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Investigate the role of skills development hubs in equipping disadvantaged communities in South Africa to gain competencies required for the Fourth Industrial Revolution (4IR)

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Investigate the role of skills development hubs in equipping disadvantaged communities in South Africa to gain competencies required for the Fourth Industrial Revolution (4IR)

Mohsin Desai

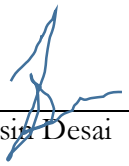
WITS Business School

Thesis presented in partial fulfilment for the degree of Master of Business Administration to the Faculty of Commerce, Law, and Management, University of the Witwatersrand

April 2020

DECLARATION

I, Mohsin Desai, declare that this research report entitled 'Investigate the role of skills development hubs in equipping disadvantaged communities in South Africa to gain competencies required for the Fourth Industrial Revolution (4IR)' is my own original and unaided work. I have acknowledged, attributed, and also referenced all ideas obtained from different sources. I am hereby submitting this report in the partial fulfilment of the requirements of the degree of Master of Business Administration. I have not submitted this report before for any other degree or examination to any other institution other than this submission to the University of the Witwatersrand, Johannesburg.



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Signed at Johannesburg on 29th March 2020

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LIST OF ABBREVIATIONS

4IR	Fourth Industrial Revolution
5IR	Fifth Industrial Revolution
AI	Artificial Intelligence
BBBEE	Broad Based Black Economic Empowerment
CM/ ER	Corporate Managers/ Entrepreneurs
EL	Experiential Learning
GDP	Gross Domestic Product
GEM	Global Entrepreneurship Monitor
HR	Human Resources
HRD	Human Resource Development
ICT	Information Communication and Technology
IoT	Internet of Things
L&D	Learning and Development
ML	Machine Learning
NDP	National Development Plan
ROI	Return on Investment
SA	South Africa
SE	Social Entrepreneurship
SETA	Sector Education and Training Authority
STEM	Science, Technology, Engineering and Mathematics
UJ	University of Johannesburg
UNISA	University of South Africa
VUT	Vaal University of Technology
WEF	World Economic Forum
Wