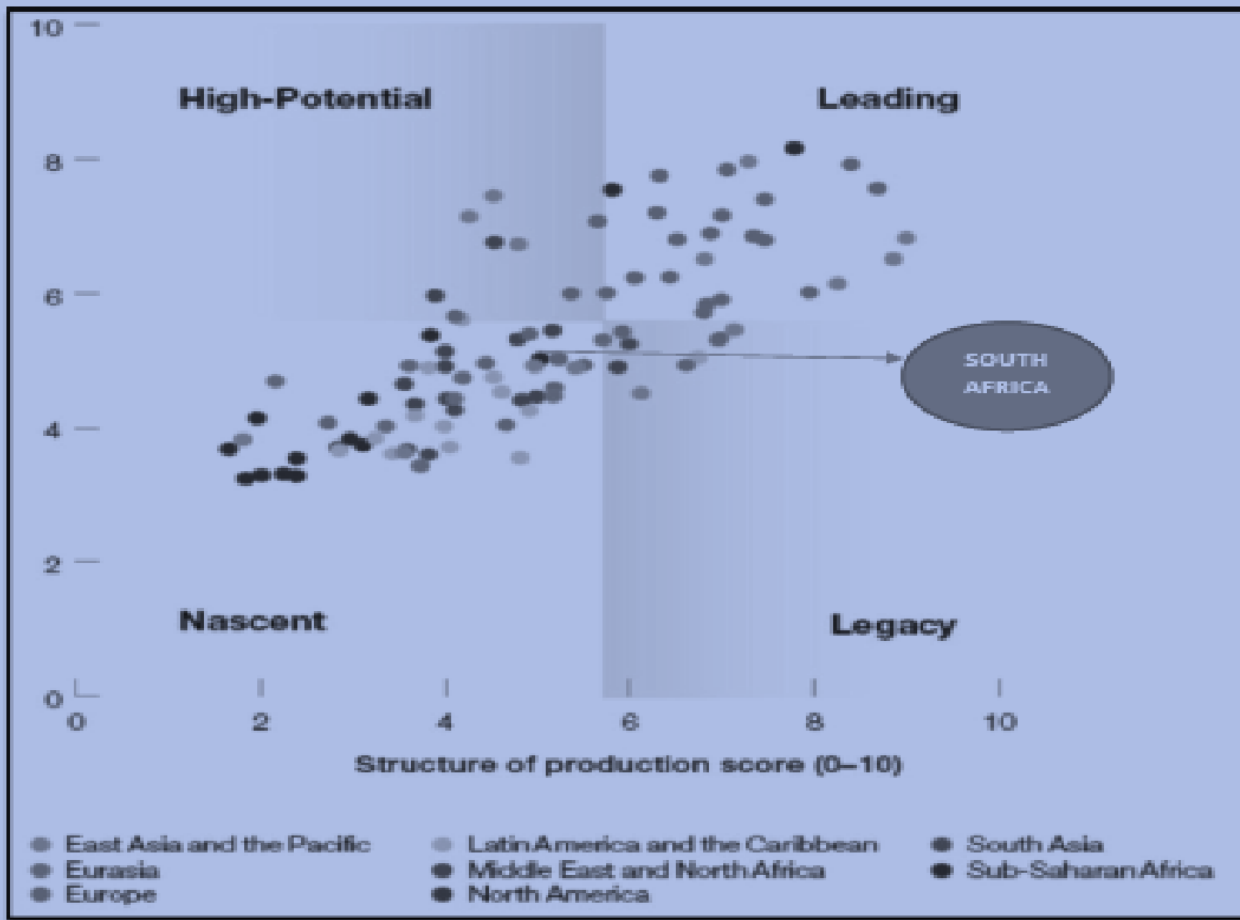
Figure 2.6: Global assessment of production readiness
Source: Adapted from WEF, 2018

Moreover, Deloitte (2014) states that presently, the adoption and impact of 4IR on the African continent is low or at a foundational stage compared to the rest of the world. However, the automotive industry in South Africa has demonstrated greater improvement in terms of adopting 4IR technologies in comparison to other sectors. Nonetheless, in line with the Readiness for the Future of Production Report (WEF, 2018a), South Africa has an advantage relative to developed markets as it is not weighed down by legacy infrastructure. It can thus potentially become an early adopter of 4IR paradigms and thereby leapfrog its global competitors. The biggest challenges though remain internet connectivity and accessibility as well as the extensive need to reskill and

upskill the workforce. In order for South Africa to harness the opportunities of the 4IR, access to affordable IT infrastructure and sustainable electricity will be a prerequisite to participate within a digitally-driven ecosystem (COEFS, 2017).

2.6 4IR technologies used by SMMES
The following section comprise some of the disruptive technologies used by SMMEs.

2.6.1 Artificial Intelligence
Artificial Intelligence (AI) is merely defined as the ability of machines or computers to exhibit human-like capabilities that would otherwise require human intelligence (Mohammed, 2018:4). Machines powered by AI are capable of recognising complex patterns, synthesising information, drawing conclusions and forecasting trends (Bughin et al., 2017:8; Kavya, Hariharan & Chandrakhanthan, 2020:104). Although AI dates as far back as 1950, it has gained increased attention in the past decade owing to advancements in central processing units, cloud computing and notably deep learning. The most prevalent use of AI tools are chatbots, search engines, self-driving cars and advanced demand predictions which are considered among the few new AI technologies (Baez & Igbekele, 2021:7; Kavya et al., 2020:104).

AI is considered to be the technology with the most disruptive potential, and it is gradually becoming part of how businesses remain competitive and productive (Vistage, 2018:1; Baez & Igbekele, 2021:7). For instance, a few studies have identified how digital technologies such as AI are transforming the nature and scope of entrepreneurial activities in SMMEs. SMMEs are leveraging AI to predict the purchasing behaviour of consumers, automate repetitive tasks, streamline communication with chatbots, drive operational efficiencies and lower costs (Vistage 2018:1; Drydakis, 2022:2).

According to Vistage (2018), most SMMEs are already reaping the benefits of AI through the applications they use, even though they might not be aware that the technology itself is intelligent. QuickBooks, for example, uses AI which is embedded in its software to automatically categorise expenses for customers.

2.6.2 Machine Learning
Machine learning has emerged as one of the most key topics among development organisations looking for novel ways to leverage data assets to help businesses gain a new level of understanding (Hurwitz & Kirsch, 2013:4). Machine learning is a subcategory of AI that allows machines to recognise and study patterns accurately without being explicitly monitored or

programmed by a human. The primary focus of machine learning is the creation of algorithms that can receive input data and utilise statistical analysis to predict an output while updating it with new data (Hurwitz & Kirsch, 2013:4; Mohammed, 2019:7). A good example of understanding how machine learning works is to look at technology firms such as Netflix. Netflix is one such technology firm that uses machine learning algorithms called 'recommendation engines' to suggest shows and movies to users based on their preferences (Chow & Kennerberg, 2020:1).

Machine learning technology-based solutions are becoming more relevant and accessible to SMMEs. It now benefits SMMEs in the same way larger businesses benefit from machine learning. For instance, SMMEs are using machine learning technology-based solutions, to resolve customer queries, acquire talent and improve advertising and other marketing-related functions (Bhalerao et al., 2022:4; Alkhayyat & Ahmed, 2022:10).

2.6.3 Big data

Big data is not a new phenomenon however, it has recently gained traction due to the emergence of five new technologies namely cloud computing, mobile devices, data analytics, social networking, and smaller sensors (Ghavami, 2020:3). Big data broadly refers to the collection of large, complex sets of data which cannot be processed and analysed using conventional methods and technologies (Elgendy & Elragal, 2014:215; Krasavac, Soldic-Aleksic & Petkovic, 2016:121; Baig, Shuib & Yadegaridehkordi, 2019:3). The datasets can be in the form of structured, unstructured and semi-structured (Baig, Shuib & Yadegaridehkordi, 2019:3) and are often analysed for actionable insights and effective decision-making. The key characteristics of big data are volume (amount of data), velocity (the speed at which data is being generated) and variety (range of data of types) (Ghavami, 2020:3) which is usually cited in literature as the 3Vs (Krasavac, Soldic-Aleksic & Petkovic, 2016:121; Seseni & Mbohwa, 2021:1990).

Data is considered the most valuable asset for businesses in the era of the 4IR. Businesses around the world, from large to small and medium-sized enterprises (SMEs), are looking for innovative ways to exploit the benefits of data. It is important to note that big data is not exclusive to large businesses. SMMEs can also reap the benefits of big data for reliable and effective decision-making to enhance the functionality of the business (Iqbal et al., 2018). Although big data adoption amongst SMMEs is relatively low, particularly in developing countries (Seseni & Mbohwa, 2021:1990), Potter (2015:2) is of the view that SMMEs are well-suited to harness the opportunities of big data given their reputation of being agile and nimble in their response on data-driven insights.

2.6.4 IoT

Internet of Things (IoT) is simply the interaction between the physical and virtual worlds (Guptha, 2020). To put it into perspective, IoT is a network of smart devices or objects are embedded with sensors, software and actuators that can connect and exchange data with other devices and systems over the Internet (Manyika et al., 2013:51; Dewa et al., 2018:657; Jones & Graham, 2018:3). The embedded sensors, software, and actuators allow the devices to not only be tracked, but also to sense their environment and report to other machines and humans (Dlolo, Foko, Mvelase, Mathaba, 2012:224). It is anticipated that IoT will expand rapidly in the upcoming years, and this convergence will open a new realm of services that enhance the life of consumers and productivity of businesses. For instance, the Internet of Things (IoT) has the potential to offer consumers solutions that significantly enhance security, health, education, and many other facets of their daily life. Whereas with businesses, IoT can underpin solutions that boost productivity and decision-making in various industries such as manufacturing, retail, agriculture, transport, education amongst others (GSMA, 2014).

Although in its infancy, SMMEs can benefit significantly from the IoT by automating routine processes like inventory management or procurement. For instance, Jones and Graham (2020:3) states that inventory can easily be tracked in real time from production, packaging, shipment, and retail sale by using RFID (radio frequency identification) tags.

2.6.5 Cloud computing

Cloud computing is a technology that has become increasingly prevalent among businesses over the last decade. This is attributed to the benefits that cloud computing offer such as lower operating costs, enhanced computing capabilities, increased flexibility, and on-demand storage capacity (Bakasa & Pekane, 2021:252). According to the National Institute of Standards and Technology (NIST, 2011), cloud computing is referred to as 'a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This technology typically consists of three primary service models namely Infrastructure-as-a-Service (IaaS), Software-as-a-Service (SaaS), and Platform-as-a-Service (PaaS) (Vajjhala & Ramollari, 2016:132).

Cloud computing has been touted as a game changer for SMMEs as it offers scalable infrastructure and capabilities (Gomes, 2015:534; Khan, 2015:7) that would otherwise be inaccessible to them (Adane, 2018:197). Several studies have shown that small businesses in South Africa are starting to recognise the benefits of using cloud-based solutions and services to

increase productivity and growth (Mujinga & Chipangura, 2011:196; Osembe & Padayachee, 2016:1262). This is demonstrated in their use of SaaS applications such as Microsoft Office 365, email services, accounting and human resource packages, Enterprise Resource planning (ERP) as well as customer relationship management applictaions (Mohlameane & Ruxwana, 2013;398; Osembe & Padayachee, 2016:1262).

2.7 Overview of SMMEs

The importance and contribution of SMMEs to the overall economic development of any country cannot be overlooked particularly within the context of a new technological revolution. Owing to a high unemployment rate and stagnant economic growth, the 4IR emerges as an ever-present need for SMMEs to keep relevant in the global competitive landscape. According to Deloitte (2014) and Manda and Dhaou (2019:244), the 4IR presents an opportunity for developing countries to become early adopters and leapfrog developed markets by embracing and implementing disruptive technologies. However, the implementation of 4IR technologies specifically within the development and growth of the small business sector is low. As such, a study focused on the discourse of SMME development in this new era of the 4IR is critical in order to drive innovation and entrepreneurship, thus increasing South Africa's competitiveness.

2.7.1 Definition of SMMEs

SMMEs are notably the cornerstone of economic development and competitiveness in most countries. The contribution of this sector is well recognised worldwide for its potential to create employment opportunities, social advancement, and economic growth (International Finance Corporation (IFC) & World Bank, 2018; Rungani & Potgieter, 2018:1). SMMEs are heterogeneous in nature, ranging from lone survivalists operating in informal economies to established formal medium-sized businesses that employ over a hundred people (Berry et al., 2002, Bureau for Economic Research (BER), 2016). They play a vital role in the development of any country, largely due to their contribution to the GDP and job creation (Afolyane, 2014:16; Dhanah, 2016:11). The term SMME is often used interchangeably with 'SME' and 'small businesses' (BER, 2016; van Scheers, 2016:641; WRSETA, 2014).

Despite their significance, there is no universally agreed-upon definition of what constitutes an SMME as their structure, characteristics and size vary globally (Abor & Quartey, 2010:219; Afolayan, 2014: 18; Bvuma & Marnewick, 2020:17; Mudzamba, 2019:32). According to the Organisation for Economic Cooperation and Development (OECD, 2017), the divergence of definitions across countries is particularly because the dimensions 'small' and 'medium' of a business are relatively limited to the size of the domestic country. For instance, member countries

of the European Union (EU) consider a business with fewer than 250 employees an SME, SMEs in the USA may have approximately 1500 employees depending on the industry sector. Although the emphasis tends to be placed on the number of employees within existing literature (Mudzamba, 2019:2) other variables, such as financial turnover and capital assets, have also been used as criteria for defining SMMEs (Blose & Okeke-Uzodike, 2020:2; Dhanah, 2016:17).

In the context of South Africa, the National Small Business Act 102 of 1996 as amended by the National Small Business Amendment Acts of 2003 and 2004 (NSB Act), is the most prevalent framework used to define SMMEs, and it classifies these businesses into five distinct categories namely survivalist, micro, very small and medium. The Act adopts the international practice of incorporating the number of employees per enterprise size along with the annual turnover categories, gross assets excluding fixed property. The distinct categories of businesses outlined in the NSB Act can be summarised as depicted in the table below.

Table 2.1: Definition of SMMEs provided in the National Small Business Act (Falkena et al., 2002)

Enterprise size	Number of employees	Annual turnover (in South African Rand)	Gross assets, excluding fixed property
Medium	Fewer than 100 to 200, depending on industry	Less than R4 million to R50 million, depending upon industry	Less than R2 million to R18 million, depending on industry
Small	Fewer than 50	Less than R2 million to R25 million, depending on industry	Less than R2 million to R4.5 million, depending on industry
Very Small	Fewer than 10 to 20, depending on industry	Less than R200 000 to R500 000, depending on industry	Less than R150 000 to R500 000, depending on Industry
Micro	Fewer than 5	Less than R150 000	Less than R100 000

Considering the above, the study adopts the updated definition of SMMEs revised by the minister of Small Business Development in 2019. The new definition outlined in the South African Gazette (2019), accounts for only two proxies: number of employees and total annual turnover. The exclusion of the initial third proxy, gross asset value, was due to its inaptness and difficulty of measuring. The definition also removed the 'very small enterprise' category as it was deemed unhelpful and inconsistent with international practice (Appendix G displays the new National Small Business Act thresholds for defining enterprise size categories according to the industry sector, using two proxies). For that reason, the study defines an SMME as:

'…a separate and distinct business entity, together with its branches or subsidiaries, if any, including cooperative enterprises, managed by one owner or more predominantly carried on in any sector or subsector of the economy mentioned in column 1 of the Schedule and classified as a micro, a small or a medium enterprise by satisfying the criteria mentioned in columns 3 and 4 of the Schedule.'

2.7.2 Importance of SMMEs to South Africa

SMMEs are increasingly recognised as significant role players in most economies, predominantly developing countries (Marks & Hidden, 2017:6; Kumalo, 2018:4; Olawale & Garwe, 2010:729; SEDA, 2019). They account for vast majority of businesses globally with several institutions acknowledging them as key instruments in attaining inclusive economic growth and social stability (IFC & World Bank, 2018; SEDA, 2019; South Africa, 2017). Relative to large businesses, the SMME sector have evidently shown higher labour absorption capacity and thus have lower capital costs related to job creation. They adapt more rapidly to challenging market conditions and trends and its role in technical and innovation is crucial for many of the socio-economic quandaries facing South Africa's economy. (Abor & Quartey, 2010:223; Mahembe et al., 2011:89; Nieman, 2006:12). Hence SMMEs have become of strategic importance in the overall policy objectives of the South African government. (South Africa, 2017)

The role and contribution of SMMEs to both developed and developing countries in terms of economic development is indisputable (Cant, 2016:559; Kumalo, 2018:51). The OECD (2017) supports this view and averts that SMEs constitute over 90% of formalised businesses, account for 45% of total employment, and generate one-third (33%) of the GDP in emerging economies. These statistics are significantly higher when considering informal SMMEs (Marks & Hidden, 2017:6; Ndiaye et al., 2018:269). In South Africa, it is estimated that SMMEs account for approximately 91% of formal businesses, contribute between 52 and 57% of the country's Gross Domestic Product (GDP), and employ about 61% of the workforce (Abor & Quartey, 2010:28). SMMEs are therefore seen as the backbone of most economies around the world (International Trade Centre (ITC), 2018; Leboea, 2017:18).

Given the paramount role of SMMEs, South Africa, along with many other countries, has expressed considerable interest in the promotion of SMMEs. South Africa, along with many other countries, has expressed considerable interest in the promotion of SMMEs. This is particularly in cognisance of their potential to alleviate unemployment and concomitantly, poverty (Booyens, 2011:1; Mahadea & Pillay, 2008: 431). The South African government demonstrates its

commitment to the promotion of SMMEs by acknowledging the role they play through the implementation of various measures and strategies such as the Small Enterprise Development Agency (SEDA), the National Empowerment Fund, the Umsombovu Youth Fund and the Accelerated and Shared Growth Initiative for South Africa (ASGISA) to empower formerly disadvantaged individuals (Mahadea & Pillay, 2008: 432; BER, 2016).

Despite the commendable efforts of the government's attempt to restructure the national economy through their political and legislative commitments, SMMEs still face a myriad challenges in the development of their ventures. These challenges range from insufficient/unavailability of start-up and expansion finances to lack of entrepreneurial skills and awareness as well as access to appropriate technology (Nieman et al., 2014:40). The inevitable shift within the business environment is forcing organisations to re-examine the way they conduct business (Schwab, 2015:4). For the purpose of this study, the researcher will focus on the importance of implementing disruptive technologies to remain relevant and competitive in the ever-changing environment.

2.8 Barriers faced by SMMEs

SMMEs face a variety of challenges that hinder their growth and development. The following barriers are listed below. Recognising and removing these barriers could create an ecosystem that is conducive to implementing technological change and contributing to inclusive growth and competitive markets.

Access to finance and credit: Access to the appropriate finance and external funding are a major constraint on SMME development in South Africa. It is difficult for entrepreneurs at all stages of the entrepreneurial pipeline to obtain funding, particularly those who intend to start a business and those in the early and nascent stages. Many entrepreneurs do not have the required track record in most instances, nor have they been able to obtain the required collateral requested by the financial institutions. Therefore, accessing finance remains a major hindrance for SMMEs (GEM, 2016; Nieman & Nieuwenhuizen, 2016:40).

Inaccessibility to markets: Another challenge SMMEs are faced with is the lack of sustainable markets for the products and services offered. Entrepreneurs usually develop and offer a product or service for a market that does not yet exist (Nieman & Nieuwenhuizen, 2016:40). It is very crucial for SMMEs to gain an understanding of the dynamics of competition as well as develop the skills and capabilities to ensure survival in the business environment (Chimucheka, 2013:787).

Onerous labour laws: The labour laws of South Africa have been considered as a significant

regulatory burden. SMME owners have discovered that the law makes it difficult to let go of workers if the business is unable to pay them or if they turn out to be unproductive (BER, 2016).

Research and development (R&D): Developing R&D capabilities is paramount for small businesses as it can assist with determining the feasibility of an idea for an actual business. By investing in this area, businesses will gain access to innovative solutions by means of discovery (BER, 2016). However, South African SMMEs tend to have low levels of R&D as they fail to collaborate with larger firms (Booysen, 2011:76).

ICT adoption: The utilisation of ICT plays a fundamental role in the growing and present knowledge economy. It is used by numerous enterprises globally to gain a competitive edge over their competitors (Chube, 2015:1). This affirms that in order for SMMEs to take advantage of the changing environment, they need to adopt technology in their business operations to remain relevant in the market. On the contrary, studies have shown that SMMEs in developing countries are slow or hesitant to adopt ICT in their business operations due to numerous challenges such as high setup costs, insufficient IT skills and training and the absence of government policies (Afolayan, 2014:39, Chube, 2015:1; Modimogale. 2008:24).

2.9 Potential impact of 4IR technologies on SMME development

The proposed 4IR technologies in the context of SMME development in South Africa are at nascent stage, therefore it is quite difficult to determine the exact impact they may have on the SMME sector. However, as previously mentioned, the current adoption of 4IR technologies in South Africa is relatively low (Deloitte, 2014). Previous studies regarding the adoption of ICT have nonetheless suggested that SMMEs are not fully leveraging ICT and e-Business solutions in comparison to their larger counterparts. As a result, Dai (2009:53) notes that the reluctance to adopt emerging technologies may further lead to SMEs becoming vulnerable to economic conditions as they have comparatively lower levels of competitiveness. Futcher (2018:26) highlights that even though it is presently challenging to ascertain the potential effects of industry 4.0 for SMEs in South Africa, there are real threats that point towards increased global competition, loss of unskilled labour and increased financial constraints making it difficult to remain competitive. From a smart manufacturing perspective, Gumbi and Twinomurinzi (2020:42) argue that in comparison to larger firms, SMMEs are underprepared for the adoption as well as the implementation of smart technologies due to their resource-constrained environment. On the other hand, the potential of 4IR technologies may provide opportunities to alleviate some of the barriers faced by SMMEs. Some authors are of the opinion that SMMEs are well positioned to leverage the opportunities of the 4IR given their flexible and adaptive nature and the fact that they are not

weighed down by legacy infrastructure (Matt & Rauch, 2020:5).

Furthermore, there is a growing interest amongst scholars regarding the adoption of certain disruptive technologies by SMMEs. For instance, Chiza (2018) looked into the factors that influence the adoption of cloud computing amongst micro-enterprises in Cape Town and found a lack of awareness relating to its benefits. Mudzamba (2019) developed a framework that can be used to guide SMEs through cloud adoption processes as the scholar found that there is a limited amount of literature in this regard. The study also highlights that the use and adoption of cloud computing services is an excellent mitigating factor for some of the ICT-related challenges experienced by small businesses. Given the entrepreneurial and agile nature of small business leaders, Potter (2015) did a qualitative study on big data adoption in SMMEs and identified that 'evidence-based decision-making' and a 'strong entrepreneurial orientation' aid in the implementation of big data. This is mainly due to the availability of cloud and online platforms allowing SMMEs to create new business models while providing data and analytical skills services to larger organisations. Adesina and Ochalla (2019) carried out a systematic review of knowledge management strategies that SMEs can leverage for optimal performance and competitive advantage in the era of the 4IR.

2.10 Chapter summary

This chapter evaluated the literature pertaining to the 4IR and related concepts from the perspective of developing countries and SMME development. The phenomenon under the inquiry is quite limited within extant literature which requires further academic research. The following chapter discusses the research methodology and design pertinent to achieving the objectives of the study.

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

Research is a logical and systematic inquiry or investigation that uses empirical methods to find solutions to a research problem, thus contributing to the creation of new knowledge. It is undertaken within a framework of philosophical paradigms which guides the research to adopt the appropriate strategies and methods to achieve credible and reliable results (Kumar, 2014:7; Mouton, 1996:35). The main purpose of research is to investigate a research question with a perspective of generating knowledge (Collis & Hussey, 2014:2). The preceding chapter provided a theoretical framework surrounding the 4IR phenomenon upon which the research is based. The current chapter outlines the research design and methodology that pertains to the study.

The phenomenon under study is a relatively progressive research domain. The potential impact of disruptive technologies in the context of small business development in South Africa remains sparse in academic literature. Such a nascent research area necessitates a qualitative exploratory approach as it is best suited to achieve the research endeavours of the study.

3.2 Research questions

As outlined in Chapter One, the following research questions formed the basis of the study:

- What is the impact of new disruptive technologies on the transformation of South Africa's small business sector?
- What are the skills required for SMMEs to thrive in the 4IR?
- What are the perceptions of small businesses embracing the 4IR?
- What new policy guidelines can be implemented to develop home-grown innovative solutions to enhance small business participation in the growing digital economy?

3.3 Research philosophy

A crucial aspect of developing a conceptual framework is recognising the philosophical assumptions that one brings to the research (Farquhar, 2012:16; Jackson, 2013:49). All research is underpinned by a system of beliefs or assumptions (Bell, Bryman & Harley, 2019:10) which ultimately influences the way research is undertaken (Collis & Hussey, 2009:55; Kumar, 2014:7; Saunders & Lewis, 2012:104). The researcher adopts a philosophy that reflects important assumptions pertaining to their worldview and consequently to their theoretical perspective. This perspective provides conceptual coherence in terms of adopting the appropriate methodology and

methods to conduct credible research (Saunders, Lewis & Thornhill, 2009:108; Quinlain, Babin, Carr, Griffin & Zikmund, 2019:57). Thus a research philosophy represents a particular way of thinking that defines the nature of inquiry along three spheres: ontology, epistemology (Blanche, Durrheim & Painter, 2006:6) and axiology (Farquhar, 2012:17; Saunders, Lewis & Thornhill, 2019:130).

According to Saunders et al. (2019:144), there are five dominant philosophical paradigms in business and management research, namely positivism, interpretivism, critical realism, pragmatism and postmodernism. Positivism and interpretivism are considered as two opposing ends of a continuum of paradigms with a range of paradigms bridging the gap (Collis & Hussey, 2009:67). Positivism is underpinned by the assumption that reality is objective and independent of the researcher and relies exclusively on measurable and testable theories (Bhattacherjee, 2012:18). In contrast, a philosophical stance that advocates the necessity to understand a social phenomenon from the perspective of individuals and relies on qualitative techniques to decipher these meanings is referred to as interpretivism (Collis & Hussey, 2009:57; Chilisa & Kawulich, 2012:59; Saunders et al., 2012:106). Postmodernism reflects similar interpretivist traits, although its critique of positivism is more profound in claiming the importance of language in challenging the dominant ways of thinking (Creswell & Poth, 2018:65; Kroeze, 2012:6; Saunders et al., 2019:150). Critical realism and pragmatism incorporate elements of positivism and interpretivism and are often associated with mixed methods approaches (Lapan, Quartaroli, & Riemer, 2012:77; Saunders et al., 2019:181). Each of these philosophical paradigms comprises a set of accepted theories which allows the researcher to maintain consistency between the philosophical starting point and the methodological choice (Ritchie & Lewis, 2003:2; Farquhar, 2012:16; Neuman, 2014:96).

3.3.1 Interpretivist paradigm

Based on the nature of the study, an interpretivist paradigm was deemed to be well suited to provide an in-depth understanding of the phenomena under inquiry. According to Garner, Chilisa and Kawulich (2012), interpretivism and constructivism are related concepts that consider the world as individuals experience it. This type of approach emerged as a critique of positivism in relation to its limitations in social sciences (Quinlan et al., 2019:59). Interpretivism differs from positivism based on the assumptions about the nature (ontology), of what counts as knowledge and its sources (epistemology) as well as the values and their role in research (axiology) (Garner et al., 2012). Interpretivists argue that reality is subjective and socially constructed through multiple interpretations (Saunders et al., 2009:111; Chilisa & Kawulich, 2012:56; Collis & Hussey., 2009:57; Kivunja & Kuyini, 2017:33). It is based on the assumption that social reality is shaped by

human experiences and their unique context and thus best studied within its natural setting to integrate the interpretations of its subjects (Bhattacherjee, 2012:103). The core of interpretivism is not to develop a generalised viewpoint of the phenomena of interest but rather to acquire a deeper understanding of how individuals interpret and attribute meaning to the world they engage in (Farquhar, 2012:19; Creswell, 2014:9; Neuman, 2014:104).

Table 3.1: Interpretivist research paradigm (Saunders et al., 2019:144)

Ontology (nature of reality or being)	Epistemology (what constitutes acceptable knowledge)	Axiology (role of values)	Typical methods
Interpretivist			
Complex, rich. Socially constructed through culture and language. Multiple meanings, interpretations, realities Flux of processes, experiences, practices.	Theories and concepts too simplistic. Focus on narratives, stories, perceptions and interpretations. New understandings and worldviews as contribution.	Value-bound research. Researchers are part of what is researched, subjective. Researcher interpretations key to contribution Researcher reflexive.	Typically inductive. Small samples, in-depth investigations, qualitative methods of analysis, but a range of data can be interpreted.

Interpretivist studies often adopt an inductive approach to theory development, which generally incorporates a naturalistic and flexible research design to construct theory or develop a richer theoretical perspective from existing literature (Saunders et al., 2019:179). Conversely, research based on positivism tends to rely on deductive methods which are aimed at testing a series of propositions (Collis & Hussey, 2009:188; Saunders et al., 2019:153). Proponents of positivism consider interpretive research as biased and non-scientific due to the subjective nature of the analysis and interpretation of the qualitative data. However interpretive studies are capable of generating new and richer insights into areas with insufficient or no prior theory. In addition, interpretive research can help unearth existing gaps and relevant issues that may require further research (Bhattacherjee, 2012:104-105).

Since the study is qualitative in its nature, the purpose of the interpretivist approach was to understand the experiences and challenges small business owners encounter in terms of adopting a disruptive technology-driven business model. The researcher assumes that the benefits or difficulties of adopting disruptive technologies are unique to each participant as well as the manner in which they construct their experiences and interpret the environment they operate in. The multiple realities of the participants may be multifaceted and complex and such complexity cannot sufficiently be measured quantitatively. Hence the data collected were qualitative (Quinlan et al., 2019:63). Espousing an empathetic stance as Saunders et al. (2019:149) note is absolutely

paramount to the interpretivist paradigm. It was crucial for the researcher to establish a natural environment whereby the owners or managers felt comfortable and safe to participate in open-ended question interviews. This approach allowed some form of trust, rapport and authentic communication to be established. The study acknowledges that based on the complexity, richness as well as the multiple interpretations of the participants involved, the chosen paradigm is explicitly subjective and therefore ensured that neutrality and transparency were adhered to.

3.4 Research design

The research design provides a strategic framework between the philosophical paradigms and the subsequent choice of methods required for the data collection and analysis (Denzin & Lincoln, 2018:58). As previously noted, a research design is defined by Maree (2016:72) as 'a plan or strategy that changes from the underlying philosophical assumptions to specifying the data-gathering methods to be used and data-analysis to be done.' It is based on the nature and extent of the data collected for the research. The research design constitutes a 'blueprint' intended to explicitly answer the research questions and objectives (Bhattacherjee, 2012:35). There are various research strategies that can be adopted to conduct research. These strategies form part of a widely used model, known as the research onion. The research onion, initially developed by Saunders et al. (2007:130), provides a graphical representation of the different stages involved in the research process. It can be utilised as a guide to develop an effective and coherent research design. Overall, Saunders and Lewis (2012:104) iterate that the researcher's choice of design should essentially reflect the aim and objectives as well as the researcher's philosophy that forms the basis of the inquiry.

The current study employed an exploratory and descriptive research design to achieve the research endeavours. Exploratory research is often undertaken when a specific topic of interest possesses little or no scientific knowledge but contains elements worth investigating (Given, 2008:327; Kumar, 2014:13-14). Such research embraces an open-ended, flexible and inductive method in an attempt to generate new insights into phenomena (Blanche et al., 2006:44; Maree, 2016:55). The aim or outcome of an exploratory design is to seek testable patterns, ideas or hypotheses that will form the basis of a more extensive and rigorous future research (Collins & Hussey, 2009:5; Quinlan et al., 2019:130). This research design strategy is particularly apt as the concept of 4IR represents a relatively emerging research domain in the field of entrepreneurship. Little is known of the potential impact of disruptive technologies on the growth and development of SMMEs mainly from a South African perspective.

Descriptive research designs attempt to provide an accurate portrayal of a particular situation or

phenomenon under the inquiry (Christensen, Johnson & Turner, 2015:38). The descriptive approach was used in tandem with the exploratory strategy to provide an accurate and valid representation of certain characteristics pertaining to research endeavours. It also helped demystify the phenomenon of interest from the perspectives of the selected SMMEs. Due to the lack of empirical evidence, incorporating both descriptive and exploratory research designs assisted the researcher to gain a better understanding of the issues inhibiting SMMEs from implementing or adopting technology-driven business models.

3.5 Research method

Research methods and methodology tend to be used interchangeably but are distinctive in nature. Research methodology is defined as a set of systematic techniques and theoretical analysis of the methods applied to a field of study (Igwenagu, 2016:4), and clarifies the types of research approach that is suitable for the study (Babbie & Mouton, 2010:75). A research method is a technique used to collect data. It involves specific data collection instruments such as questionnaires, structured or unstructured interviews, surveys and observations (Bell et al., 2019:39).

3.5.1 Qualitative methodology

According to Berg and Lune (2012:3), qualitative research is concerned with collecting highly detailed information and answers how and when a certain phenomenon occurs. Qualitative research attempts to provide holistic and in-depth accounts reflecting complex, contextual, interactive as well as the interpretive nature of social reality (Salkind, 2010:1158). What distinguishes this particular approach from quantitative studies is its primary reliance on non-numerical data and the rejection of some methods that impose fixed or predetermined structures on the social world (Bryman & Bell, 2014:47; Salkind, 2010:1158). Instead, Bryman and Bell (2014:47) note that qualitative researchers prefer to understand the phenomenon through the lens of the individuals being studied. Another element of qualitative research raised by Oham (2005:279) is the implementation of flexible and emergent research designs which allows the adjustment of research endeavours in accordance with the results of the study.

The reason behind incorporating a qualitative method is the leverage it provided the researcher to explain 'complex textual descriptions' based on how individuals encounter a particular research problem (Mack, Woodsong, MacQueen, Guest & Namey, and 2005:1). This approach helped interpret and comprehend the complexity of assessing disruptive technologies within the growth and development of SMMEs through an in-depth analysis of the challenges and experiences they face regarding adopting a technology-driven business model. The qualitative approach is

particularly apt for the exploration of relevant constructs in areas where theory development is at its formative stages. The current study incorporated a qualitative data collection method due to the nature of the information required for this study and primarily used semi-structured interviews to collect the data.

3.6 Study area

The current research was conducted in the Western Cape Province of South Africa, focusing on Cape Town Metropolitan areas. The city of Cape Town is the economic hub of the Western Cape and the legislative capital of South Africa. The targeted SMMEs were situated within a radius of fifteen km from Central Business District (CBD) with an average distance of nine km as depicted on the map below.

Figure 3.1: Map of City of Cape Town
Source: Author based on fieldwork.

3.6.1 Justification of study area

As discussed in section 1.8.2 above, Cape Town's economy is deemed as the second-largest municipality in South Africa and is amongst the significant contributors to national employment (EPIC, 2016). The city has grown into a national corporate leader and has developed a vibrant and innovative knowledge economy with several investment prospects (GAN, 2019). Furthermore,

the Western Cape Province accounts for 14% of GDP and has been ranked as South African most entrepreneurial city. The financial and business service sectors have been noted to be the biggest contributor to the region's GDP (WCG,2017).

Moreover, several studies have recognised the Western Cape, particularly Cape Town, as a leader of technology (tech) start-ups and a driver of innovation on the African continent. This is exemplified in their thriving and emerging start-ups such as Yoco, Aerobotics, Dataprophet and SweepSouth amongst others. In 2017, these companies accounted for about 50% of emerging tech companies in South Africa (OC&C, 2018; Pioneer, 2020).

3.7 Sampling procedures

3.7.1 Survey population

Defining the target population of the study is a crucial step within the sampling process, as it allows the researcher to limit the scope of the study from an entire population to one that is manageable (Shirish, 2013:9). Bhattacherjee (2012:75) defines a population as 'all people or items (unit of analysis) with the characteristics that one wishes to study. The unit of analysis may be a person, group, organization, country, object, or any other entity that you wish to make scientific inferences about'. Thus a population is a defined body of individuals or objects that share similar characteristics for statistical purposes (Collis & Hussey, 2009:62; Quinlan et al., 2019:401).

The current study comprised owners and managers of small, medium and micro businesses operating within the tourism, retail and financial sectors. The aforementioned sectors are among the key sectors that significantly contribute towards the GDP of the South African economy (EPIC, 2016). However, despite their importance, there is a lack of empirical evidence in the domain of disruptive technologies. In line with the definition of SMMEs, the study focused on SMMEs that employ fewer than two hundred and fifty people and have an annual turnover not exceeding eighty million.

3.7.2 Sample techniques

Sampling is defined as the statistical process in which the researcher selects an ideal number of units to represent the survey population. The intention is to observe and analyse the population to deduce behavioural patterns within a chosen populace (Bhattacherjee, 2012:65). In other words, Bhattacherjee (2012:65) points out that sampling involves selecting a suitable sample size that represents the survey population as the financial costs and enormity of selecting an entire population within a certain framework is impractical. There are two sampling method categories

namely probability and non-probability methods. Probability methods involve elements of random selection whereas non-probability methods are dependent on the subjective judgement of the researcher (Maree, 2016:192).

The nature of qualitative research under an interpretivist paradigm is to seek to gain in-depth knowledge, typically from a small sample size (Kumar, 2014). Thus a non-probability sampling technique was suitable to attain the objectives of the study.

3.7.3 Non-probability sampling

In non-probability sampling, certain units of the targeted population have zero chance of being included and the probability of being selected cannot be predetermined (Cooper & Schindler, 2010:343; Bhattacherjee, 2012:69). Typically, this type of method deals with a relatively small number of units which is directly linked to the research questions being posed. The research questions should give an idea as to what unit of analysis needs to be sampled. (Bell et al., 2019:109). The importance of non-probability sampling is the ability of the researcher to select 'information-rich cases' that are best suited to provide theoretical and detailed insights into the research questions and objectives (Emmel, 2013:33).

Non-probability samples are largely perceived as inferior to probability samples due to their biased selection and the limits to statistical inference. However, non-probability sampling has the advantage of generating in-depth, idiographic understanding of the phenomenon instead of a more general and nomothetic understanding (Blackstone, 2012:80). Furthermore, non-probability sampling methods tend to be convenient and cost-effective in comparison to random sampling (Allen, 2017:1538). There are four main types of non-probability sampling methods which include convenience, purposive, snowball and quota sampling (Christensen et al., 2015:170).

This study employed a purposive sampling technique as it is based on the knowledge and certain elements of the population (Babbie, 2016:187). Purposive sampling (sometimes referred to as judgemental sampling) requires the researcher to strategically select cases that will assist in answering the research questions (Saunders et al., 2019:320) and have the likelihood of providing complete and diverse information (Kumar, 2014:248). The SMMEs were purposively selected based on their geographical location, accessibility, operational size as well as their expertise in the phenomenon under consideration. The interviews were conducted with selected participants from the population and an interview schedule was prepared and distributed prior to the data collection times to allow the subject to familiarise themselves with the collection tool and information required from them.

3.7.4 Sample size

Kumar (2014:229) asserts that considerable importance is generally placed on the size of samples in quantitative studies based on the notion that larger sample sizes are more representative of the study population. Conversely, Flick (2018:89) notes the discussions pertaining to sample size in qualitative studies are controversial. Some authors contend that sample size is insignificant in qualitative studies as the aim is to only study one or few units that are capable of addressing the research questions (Kumar, 2014:229). There is no formal criterion to determine the sample size and thus, no standard rule to propose whether the magnitude of the sample is large or small enough for the study (Violet & Lopez, 2013:7). Essentially, selecting cases that are information-rich is deemed more important than determining the sample size (Patton, 2015). In such cases, it has been recommended to continually collect qualitative data until theoretical or data saturation has been achieved. In other words, more recently acquired data no longer contribute any additional insights or generate new themes (Mack et al., 2005:5; Violet & Lopez, 2013:7; Saunders et al., 2019:315).

As previously noted, the researcher purposively selected thirteen SMMEs from various industry sectors. The criteria of selection were based on their geographical location, accessibility, operational size and most importantly, their expertise in the 4IR and the underpinning technologies. The sample size was deemed suitable for the study as the common range for selecting the number of participants is usually between 8 to15 participants, but may vary depending on the scope of the study (Violet & Lopez, 2013:7). The researcher also consulted similar qualitative research studies to determine a suitable size (Potter, 2015; Ainslie, 2016; Mbuyisa, 2017; Chiza, 2018; Mudzamba, 2019).

3.8 Data collection instruments

As outlined in section 3.5.1, the empirical evidence (data) incorporated in a qualitative inquiry is mainly non-numeric and collected through various forms such as observations, interviews, documentation, archival records and artefacts (Kabir, 2016:202; Miles, Huberman & Saldana, 2020:7; Salkind, 2010:1161). These forms of qualitative data techniques are commonly favoured by researchers deploying interpretivist and constructionist paradigms concerned with understanding multiple realities and interpretations of the phenomena from the perspectives of the participants (Blanche et al., 2006:52; Saunders et al., 2019:436). Data for the research was carried out by exploring primary sources (interviews) and secondary sources (literature review) respectively. Relevant literature pertaining to the 4IR and related concepts was obtained through various academic databases including Google Scholar, ScienceDirect, EBSCohost, SpringerLink,

IEEE Xplore and Scopus**.** Purposive random sampling technique through the use of interviews allowed the researcher to probe key issues that could not be predetermined at the time of initiating research. The following subsection will further elaborate on the primary data collection instrument of the study as well as the preparatory steps taken to collect the data.

3.8.1 Interviews

An Interview involves a two-way purposeful conversation in which the interviewer asks the interviewee concise and clear questions in order to collect data about a particular subject matter. The aim of such interviews in qualitative studies is to attain rich descriptive data allowing the researcher to understand how participants construct knowledge and social reality. If used correctly, interviews can be a valuable and reliable technique in collecting data pertinent to the research questions and objectives (Kabir, 2016:212; Maree, 2016:93, Saunders et al., 2019:435). Interviews are usually classified as structured, semi-structured or unstructured **(**see figure 3.4).

The main data collection instrument for the study was semi-structured interviews. Semi-structured interviews are non-standardised which allows for some flexibility in the way questions are asked or presented. Questions may differ from interview to interview based on the participant's responses and certain questions can also be omitted which may be irrelevant to the context of the interview (O'Reilly & Dogra, 2017:39; Saunders et al., 2012:151). The semi-structured interviews were conducted face-to-face as well as online due to the stringent health protocols brought about in response to the COVID-19 pandemic. Face-to-face interviews afforded the researcher the opportunity to build rapport with the participants while the online interviews provided a cost-effective alternative to face-to-face interviews.

Another key aspect of interviewing is proper planning and preparation which demonstrates competency and credibility in terms of gaining the trust of the participants and collecting quality data (Saunders et al., 2019:451). During the planning and preparation phase, the researcher needs to take into consideration the technical aspects of the interviews. This includes contacting potential participants, obtaining informed consent, arranging a mutually convenient interview time and location and testing audio-recorded equipment (DeJonckheere & Vaughn, 2019:4). The researcher considered the following preparatory steps:

Prior to the interviews, potential participants were contacted via email (Appendix E) and telephonically to obtain consent for conducting research with the business. This request entailed an interview with the owner, manager or any personnel involved in key decisions of the business. A permission letter detailing the nature, purpose, affiliation with academic institution, relevant

contact details and estimated length of interviews were attached with the email (Appendix A). Follow-up emails were also carried out to contact non-responsive participants who showed interest in the study. Once the SMMEs granted permission to participate as well as to establish a mutually convenient time and location, reminders of the interviews were scheduled on Google Calendar to allow for preparation (Appendix F).

The interviews were mostly conducted face-to-face at the premises of the SMMEs. This afforded the researcher the opportunity to build rapport while allaying any uncertainties that the participant might have had regarding the sharing of data.

A number of authors have stressed the importance of establishing rapport with the participants from the onset as it can have a positive impact on the subsequent development of the interviews (Bryman & Bell, 2014:219; DeJonckheere & Vaughn, 2019:5; Gill, Stewart, Treasure & Chadwick, 2008:292) Credibility was promoted through the provision of relevant information to gain the confidence of the participants (Saunders et al., 2019:456). At the start of the interview, the researcher expressed gratitude for the willingness and interest to participate in the research study. The participants were also briefly informed about the rationale and objectives of the study combined with assurance of anonymity and confidentiality. The interviewees were also made aware that their participation was entirely voluntary and they were free to withdraw at any time. This gave the interviewees some idea of what to expect and thus increased the likelihood of honesty (Gill et al., 2008:292). The interviewees were further encouraged to share as much information as possible as their opinions were crucial to the success of the study.

Special attention was paid to the appropriateness of the attire and behaviour of the interviewer to avoid response biases. As highlighted in section 3.3.1, espousing an empathetic stance is imperative and therefore the researcher made sure to establish a relaxed environment whereby participants felt comfortable and safe to express themselves openly and candidly. The interviews were carried out in a language (English) that was comprehensible and relevant to the interviewees (Bryman & Bell, 2014:229). One of the most important aspects of a successful interview is the ability to listen attentively and respectfully to the responses of the interviewees (DeJonckheere & Vaughn, 2019:5). A non-judgemental and amicable attitude was adopted throughout the interview and a warm and conversational tone was maintained to ensure the participants felt at ease.

An interview guide consisting of predetermined open-ended questions was utilised to yield as much information about the phenomenon of interest and to address the research endeavours. In order to obtain maximum information, it was essential to ask follow-up and probing questions to

encourage interviewees to elaborate on their statements (Collis & Hussey, 2014:135). For instance, in the case where the interviewees had little or no understanding of the disruptive technologies underpinning the 4IR, the follow-up questions would be along the lines of determining the importance of technology to the business and identifying the factors or challenges behind adopting new technology.

All interviews were audio-recorded which was subjected to the consent of the participants, and it was stated that the research data would be solely used for academic purposes. In addition, field notes were used during the course of the interviews not only to capture and reflect on the interview conversations but also as a precautionary backup to the audio-recordings. Towards the end of the interviews, it was important to portray common courtesies such as thanking participants for their time and asking whether they had any suggestions or recommendations to add. It was also noted that feedback on the research would be made available to the participants.

3.8.1.1 Development of interview questions

When it comes to designing an interview schedule or guide, Gill et al. (2008:292) highlight the importance of asking open-ended questions that will potentially produce as much information as possible regarding the phenomenon of interest as well as adequately addressing the research objectives of the study. Open-ended questions are designed in such a way to permit interviewees to provide extensive and detailed responses (Allen, 2017:1715) and usually starts with 'what', 'why' or 'how' (Saunders et al., 2019:459). Moreover, Gill et al. (2008:292) propose that it is best to commence with questions that can be easily answered and then proceed to more challenging or sensitive questions. An exploratory approach was employed to design the interview questions which were guided by the research objectives of the study. The following interview guide consisted of four sections aimed at collecting rich, open-ended data pertinent to the phenomenon under the inquiry.

Section A: Introduction

The introductory section of the interview guide was aimed at obtaining demographic data related to the participant's position and business experience, industry sector, highest education, business core activities and the number of employees. These demographic characteristics aided in the sample description and to draw comparisons and relations amongst the participants operating in various industries.

Section B: Impact of disruptive technologies on the development of business and perceptions of small business owners

This section adopted a broad approach to explore the factors that might potentially encourage or inhibit the adoption of 4IR technologies. Questions were also designed to assess the readiness for and views on embracing the 4IR.

Section C: Required skills for the 4IR

The advancement and adoption of 4IR technologies require a workforce that is adequately equipped for the imminent disruptions brought by the 4IR. The purpose of this section was to assess whether the research participants were proactively upskilling and training their workforce and if they also had the skills and competencies to thrive and compete in an era of technological innovation.

Section D: Government and business development support

The last section of the interview schedule was aimed at determining the support mechanisms available to SMMEs particularly from a technological standpoint. In line with the objective of providing recommendations to policymakers, it was also important to solicit their views in terms of increasing small business participation in a growing digital economy.

3.9 Data coding and analysis

Data analysis is a method of summarising and evaluating data collected. It involves interpreting the data gathered through analytical and logical reasoning in order to establish patterns, relationships and to apply statistical techniques (University of Pretoria, 2019). Analysing data in qualitative research aids the researcher to understand the essence of the phenomenon and uncover emerging patterns and themes. This is achieved through the reduction of the collected data to a meaningful and viable size through applying the appropriate statistical techniques (Maree, 2016:120; Nyikana 2013:23).

Qualitative research is saliently differentiated from quantitative research in data analysis. While the latter is concerned with statistical methods (Wong, 2008:14), the former yields unstructured non-numeric data (Quinlan et al., 2019:402) that provides a thick and rich description of the phenomenon under study (Nishisiba, Jones & Kraner, 2014:284). There are various approaches or strategies suitable for qualitative data analysis. These approaches include thematic, grounded theory, content and narrative analysis. According to Bell et al. (2019:199), thematic analysis and grounded theory are considered to be the most frequently used approaches to qualitative data analysis. Once the researcher evaluated these approaches extensively, thematic analysis appeared to be the most appropriate due to its flexibility and compatibility in analysing qualitative data.

Thematic analysis is defined as a method for systematically identifying, analysing and reporting key themes or patterns that emerge across a dataset (Braun & Clarke, 2012:2). The themes and patterns are facilitated through a process of coding which assigns categories and concepts pertaining to the research endeavours (Friese, 2012:10; Saunders et al., 2019). Thematic analysis is seen as a 'foundational method for qualitative analysis' and offers great flexibility within a variety of paradigmatic and epistemological frameworks. This approach is best aligned with the interprevist paradigm underpinning the study given its ability to comprehend a set of experiences, thoughts and behaviours present throughout the data set (Kiger & Varpio, 2020:846).

The thematic analysis approach typically follows a six-step process based on a widely adopted framework developed by Braun and Clarke (2006). It firstly requires the researcher to become familiar with the data through repeated and active reading (Saunders et al., 2019:580). Thereafter, a systematic analysis of the data begins whereby the researcher generates initial codes focusing on exciting features of the data. The third step is regarded as the start of the interpretative analysis of the coded and collated data. This involves organising the codes into potential and relevant themes. Once the relevant themes are identified, further review and refinement are required to determine whether some of the initial themes should be combined, separated or discarded. The data within themes should meaningfully cohere together, with clear and identifiable distinctions between themes (Braun & Clark, 2006:20; Apolloni, 2010:91). Furthermore, the fifth step entails the researcher to succinctly define and name themes in ways that capture the essence of each theme (Singh, 2019:38). During this phase, it is also crucial to take into account how each theme fits into the overall 'story' the researcher is telling about the data and how it answers the research questions. The final step involves the write-up of the final analysis and description of the findings. The researcher should not merely present an interpretation of the data but also demonstrate a clear and logical narrative that fully answers the research questions. (Braun & Clarke, 2006:23; Kiger & Varpio, 2020:853).

3.9.1 Qualitative data analysis

The use of computer-aided qualitative data analysis software (CAQDAS) such as ATLAS.ti and NVivo has proliferated over the past two decades. This is predominantly due to the laborious and daunting task of having to conduct an analysis manually when dealing with large volumes of unstructured data (Collis & Hussey, 2009:168). The benefit of using CAQDAS helps the researcher to manage and organise data which facilitates an analysis through a suitable program (Saunders et al., 2019:638). Taking into consideration the phenomenon under inquiry, the advancement of new and innovative ICTs along with the availability of audio recording devices

and transcription software, made the process of converting the data collected from the semi-structured interviews into digital format relatively easier. Additionally, a meticulously conducted analysis with the assistance of CAQDAS increases the validity of the research results (Friese, 2012:1).

Recommended standard software programs such as ATLAS.ti can be utilised in qualitative research methods to automate the coding processes (Bhattacherjee, 2012:117). For the purpose of the study, the qualitative data was analysed using ATLAS.ti data analysis software. ATLAS.ti is one of the most appropriate software systems for analysing qualitative data in a wide variety of disciplines. This program allowed the researcher to uncover and systematically analyse complex phenomena hidden in the data in the interview transcripts and as a result, the researcher was able to develop themes and unearth existing gaps within current literature.

3.10 Evaluation of qualitative research

Numerous authors have emphasized the subjectivity of qualitative approaches in comparison to a quantitative approach. Qualitative research is based on the philosophy that reality is socially constructed and each individual interprets and experiences reality differently. Thus implementing the reliability and validity measurement in qualitative research cannot be applied as it is based on the ontological view that reality is objective and independent. An alternative set of criteria that can be used to evaluate the trustworthiness and authenticity of qualitative research is the following: dependability, credibility, confirmability and transferability (Trochim & Dolley, 2016:71).

3.10.1 Dependability

Qualitative research can be regarded as dependable or authentic if two researchers exploring the same phenomenon independently obtained the same results utilising the same methodology and methods (Bhattacherjee, 2012:110). This concept is a criterion parallel to reliability in quantitative research (Lapan et al., 2012:29; Saunders et al., 2019:217). Within this criterion, the researcher needs to ensure that the details of the phenomenon of interest, as well as the social context, are dependable to allow others to authenticate their findings and interpretations. The discourse on the 4IR has received considerable attention amongst global leaders, industry experts and academia. The primary focus of these discussions has been to establish its disruptive effects on society, individuals and particularly the world of work. Despite the growing body of literature, there is a lack of empirical evidence on the phenomenon under study, particularly from a South African perspective. This study asserts that in order to leverage the benefits and opportunities of the 4IR, SMMEs need to be at the forefront of this technological revolution. Thus the focus throughout the study was to assess the impact of disruptive technologies on the growth and development of

SMMEs in order to identify the required skills which could assist the SMME sector to thrive and compete in a technology-driven ecosystem. This was achieved by adopting a qualitative exploratory design in tandem with a descriptive method. The SMMEs were selected purposively from the finance, retail and tourism sector and key individuals were interviewed to obtain qualitative data.

3.10.2 Credibility

The credibility criteria of qualitative research ensure that the results are believable from the perspective of the participants involved in the study. As qualitative research is intended to explore and gain a deeper understanding of the phenomenon of interest based on the experiences, perceptions and beliefs of the participants, it is presupposed that they are in a better position to accurately verify the research findings. For that reason, credibility is akin to internal validity in quantitative research (Bhattacherjee, 2012:110, Kumar, 2014:219). The researcher employed a semi-structured interview as the main data collection instrument. This type of data collection technique required the researcher to interact face-to-face with participants. Strict anonymity and confidentiality were adhered to by providing a consent form. This allowed the researcher to build some form of trust and rapport. The interviews were recorded and transcribed verbatim and field notes were used pre-emptively as a backup. The credibility of the findings was established through meticulous and proper data management as well as analytical procedures.

3.10.3 Confirmability

Qualitative research tends to be orientated within the contextual uniqueness of the subject being studied and thus interpreted from the perspective of the researcher (Bell et al., 2019:91). Subsequently, the elements within the research process should be described in detail and be coherent with the acquired data (Collis & Hussey, 2009:264). In essence, confirmability within qualitative research can be achieved if the results of the inquiry can be corroborated or confirmed by other researchers (Trochim et al., 2016:70). The results of the study can be confirmed by ensuring that the inferences or the outcomes of the study reflect the research questions and objectives.

3.10.4 Transferability

This criterion is concerned with whether the results of the qualitative research can be generalised to other settings or contexts. Although it is quite elusive to establish transferability due to the nature of qualitative approaches, to some degree it can be enhanced if the methodologies and methods adopted are thoroughly explained for other researchers to replicate (Kumar, 2014:219). The researcher is responsible for determining whether the results are capable of being transferred to

a different context (Trochim et al., 2016:72). The researcher adopted a qualitative exploratory approach and employed a semi-structured interview as the main data collection instrument. This approach is best aligned with the interpretivist paradigm as it aims to acquire an in-depth understanding of the phenomenon of interest from multiple perspectives. Semi-structured interviews consisting of open-ended questions were designed in accordance with the research objectives. Non-probability purposive sampling was employed to select participants heterogeneously as the researcher discovered that each sector as well as the participants had their own unique challenges. The data was analysed using CAQDAS, which assisted in generating themes and helped increase the validity and transparency of the research.

3.11 Ethical considerations

Saunders, Lewis and Thornhill (2009:184) point out that researchers must be aware of ethical considerations and possible dilemmas throughout the research. The ethical principles that are governed by a code of ethics in research help to mitigate any ethical risks that the researcher may encounter (Bell, et al., 2019:398). In the context of research, ethical consideration is defined as 'appropriateness of your behaviour in relation to the right of those who become the subject of your work or are affected by it' (Saunders et al., 2009:184). The following ethical principles were applied.

Informed consent and voluntary participation: The researcher sought authorisation and approval from the Research Ethics Committee (REC) at the Cape Peninsula University of Technology (CPUT) by submitting the research instruments. In order to adhere to ethical standards of undertaking the research, the identities and personal details of the SMMEs were not disclosed. Hence the strength of qualitative research depends on the informality of communication as well as the interactive aspect of the research process (Maree, 2016:44).

Confidentiality and anonymity: Strict confidentiality and anonymity were assured verbally as well as in a letter of informed consent from CPUT (Appendix B) to the participants. In addition, the researcher specified the purpose and significance of the study before commencing the interviews. This process helped establish a rapport with the participants that enabled an environment where the participants felt comfortable in providing open and candid responses throughout the course of the interview. The researcher meticulously explained and emphasised that feedback provided during the course of the interview would remain confidential and pseudonyms would be used for the participants.

Protection of participants: An ethical clearance certificate (2019FOBREC715) was obtained

from the REC to ensure the protection of the participants. By obtaining ethical approval from the REC, the researcher demonstrated the adherence to ethical standards in the current study (University College London, 2016).

3.12 Chapter Summary

This chapter deliberated on the philosophical underpinnings that guided the research methodology and design. An interpretivist approach was espoused to acquire multiple interpretations of the phenomenon under the study and incorporated an exploratory qualitative design to attain the objectives of the study. Semi-structured interviews were used in tandem with field notes and audio recordings as the primary data collection tool which consisted of open-ended questions. A purposive sampling method was utilised to select participants heterogeneously for the study. The subsequent chapter presents the findings and interpretations of the results.

CHAPTER FOUR
RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

SMMEs remain an integral component of the government's endeavours to attain economic development and inclusive growth. Presently, the SMME sector is ill-equipped to deal with the current technological advancements brought about by the 4IR. Given the importance of this sector, it was therefore critical to obtain a deeper insight to the experiences and challenges of adopting a technology-driven business model. Recognising the potential risks and challenges associated with the 4IR may possibly encourage SMMEs to proactively adopt emerging technologies within a competitive and ever-changing environment. The main focus throughout the study was to assess the impact of disruptive technologies on the growth and development of SMMEs in order to identify the required skills which could assist the SMME sector to thrive and compete in a technology-driven ecosystem.

The current chapter undertakes an analysis of the data obtained from the semi-structured interviews as expounded in Chapter Three. The research findings deriving from the interviews pertaining to the conceptual constructs that emerged from the data analysis are presented and discussed thoroughly. In addition, interpretations of the results are discussed in tandem with the applicable reviewed literature. ATLAS.ti was used to analyse the qualitative data and an inductive approach to the analysis and interpretation of the results was incorporated. The themes and patterns were facilitated through a process of coding which assigns categories and concepts relevant to the research endeavours. The researcher followed Braun and Clarke's (2006) six stage thematic analyses to the qualitative data. The subsequent chapter provides recommendations to policymakers based on the key insights of the study that could provide home-grown innovative solutions to enhance small business participation in the growing digital economy. Epistemologically, the research is embedded within an interpretivist paradigm.

4.2 Demographics overview of research participants

This section provides an overview and description of the demographic information that was extracted from the semi-structured interviews. Table 4.1 below displays the characteristics of each participant such as their industry sector, the position of the participant in the business, years of business and entrepreneurial experience, the classification of the business and the total number of employees. In addition, the participants have different levels of education and qualifications ranging from secondary to a CA(SA) qualification.

Table 4.1: Demographic data of research participants

Participants	Industry Sector	Position in the business	Years of Business/ entrepreneurial experience	Highest education	Classifi- cation of business	Number of employees
Company A	Finance/ Accounting	Owner/ Director	Most of their life	CA qualification	Micro	1
Company B	Fintech	Co-founder	2 years	BTech	Small	15
Company C	Insurance/ Finance	Chairman CEO	21 years	NQ level 4	Micro	10
Company D	Finance/Banking	Founder & CEO	14 years	Matriculation	Small	15
Company E	Wholesale & Retail	Owner	±30 years	BCom	Small	16
Company F	Retail	Accounts & Administration	None	Matric	Small	14
Company G	Retail	Branch Manager	±5 months	BSc Honours	Micro	±5
Company H	Retail	Sole Owner	2 years	Diploma	Micro	1
Company I	Retail	Owner	5 years	Higher Certificate	Micro	1
Company J	Tourism	Founder & Tour Director	2 years	Matriculation & short courses	Micro	4
Company K	Tourism	Marketing Manager	2 years	Matriculation & PR	Medium	±200
Company L	Tourism	Founder & Director	±30 years	Matriculation	Small	19
Company M	Tourism	Assistant Operation Manager	3 years	Matriculation	Small	38

4.3 Research Findings

The following section presents analyses of the findings pertaining to the research questions of the study. The majority of the interviews were conducted face-to-face in the workplace of the SMMEs. Due to external factors that emerged from the COVID-19 pandemic, two of the interviews were conducted through the use of a video conferencing platform, namely Zoom. All interviews were audio-recorded with the consent of the participants. The interviews were semi-structured with an average duration of an hour. Owing to the sparse literature on the phenomenon, the results were analysed inductively to create relevant themes. The main focus was on gaining a deeper insight to the challenges of adopting a technology-driven business model with the aim of proposing pragmatic solutions to enhance small business participation. The interviewees were enthused and showed keen interest in the research as they became cognisant of the need to continuously adapt to the ever-changing digital landscape.

4.3.1 Understanding the 4IR concept

The first section of the interview entails a contextual understanding of the 4IR phenomenon from the perspective of the SMMEs. According to a report conducted by Kagiso Trust (2019), the importance of attaining knowledge of the 4IR is equally crucial and relevant as it is anticipated to have transformative effects on all facets of society. Thus, increased knowledge could be an impetus and motivator for small businesses to embrace and harness the opportunities of the 4IR. Moreover, the 4IR phenomenon is relatively new and conceptual (Futcher,2018:4) with contrasting definitions amongst extant literature. The lack of consensus is understood to be a challenge, particularly within resource-constrained environments. However, it simultaneously presents an opportunity for developing countries such as South Africa to contextualise 4IR related concepts to country policies and strategies (Gumbi & Twinomurinzi, 2020:50). In order to close the research gap, the perspectives of the SMMEs provided in this section could help demystify the concept.

Overall, the respondents demonstrated a basic understanding of certain elements and technological trends pertinent to the 4IR phenomenon. The key informant for a fintech and community development organisation provided some context to the previous industrial revolutions by highlighting the transition and advancements of technology in noting the following:

> So, I think based on my understanding, it's a transition from like the previous way of doing things and at the way that you can imagine. Technology and its abilities…it's basically a transition from how things used to be like around the Third Industrial Revolution to a new way of doing things, which is more around digitalisation. So that's mainly includes things like

how we can reimagine things like communication, how we can interact with machines, how we can bridge the gap around communication. So it's a wide range of things that can be imagined, like how cars can drive themselves, how we can talk to machines, how we can basically improve the way that we just interact on a regular basis. So I think for me, in the core of the Fourth/Industry 4.0, it is like moving things from pretty much manual to more digital. I think that's the main transition if I can sum it up.

In addition to the previous key informant's statement on the advancement of technology, The founder and chief exponential officer (CEO) of a digital banking platform also perceived some of these advancements throughout the past three generations.

I understand, I would say more than 99% of the executives in this country. I am an entrepreneur that has seen three generations of technology surpass us. I mean I am talking about a fixed line phone to a fax machine to a MS desktop computer with a printer. That went to a SunRace laptop that became a consumer int - like Windows 95 or 92 even. From there on, it just evolved through all the generations…I've seen all the revolutions and disruptions throughout the technological last 20/30 years.

A common theme that tends to emerge frequently within empirical studies is the rise of automation or displacement of manual tasks which was articulated by the majority of the respondents. The marketing manager of a sightseeing tour company stated that the 4IR is:

Basically using technology as opposed to manually doing everything as we used to in the past and using technology as your friend, as opposed to being scared of it. And using it to your advantage to make your business work better and flow better.

The owner and director of a financial accounting firm concurs with the above interpretation and vaguely points out the relevance of automation to their respective field.

In a short sentence is just automation of pretty much everything. You know in my field, you would be talking about stuff that you do on a daily basis, something itself – you repeatedly try to automate the stuff.

Furthermore, the branch manager of an online retail store emphasised the displacement of manual labour and made reference to the current risks of the 4IR on the banking and financial sectors:

Basically what I understand in terms of, regarding the Fourth Industrial Revolution is how the technology is taking over manual labour and it's been happening, especially in the finance department. Like for example, for banks, a lot of people are at risk right there.

The respondent further pointed out that machine learning is at the core of this new revolution:

So machines are basically taking over and machine learning is like the core of the Fourth Industrial Revolution right now.

In addition to the statements concerning the displacement of manual labour, the founder and director of a guest lodge accommodation conveyed that the 4IR presents an opportunity of learning new things and venturing into uncharted territories:

My understanding of the Fourth Industrial Revolution, I presume that it is a change that is going to happen which is taking people away from their usual way of operation. With that is…that is equally learning a new way of doing things and in learning a new way of doing it comes with its own challenges. But at the end of the day, it could be of beneficial to those who are willing to venture into new space.

On the other hand, there were a few respondents who displayed little or no understanding of the 4IR concept. However, they made an attempt to shed some light on their perception of the 4IR. For instance, the chairman and chief executive officer (CEO) indicated the following:

I know it's about blockchain and all those things and makes it easier so you can store in the cloud and all those types of things and robotics. So I am not here to tell you I know it all, I don't really because it wasn't my focal point…I've read about it a bit, but to me you need to be tech or IT savvy to understand all those things and with my little… I mean it's beyond me, so I will not enter into something that I do not know.

The owner of a service station and convenience store briefly touched on how things are becoming more efficient and different compared to the past.

Yes they speak a lot about it but it's – I tend to think of electronics, people doing things more efficiently and differently. Using whatever means – computers, internet to run a business or to do anything. It's fairly [dependent] differently to how things were done before.

Although the assistant operation manager of a hostel does not fully grasp the concept, there are some noticeable technological changes that this key informant foresees in the accommodation industry as a result of this revolution.

> I'm not actually sure, but my understanding – that probably means to do with internet, everything going online, technology going forward. So that's my perception, I might be wrong…For hotels and stuff, the new revolution is probably that everything moves to let's say, contactless and online. Where people don't…where you actually won't even need a reception in the future. You would make a booking on your phone, you will get your key card on your phone and you will make payment on your phone. You get all the information over the phone and yes, basically, that's how I see the future possibly going which is both with the current climate, which encourages contactless, with the pandemic and all of that.

Based on the above responses, the understanding of the 4IR confirms that this new wave of technological advancement is presently at a nascent stage. The respondents presented a basic understanding of the concept highlighting certain factors pertinent to the 4IR. These factors included the evolution of the 4IR predecessors, advancement of technology, displacement of jobs through technology, increased efficiency and the increasingly integration of the physical and digital worlds. The limited understanding surrounding the 4IR heightens the importance of promoting 4IR awareness and further demystifying the concept.

4.3.2 Understanding disruptive innovation

Central to the discourse on 4IR is the novelty of disruptive technologies underpinning the current revolution. The underpinning technologies of the 4IR are projected to disrupt virtually every industry across the globe (Klaus, 2015:1). It can be determined that the advent of the 4IR has led to the development of various emerging technologies which possess disruptive effects (Rahman, Hamid & Chin 2017:3).

In addition to obtaining an understanding of the 4IR, the respondents were asked to define disruptive innovation from their viewpoint. The aim was to assess their awareness of the fast-paced technological changes and current market trends transpiring in their sectors. This would lay the groundwork of the study in terms of their agility to respond to market trends and willingness to embrace disruptive technologies. In contrast to their perspective of the 4IR concept, the majority of the respondents were well-versed with the concept of disruption innovation. The key informant of a fintech and community development organisation mentioned the following:

In order for something to be considered a disruptive innovation, it must at least completely change what was already there in the market. So in order for something to be disruptive, it must like change human interaction, how people perceive certain things to a totally new perspective on how things can be done. So any technology that can do that, I think for me will meet the criteria of like being disruptive.

The founder and director of a food tour company concede with this notion and observed that disruptive innovation 'could mean change [for] the industry'.

The above statements align with Darji et al. (2016:8) in noting that disruptive technologies, a subset of disruptive innovation (Seet et al., 2018:14), will significantly transform the manner in which businesses and industries operate. In other words, for an innovation to be truly disruptive, it must have the potential to create an entirely new market through the introduction of a unique product or service. As a result, the incumbent industries affected become obsolete or redundant. The impact of these changes could possibly lead to a new way of doing things and alter how individuals engage with one another, as the informant from a fintech and community development organisation noted.

Another important aspect that Christensen et al. (2000:2) underscores is that disruptive innovation is often a simple, convenient and affordable solution. This corresponds to the perceptions of the founder and CEO of a digital banking platform and the owner of an e-commerce platform on the notion of disruptive innovation. As the former noted,

Disruptive innovation, I would say it is when technology can execute and deliver value to consumers quicker than the incumbent can do it. That's it. So the rate at which an innovator and at the cost…the rate and the cost that someone can deliver something of value. Like, let's call it a single purpose feature or a minimum lovable product at a quicker, 10 times faster, 10 times cheaper and 100 times bigger scale than what an incumbent can and that is technological disruption.

The owner of an e-commerce platform agreed with the cost-effective aspect of technology and indicated that disruptive innovation is the following:

Just bringing a better solution but at a much cheaper price.

Disruptive innovation was also perceived by some of the respondents as developing or creating

something unique that no other incumbent has done before and going against conventional norms. The chairman and CEO of an insurance firm stated that:

> Disruptive is when you come with unique things which is not really there yet, and disruptive is when you offer services which is not there yet. You are out of the box thinking like - and sometimes we have to be a breed of disruptive people because if we are going to do that, people will not actually look at you. And if you come up with innovative things and be first, you stand to gain momentum and bigger.

The branch manager of an online retail store resonated with this statement and specified the following:

> From a business perspective, it would be, like if I want to be disruptive in my markets, to me I would have to be someone who's doing something that no other designer has done before. So to come up with something new, something not seen but something that everybody wants to buy into and sort of going against the norm. For me I would say that has been, especially in my industry, to be disruptive is to ruffle the feathers where convention says do this but you thinking new and out of the box and cutting edge.

Moreover, several respondents provided examples of businesses that are deemed disruptive and have witnessed the impact of their presence in their respective industries. The assistant operation manager compared disruptive innovation to existing technology-enabled platforms.

> Disruptive, that would possibly pertain to things like Airbnb which was a big disrupter for the hospitality industry, just like Uber was also a big disrupter for the transport industry. I would personally say yes, there was quite a concern with the amount of Airbnbs, which started to flood the market. You could see a noticeable downturn, before all of this pandemic stuff. Let's say from last year, there was a noticeable downturn, because there were just so many choices for, let's say guests. So and also, it completely affected the rates of all levels of hospitality.

The marketing manager of a sightseeing tour company noted the discomfort of disruptive innovation; however embracing it could be to one's advantage:

> Disruptive innovation, things like Airbnb, your…the stuff that you throw into the mix that makes you uncomfortable but if you use it and embrace it, it can make your life a lot easier.

Conversely, one of the informants from a service station and convenience store had a limited understanding of disruptive innovation. This could be due to a lack of knowledge or awareness of the disruptions that have occurred in the industry.

> I can't really think of anything that – obviously ahead of time things happened and become more efficient, you get more computer systems that gives you more and more information. But nothing so dramatic in our industry that has changed. Everything just moves to get things done quicker faster, better and more efficiently.

The responses overall demonstrated certain intricacies parallel to the concept of disruptive innovation. In addition to transforming the market and providing inexpensive solutions, firms that challenge the status quo tend to first target segments that were previously overlooked and subsequently migrate to mainstream markets (Christensen et al., 2015). It is imperative for the SMME sector to be cognisant of the current technological trends transpiring in their respective sectors and thus respond appropriately. Failure to do so could potentially result in forfeiting market opportunities and becoming irrelevant (Chan, Teoh, Yeow & Pan, 2018:437). It could also lead SMMEs into the quandary of falling behind other industries pertaining to the evolution of technological innovation.

4.3.3 Embracing disruptive technologies

This section provides an important foundation into assessing the implementation of disruptive technologies in the context of SMME development. The level of awareness of the technologies underpinning the 4IR and the implementation thereof is sparse, as highlighted in the preceding chapters. Although key 4IR technologies have been identified by prestigious institutions such as WEF and McKinsey, there is a gap in identifying the relevance of these technologies to the SMME sector, especially in developing countries. For that reason, respondents were asked to provide examples of disruptive technologies that are driven by the 4IR as well as the relevance of these technologies to their respective sectors. Table 4.2 summarises the technologies that respondents considered disruptive and relevant to their respective sectors and businesses.

Table 4.2: Summary of disruptive technologies underpinning the 4IR

Disruptive technologies	Examples	Sectors
Cloud computing	Cloud accounting,	Finance

	Google Cloud	Tourism
	Amazon Web Services (AWS)	
	Google Analytics	
	Oracle	
	Cloudbeds	
	Dropbox	
	Video conferencing platforms	
Artificial intelligence	Presentations	Finance
	Chat bots	Retail
	Predictive analysis	
Machine learning	Application Programme	Finance
	Interfaces (APIs)	Retail
	GraphQL	
	JavaScript	
	Python	
Blockchain	Cryptocurrency	Finance
	Smart contracts	Retail
Social media	Facebook	Retail
	Instagram	Tourism
	WhatsApp	
Virtual reality	VR technology	Tourism
	Virtual key	
Robotics	Smart machines	Finance

Table 4.3 confirms that the respondents are aware of some of the key technologies driven by the 4IR and already embraced some of these technologies in their business operations. In addition to the 4IR technologies that are displayed in Table 4.2, there were other technologies that were deemed disruptive although not extensively cited in 4IR literature. A few respondents from the tourism sector made reference to online booking apps or systems such as Booking.com and Tripadvisor amongst others. The other respondents from the remaining sectors made reference to OCR technology, video technology, e-commerce websites, marketplaces (Takealot) and smartphones. Surprisingly, there was no mention of IoT, IoS or mobile internet, given the increasing convergence of physical and digital devices. On the other hand, the findings also revealed that a few of the participants were unaware of the disruptive elements integrated with the

current technologies that they make use of.

This also indicates that the promotion of the underpinning technologies of the 4IR is indispensable and should be contextualised to the respective sectors of the SMMEs.

4.3.3.1 Adoption drivers and benefits of disruptive technologies

The aforementioned disruptive technologies displayed in Table 4.2 are gradually transforming the ecosystem for SMMEs. The changes are evidenced in the way the SMMEs operate, interact and engage with their consumers. The following subsection highlights some of the adoption drivers and benefits that emerged from the findings.

Streamlined operations: The results have shown that some SMMEs are implementing emerging technologies to further streamline their core business operations and processes. This is supported by several operational and performance benefits cited, which include simplification of tasks, increased productivity and efficiency and convenience. Achieving these operational objectives can help the SMME owners save time, minimise costs and wastage of resources. Apart from the aforementioned operational benefits, an informant from the finance sector pointed out the relevance of adopting 4IR technologies to help scale at a faster pace in terms of developing the business and operating in different regions.

> I think they are relevant in terms of like simplification of things that would have required so much resources and energies. I think for us, they are more in the sense of like simplifying the work that we're doing and obviously allowing us to scale on a much faster pace in terms of growing our business and making sure that you can operate in different region. So like, then that's the relevance that we have seen in terms - they have improve our operations in terms of the day to day operations, and also help us operate much more efficiently and with so much efficiency in everything that we do.

The founder and tour director of a food tour company also confirmed the aforesaid operational and performance benefits:

> For us, as in the background. I feel like these apps, these platform assists us better to save time, number one. To also be able to work on more projects, to get more feeds into the business.

Increased accessibility: The deployment of cloud technologies offers flexibility for remote

working whereby the workforce has seamless and continuous access to information from any location. Information can be accessed from any device including smartphones, tablets and laptops, provided that there is internet connectivity. The informants from the finance and tourism sector have noted the relevance of implementing cloud computing in relation to remote working.

> The Xero accounting software that I use, you can access it from your phone so you don't have to do it on a computer. So in the bus, in the taxi, wherever you are, you can do your work.

> So in the last year, we changed on to Cloudbeds, which means our reservations manager can, even on her off day when she's at home, she can quickly go on Cloudbeds and make changes and stuff like that. Which I think most hotels and hostels have already done or have…most of them are on cloud-based systems.

Enhancing team collaboration: In addition to remote work, some of the participants are leveraging cloud collaboration platforms to facilitate communication, data sharing and project management tasks. Employees are able to collaborate on projects, share files and edit documents in real time regardless of geographical location. As a result, this contributes to increased productivity and efficiency amongst the workforce. One of the key informants of a Fintech and community development organisation touched on some operational benefits of cloud collaboration:

> We look at things like sharing files on the drive. It's simplifies everything…Yes because you have that one location. And things like Trello, where you can store, we can all work as a team on one board, like everyone can update each other.

Video-conferencing tools are also used to host meetings with clients virtually, allowing SMME owners to save on traveling costs.

> So for me, that was the biggest one and it makes life easier. And I mean, we do calls online, we do video calls – those are other technologies that help us. Skype, Google Meet, WhatsApp video calling…there [are] a lot. Zoom, etc.

Security considerations: Information security and privacy has been a bone of contention due to the increasing cyber threats and fraudulent activities online. Technological advancements centred on collecting, processing and analysing data from various platforms have contributed to the

mistrust of utilizing digital technologies. To address this issue, some participants have adopted blockchain and other fraud detection technologies to enhance security, ensure transparency of information and prevent fraud and unauthorised activities. The key informant of a fintech and community development organisation has already experienced the security benefits of adopting blockchain, mostly from a security perspective:

> So I think for us, in terms of security, we've already seen benefits in terms of being at the peace of mind knowing that the records on the blockchain in terms of like a storage perspective. We know now that everything that we do is super stored on the blockchain and no-one can delete it.

The participant is also experimenting with smart contracts to further provide decentralised storage of vital information.

> We play around with something that's called smart contracts or using like…smart contract, where it creates a decentralised like contract that goes to our user base and then they're the one that evaluates deeds through those smart contracts.

Although the chairman and CEO of an insurance firm is reluctant to implement the disruptive technologies mentioned in table 4.2, the participant is however aware of the relevance of blockchain within the finance sector in terms of minimising external threats.

> I would think so because the sector is actually going that way and there are a lot of things about blockchain, storing information and doing things easier. So I think, as I've said to you that it's going to be various secure driven tool[s] on the blockchain side of things. I think what they are doing is to try and minimise the hacking of things, that is why they developed this blockchain thing.

On the other hand, one of the participants from the tourism sector pointed out how the interoperability of their booking systems and front desk has helped combat fraud.

> You're looking at booking systems that talk to the front desk. So for now, you'll buy your ticket online, you will then have it scanned at the front desk. All of that has helped us combat fraud.

Business model innovation: There is a noticeable shift in the way businesses interact, engage

and deliver value for their customers. Based on the results, a few entrepreneurs are shifting their strategic focus from a product-centred model to a more customer-centric business model. With the rapid advances in technologies such as AI, machine learning and big data as well as the pervasiveness of social media, businesses are creating innovative methods to personalise and enhance the customer journey. The founder and CEO of a digital banking platform exemplified the importance of adopting a customer-centric business model with the overall aim of creating an exponential and sustainable organisation.

> It is the number one reason why we can exist because we can build an exponential financial institution, or I would say not an institution but organisation. Because we want to take all the disruption and create organised value amongst our consumer ecosystem. You see for us our success is when the business model of the people and the value they that get. If we can save - if we can make as much money as what we are saving then from the traditional institutions then we have achieved mutual success. And a way for us to do that is the zero sum marginal cost scale, that's number one. It is building scalable technologies at a fraction that is 10 times cheaper, that is 100 times more valuable and that is 1000 times more scalable than traditional institutions.

To further support the above view, the respondent accentuated the main purpose of the company which is not merely to disrupt their industry but to empower people.

> So I've been able to focus on the niche, its technology, its financial services technology and everything comprising from institutions plus the ecosystem like fintechs and software services around the industry, and that ultimately how that impacts the consumer. By heart it's always been there to champion people. I think that just really my purpose. It is not so much to disrupt banking but it's just to empower people.

Customer experience and engagement: One of the reasons businesses are gradually shifting towards a customer-centric business model is the increasingly evolving customer demands and expectations. Customers have recently become more digitally conscious and informed, thus compelling businesses to provide a holistic, seamless, and convenient experience across various channels. In context of the hospitality and tourism sector, the upsurge of on-demand and digital platforms have disrupted the way individuals manage their holidays which has reduced the reliance on traditional methods of traveling and lodging reservations. Therefore the participants within this sector recognised the importance and relevance of adopting the appropriate technologies to provide a unified customer experience.

Technology is making the world a lot smaller. So it's not – gone are the days where the guy in Germany has to write a letter to find out if the hotel has accommodation, he can do it on his phone within two minutes of arriving into the country. It's not like he has to plan three weeks ahead like they used to or should I say three months ahead like they used to. With internet, it got down to that they would plan three weeks ahead.

Guests arrive, you sign in with a tablet. It's become more clean, there's no, once again, no paper trail. For me it's a lot more professional and they feel so much more important. The fact that if someone pulls out a tablet or something. Makes you feel like, oh this is invested not only just into me but into the quality of the product as well.

Hotels want the check-in experience to be quicker. They want to get over with quicker so that there are no over the top lines of guests formed. They want the guests to arrive, they want all of that sorted in like two minutes and then the guests are shown to the room. This obviously will help immensely with the shorter time.

Along with providing a unified customer experience, some participants perceive the benefits of incorporating omnichannel platforms to establish ongoing interactions and engagement amongst their customers**.** Social media such as Facebook and Instagram are examples that have become excellent marketing platforms for the founder and tour director of a food tour company in terms of receiving positive feedback and reviews.

I love social media, for example, Twitter, Instagram and Facebook has been a marketing platform for us as well. They have brought in great feedback regarding our product so that's great, but also you've lost the focus of the guests, it's like very short.

Another case in point of enhancing consumer engagement is the use of chatbots. The owner of an online store leverages engagement tools such as chatbots which provides automated responses to queries as well as creating invoices.

There is actually two. So one of them is instantly when you log into Facebook or when you get into the website, you actually see like a little box there that says you can actually contact us or talk to us via Facebook. The other one, we're still implementing is that when you get to the website, you can still have an option to talk to us, like directly on WhatsApp. You don't really have to go through all that like Facebook or send emails and stuff, you can directly

talk to us. And we can reply instantly with messages that come there and then. And also, we have for sending invoice that is handed when a customer buys something.

Market opportunities: Having an online presence has also emerged as an essential growth strategy for small businesses to reach a wider audience and increase access to market opportunities globally. One of the informants from the retail sector stated that their online presence affords them the opportunity to reach various demographics through their online store and social media platforms.

> We started as an online business which has been working well because our market is always online. That's how we actually reach higher demographics through marketing on Facebook, Instagram, and WhatsApp basically.

E-commerce platforms such as Takealot were considered as a disruptive marketplace that could help smaller online retailers further extend their market reach with minimal effort, thus saving additional operational costs.

> I'm using Takealot. That's a marketplace, that's a disruptive marketplace. All of a sudden with Takealot, what it did is, it created a portal where, you know, you don't have to go and get a space, like a big shop or like a stand outside. All you have to do is sign up for an account, you get your details, and now you're a seller on Takealot. So that kind of eliminates all the stuff like paying for rent.

Sustainability: Along with the above adoption drivers and benefits, there is a trend towards implementing eco-friendly and sustainable business practices. The research participants, particularly from the tourism sector, have recognised the importance and benefits of digitising their operations through the transition of paper-based processes to digital platforms. In this way, the adoption of emerging technologies can promote SMMEs to contribute positively to the environment and subsequently reduce their carbon footprint.

> I feel like for most of it, it was for the better, because less paper trail. Not merely, we are much more green in the form of saving paper and trying to not…be as recyclable as possible. So technology has definitely improved that side.

> We try and keep up with all innovations and that ranges from everything from how the bus works; from a factor of taking a diesel bus to an electric bus down to how booking systems

work, whether it's a piece of paper and a pen going to online, online bookings, and also how we handle our ticketing systems. In the past, you could show a piece of paper. We're trying to get to a point of scanning your barcodes on your cell phones. So it goes right across the board, it's not just about taking bookings on the internet, it's about everything we do.

The above adoption drivers and benefits were discussed in terms of their relevance and importance of implementing some of the considered disruptive technologies mentioned in section 4.3.3. The research participants viewed these benefits in relation to further streamlining operations, increased accessibility for remote work, workforce collaboration, security considerations, enabling innovative and customer-centric business models, market opportunities and implementing sustainable business practices. It can be presupposed that the perceived advantages show potential for SMMEs to become early adopters of the 4IR, thus enhancing their ability to remain relevant and competitive. The following section looks into the importance of having access to reliable ICT infrastructure to attain some of the aforementioned benefits afforded by digitisation.

4.3.4 ICT infrastructure

The findings provided in this section confirm that leveraging the benefits associated with the 4IR requires accessibility to affordable and reliable ICT infrastructure, especially as it enables SMMEs to adapt reasonably and participate within a technology-driven ecosystem. Most of the respondents interviewed had access to reliable Internet connectivity whereby the majority used fibre-optics or planned to install it in the near future. Fibre-optic Internet access provides reliable, secure and fast connectivity and it is deemed as an essential tool for growth and scalability, particularly for small businesses seeking to adopt 4IR technologies. For instance, the high speed and bandwidth capabilities of fibre are exemplified in the food tour company's usage of cloud computing software in terms of capturing finances.

We just got our fibre, I feel like that has sped up everything, not just from…I mean even if it's like two seconds - we counted or we calculated the other day with Oracle for example, the way we did finance, logging into our systems and then having to sign in…With Oracle everything is on one and then with slow Internet it takes like forever. With fibre it literally took us I think 5.8 seconds faster to capture one bill which is fantastic, because we have about three hundred bills that we need to capture every month, so that['s] just insane. It's more than two hours of time that we have saved in your day. So, from that perspective, definitely Wi-Fi has saved our lives and with fibre.

Table 4.3 provides an overview of the common ICTs used in the daily operations of the participants.

Table 4.3: Summary of various ICT tools used amongst participants

Categories of ICT	Examples of ICT being used
Hardware	PCs, Laptops, servers, printers, scanners, mobile devices, telephone system
Web-based application	Email, Google Sheets, Google Docs
Financial tools	Xero, Sage Pastel, Oracle, CaseWare
Project management tools	Trello, Asana
Communication tools	Slack, WhatsApp, WhatsApp Business, Facebook Messenger
Chatbots	Front, Intercom
Video-conferencing platforms	Zoom, Skype, Google Meet
Reservation/booking apps	Booking.com, TripAdvisor, Expedia, Hostelworld, Agoda

Moreover, access to affordable and sustainable electricity is another key requirement for the adoption of modern technology (COEFS, 2017). Limited access to electricity is perceived as a significant challenge in the effort of developing countries to adopt 4IR technologies. Presently, South Africa is plagued with ongoing power shortages and load-shedding which continues to have severe implications for the economy and the business environment at large (Pretorius, Piketh & Burger, 2015:255). Small businesses are particularly vulnerable to the instability of the macro-environment in comparison to their larger counterparts. This is mainly due to the inadequacy of resources required to invest in alternative sources of energy in this particular context (Von Ketelholdt & Wöcke, 2008:4). The government's reluctance to address the increased electricity demand has further compounded the impending electricity crises (PSA, 2015). Owing to the uncertainty of the power shortages, SMMEs should pre-emptively pursue inexpensive alternative sources of energy such as uninterruptible power supply (UPS) devices, which one of the respondents indicated that they use.

We have UPSs now as well because of Eskom, so we can make sales even if the electricity

goes out. However, the UPS only run certain machines and devices and does supply back-up power for the Internet. 'We have a UPS but the UPS doesn't run our Internet. It only runs our credit card machines, our server for Pastel and our two computers in the front. So it's a small UPS but it's just for those small – just so that we can function and make money.

Although other alternative sources of energy such as generators are quite costly, the founder and tour director of a tour company is fortunate to operate within commercial premises that already have a back-up generator.

So we lucky the building here has a generator I don't know if that applies. So when it goes off within seconds it goes on, so it's fantastic you know.

Overall, the participants have a steady and reliable ICT infrastructure to enable them to participate within a technology-driven ecosystem. The participants also have adequate access to the appropriate hardware and software facilities required to function and operate efficiently. Access to basic infrastructure remains a pressing challenge for developing countries. For that reason, the government plays a crucial role in facilitating the necessary infrastructure development (Mabotja, 2018:25). In addition, the participants can opt for affordable sources of energy such as a UPS to help mitigate the risks and continue their operations during load shedding.

4.3.5 Adopting a technology-driven business model

This section expounds on various factors that impedes participants from implementing or adopting new and emerging technologies. The implementation of disruptive technologies can be considered multifaceted or sector-specific, therefore gaining an in-depth understanding of the experiences and challenges can help enhance small business participation within an ever-growing digital economy. These challenges encompass the lack of financial resources, the digital divide, fast-paced technological changes, research and development, future workforce, and lack of support mechanisms and appropriate government regulations. Figure 4.1 is a graphical representation of concepts related to the some of the experiences and challenges of adopting a technology-driven business model.
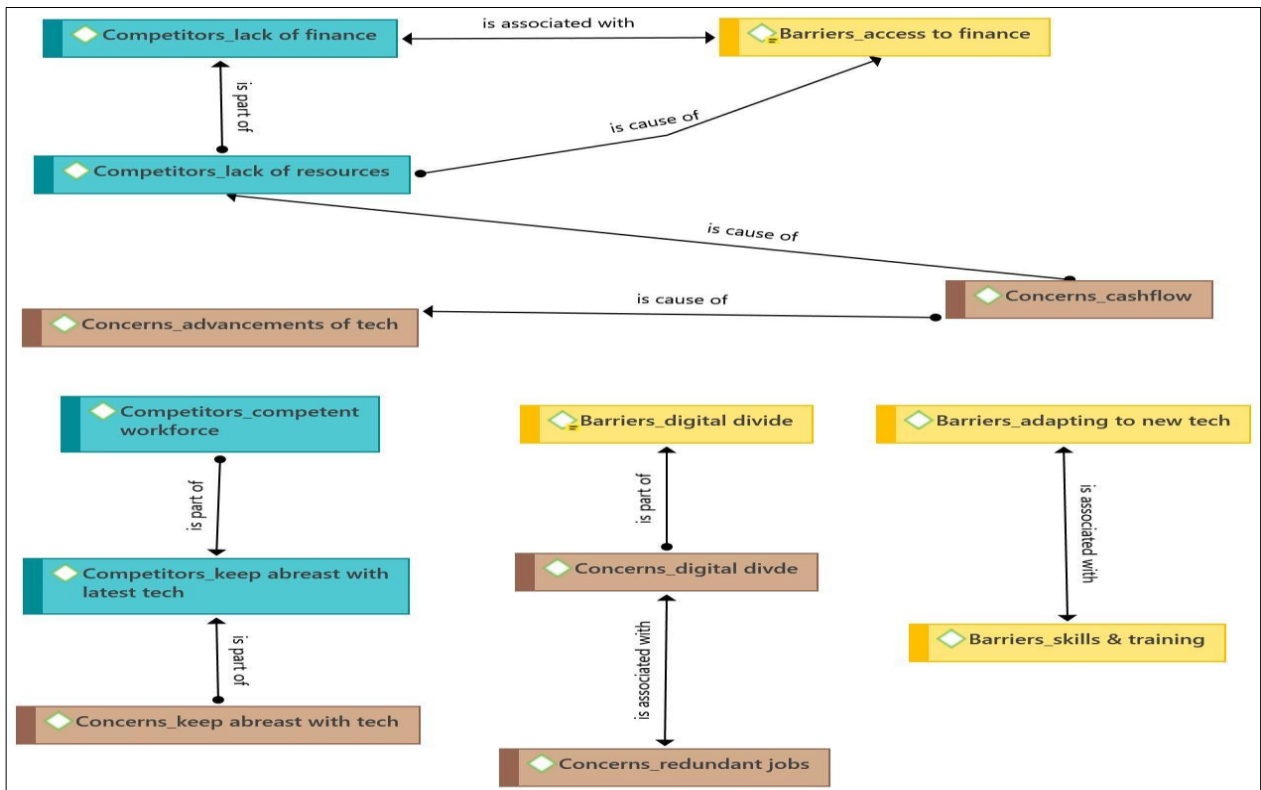
Figure 4.1: Barriers to adopting a technology-driven business model

4.3.5.1 Lack of financial resources

Access to the appropriate financial resources has emerged as one of the main barriers that hinder the ability of SMMEs to adopt a technology-driven model. The founder and director of a guest lodge accommodation indicated that a barrier to adopting a technology- driven business model is:

> Always lack of cash flow and lack of capital. So you have to kind of find a way to manage yourself because as the technology comes, you already have your capital baseline which is what I stand monthly, daily to run the business and this is what I can keep. But the more the technology come, for you to keep up, you have to see how much can you can invest in this area. So, because of these changes in technology, we'll always seek a way to adapt, and as we look for a way to adapt, it costs resources - it costs money.

The respondent further mentioned that this constraint is also a concern that may impede the ability to proactively participate within the 4IR.

> The main concern of the new digital revolution is our ability to have the necessary finances to adapt to the changes, because with the changes comes new ideas and new ways of learning. Therefore, you will need resources to invest into those new educational materials

that could take either you or your staff to the modern age.

The chairman and CEO of an insurance firm is of the opinion that the rapid advancements of technology will have an impact on the cash flow of the business.

> I think the main concern is the rapidness that is going to happen and also it is going to cost you a lot of money. It's to enable to get there and enable to work along and to be in line with your competitors or go beyond them. So the idea is great, but the impact is probably going to be cash flow, because these things happen so quickly, like your cell phone, within a few months there is a new cell phone that will be coming out. You got to keep up with technology…it's crazy. And to be able to keep up with times, you have to flow as well. And it can be an impact on your cash…it can be a financial burden.

Another challenge pertaining to the cost of adopting emerging technologies is the ability to compete with larger firms that keep abreast with the latest technologies. The owner of an e-commerce platform stated the following:

> Money will always be a factor. If you are competing with big guys and you still small, money is always going to be a big factor. Because they have money for marketing, they have money for everything. You just have money to buy stock, they have money for adverts, all channels of marketing, salespeople, and big teams. If you still micro, you are alone. You do everything on your own. So you don't really have that proper structure. They have like 20 to 30 people mainly on marketing or 50 people on just sales. And you are one person divided into eight pieces.

This sentiment is similarly echoed by the founder and tour director as well as the owner and designer of an online retail store.

> I think also finance, if you don't have as much capital as your competitors or such, it makes it difficult to stay advanced. That will make it a bit slower.

> It's again, the fact that they have the money like I mentioned to you earlier on. There are so many things I want to do but I can't because I don't have the capital. And also a big organisation like Edgars, for example and Ackermans or Mr Price even, they have the potential to…they have the power to buy in mass, whereas with me, because my items are once off and its small quantities, I don't have that so I pay a fortune. Like for me the fabric

alone costs what the garment cost in the shop.

Some of the respondents who have experienced minimal issues concerning the adoption of emerging technologies have cited a lack of finance as a possible barrier.

> For me as a person, no [barriers], because I love technology and I love to simplify things, and if I can find something that can simplify what I'm doing, I'll jump at it. Unless there's too much cost involved in it, but if there's no cost or if the cost is minimal, then I'll go for it.

Similarly, acquiring the necessary capital to fund the business model can emerge as a barrier for first movers such as the founder and CEO of a digital banking platform. However, the participant noted that one does not need massive funding to adopt a technology-driven business model.

> We are the first, so there are no barriers other than capital, skills and devotion to the business so I can... maybe if you speak to my co-founders they might have a different opinion but I don't think of barriers are that...The barriers are the capital required to operate the business model but the business model is delivered through technology, so chicken and egg. You need funding but not massive amount of funding.

Furthermore, importing certain technologies due to the unavailability in South Africa can also be quite costly.

> And then also, a lot of the stuff in South Africa you have to import. So it's also sort of getting your hands on the latest information, latest technology. It's not like it's at Dion's technology. You actually got to go and look for it.

It can be inferred from the abovementioned perspectives that a lack of financial resources is a critical factor pertaining to the adoption or implementation of a technology-driven business model. Acquiring the necessary finances, as Afolyane (2014:195) contends, will remain an ever-present factor, particularly when it comes to technology. The costs involved are usually perceived as a major impediment, especially by businesses that are not entirely cognisant of the attainable benefits or have not thoroughly evaluated the benefits. Cloud computing is one such disruptive technology that can offer SMMES a viable and affordable alternative to traditional ICT infrastructure (Hinde & Van Belle, 2012: 40). This is supported by a survey conducted by Xero (2018), which found that small businesses have cited significant operational advantages such as cost savings. Moreover, more financial support needs to be made available to assist SMMEs with

the necessary training and the implementation of new technologies (Mabotja, 2018:25).

4.3.5.2 Digital divide

The subsequent issue concerning the adoption of a technology-driven business model by SMMEs is the current digital divide. The digital divide refers to 'the gap between those people who have access to digital technologies and information on the Internet and those who do not' (Singh, 2004:4). In other words, it relates to 'the unequal access to and usage of technologies or Internet services such as cloud computing' (Le Roux & Evans, 2011:11). According to a report carried out by Research ICT Africa (RIA, 2018), the digital divide continues to persist in Africa as Internet access and usage is higher in more developed economies, coupled with social disparities in the use of the Internet. The persisting digital divide is evident in the historical social inequalities which further exacerbate the gap between the affluent and poor. For instance, the apartheid legacy which was entrenched in racial segregation provided inferior education and limited learning opportunities for the marginalised (Singh, 2004:6). Although steps have been taken to ameliorate or bridge the digital gap, the Internet penetration levels remain low and unaffordable to the broader population (Darji et al.,2016:6).

The foregoing presents several challenges for developing economies such as South Africa to successfully participate in the 4IR. Emerging economies are usually faced with more constraints compared to the developed world in terms of the adoption of new technologies. (Deloitte, 2016). Internet connectivity and accessibility remain a huge challenge which may potentially limit the adoption of 4IR technologies and consequently widen the gap even further. The effects of the digital divide are evident in some low-income communities that do not have the means to access certain services that are digitally driven or possess the knowledge to utilise these services. For that reason, a few respondents have recognised this gap as a barrier to adopt certain technologies.

> I think one of the key barriers for us is the fact that we are operating in a country and also in communities whereby technology is not in the first world state. So we are operating in communities, in a country whereby people are still playing catch-up with the rest of the world. So we can't – our platform and tech is ready for other markets like America, but not really for South Africa because people are still left behind in terms of technology. So I think that's one of the barriers or challenges that we come across frequently. We have this amazing platform that can do all these things, but people just don't have the means to access these or understand these technologies that we have.

This can be considered a conundrum, because on the one hand SMMEs are compelled to relentlessly embrace emerging technologies in order to remain competitive and on the other, have to factor in those who do not have the adequate facilities to access their platforms. Due to a lack of proper infrastructure, it will become increasingly challenging for individuals to be active participants within the 4IR. Hence, the informant from a fintech organisation felt strongly that South Africa is underprepared to leverage the advancements of the 4IR.

> Yes, I think that's the concern. That's the concern that South Africa, at this present moment, the reality is that it's not ready. The majority of the South Africans are not ready for like the Fourth Industrial Revolution. So that's like the sad reality and then you attend these conferences and then they tell you – they make you feel hyped, but then when you go back to implementing your brilliant app in the township, people don't have data to access the Internet then what?

However, the same informant recognised the need to develop their platform and services in such a way that would be accessible to their customers.

> So that was like one of the key things that we realised quite early on is that you have to balance and some things you just don't adopt them. We've seen people adopting certain technologies just to be relevant and to look good, but they're not going to be beneficial for their operations because people are not ready for them yet. So getting the timing right is quite important to balance between not getting caught up in the whole bubble of Fourth Industrial Revolution, neglecting the reality that South Africa isn't...

An informant from the hospitality and tourism sector shares similar sentiments and pointed out the potential impact of embracing new technologies within the accommodation/hotel industry. The implications of being digital or online-based could eliminate potential consumers who do not have access to the Internet or possess a smart device.

> The one thing I would mention though is I think it might still be quite a while before technology likes this becomes a very commonplace in South Africa especially. Because not everyone has access to WiFi, not everyone has smartphones. So you still will need people as receptionists, people on the ground, to help those guests who walk in. Otherwise if you go all out with this contactless and new technology, you are alienating quite a big portion of potential customers out there. However, by doing that, you are also alienating a lot of customers, because not everyone has access to that app, not everyone has a smartphone.

So, no, it would basically…if you only focused on that, you would eliminate walking guests, or telephone guests because now there's no receptionist, so that's my only concern.

The digital divide does not exclusively manifest between developed and developing economies. There are other factors that contribute to the digital divide including age, gender, racial segregation and physical disability (Singh, 2004:5). Amongst these factors, the findings revealed a subtle distinction between the older and younger generations regarding the adoption of new and emerging technologies. Some of the younger respondents were more optimistic and willing to embrace emerging technologies whereas the older respondents, particularly those who have been operating for more than 20 years, were resistant to the changes that come with technological advancements. The chairman and CEO of an insurance firm is of the opinion that the older generation lack the technical expertise to utilise certain ICT tools and would rather pay the relevant person to do it.

I think the main barrier is that we old folks don't know how to work these things – that's because of our age but we are never too old to learn. I am of the philosophy that whatever you can do I can do….the thing is this, with regards to IT, you need to have a mind, a technical mind that can do these things. I don't have that type of thing. I got other gifts than that. What I would do is I would rather engage with you and pay you to do it for me…. We got the tools, but we have a lack of understanding of how to work it. But as I am saying to you, I'd rather pay someone else to do it.

Similarly, the founder and director of a guest lodge accommodation believed that the 4IR is more applicable to the younger generations and stated the following:

So, you as the young people now have to think, okay, how I can fit into the Fourth Industrial Revolution. What role can I play because there will be different areas that one could fit in and that's it. But like us who are old, who are getting into the retirement stage, I don't bother about that.

In some cases, the implementation of new technologies is not always well received by the clients as they are complacent and accustomed to the traditional way of doing things.

I love technology and I love to simplify things, and if I can find something that can simplify what I'm doing, I'll jump at it…But for some clients, like I said with that guy, they just don't see the point of it because they've been doing things in a certain way and they think that

that's how they should just do it.

The above discussion has highlighted a few challenges pertinent to the adoption of new technologies. These challenges encompass the ever-widening digital divide which inhibits small businesses from fully adopting a technology-driven business model. The digital divide is not exclusively restricted to developed and developing economies but also exists among gender, race, physical disability and age demographics. As the 4IR pervades, an urgent need to address the digital divide becomes a critical prerequisite to foster social and economic transformation. The onus is on the government and various stakeholders to bridge the gap not only through investments in basic infrastructure, but also through digital literacy and skills (UNIDO, 2017). Despite slow progress within this area, the increased usage of mobile devices has proven to be a critical driver of social and economic development as they have become an important means of Internet connectivity for the disadvantaged (RIA, 2018). For example, the Kenyan mobile banking platform M-Pesa capitalised on this opportunity by providing financial services to those who previously had limited access to formal banking and infrastructure. This demonstrates how SMMEs can utilise disruptive technologies to modify their services or products in a way that is accessible to the broader populace.

4.3.5.3 Fast-paced technological changes

The rapid advances of information communication technologies have dramatically transformed the global landscape over the past decade. Breakthrough technologies such as AI, IoT, robotics, 3D printing amongst others, are occurring at an unprecedented speed and fundamentally reshaping how individuals live, work and relate to one another. The global economy is currently on the brink of a new disruptive technological revolution characterised by exponential innovation and substantial market potential (European Commission, 2019). The dynamic nature of this new technological era is bound to have a major impact on companies as they will be compelled to re-examine the way they operate and interact with their consumers. A common theme that emerged from the findings was the increasing threat of fast-paced technological advancements and the fear of being left behind in the era of the 4IR. This could be seen in the frequent use of terms or phrases such as 'left behind,' 'going to fall behind,' and 'have to adapt' when discussing the concerns, challenges and readiness of adopting new technologies.

Keeping abreast of these advancements in technology is a challenge for many firms, particularly smaller businesses, due to their resource-constrained environments. The rate at which technology is evolving is adding immense pressure on SMMEs to continuously innovate and adapt to the increasing challenges brought by technological advancements. A few respondents felt

overwhelmed by the latter as they had limited time to accustom themselves to new technologies in order to remain relevant.

> I would say getting used to whatever technology you adapting to. A lot of… especially in tourism, you don't have time, so having to first get used to something, can be frustrating. Because most of the tools we use online is a little bit - it's complicated. Its finance driven, it's...everything is T&Cs applied. I would say that's the biggest challenge, getting used to it.

The founder and CEO of a digital banking platform agrees with above respondent and further highlighted how the rate of technology can become overwhelming:

> My main concern is you go through burnout quite often, all the time without knowing it. So it is overwhelming. It's overwhelming between what the people are marketing to you like the research that finds you, it's overwhelming, the pace. I am a 35 [year] executive, born, live and eat technology, but even in my human mind, it's a very overwhelming task to be on top of it all the time. Yes, it's just the rate at which the speed…it's terrifying.

Owing to the rapid advancements and modernisation of technology, some respondents fear the risk of being left behind or becoming irrelevant if they fail to keep abreast of the current trends.

> Not being able to keep up I think will be the biggest one. I think also with the [Fourth] Industrial Revolution comes the modernisation of everything. So everything changes and if you don't keep up with the new trends - and everything is looking slimmer, thinner and everything just looks much cleaner and neater. If we don't keep up with that trend, we can fall behind as well. So we become outdated.

Irrespective of the above implications brought by the advancements of technology, the marketing manager of a sightseeing tour company notes that the anxieties of this digital revolution can be perceived as a catalyst for small businesses to relentlessly develop and innovate.

> Concerns are also good things and your concerns are that it's ever-changing. So once you get to the top of your game, the game changes. So it's an ever incurring cost and I think that's probably the scariest part of it all, is that you'll never get to the top. You're always going to be changing and improving and that's why I say it's also a good thing because you're always going to be changing and improving.

In the similar vein, as vast amounts of data are being generated and consumed across various digital platforms, SMMEs can benefit from up-to-date information in the form of automated personalised content that is relevant to the changes in their industry.

> There is an enormous amount of data being consumed through digital. So you have all these connected devices, all this intelligence, all these social networks, and all this content. The information kind of finds you. So like we discussed the last time, for me to stay ahead, obviously I need to imagine what the future is going to look like and shape my own hypothesis.

In the era of rapid technological advances, the survival of SMMEs will highly depend on their ability to respond strategically to the unanticipated changes in their environment. As emerging technologies continue to transform the way industries operate, the need to be adaptive and innovative is imperative in order to remain relevant and competitive. Failure to respond to these swift changes could possibly result in SMMEs losing their competitive advantage and thus becoming irrelevant. Considering the explosion of data through the increase of connected smart devices (Internet of Things) (Liu & Song, 2018:21) as one of the respondents pointed out, SMMEs will have to be nimbler in their response to emerging opportunities and threats.

4.3.5.4 Risk of disruption

A further challenge contributing to the immense pressure of adapting to rapid technological advancements is the number of new disruptive or digital entrants entering the market. Disruptive technologies have caused a paradigm shift in the way businesses operate and have contributed new competitive dynamics which have threatened profit margins of incumbents (Bughin & Van Zeebroeck, 2017:83). Historically, incumbent firms benefited from high barriers to entry through restricting the level of competition in their respective industries (D'Aveni, 1998: 184). However, within this new era of digitalisation, incumbents find themselves competing with non-traditional players equipped with new disruptive business models and value propositions (Moore & Seedat, 2020:7). One of the main driving forces behind the increased competition is the development of new and emerging technologies, which have the potential to lower barriers to entry of an industry and therefore trigger the blurring of boundaries between industries. As a result, these technologies provide the opportunity for agile and fast-paced firms to compete with traditional industry players (Padayachee, Matthee & van der Merwe, 2017:844).

The initial discussion regarding disruptive innovation highlighted the importance of SMMEs being cognisant of technological changes and trends transpiring in their sectors. It was crucial to assess

whether they were aware of such changes in their environment and agile in their approach to respond to technological disruption**.** While the pace of disruption is increasing and affecting all sectors to varying degrees (EY, 2017), little is known of how smaller firms within the selected sectors respond to these changes, which are primarily driven by emerging technologies. In addition to understanding the concept of disruptive innovation, the respondents were asked whether they foresaw the risk of being disrupted by companies that are currently not in their industry or sectors. The views expressed varied amongst the respondents, with the exception of those who operated within the tourism sector. The majority of the respondents in the tourism sector see the risk of being disrupted and have already been impacted by the existence of online reservation platforms, particularly the likes of Airbnb. Airbnb has significantly transformed the dynamic nature of both the travel and hospitality industries by creating economic opportunities for individuals who are not entirely established within the tourism space. A few key informants from the tourism sector reiterated the impact of online reservation platforms:

> So that changed the whole dynamic in the tourism industry. We've seen so many different booking platforms pop up. So Booking.com, TripAdvisor, GetYourGuide, Airbnb you name it. And they all now create their own experiences as well, so they are not reliant on an agent or someone like me. They can just do it themselves so that has taken a bit of a toll.

> With Airbnb, we see that people, who are not really into the tourism space, will use a room or two in their houses and put it on the market. They charge [less] and they don't have people that they employ.

Due to the tourism sector being completely disrupted by Airbnb, the assistant operations manager of a hostel recognised that anything which has the potential to improve the experiences of consumers and continually challenge the way existing regulated properties operate will inadvertently be disrupted.

> The hospitality sector and tourism has already been disrupted by Airbnb, thoroughly disrupted but, something new could be on the horizon. A new app that has maybe already been designed in a different country, which I haven't heard of yet. So anything that makes life easier for the consumer and makes life a little more challenging for regulated properties or licenced properties, like hotels and backpackers and stuff like that. Anything like that will inadvertently disrupt, there's no doubt about it. If something becomes popular, whatever it may be, it will disrupt and change how things are done in one way or another. There's no doubt about it. It's just basically the wait and see what it will be.

On the other hand, the perceptions of the respondents from the finance and retail sectors were manifold. This could be due to the diverse nature and broadness of the industries, particularly retail. For instance, an independent fuel retailer operating in a highly regulated industry perceives minimal technological disruption emanating from outside the industry. However, there is always a risk of increased rivalry within the same vicinity, which could have an impact on the existing service station.

> No, not really. There's always a risk of somebody building another service station not specifically here but in areas where somebody might see an opportunity of putting another service station and that can have a huge impact on the existing service station. But, that's not electronically.

In general, new and innovative technologies tend to displace low-skilled routine jobs of which Africa has an unevenly substantial amount of (Naudé, 2017:4). Thus, the owner of a service station and convenience store is of the opinion that the government is unlikely to support technologies that result in significant reduction in low-skilled jobs, as the fuel industry is already a large contributor to employment.

> The government won't let it happen because of employment. There is something like hundred thousand pump attendants in the country. So if you go self-service stations, we lose a lot of jobs. Every now and then the topic is raised by the public because obviously it happens overseas. And the people believe, and they're probably right when they say that price of fuel will come down because we don't have to pay wages. So but yes, it's always a no from the cabinet's side of things and it will become more so now with the unemployment rising as it is.

While the above industry may be exposed to minimal disruption, certain retail industries with less stringent compliances are threatened by new competitors emanating from other industries. These businesses also find themselves having to compete with their suppliers as consumers nowadays have instant access to information on the web. Therefore, consumers can easily switch from one competitor's product to another without bearing much cost.

> There is the threat of like, for example, you have builders who will take over plumbing. You have plumbers who are not plumbers taking over plumbing. We have a lot of people that will dip their toes where not necessarily they should be. And it's the same thing with other

suppliers, or competitors. They don't normally sell that product, but because they want to get our customer, they will sell that product and then they will still undercut our prices as well. So that was an issue that we also had and again, that's where technology comes in because our customers have access to our suppliers. Because everyone just goes on Google, to find whoever and then can go directly to our suppliers. That is very disruptive.

Within the finance sector, there was some degree of uncertainty related to the anticipated disruption. One of the respondents operating in a sub-sector of the finance sector had some doubts about the insurance industry being disrupted by non-traditional insurance firms. The CEO of an insurance firm conveyed that it is quite challenging to identify disruptive innovation in the insurance industry as all industries require some form of insurance. However, the respondent acknowledged that it might change the way insurer brokers perceive risk by being more innovative than their competitors.

I don't know whether we can still disrupt the industry. Because as I said to you, we do insurance and we just have to see how we can disrupt our competitors perhaps. Do things that they don't do, as I said earlier on, try and do it and be innovative and be the first in coming up with innovative ideas and things…it's difficult to tell you or to explain to you about a disruptive in the insurance industry. Remember each and every industry in the world needs insurance. That company might be innovative and disruptive, but it wouldn't affect the insurance side of things. It might change that the insurance company to look at the risk differently now…But that doesn't mean that the insurance company, as a broker we have to change. What we need to change is probably to understand how this thing work[s], and how best we would want to insure that robot. So it's going to have influence, but I don't know to what extent as an insurance broker.

While the challenges of disruption may be a threat to some businesses, it can be viewed as an opportunity by another (Sieber & Langlotz 2014:41). Despite the risk of being disrupted by innovative and dynamic firms emanating from other sectors, some respondents regard it as an opportunity to collaborate or create cross-sectoral partnerships or alliances with disruptive firms such as Uber. This gives SMMEs an advantage to expand their market visibility and redefine the way they do business.

Yes, we see a risk of being affected by that as well in terms of our delivery. So also these companies are expensive - the couriers are quite pricey. So that as well as looking into Uber. I think there's a combination between Uber and like now they're these things of Uber Eats.

So I'm wondering if Uber actually has introduced to deliver certain products that are not food for customers. So that is also another challenge. I think it might work in our favour as well if we get more committed in that aspect of the business. It means you might also find cheaper alternatives.

It depends on what lens you look through in my opinion. So when Uber launched, the typical South African would say it's a taxi that you order with an app. Simple. Through the lens of technology, I could see this being a global technology logistics infrastructure…So if Uber today starts offering the riders a bank account and start offering the driver a bank account, it makes complete sense. They have a loyal customer base right, they have already paid for the acquisition; the customer is at least spending R800 to R1000 a month on Uber. I mean that's my Uber bill. And you know R500 to R1000 in a digital banking account is good enough business, that's efficient. That is a good enough deposit to make your business model start working. So I do see that being as a threat. The way I would respond to that would be…you know I need to create a horizontal immediate service that could compliment as oppose to disrupt me. And that requires new thinking and new ideas that is practical, that you can execute, that is within reach, within budget, within industry and doesn't affect your own long term vision, because it is good to have competition. Competition drives consumers' choice.

The above views illustrated the extent to which disruptive innovation is transpiring in the tourism, finance and retail sectors. While the tourism sector has been largely disrupted by digital platforms such as Airbnb, there was no clear distinction as to how the finance and retail sectors were impacted by such changes. This could be attributed to the broadness and heterogeneity of both sectors as well as the rate of adopting new technologies. Disruption is inevitable and the vast majority of industries in South Africa are susceptible to future disruption (Moore & Seedat, 2020:3). The insurance industry and forecourt retailers (fuel retailers) are no exception (Nair, Law & Seedat, 2020:4). As mentioned in the preceding discussion, the survival of SMMEs will vastly depend on their ability to respond to technological disruption in their environment. When new and emerging technologies continue to challenge traditional business models, SMMEs will need to adopt innovative ways of doing business or risk becoming irrelevant (Khanagha, Zadeh, Mihalache & Volberda, 2018:1080)

SMMEs also need to be cognisant of the evolving changes in customer behaviour and preferences. As technology advancements accelerate, so does the pace at which customers demand change (Nair, Law & Seedat, 2020:5). Today's customers are more digitally-empowered through instant access to information and becoming the focal point of emerging industries (EY,

2017). For that reason, it is paramount to be agile and adaptive to the ever-changing digital landscape and responsive to customer demands given the larger impact of market changes on their ability to remain relevant (Chan et al., 2018:49). Failure to do so could find SMMEs going down a similar trajectory as Kodak and other industry leaders. Their inability to respond to such changes in a timely manner was their ultimate downfall. The Kodak anecdote reflects an increasingly common scenario in which the implementation of disruptive business model innovations leads to a rapidly evolving or hypercompetitive environment for incumbents (Dewald & Bowen, 2010:198). Furthermore, SMMEs can benefit from new forms of collaboration or cross-sectoral partnerships which can provide access to new technologies, capabilities, larger market share and specialized skills or talent. In this way, they can respond to disruption in innovative ways and at scale.

4.3.5.5 Research & development

The preceding discussion underscored the importance of monitoring the evolving changes in customer behaviours and preferences within an ever-changing environment. Increasing transparency, consumer interaction and new consumer behaviour trends are compelling companies to adapt the manner in which they design, market and deliver products and services. These major shifts in customer behaviour are redefining and disrupting traditional boundaries (Schwab, 2016:53). The upsurge of digital technologies has provided customers access to instant information, given them a more powerful voice, allowed informed decision-making and enabled greater choice of products and services. For that reason, today's digitally-enabled customers recognise their commercial value. Moreover, digital technologies are enabling businesses to keep ahead with customer demands and understanding customer behaviour through large amounts of data being generated across various digital platforms (EY, 2017). Leveraging these technologies along with gathering real-time data can help SMMEs gain critical insights regarding trends that may bring disruptive changes to their environment.

Disappointedly, the respondents lagged behind within this area of leveraging innovative technologies to improve customer experiences. Although there was a gradual shift towards providing a unified customer experience, there was a lack of adopting technologies pertinent to understanding consumer behaviour. Keeping track of consumer behaviour and preferences plays an important role for businesses to remain responsive and adaptable in an ever-changing environment. Consumer behaviour analytics such as data or web analytics is one such technology that helps understand customer behaviour and thus improves customer experience by offering personalised services or products. There were only a few respondents that actively engaged or adopted these tools. The branch manager of an online store utilised social media analytics to

gather and analyse data from adverts which provided actionable insights pertinent to prospective customers. In tandem with their market research, the company made use of customer feedback questionnaires on their website which revealed important insights on how customers experience their products. In that way, they were able to customise their offerings for their customers.

> So in terms of research, what we do is we actually gather data from Facebook adverts and it tells us how many people we have reached and how many people we are likely to reach with our network, because also the likes on Facebook determine the audience we're going to reach and what impact – so sometimes we get those clickbaits where people just click but they don't actually interact with or look at our products. So that's the research part of it. We do some questionnaires on our websites, that's how we get data from people. And just try to get also feedback of what people think of the product. So that just helps us to know whether our product is good enough and to find ways to actually better it.

Likewise, the informant from a fintech and community development organisation utilised web analytics such as Google Analytics which tracks and monitors website activity such as page per session and the bounce rate of individuals visiting the website. It is considered a valuable tool as it shows crucial and real-time metrics that one would not otherwise be able to identify so easily. The framework of information collected can help improve the company's marketing efforts.

> Technologies such as Google Analytics are helpful especially when you have a website or anything that is done like via the Internet. It's quite helpful because mainly it shows you so many crucial things that you won't be able to pick up on your own. So I think like, because that again leads to the whole theme of what's the bounce rate of the platform like, which page are clicked on most frequently, which page is not just clicked on at all. So like now you have a framework of information that you can at least sit down and say, okay, this is not working so how do we improve this.

The founder and CEO of a finance firm pointed out how technology-driven firms are leveraging data to predict customer trends and thus be at the forefront of innovation. For that reason, businesses can benefit from personalised information.

> That's the fun thing about tech, it finds you. People who are building the latest technology have already foreseen your next need because of data. Data quantifies, produces analytics that can then be used in foresight predictions and so forth. The people like Amazon, Intercom and all these technological providers, they can already see the rate at which innovation is moving. And for that matter they find you before you need to find them.

With the emergence of disruptive technologies such as AI, big data, IoT and cloud computing, together with enormous amounts of data generated across various digital platforms, it will become indispensable for SMMEs to adopt analytical tools and other digital marketing tools to better understand consumer behaviour trends. Data has become a valuable asset and large technological companies have adopted big data analytics to gain insights for enhanced and informed decision-making, thereby creating compelling value propositions (Potter, 2015:2; Sivarajah, Kamal, Irani & Weerakkody, 2017:264). Although the respondents are lagging behind within this area, it has been argued that SMMEs are better suited to leverage the opportunities of big data analytics as they are generally more agile and nimble in their response on data-driven insights. Thus big data analytics enables SMMEs to enhance their decision-making regarding marketing and customer needs (Potter, 2015:2; Sen et al., 2016).

4.3.5.6 Future workforce

The adoption of 4IR technologies requires a workforce that is adequately skilled for the imminent disruption of the employment landscape. The recent wave of technological revolution is likely to bring disruptive changes to the labour market with an increased demand for highly specialised and skilled individuals (Manda & Backhouse, 2017:2). These changes will have a major impact on the workforce, ranging from significant job creation to job displacement as well as increased labour productivity to widening gaps in skills (WEF, 2016). Developing countries in Africa are likely to be faced with several challenges that may hinder the workforce for the upcoming disruptions, considering the lack of skill sets required to meet the demands of a digitally-driven ecosystem (Ayentimi & Burgess, 2018:7). Several researchers have raised concerns about the potential impact of the 4IR on jobs particularly in emerging economies. According to a study conducted by Accenture (2018), more than a third of blue and white-collar jobs in South Africa are susceptible to automation. With the workforce becoming more skills-intensive, this could further aggravate the high unemployment rate given the abundant skill shortages. Similar concerns were echoed by the respondents as they feared that some positions in their sectors will be threatened by redundancies. For instance, some administrative positions within the hospitality industry may be more at risk of job redundancy due to the increased adoption of digitally-driven tools.

> Basically, the only concern is… I don't want to sound like an old person or anything like that, but, technology is going to make more and more people redundant. Or not to say people will be redundant but some positions in the sector might become redundant. Let's say for example, if everyone is using this online checking thing and everything is done online and all of that, there wouldn't be more or a need for a dedicated reservationist or dedicated

receptionist anymore. However, by doing that, you are also alienating a lot of customers, because not everyone has access to that app, not everyone has a smartphone.

Job redundancies or displacement of jobs is not a new phenomenon, as technology has been redefining the workforce since the first industrial revolution (EY, 2017). While automation technologies will continually diminish the need for mundane, repetitive routine roles, they will also potentially lead to the creation of new types of positions (WEF, 2018b). This statement is in accordance with the notion held by the assistant operation manager of hostel accommodation on how job redundancies through technology will enhance the workforce by creating new positions.

> However, moving everything online might create new positions, it might create new job opportunities, where instead of a reservationist, now you might be working full time on an app, communicating with guests, maybe because of everything being online, as mentioned, you might need a full time IT person on properties. So that's also a new opportunity. So everything changes, nothing ever stays the same. Everything will come with its own challenges. It's difficult to make any predictions, especially with this new pandemic that we are busy going through, nothing will most likely be the same. So whatever is going to happen is going to be interesting.

The shortage of skills and competencies required to adapt to the new world of work is largely due to the education system. A few respondents have recognised that the education system is not in sync with the evolving and dynamic pace of the business environment. This is in line with a study by McKinsey (2017) which states that the education systems have not kept pace with the changing nature of the workforce. For that reason, giant technology companies such as Google and Facebook amongst others have their own training centres that continuously focus on upskilling their workforce.

> The skills required to build this kind of technology is extremely scarce in South Africa. And I am not just talking about… well that's why the companies themselves like RE apps, Facebook, GraphQL, Amazon, Google, they have their own training centres to upskill engineers, because tertiary institutions cannot incorporate or even try to create educational curriculum material. They can only teach foundational and constructs, but they can't be in sync, on par all the time because the world moves so fast.

On the other hand, upskilling and training the workforce is also a challenge for SMMEs as the employees are at various levels when it comes learning and adapting to new technologies.

> Let's say training, training issue is – not everybody catches on quickly. And technology, it's there to help you but if you don't know how it works, you could terrify people but I think training is the major issue to getting everything up and running.

> And also, not everybody is the same, so we might have to train someone and they are not as fast to learn.

Most importantly, changes in demographic and socio-economic drivers will fundamentally reshape the workforce as more individuals particularly millennials and Generation Z (GenZ) are gravitating towards working environments that are convenient and flexible.

> And then we have the, 'ama2000s' (GenZ), those people that are going to be moving from one job to the other in a short space of time. And as long as they don't see value in whatever place they are, they're just going to move.

With such a rapidly evolving employment landscape, it will become an ever-increasing need for SMMEs to anticipate and proactively prepare for the required future skills. Technological advancements have been transforming the employment landscape since the first industrial revolution, yet the pace at which emerging technologies are developing and the degree to which they disrupting industries are largely unprecedented (McKinsey, 2017), particularly with the impact of the COVID-19 pandemic which is expected to transform or compel the way businesses operate going forward. Although emerging technologies may threaten low to middle-skilled jobs, they can lead to the creation of new types of positions. Taking this into account, SMMEs play a pivotal role towards economic development and job creation therefore SMMEs will need to be adequately prepared for the disruptions of future skills.

4.3.5.7 Role of government

The majority of SMMEs interviewed are discouraged by the lack of government support. Most of the participants specified that the government has played little to no role in the development and growth of their ventures. This is quite a concern as the government has a responsibility to create an enabling business environment that is conducive to promoting entrepreneurship activities (Herrington, Kew & Mwanga, 2017:69). Moreover, the imposed regulatory compliance costs and ongoing power shortages have become a hindrance to small business development. A key informant from the retail sector expressed the negative impact of Value-Added Tax (VAT) and load-shedding on their business.

They have stunted the growth of this business with VAT and with load-shedding is a perfect example.

Despite the minimal effort from the government, a few respondents have acknowledged the active role government plays in terms of educating and training their workforce:

There's no real support from the government except through the SETA which I find it very frustrating. Usually admin and most of the time I don't understand what's going on.

I would say the education, that is one field where they have assisted because we do courses so in that aspect, they assist us with educating our staff.

In relation to the initial views on government support, a few of the respondents expressed their discontent with regards to seeking assistance from the government. One of the respondents had an appalling experience concerning the DTi funding grant. The chairman and CEO strongly felt that the government does not sufficiently support SMMEs even though they are significant contributors to job creation:

We have applied twice for DTi grant. The first guy ran away with our money. Well he is a facilitator for DTi, he ran away with our money. We paid him and he ran away. Nothing happened. Second guy we paid him as well and he only went to a certain point and no further. We supplied all the documentations, there was nothing. The government is doing absolutely nothing for small…The small businesses are the biggest generator of employment but yet we don't get support from the government. If you not in with the government, you get actually nothing.

Another respondent felt that government facilitators are not entirely helpful when disseminating the necessary information pertaining to funding irrespective of meeting the requirements and being one hundred per cent BEE compliant.

I heard on CCFM news or something that there's money in the clothing sector, because they want to promote that. But at this particular Expo, that they have at the centre…so there was a stand that the government had where you could go for information on how to get funding. And number one, they were totally unhelpful, I won't say useless, I would just say they were unhelpful and the fact that I do meet all the requirements, I am 100% BEE compliant and I

even got my certificate.

Regardless of the lack of government support, most SMMEs are self-funded and rely on IT specialists or their own personal experience and expertise to access the appropriate technology for their businesses. Some respondents receive partial funding from angel investors as they have a better understanding of the landscape under-resourced companies operate in. In addition, cloud service companies such Amazon cloud services have been beneficial in terms of implementing the necessary IT infrastructure for small firms.

> No accelerator, no government funding. It's our own money. It is a few angel investors' money and the support we got was really from the vendors themselves because they understand our landscape. They understand how under-resourced a start-up company is and for that they provide their own training and they've got a team of people that accelerates their own product within your business. So let's say Amazon has been extremely helpful, AWS - Amazon's cloud services. They have openly invited us to numerous events, they have hosted meetups, and they have sent people over to our offices to evaluate if our implementation is correct at no charge.

On the basis of the above views, it is evident that the government's commitment to SMME development requires more intervention, particularly in enabling a business environment that is conducive for entrepreneurship activities. In order to leverage the opportunities of the 4IR, the development of a robust SMME sector is critical to pioneering the 4IR. The Presidential Commission of the 4IR (PC4IR) is well aware of the importance of prioritising SMMEs to take advantage of the 4IR and are aware that SMMEs can lead the digital transformation efforts and innovation. Thus it will be more likely for the government to play an active role in the promotion and support of SMMEs adopting 4IR technologies (South Africa, 2018).

4.3.6 Skills development and training

The final section focuses on the required skills that could assist SMMEs to thrive and compete in the 4IR as well as embracing future technological disruptions. According to Mabotja (2018:23), keeping abreast with 4IR necessitates ongoing training and upskilling of the workforce on emerging technologies. Global industries are undergoing a significant transformation as a result of key demographic and socio-economic drivers which pose significant challenges to the workplace. These changes brought about by the 4IR are demanding a new breed of worker who is highly 'skilled, innovative and technological savvy' (Manda & Backhouse, 2017:3). Thus it will become critically imperative for SMMEs to anticipate and proactively prepare for future skills in

order to fully leverage the opportunities of the 4IR (WEF, 2016:3).

Based on the urgency to prepare for the imminent disruptions to skills, it was important to assess whether SMMEs are proactively upskilling and training their workforce. The respondents were asked whether their workforce possessed the skills to implement new technologies as well as if they had a skills development programme centred on the utilisation of new technologies. Most of the SMMEs has some sort of training programme; however, the training was more related to the job such as quality and safety training as opposed to digital or IT skills training.

> Skills development is important. We do belong to the SETA and they do offer courses. Ours is more job-related training which is related to procedures, fire safety, firefighting, fire marshalling. If there's a petrol spills course management, how to contain it, what to do. Most of it is related to our jobs as opposed to sending them on a computer course. It's more focused on them being prepared to do the job like First Aid training in case something happens.

Similarly, other businesses are subjected to continuous professional development (CPD) training which is more related to the products and services that the business offers. The CEO of an insurance firm is obliged to continuously update employees' knowledge on the products that they offer due to the requirements of the law.

> If there is any training that is provided by INSETA, we will partake in that. We will send our staff on training, product training. Where an insurance company offer product training for free, we will send our staff there. We have to do that because in our industry, it's called continuous professional development (CPD). As for me, I have to have certain hours per year, because it is regulated and it is the law. I have to do it. Each and every person in this company must have CPD points because the FSCA can come in at any time and ask what is happening. So we have to be abreast of things. So it is your continuous professional development, continuous because that is the only way that you can understand and do things better and compete with other people. So it has to happen. If we don't do it the FSCA can fine us.

Nonetheless, some of the respondents recognised the importance to equip the workforce with the necessary skills to utilise new technologies. For instance, the informant from a fintech and community development organisation was conscious of the skills mismatch which mostly existed amongst the youth, and so partnered with various organisations to help bridge the skills gap in the

workforce.

> And then we understand, obviously, because we're working with young people, not all of them have those skills. So that's why we then work with different programmes like, we have like RLabs and Naspers labs. So we have like partnership with them and then [the] YES programme, so there's so many cool spaces that are training young people and equipping them with the necessary skills to function and operate. So that's where we get some of our staff in terms of like recruiting.

Regardless of a lack of internal training centred on the utilisation of new technologies, the SMMEs are convinced that they have the requisite skills that will enable them to effectively adopt new technologies and operate within the 4IR. The informants from the retail and finance sector equally believe that they are equipped the necessary skills.

> I think we are equipped. We weren't, like I said until we moved into the shop. When we moved into the shop, we moved onto the new systems. We were very outdated before that, but now slowly but surely we are getting there. We're catching up.

> I believe that we do have the skill set that is needed to really operate on the Fourth Industrial Revolution. And I think, for us that's a non-negotiable….

Although the branch manager of an online retail store does not have a specific training programme that is assigned to the utilisation of new technologies, the company benefits from a highly skilled workforce that has diverse experiences in industries ranging from finance, insurance to data analysis and graphic designing. This recapitulates the importance of collaboration.

> So we also have people that are in finance, people that are in insurance and myself, I am partially a data analyst. So that works in our favour and I can also do development. We actually have people that are running our online business ourselves and we have graphic designers that are partners. So we have enough skills, that's why it's been also quite easy for us to penetrate the industry and running our online store.

Going forward, it is essential that SMMEs are actively involved in supporting their existing workforce by reskilling and upskilling on the adoption of new and emerging technologies. There is also an extensive need to incorporate a culture of lifelong learning and the necessary resources to help make such continuous learning and training possible. This is particularly indispensable due

to the rapid technological advancements transpiring in the global labour market. Furthermore, SMMEs need to ensure that the technology augments and complements existing jobs instead of displacing human labour (WEF, 2018b).

4.3.6.1 Required skills for the 4IR

To be able to compete and thrive in an ever-changing environment, SMMEs need to be adequately skilled and prepared for the imminent technological disruptions. The following table displays the soft and technical skills considered necessary to thrive in the 4IR from the perspectives of the SMMEs.

Table 4.4: Skills required to thrive in the 4IR

Soft skills	Technical skills
Critical thinking Analytical thinking Problem-solving Emotional Intelligence (EQ) Communication Social skills Interpersonal skills Creativity Agility and adaptability	Computing skills IT skills Digital skills Coding Machine learning

In addition to some of the soft skills displayed in the above table, certain entrepreneurship skills were also deemed essential to compete and thrive in the 4IR. These skills encompassed leadership, teamwork, marketing, sales, business models, design thinking, intuition, and initiative. The increasing demand for soft skills combined with cognitive skills confirms that the advancement of technologies cannot completely automate or substitute for the human factor. Equally so, entrepreneurship skills will be indispensable for SMMEs to leverage the opportunities brought by the 4IR.

4.4 Chapter Summary

The findings obtained from the semi-structured interviews were interpreted and discussed with reference to the objectives of the study, the conceptual constructs provided as well as the relevant literature. The themes that emerged from the data provided insights related to the understanding of the 4IR concept, disruptive innovation, embracing disruptive technologies, ICT infrastructure, as well as the factors that hinder SMMEs from adopting a technology-driven business model. Furthermore, the chapter briefly touched on the importance of SMMEs reskilling and retraining in order to prepare for the impending disruption to the workforce. The final section also looked into the skills that were considered by the research participants as a requisite to thrive and compete

in the era of the 4IR.

Based on the above analysis and interpretation of the results, the overall knowledge of the 4IR and related concepts are at a nascent stage, requiring further clarification to ensure the successful transition into the 4IR. Nonetheless, the majority of the research participants are cognisant of some of the key disruptive technologies driven by the 4IR and pointed out the relevance of these technologies to their respective sectors and businesses. The relevance of adopting disruptive technologies was supported by some of the drivers and benefits provided by the participants. Regardless of the abovementioned benefits of implementing disruptive technologies as well as having access to reliable ICT infrastructure, the findings showed that the participants faced certain challenges which might potentially impede their ability to fully harness the opportunities of the 4IR. Access to the appropriate financial resources has emerged as the biggest constraint for the participants to adopting a technology-driven business model. Although the South African government has implemented various strategies to promote SMME development, the participants strongly expressed the lack of support mechanisms from government.

Going forward, it will be paramount for SMMEs to proactively prepare for the required future skills through upskilling and retraining of the workforce. While technical and STEM-related skills are crucial for the 4IR, the higher demand for soft skills from the perspectives of the participants indicated that certain human traits cannot be entirely automated. It also highlights that the implementation of new and emerging technologies should augment and complement rather than displace human labour.

The subsequent chapter will provide conclusions based on the objectives of the study, and make recommendations which could be useful to policymakers based on the key insights of the study that could be implemented in order to enhance small business participation in a digital-driven economy.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Globally, industries are presently on the cusp of a new technological era characterised by unprecedented growth and exponential innovation. As previously noted, a range of new and emerging technologies, collectively termed as the Fourth Industrial Revolution (4IR), is blurring the boundaries between the digital, physical and biological worlds and consequently transforming the way individuals work, live and interact with one another. While the advancements brought by the 4IR hold great potential for developing countries such as South Africa to leapfrog developed markets and possibly fast-track previous industrial revolutions, these technologies also pose social and economic challenges that may hinder South Africa from fully participating in the 4IR. Thus, the current research emphatically asserts that the successful adoption of the 4IR will strongly depend on the ability and collective effort of businesses and government to prepare proactively for the imminent disruptions or face the risk of being left behind.

In light of the above, the study intended to provide a fresh local and multi-sectoral perspective pertaining to the impact of disruptive technologies on SMME development. Although the discourse on the 4IR phenomenon has been widely discussed amongst scholars, academia and industry experts, limited empirical research had previously focused on the phenomenon under inquiry particularly within a South African context. Such a nascent research domain required the researcher to delve further and establish the extent to which the underpinning technologies of the 4IR could accelerate small business participation. SMMEs are considered the backbone of most developed and developing economies due to their significant contribution to job creation and economic growth. The SMME sector is responsible for 52-57% of South Africa's GDP and employ approximately 60% of the country's workforce. The National Development Plan (NDP, 2012) has identified SMMEs as the primary job creator to attain 90% of the projected 11 million jobs by 2030. For that reason, their importance and contribution cannot be overlooked within the advent of a new technological revolution as the SMME sector has the potential to propel South Africa into a new era of unprecedented economic prosperity. Owing to the high unemployment rate and stagnant economic growth, the 4IR presents an ever-present need for SMMEs to adopt emerging technologies in order to remain relevant in a highly competitive and ever-changing digital landscape.

This final chapter encapsulates the conclusions that were reached in the previous chapters. The

key findings of the study are presented in line with the research questions, and the chapter evaluates whether the research endeavours have been attained. Furthermore, a set of guidelines that can be used as an impetus to propel the implementation of 4IR technologies within SMMEs is provided. The research limitations encountered in the study are highlighted, while implementable recommendations and suggestions for areas that could constitute further empirical enquiry are proposed in this chapter.

5.2 Summary of key findings

The overarching objective of the study was to assess the impact of disruptive technologies on the growth and development of SMMEs to identify the required skills which could assist the SMME sector to thrive and compete in a technology-driven ecosystem. The study adopted an interpretivist epistemology to obtain multiple perspectives and gain a deeper understanding pertinent to the research topic. A qualitative exploratory approach was incorporated as it was best suited to achieve the research endeavours of the study. This current section provides a summary of the results of the study in relation to the research objectives, focusing on the key factors that encourage or inhibit SMMEs to adopt a technology-driven business model. The respondents were selected from the financial, retail, and tourism sectors. The adoption of disruptive technologies by SMMEs is multi-faceted and sector or industry-specific, therefore obtaining an in-depth understanding of the experiences and challenges could further advance small business participation within an ever-changing technology-driven environment.

5.2.1 Objective One: The impact of new disruptive technologies on the transformation of South Africa's small business sector

Analysis of the semi-structured interviews revealed that some of the technologies underpinning the 4IR are gradually redefining the way SMMEs operate, compete and interact with their consumers. More than half of the SMMEs interviewed had already begun exploring and implementing emerging technologies to further streamline and optimise their business operations. The respondents that made use of these technologies cited operational and performance benefits which included increased efficiency, scalability, data security and convenience amongst others. One particular disruptive technology that frequently emerged from the results was cloud computing. Cloud computing offers a cheaper alternative to the traditional ICT infrastructure and helps small businesses scale at a faster pace. It is anticipated that this new development era will provide opportunities for small businesses to become early adopters of 4IR technologies, thus increasing their innovative capabilities to respond swiftly to emerging opportunities and challenges within their environment. Based on the responses in this regard, some of the SMMEs are of the opinion that the advancements of the 4IR are among the reasons that afford them the opportunity

to build exponential and sustainable business models that are customer-centric and that can capture new market share transcending geographical boundaries. Several studies have argued that SMMEs are generally better positioned to leverage these advancements compared to their larger counterparts, given their ability to innovate as they are not weighed down by legacy infrastructure and have a reputation for being agile and adaptive to the changes in their environment (Matt & Rauch, 2020:5).

While the abovementioned serves as a catalyst for SMMEs to adopt 4IR technologies in order to remain relevant and competitive, there were a few SMMEs across the chosen sectors that expressed a certain degree of scepticism in terms of this new development era. Their viewpoints were based on two factors; from an operational perspective, the impact of the 4IR is perceived to have a minimal impact on the development and growth of their businesses as the services offered are considered simple and non-technical. Moreover, some believed that the advancements of the 4IR may take a while before it becomes mainstream in South Africa as the broader populace have limited access to Internet connectivity and also have limited knowledge regarding the underpinning technologies of the 4IR.

On the other hand, new advancements in technologies and innovative business models will increasingly challenge the dynamic nature of competition across all sectors. These technologies allow new entrants to disrupt traditional markets and consequently lower entry barriers. In the past, industry incumbents profited from high barriers to entry by limiting the level of competition in their respective industries. However, the increasing advancement of technology has allowed smaller and unconventional competitors equipped with disruptive business models and value propositions to compete with traditional incumbents or larger firms. For instance, one of the key trends that have emerged from the 4IR is the development of technology-enabled platforms which amalgamate demand and supply to create new ways of consuming goods and services. This has brought forth the 'sharing' or 'on demand' economy such as Uber and Airbnb through the deployment of people, assets and data relying on mobile technology (Klaus, 2016:3). These advancements will also pose several challenges for industry regulators and policy-makers to level the playing field and better comprehend the implications of disruptive technologies related to competition. As a result of these changes, some of the respondents have acknowledged the immense pressure that they are faced with in terms of re-examining the manner in which they operate and respond to customer demands. The survival of SMMEs will therefore vastly depend on their ability to respond strategically to the unanticipated changes in their environment. The need to be adaptive and innovative will become imperative in order to remain relevant and competitive. Failure to do so could possibly result in SMMEs losing their competitive advantage

and subsequently becoming irrelevant.

Rapid advancements in technology, as well as innovative business models, could also have a significant impact on the way SMMEs interact and respond to customer demands. From a demand perspective, those presently benefiting from the technological advancements of the 4IR are mainly consumers who have the means of access to affordable services. Growing transparency, consumer interaction and new consumer behaviour trends are compelling companies to adapt the manner in which they design, market and deliver products and services. These major shifts in customer behaviour continue redefining and disrupting traditional boundaries. Today's customers are digitally-empowered and progressively becoming the epicentre of the digital economy (Klaus, 2016:54). Customer expectations are therefore likely to continually shift towards improving how they are served. Equally, the adoption of innovative technologies such as AI and big data analytics should enhance the way businesses utilise data to monitor and understand consumer behavioural patterns and preferences.

This study found that the research participants lagged in the area of exploiting innovative technologies to improve customer experiences. There was only a small number of participants who actively utilised analytical tools to gather and analyse real-time consumer data. This indicates low levels of research and development activities or a lack of knowledge of analytical tools. According to the participants, the use of analytical tools helps provide valuable insights pertinent to prospective customers which can be utilised as a more detailed segmentation. It also offers crucial and real-time metrics about customers which were not previously accessible or could not be easily depicted. In this way, it enables the participants to personalise their marketing efforts thus providing customised products or services for their customers. With the emergence of disruptive technologies such as AI, big data, IoT cloud computing and the proliferation of data generated and shared across various digital platforms, it will become indispensable for SMMEs to adopt analytical and other digital marketing tools to better understand consumer behavioural trends. Data has become a valuable asset and adopting big data analytics to gain valuable insights for enhanced and informed decision-making will be a key competitive advantage within the current digital landscape.

Moreover, access to affordable and reliable ICT infrastructure as well as sustainable electricity is a prerequisite for SMMEs to participate within a technology-driven ecosystem. Adopting 4IR technologies, as highlighted by several authors in the literature review, requires a reliable and comprehensive broadband infrastructure. Poor Internet connectivity infrastructure and limited access to electricity has been identified as one of the barriers that impede developing countries

from adopting 4IR technologies. However, the results revealed that most participants have access to a steady and reliable Internet infrastructure in which the majority have fibre-optic Internet connection or intend to install it in the near future. The participants also have adequate access to the appropriate hardware and software facilities required to function and operate efficiently. While there is much uncertainty surrounding the electricity crisis, the participants are advised to invest in alternative and affordable sources of energy such as uninterruptible power supply (UPS) devices to help mitigate the risk of losing revenue.

Adopting a technology-driven business model comes with certain difficulties and challenges for SMMEs. The participants expressed various factors that impede the implementation of emerging technologies of which may further impact their ability to fully participate within the 4IR. The factors encompassed lack of financial resources, the digital divide, fast-paced technological changes, automation of jobs, shortage of relevant talent and regulatory compliances. Based on the findings, access to the appropriate financial resources emerged as one of the main barriers that hindered the ability of several participants to adopt a technology-driven model. Acquiring the necessary finances (cash flow and capital) was considered a key constraint to adapting to the rapid advancements of technology. In addition, competing with firms that have access to the latest technologies was deemed challenging for some of the participants to remain abreast with current and future technology.

Another noteworthy issue concerning the adoption of a technology-driven business model by SMMEs is the current digital divide. Internet connectivity and accessibility is the biggest contributing factor to the digital divide which may potentially limit the adoption of 4IR technologies and thus exacerbate the gap further. The participants perceive the digital divide as an obstacle due to the broader populace not having the means to access digitally-driven services or possessing the knowledge to utilise these services. As a result, the implications of embracing 4IR technologies or being digitally-driven could potentially eliminate many customers.

The participants also considered the fast-paced technological developments as a concern of the new digital revolution. The accelerating pace of technological advancements is applying immense pressure on SMMEs to continuously innovate and adapt to the increasing disruptive changes in order to remain relevant. A few respondents strongly felt overwhelmed by these technological changes due to the time required to accustom themselves to new technologies. Owing to the rapid advancements and modernisation of technology, some participants feared the risk of being left behind or becoming obsolete if they failed to keep ahead of current trends. On the other hand, the aforementioned trepidations and concerns were seen by some participants as catalysts for

SMMEs to innovate relentlessly in an ever-changing environment.

Lastly, the adoption of 4IR technologies will require a workforce that is adequately skilled for the imminent disruptions to the employment landscape. The new wave of technological revolution is expected to bring disruptive changes to the labour market with an increased demand for highly specialised and multi-skilled individuals (Manda & Backhouse, 2017:2). Thus, there is bound to be a salient change within the workforce ranging from significant job creation to job displacement as well as increased labour productivity to the widening gap in skills (WEF, 2016). Concerns have been raised in relation to the implications of the 4IR on the workforce, particularly within developing countries rife with high unemployment and poverty. The participants feared that some semi-skilled positions were at risk of job redundancy as a result of the increasing digitally-driven platforms. They also foresaw challenges regarding upskilling and training the workforce as the employees were not as agile in terms of learning and adapting to new technologies.

The advancements of the 4IR will also require an adjustment and restructuring of the current education system to meet the skills demand of the future. The participants are of the opinion that the current education system is not synchronised with the evolving and dynamic pace of the current technological trends. This view substantiates the view of WEF (2016:20) that based on the unprecedented rate of change brought by the current technological trends, approximately half of the subject knowledge obtained throughout the first year of a four-year degree becomes outdated by the time students graduate**.**

Furthermore, demographic and socio-economic changes are likely to have just as strong impact on business models and work structures as the expected technological changes. New developments in technology provide opportunities for workplaces to deploy flexible working structures or arrangements such as freelancing and remote and on-demand work. Therefore, as mentioned by one of the participants, employees, particularly millennials and GenZs, will possibly demand more flexible working arrangements.

As the nature of the labour force evolves, it will become an ever-increasing need for SMMEs to anticipate and proactively prepare for the required future skills. Even though the rise in automation may threaten low to middle-skilled jobs, it can also lead to the creation of new types of work opportunities. For instance, the advancements in technology over the years have led to the emergence of new job positions such as data analysts and scientists, app developers, social media marketers to name a few. Considering the pivotal role of SMMEs in economic development and job creation, SMMEs will need to be adequately prepared for the disruptions of future skills

requirements.

5.2.2 Objective Two: The required skills for SMMEs to thrive in the 4IR

Keeping abreast with the advancements of the 4IR necessitates ongoing training and upskilling of the workforce on new technologies (Mabotja, 2018:23). Taking into consideration the urgency to prepare for the imminent disruptions to the workforce due to a shortage of relevant skills, the study aimed to assess whether the research participants were proactively upskilling and training their workforce. The findings showed that most of the SMMEs had some sort of training programme; however they were mostly related to on-the-job training as opposed to utilisation of new technologies. Some of these training programmes were either provided by the government (SETA) or the employers provided in-house training. Other participants recognised the importance of equipping the workforce with the necessary skills to utilise new technologies, particularly amongst the youth. Regardless of a lack of internal or external training centred on the utilisation of new technologies, some SMMEs were convinced that they had the requisite skill set to enable them to effectively adopt new technologies and operate within the 4IR.

Furthermore, the impending technological disruptions to business models are influencing the demand for both technical and non-technical skills in many occupations. The WEF (2016) have anticipated that a wide variety of occupations will require a higher degree of cognitive abilities, social and specific technical skills in order to be successful in the 4IR. There were various skills, mostly cognitive and social skills that were deemed by the participants as requisites to thrive in the 4IR. These skills encompassed creativity, logical reasoning, problem-solving, emotional intelligence, communication, adaptability, and interpersonal skills amongst others. Conversely, most participants foresaw a shortage of digital and ICT-related skills in their workforce within the next two to five years. There were also certain entrepreneurial skills considered essential for the 4IR such as leadership, teamwork, marketing, sales, business models, design thinking, intuition, and initiative. The higher demand for social skills highlights the fact that the upsurge in automation and AI technologies cannot fully replace the human factor. Possessing the necessary entrepreneurial skills will also be key to remaining relevant and competitive in the 4IR.

Going forward, it will be essential for SMMEs to be actively involved in supporting their existing workforce by reskilling and upskilling in the adoption of new and emerging technologies. There is also an extensive need to incorporate a culture of lifelong learning and the necessary resources to help make such continuous learning and training possible. This is particularly indispensable due to the rapid technological advancements transpiring in the global labour market. Most importantly, SMMEs need to ensure that the implementation of technology augments and complements

existing jobs instead of displacing human labour (WEF, 2018b). This will allow employees to relocate or focus on the tasks that require more cognitive and social skills.

5.2.3 Objective Three: Perceptions of small businesses on embracing the 4IR

The research study sought to gain an understanding of the 4IR and related concepts from the perspective of the SMMEs. Attaining knowledge of the 4IR is equally crucial and relevant as it is anticipated to have transformative effects on all facets of society. Therefore, increasing knowledge and awareness of the 4IR could be an impetus and motivator for small businesses to embrace and harness the opportunities of the 4IR (Kagiso Trust, 2018). This study found that the participants demonstrated a basic understanding of the 4IR phenomenon, which underlines certain factors pertinent to extant literature on the 4IR. These factors encompassed the four phases of industrialisation, advancement of technology, displacement of jobs, increased efficiency and the convergence of physical and virtual boundaries. The few that had limited knowledge of the concept made an attempt to shed some light on their perceptions of the 4IR. The overall knowledge and awareness of the 4IR phenomenon from the perspectives of the SMMEs indicate that the concept requires further clarification and demystification to ensure the successful transition into the 4IR.

Central to the discourse on the 4IR is the novelty of disruptive technologies underpinning the current revolution. It was crucial to assess whether the SMMEs were aware of the fast-paced technological changes as well as the current market trends transpiring in their sectors. In contrast to the abovementioned, the participants seemed to have a greater level of understanding regarding the concept of disruptive innovation. Their understanding unveiled certain intricacies associated with the concept of disruptive innovation such as significantly transforming and creating entirely new markets, offering simple and inexpensive solutions, and challenging conventional and traditional norms. In the era of rapid technological advances, it will become imperative for the SMME sector to be cognisant of the current technological trends transpiring in their sector and thus respond accordingly. Failure to react in a timely manner could potentially lead to forfeiting market opportunities and becoming irrelevant.

Furthermore, most of the participants were aware of some of the important disruptive technologies driven by the 4IR and had already begun embracing these technologies in their business operations. The technologies that the participants considered to be associated with the 4IR were artificial intelligence (AI), machine learning, cloud computing, blockchain, robotics, virtual reality and social media. There were also other technologies that the SMMEs deemed disruptive which are not entirely cited in 4IR literature. These technologies include online booking apps or systems,

OCR technology, e-commerce websites, and marketplace platforms amongst others. Interestingly, there was no mention of IoT and/or mobile internet, considering the number of smart devices or objects connected to the Internet. This could be due to a lack of awareness or unfamiliarity pertaining to the IoT concept.

In the similar vein, the participants who had already implemented some of the above disruptive technologies listed a few operational advantages. There was agreement amongst the participants from all three sectors that the relevance of these technologies was to simplify tasks, and enhance business productivity, efficiency and scalability. In addition to the operational advantages, a few participants indicated that these technologies allowed them to be more customer-centric, which has provided a competitive edge. Those who were unaware of the technologies driven by the 4IR recognised the importance of technology for the functioning and operation of their businesses.

In addition to obtaining an understanding of the disruptive innovation concept, the findings revealed the extent to which disruptive innovation was transpiring in the tourism and finance and retail sectors. The majority of the participants operating in the tourism sector foresaw the risk of being disrupted by firms emanating from other sectors and had already been impacted by the existence of digital platforms such as Airbnb. There was no clear view as to how the remaining sectors had been impacted by such disruptive changes. This could be attributed to the broadness and heterogeneity of both sectors (finance and retail) particularly the retail sector as well as the rate of adopting new technologies. Despite their varying views, Moore and Seedat (2020:3) accentuate that disruption is unavoidable and the vast majority of industries in South Africa are susceptible to imminent disruption. Thus, as previously iterated, the survival of the SMMES will vastly depend on their ability to respond to technological disruption in their environment. While the challenges of disruption may be a threat to some businesses, it can be viewed as an opportunity to continuously innovate and seek new forms of collaboration or cross-sectoral partnerships.

Overall, the above perceptions and awareness surrounding the 4IR are at a nascent stage which requires ongoing research and clarification on the 4IR and related concepts. The 4IR concept should also be further contextualised to sector or industry-specific challenges and requirements (Gumbi & Twinomurinzi, 2020). Despite the limited understanding, an overwhelming majority considered the 4IR to be indispensable for the growth of their businesses as they recognised the risk of being left behind. Bogomin et al. (2020:1), states that being well-informed about the changes brought by the 4IR and the rate at which these changes are taking place are indispensable for survival in the 4IR era.

5.2.4 Objective Four: Role of government

Despite the South African government's efforts within the promotion of SMME development, the participants conveyed their discouragement and dissatisfaction regarding the lack of support from the government. There was agreement amongst most participants that the government has played little to no role in the development and growth of their ventures. External factors such as power shortages, regulatory compliance costs and limited financial support emerged as a hindrance to small business development.

With regards to accessing the appropriate technology, most of the SMMEs interviewed were self-funded and relied on IT specialists/technicians or their own personal expertise to meet their IT needs and solutions. There was also mention of receiving partial funding and IT support from angel investors and vendors as they were better acquainted with the environment that start-up companies operate in. Irrespective of the lack of support from the government, a few participants acknowledged the active role that government played in education and training of the workforce.

It is evident on the premise of the findings that government's commitment towards SMME development requires more intervention, particularly enabling an environment that is conducive to the successful transition into the 4IR. The Presidential Commission of the 4IR (PC4IR) is cognisant of prioritising entrepreneurship and SMMEs to leverage the opportunities of the 4IR and subsequently lead the digital transformation efforts and innovation (South Africa, 2018). For that reason, it will be pivotal for the government to play a more active role in the promotion and support of SMME development.

5.3 Recommendations

The research findings highlighted the potential of SMMEs to become early adopters of 4IR technologies, yet they are faced with various challenges impeding their ability to fully participate in a technology-driven ecosystem. In addition, the research participants were quite complacent in terms of responding to disruptive changes in a timely manner. Therefore, based on the aforementioned experiences and challenges of the research participants in adopting a technology-driven business model as well as their limited understanding of the 4IR and related concepts, the following section proposes recommendations that can be utilised as an impetus to continually thrive and compete in the 4IR.

Development of a digital transformation strategy: to remain competitive and relevant in a technology-driven landscape, the owners of the SMMEs should consider developing a comprehensive and flexible 4IR or digital transformation strategy. Digital transformation is

perceived as a process of radically integrating new technologies and capabilities with all areas of the business with the aim of enhancing business processes, improving customer experiences and engagement and most importantly, responding flexibly to current technological trends. It also involves a cultural and behavioural change that necessitates businesses to continuously challenge traditional business models to ensure survival within a rapidly changing digital environment. It has become imperative for businesses of all sizes to digitalise their business and operating models, however the core focus should not only be on the acquisition and deployment of advanced technologies. Issues such as leadership, organisational culture and talent (skills) play an important role in the digital transformation process. Incorporating a digital transformation strategy will therefore help guide SMMEs in leveraging capabilities and emerging technologies to reposition their businesses in response to the demands of the 4IR. The first step within the digital transformation journey is to measure the business's digital maturity or readiness. There are various online digital assessment tools that can assist SMMEs to gain an understanding of their level of readiness and detect which areas of the business require attention.

Agile IT infrastructure: Part of developing a digital transformation strategy is identifying which technologies are best aligned to achieve the overall objectives of the business. One of the main barriers identified in the adoption of a technology-driven business model was lack of financial resources. To alleviate some of the financial burden that comes with the adoption of information technologies, SMMEs can implement an agile IT infrastructure such as cloud computing. Cloud computing has emerged as one such disruptive technology that can offer SMMES a viable and affordable alternative to traditional ICT infrastructure (Hinde & Van Belle, 2012:40).It also does not require 'additional costs for software licenses, hardware, ICT infrastructure support and maintenance' (Kumalo, 2018: 23). Thus implementing an agile cloud infrastructure can bring about flexibility, scalability and efficiency for SMMEs (Adane, 2018:197). Although cloud computing was mostly embraced by the research participants, the technology is not extensively used, for instance as an Infrastructure as-a Service (IaaS) or Platform as a Service (PaaS). The SMMEs can experiment with cloud free tiers (Google cloud, AWS, Oracle) or open source software before financially committing to it.

Invest in human capital: Investing in human capital will become a very important asset in the preparation of a skilled workforce. As mentioned earlier, SMMEs need to anticipate and proactively prepare for the skills required to thrive and compete in the 4IR. The owners of the SMMEs should firstly instil a culture of lifelong learning to ensure that employees at all levels have the necessary skills to adapt to the advancements of the 4IR. There are affordable online educational platforms commonly known as Massive Open Online Courses (MOOCs) that SMMEs can integrate into their

training programmes. Examples of these educational platforms include Digital Skills for Africa (Google), Udemy, Coursera, LinkedIn Learning, and Shaw Academy, amongst others.

Realignment of SETA programmes: Based on the findings pertaining to skills development and training, a few SMMEs acknowledged the government's commitment towards continuous professional training of the labour workforce. However, the training programmes offered typically focus on the skills required to perform the job as opposed to digital skills. The current training programmes offered by SETAs should be realigned or adapted to the future-oriented skills of the 4IR as they serve as platforms for the incubation of such programmes for the South African labour force. The reskilling and upskilling of the workforce is a key priority in preparing for the imminent disruptions brought about by the 4IR (Manda, 2019:249). Therefore, as highlighted by the WEF (2016), there is a greater need for government training institutions to collaborate with education providers and businesses to effectively harness the opportunities of the 4IR. This can be achieved by developing a digital and future work skills programme that focuses on the relevant soft and ICT skills required to thrive in the 4IR.

Integrated e-Business services: As previously stated in section 5.2.4, the South African government has a crucial role to play in creating an ecosystem that is conducive to the successful transition of the 4IR. One way of attaining this endeavour is providing an online integration of important stakeholders within the SMME ecosystem. The current BizPortal, developed by the Companies and Intellectual Property (CIPC) in collaboration with government agencies, regulators and private sector, offers an integrated and seamless digital platform for business-related services. These services range from company and tax registration to domain name registration and the opening of bank accounts. The development of the Biz Portal platform was in response to the need to enhance the ease of doing business in South Africa. The government should consider collaborating with other important stakeholders such as the small business ministries, enterprise development organisations, education and possible IT service providers to offer a more comprehensive and integrated platform for SMMEs in addition to the services related to company registration. Through this partnership, support measures such as funding opportunities, mentorship, skills training, business tools and IT support, can all be consolidated on the Biz Portal platform. Providing the appropriate support mechanisms on one platform can reduce some the red tape and financial challenges that SMMEs usually face.

5.4 Research contribution

This research study highlights the fact that the development of a robust SMME sector is critical to pioneering the 4IR in South Africa, which can place South Africa at the forefront of technological

innovation. As previously mentioned, SMMEs are widely recognised for their unique role in job creation and economic development. Owing to high unemployment coupled with a low economic growth and the deplorable levels of poverty in South Africa, SMMEs become a crucial solution (Nieman & Nieuwenhuizen, 2014: 24). Therefore, promoting digital transformation within the small business sector will not only achieve economic prosperity but also help ameliorate the socio-economic crisis of South Africa.

Moreover, the study is motivated by the fact that limited research has been carried out in the area of assessing the impact of disruptive technologies within the small business sector, specifically in Cape Town, South Africa. Although many reports have documented the economic potential and social risks of the 4IR, little is known of how the interactions with these technologies affect the sustainability of SMMEs. As such, the study aimed to fill existing gaps in literature by providing a fresh local perspective on the benefits of adopting disruptive technologies. This study advances knowledge and insight into effectively implementing new disruptive technologies in business models and gaining the required skills needed to thrive in the 4IR. Furthermore, the current study sought to assist policymakers and industry experts to develop home-grown innovative solutions to enhance small business participation in the growing digital economy. The government have recently promoted a national response action plan to cope with the advancements of the 4IR; however, there is a lack of tangible policies or programmes that support their mandate (Dewa et al., 2018:662). Thus, the study's key findings contribute to the body of knowledge on the impact of the 4IR on small business in developing countries and formulating strategic initiatives for the small business sector. The results of this study are focused on developing pragmatic digital and technological solutions to overcome the barriers faced by small business owners.

5.5 Study limitations

The research study adopted a qualitative methodology grounded in an interpretivist approach which sought to explore multiple concepts and interpretations from the perspectives of the participants. The quintessence of this approach was not to develop a statistical generalisation of the phenomenon of interest, but rather acquire an in-depth understanding of how individuals (SMMEs) interpret and attribute meaning to their social context. Therefore, this research study needed extensive quantitative or mixed-method research that would yield more conclusive evidence.

Given the exploratory nature of the study, the researcher played a profound role in all stages of the research and essentially served as an instrument in the data collection process. As such, research bias might potentially exist as the interpretations of the findings reflect the paradigmatic

views of the researcher.

The sample size of the study was limited to 13 SMMEs operating in the finance, retail and tourism sectors. The study was also restricted to the Cape Town Metropolitan areas due to ease of access and convenience. A larger sample of the aforementioned sectors would have been better, as the advancements of the 4IR are disrupting virtually every industry globally. For that reason, the findings should not be statistically generalised to the entire SMME population of South Africa.

Furthermore, the study intended to incorporate industry experts and Business Development and Support (BDS) organisations to further strengthen the validity and reliability of the results. The aim was to assess their mandate in terms of fostering an environment where small businesses have access to the necessary skills and competencies to compete in a technology-driven ecosystem. However due to the COVID-19 pandemic and the stringent safety measures implemented, the interviews could not be materialised. In addition, a few interviews had to be cancelled as a result of the pandemic and some were not entirely receptive to conducting interviews through video conferencing platforms.

Another limitation regarding the current study is that the data collection process and analytic efforts emerged to be quite time-consuming and resource intensive. While the use of a CAQDAS assisted with the management and structuring of the data, transcribing the interview transcripts and interpreting the results became a laborious task.

Lastly, the 4IR phenomenon as well as the underpinning technologies represents a relatively emerging research domain particularly in the field of entrepreneurship. Considering the rapid pace of technological advancements, the phenomenon under inquiry is limited to the period during which the research was conducted.

5.6 Future research suggestions

The present inquiry serves as a valuable precursor to a more in-depth extensive study pertaining to the impact of disruptive technologies on the growth and development of SMMEs in South Africa. This research study employed a qualitative exploratory approach focusing on the factors that could potentially inhibit or encourage the adoption of 4IR technologies by SMMEs, thus determining the required skills that could assist the SMME sector to thrive and compete in a technology-driven ecosystem. Since the 4IR concept represents a relatively emerging field, future research initiatives could further explore and confirm the initial findings by incorporating a larger sample size and ascertain whether the factors identified in the research study impact the implementation of 4IR

technologies by SMMEs in other sectors that were not included in the study. In addition, future studies should consider developing a 4IR readiness assessment model or tool that is specifically designed for SMMEs to assess their readiness or maturity levels of 4IR/Industry 4.0. This is crucial as it can accurately guide SMMEs in determining the appropriate strategies and action plans to adapt to the technological advancements of the 4IR.

As highlighted in section 5.2.1, cloud computing emerged as one of the disruptive technologies that have mostly been implemented by the research participants. The findings also revealed that a small proportion of the participants had already begun leveraging big data or advanced data analytics by means of online tools and cloud service platforms. Big data complemented with cloud computing offers a unique opportunity for small businesses that are resource-constrained to exploit high volumes of data, not merely to innovate, but also to gain a sustainable competitive advantage (Vajjhala & Ramollari, 2016:132). Future studies could employ a case study methodology to identify the key determinants of adopting big data analytics through cloud computing solutions by SMMES. A key focus should be on whether these disruptive technologies provide opportunities to create novel and scalable business models that allow SMMEs to build a solid competitive edge.

The majority of the SMMEs interviewed are classified as formal businesses operating within urbanised areas. Therefore, these SMMEs have access to reliable broadband Internet infrastructure. In order to harness the opportunities of the 4IR as indicated in the literature review and research findings, high speed Internet coverage and access to affordable broadband infrastructure is a prerequisite for any business to proactively participate within the 4IR. In contrast, informal SMMEs operating in township communities are usually faced with unique contextual challenges concerning ICT adoption which may hinder their ability to embrace 4IR technologies. This provides an opportunity for future research to conduct a comparative study which evaluates and contrasts the implications of disruptive technologies on SMMEs operating in township economies. Special attention should be on the role of 4IR technologies in the advancement of socio-economic development by these SMMEs.

The current enquiry was conducted prior to the COVID-19 pandemic where to an extent digital technologies were not considered an imperative to compete successfully. In the context of COVID-19, it is demonstrably clear that the adoption of technologies is the cornerstone for businesses to remain competitive and relevant. This is exemplified in the rapid deployment of cloud solutions to facilitate various collaboration tools and digital marketing technologies to access new markets and increase consumer engagement. A further suggestion for future research could be to adopt an

exploratory approach to investigate the post-COVID-19 pandemic effects on the performance of SMMEs in the era of the 4IR. The study could focus mainly on small businesses operating in the tourism sector as it was largely affected by the stringent measures resulting from the Covid-19 pandemic. This would make an interesting area of research as this sector largely relies on physical proximity to consume its services. It will also reveal whether the pandemic accelerated the adoption of digital transformation in order to remain relevant and competitive.

5.7 Conclusion

Significant technological advancement across a range of fields consisting of AI, IoT, robotics, 3D printing, cloud computing and nanotechnology has triggered a new era touted as the 4IR. What initially emerged as a strategic initiative of the German Federal government has permeated worldwide, compelling governments and other important stakeholders to position themselves to effectively seize the opportunities and technologies associated with the 4IR. Prioritising entrepreneurship and SMME development will therefore be key in attaining the digital transformation and innovation efforts.

The study explored the potential impact of disruptive technologies on the growth and development of SMMEs in order to determine the skills required to assist the small business sector to thrive and compete in a technology-driven ecosystem. This was achieved by adopting a qualitative exploratory design in tandem with a descriptive method. Considering the strategic importance of the SMME sector for economic development and job creation, it was crucial to gain an in-depth understanding of the experiences and challenges that encourage and/or inhibit SMMEs to participate in a technology-driven ecosystem. A heterogeneous group of SMMEs was selected purposively from the finance, retail and tourism sectors to elicit multiple interpretations of the phenomenon in the context of the study.

The results of the study confirm that SMMEs have the potential to become early adopters of the 4IR which is manifested in the use of certain key technologies underpinning the 4IR. The adoption of these technologies is gradually redefining the way SMMEs operate, compete and interact with their consumers. Cloud technology was one prevalent example that afforded smaller businesses an inexpensive alternative to integrate or transition elements of the business operations into the virtual world. The implementation of disruptive technologies within SMMEs has also been noted to provide operational agility encompassing increased efficiency, remote work, data security, customer-centric and exponential business models, as well as market opportunities.

While the adoption of disruptive technologies is ushering in substantial benefits for the selected

SMMEs, there was also scepticism and limited understanding surrounding 4IR advancements. The ambivalence towards the adoption of 4IR technologies fully confirms the importance of further developing and demystifying 4IR knowledge and related concepts. Most importantly, the identified challenges and difficulties of adopting a technology-driven business model need to be appropriately addressed in order to fully harness the opportunities and benefits of the 4IR. The South African government's commitment towards SMME development requires more intervention in enabling a conducive and thriving environment to succeed in the 4IR.

To further advance small business participation in the digital economy, SMMEs will need to proactively prepare for the skills and competencies required to thrive and compete in the 4IR. The future workforce theme highlighted pertinent issues that affirm the urgency to reskill and upskill the workforce for the imminent technological disruptions. While the advances in technology, as affirmed by the WEF (2018b), will continually diminish the need for mundane, repetitive routine roles, it will also potentially lead to the creation of new types of positions. The development and growth of the SMME sector will be crucial in this regard as the NDP envisions creating 11 million jobs by 2030 (NDP, 2012). SMMEs will also need to ensure that the implementation of technology augments and complements existing jobs instead of displacing human labour.

It is also worth noting that the advent of the COVID-19 pandemic has proven the necessity of businesses, particularly SMMEs, to harness the potential of disruptive technologies underpinning the 4IR. The pandemic accelerated the adoption of 4IR technologies, particularly for businesses that were previously reluctant to embrace such changes. It became evidently clear that the adoption of technologies is the cornerstone for businesses to remain competitive and relevant, especially in unprecedented times. Going forward, the survival of SMMEs will therefore vastly depend on their ability to respond strategically to the unanticipated changes in their environment. Further, the successful adoption of 4IR technologies requires a collaborative effort of the public and private sectors, business leaders and universities. This is particularly important if South Africa aims to be an active participant in the 4IR. There is a present need for SMMEs to have an open mindset and relentlessly innovate to remain relevant. Hence the study proposes a digital transformation strategy that allows SMMEs to respond with some relative degree of speed to technological changes and thus exploit new business opportunities.

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APPENDICES

APPENDIX A: LETTER TO RESEARCH PARTICIPANTS

Cape Peninsula University of Technology
Department of Entrepreneurship and Business Management

PERMISSION LETTER

Title: The impact of disruptive technologies on the growth and development of the small business sector in South Africa

Dear Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

I, Mayeadeh Tarr, am currently conducting research on the above title as part of the requirements in pursuit of a Master in Business Administration majoring in Entrepreneurship at the Cape Peninsula University of Technology. The aim of the study is to assess the impact of implementing disruptive technologies within the development of small, micro and medium-sized businesses (SMMEs) and therefore determining the required skills needed to thrive and compete in a technology-driven ecosystem. This research will be conducted under the supervision of Prof. Chux Gervase Iwu and Dr Hilary Kennedy Nji Bama.

I hereby seek your consent to carry out this study within your business. This will entail conducting an interview with the owner or manager. The information collected will be treated as strictly confidential and will be used solely for academic purposes. The identities and personal details of participants will not be disclosed. Your participation in this study will be voluntary and you are free to withdraw at any time.

Your consent to enable me to conduct this research within your business would be greatly appreciated. The results emanating from the study are intended to contribute towards enhancing small business participation in the growing digital economy.

Should you acquiesce to this request, please indicate in writing as the university (CPUT) only recognises written permissions.

If you require further information, you may contact me or my supervisors:

Prof. C.G. Chux: 021 460 9038 & email: IwuC@cput.ac.za
Dr. H.KN. Bama: 073 508 6869 & email: hbamason@gmail.com

Yours Sincerely,

MTarr

Miss Mayeadeh Tarr 072 864 3038
mtarr09@gmail.com

Cape Peninsula
University of Technology

Faculty of Business and Management Sciences
Department of Entrepreneurship
PO Box 652
Cape Town
8000

Tel: +27 21 460 3942

Date: 05 August 2019

Dear Sir/Madam

Title: The impact of disruptive technologies on the growth and development of the small business sector in South Africa

Thank you for participating in this research study. Your view on the above topic will potentially contribute towards enhancing small business participation in the growing digital economy. The interview will be semi-structured where a set of questions will be administered in an orderly manner and the process will take approximately 45 minutes.

Introduction

Technological innovation is evolving at a rapid speed, disrupting nearly every industry across the globe. This global concept is known as the 'Fourth Industrial Revolution' or 'Industry 4.0' which is driven by a combination of disruptive technologies blurring the lines between digital, biological and physical spheres. Therefore, the small business sector need to consider the impact this new era of development may have on the future of their businesses.

Objective of the study

SMMES are the catalyst of economic growth and an important source of job creation. Presently, SMMEs still face challenges that inhibit their ability to participate in a technology-driven ecosystem. In order to remain competitive and relevant in the ever-changing business environment, SMMEs need to adopt technological innovation within the development of their businesses. The primary aim of the study is to obtain insight on the impact of implementing disruptive technologies within the development of the SMME sector and therefore determining the required skills needed to thrive and compete in a technology-driven ecosystem.

Voluntary Participation

Participation in this study is entirely voluntary and you are free to withdraw at any time without any objections. The interview will be audio-recorded which is subject to the consent of participants. The audio recording and extracts from the interview will be solely used for academic purposes.

Risks and benefits

There will be no risks associated with your participation in this study and discussions on sensitive topics will be avoided. Although there are no direct benefits, this research is intended to advance new knowledge and insight into effectively implementing new disruptive technologies.

Confidentiality

Strict confidentiality and anonymity will be preserved at all times. The identities and particulars of participants will not be disclosed and the data collected will not be accessible beyond the researcher. Furthermore, the interview audio recordings and transcripts will be stored in a password protected folder.

Contact Information

Please feel free to contact me or the Department of Entrepreneurship if you have any questions or require additional information. A summary of the findings will be made available to participants to increase their knowledge of the subject matter.

Consent

I have read and understand the information provided in the letter regarding a study being conducted by Miss Mayeadeh Tarr in fulfilment of her MTech in Business Administration (Entrepreneurship) degree and I have had all my questions answered to my satisfaction. I understand that my participation is voluntary and that I am free to withdraw at any time without any objections. With full knowledge of the foregoing, I voluntarily agree to take part in this study.

Participant name:

Signature:

Date:

Researcher name:

Signature:

Date:

Researcher's details
Mayeadeh Tarr
mtarr09@gmail.com
072 864 43038

Supervisor's details
Prof. C.G Chux
IwuC@cput.ac.za
021 460 9038

Interview questions

Section A: Introduction

1. What is your current position in the business?
2. How long has the business been in operation?
3. How many employees does the business currently have?
4. Could you provide a brief description of the business core activities?
5. What is your highest education and years of business/entrepreneurial experience?

SECTION B: IMPACT OF DISRUPTIVE TECHNONLOGIES ON DEVELOPMENT OF BUSINESS & THE PERCEPTIONS OF SMALL BUSINESS OWNERS

6. What do you understand by the term Industry 4.0/Fourth Industrial Revolution?
7. How would you describe disruptive innovation?
8. What impact do you think this new development era will have on the growth and development of your business?
9. Are you aware of the new technologies that are driven by industry 4.0?
10. How are these new technologies relevant to the tourism/retail/financial sector? [Not relevant]: How important is technology in your business?
11. Which disruptive technologies do you currently have or which technology is applicable for your business? [Not applicable]: Do you expect that it will be easy to adopt these new technologies?
12. How do you identify the latest technology to improve customer experience?
13. What Information Communication Technologies do you currently have in your business and how have they impacted your business (E.g. Increased productivity, reduced operational costs, capture a larger share of the market).
14. What are the barriers to adopting a technology-driven business model? If any, what are your main concerns about this new digital revolution?
15. Based on current trends, what are the challenges of competing with companies that keep abreast with the latest technologies?
16. Do you see the risk of being disrupted by companies that are not currently in the financial/retail/tourism sector?
17. Do you feel that Industry 4.0/Fourth Industrial Revolution is indispensable for growth?
18. In terms of readiness, are you able to compete within this new development era?

SECTION C: REQUIRED SKILLS FOR THE FOURTH INDUSTRIAL REVOLUTION

19. Does your company possess the skills it needs to implement new technologies, and do you have a skills development programme centred on the utilisation of technology? Please elaborate.

20. What skills shortages do you expect in your workforce within the next 5 years?

21. What is the average level of IT knowledge within your workforce?

22. In your opinion, what skills do you think are required to thrive in this new development era?

SECTION D: GOVERNMENT & BUSINESS DEVELOPMENT SUPPORT

23. What type of support have you received in terms of accessing the appropriate technology for your business?

24. What role has the government played in the development and growth of your business venture?

25. How can government assist the small business sector to participate in a growing digital economy and harness the opportunities of the 4IR?

Project: The impact of disruptive technologies on the growth and development of small businesses

Code Report – Grouped by: Code Groups

(70) codes
Local filters:

Show codes in any of the groups Adoption Drivers, Barriers_Tech Model, Competitors, Disruptive Technologies, ICT Infrastructure, Knowledge on DI, Knowledge on FIR, Main Concerns of 4IR, Relevance of DT or Skills Required

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Adoption Drivers

Active: 8 Codes:

- Adopt driv_accessibility

- Adopt driv_convenience

- Adopt driv_digital marketing tools

- Adopt driv_effiency/simplicity

- Adopt driv_going green

- Adopt driv_market opportunities

- Adopt driv_productivity

- Adopt driv_security issues

Barriers_Tech Model

Active: 9 Codes:

- BARRIERS TECH MODEL

- **Barriers_access to finance**

- **Barriers_adapting to new tech**

- **Barriers_digital divide**

- **Barriers_entry barriers**

- **Barriers_marketing**

- **Barriers_no barriers**

- **Barriers_shortfalls of IT**

- **Barriers_skills & training**

Competitors

Active: 8 Codes:

- **COMPETITORS**

- **Competitors_competent workforce**

- **Competitors_keep abreast with latest tech**

- **Competitors_lack of finance**

- **Competitors_lack of resources**

- **Competitors_none**

- **Competitors_other**

- **Competitors_uncertain**

Disruptive Technologies

Active: 9 Codes:

- **DT_artificial intelligence (AI)**

- **DT_blockchain**

- **DT_cloud computing**

- **DT_machine learning**

- **DT_not aware/none**

- **DT_other tech**

- **DT_robotics**

- **DT_social media**

- **DT_virtual reality**

ICT Infrastructure

Active: 4 Codes:

- **ICT (Benifits)**

- **ICT Infrastructure**

- **ICT_electricity**

- **ICT_Fibre**

Knowledge on DI

Active: 8 Codes:

- **DISRUPT INNOVATION**

- **Disrupt_(eg) disrupt business**

- **Disrupt_Airbnb**

- **Disrupt_cheaper solution**

- **Disrupt_different/unique**

- **Disrupt_displacement of tech**

- **Disrupt_little/no understanding**

- **Disrupt_transform market**

Knowledge on FIR

Active: 6 Codes:

- **FIR_automation**

- **FIR_displacement of labour**

- **FIR_disrupt techs/inno**

- **FIR_effiency**

- **FIR_little/no understanding**

- **FIR_transition prev revolutions**

Main Concerns of 4IR

Active: 8 Codes:

- **CONCERNS 4IR**

- **Concerns_advancements of tech**

- **Concerns_cashflow**

- **Concerns_digital diviide**

- **Concerns_keep abreast with tech**

- **Concerns_none**

- **Concerns_redundant jobs**

- **Concerns_security issues**

Relevance of DT

Active: 3 Codes:

- **Relevance of tech (FINANCE)**

- **Relevance of tech (RETAIL)**

- **Relevance of tech (TOUR)**

Skills Required

Active: 7 Codes:

- **4IR skills_cognitive skills**

- **4IR skills_entrepreneurship skills**

- **4IR Skills_soft skills**

- **4IR Skills_technical skills**

- **Skills Dev_CPD**

- **Skills Dev_gov training**

- **Skills Dev_skills training**

APPENDIX E: REQUEST TO CONDUCT INTERVIEW EMAIL

Mayeadeh Tarr <mtarr09@gmail.com>

27 Feb 2020, 10:44 ☆ ↰ ⋮

to iscott ▾

Dear ▮▮▮▮▮▮

I trust this email finds you well.

My name is Mayeadeh Tarr and I am a postgraduate student pursuing a Master degree in Entrepreneurship at CPUT. I am reaching out to you to request an appointment to set up an interview.

As part of the requirements for the degree, I am conducting research on the topic **"The impact of disruptive technologies on the growth and development of the small business sector in South Africa."** The aim is to gain deeper insight into the experiences and challenges of adopting a technology-driven business model to identify the required skills which could assist the SMME sector to thrive and compete within an ever-changing environment.

Therefore, I am currently looking for participants to interview. This will entail meeting with the owner, manager or any personnel involved in key decisions of the business. The interview will be semi-structured and it will take a maximum of 45 minutes. Please note that the information collected will be used solely for academic purposes.

Feel free to contact me if you have any questions or require additional information. I am willing to sit down with you to discuss my research study in detail.
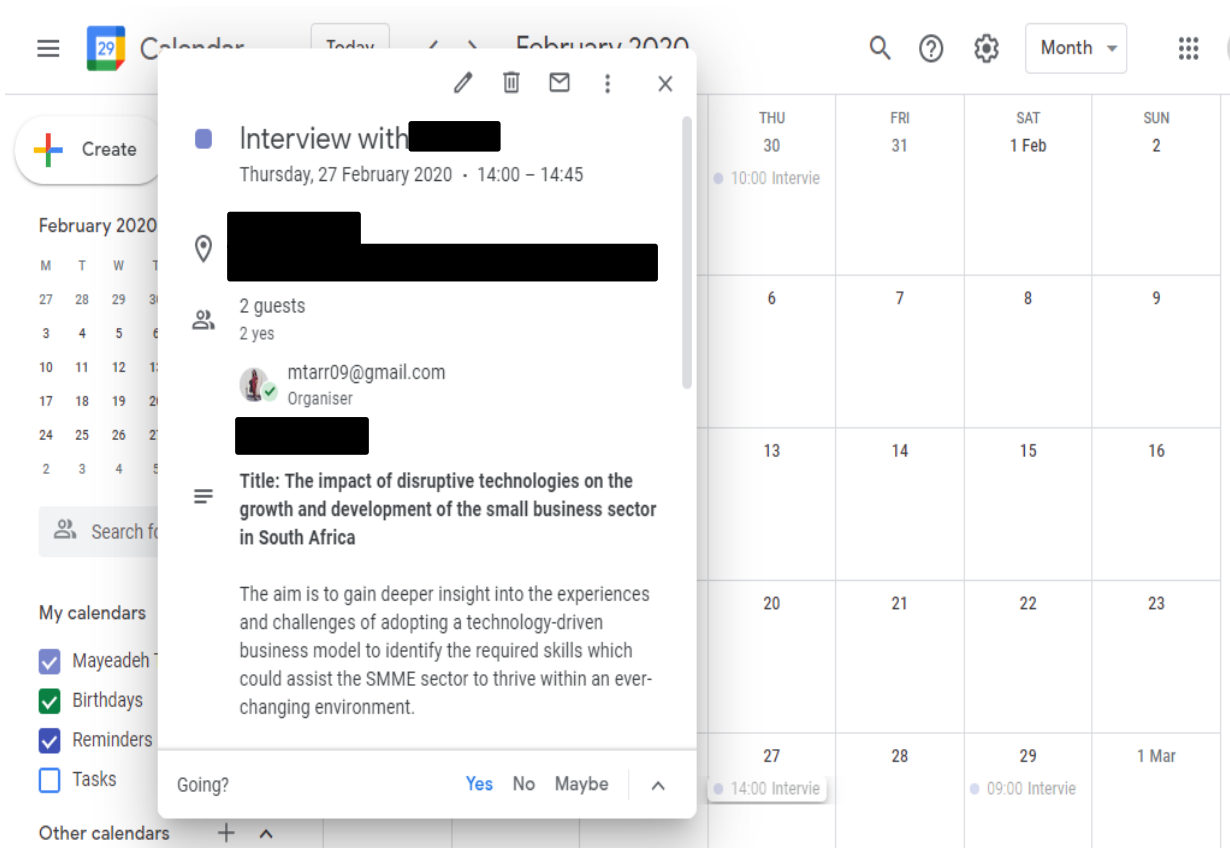
Sincerely,

Mayeadeh Tarr
072 864 3038

Hi there Mayeadeh

I hope that you are well. Apologies for the late reply.

We can defiantly participate, if you still need us.
When so you need this done by?

Best regards,
▮▮▮▮▮

APPENDIX F: INTERVIEW REMINDER NOTICE

APPENDIX G: THE NEW NATIONAL SMALL ENTERPRISE ACT SCHEDULE

SCHEDULE 1
The new National Small Enterprise Act thresholds for defining enterprise size classes by sector, using two proxies

Column 1	Column 2	Column 3	Column 4
Sectors or sub-sectors in accordance with the Standard Industrial Classification	Size or class of enterprise	Total full-time equivalent of paid employees	Total annual turnover
Agriculture	Medium	51 - 250	≤ 35,0 million
	Small	11 - 50	≤ 17,0 million
	Micro	0 – 10	≤ 7,0 million
Mining and Quarrying	Medium	51 - 250	≤ 210,0 million
	Small	11 - 50	≤ 50,0 million
	Micro	0 – 10	≤ 15,0 million
Manufacturing	Medium	51 - 250	≤ 170,0 million
	Small	11 - 50	≤ 50,0 million
	Micro	0 – 10	≤ 10,0 million
Electricity, Gas and Water	Medium	51 - 250	≤ 180,0 million
	Small	11 - 50	≤ 60,0 million
	Micro	0 - 10	≤ 10,0 million
Construction	Medium	51 - 250	≤ 170,0 million
	Small	11 - 50	≤ 75,0 million
	Micro	0 - 10	≤ 10,0 million
Retail, motor trade and repair services.	Medium	51 - 250	≤ 80,0 million
	Small	11 - 50	≤ 25,0 million
	Micro	0 – 10	≤ 7,5 million
Wholesale	Medium	51 - 250	≤ 220,0 million
	Small	11 - 50	≤ 80,0 million
	Micro	0 – 10	≤ 20,0 million
Catering, Accommodation and other Trade	Medium	51 - 250	≤ 40,0 million
	Small	11 - 50	≤ 15,0 million
	Micro	0 – 10	≤ 5,0 million
Transport, Storage and Communications	Medium	51 - 250	≤ 140,0 million
	Small	11 - 50	≤ 45,0 million
	Micro	0 – 10	≤ 7,5 million
Finance and Business Services	Medium	51 - 250	≤ 85,0 million
	Small	11 - 50	≤ 35,0 million
	Micro	0 - 10	≤ 7,5 million
Community, Social and Personal Services	Medium	51 - 250	≤ 70,0 million
	Small	11 - 50	≤ 22,0 million
	Micro	0 – 10	≤ 5,0 million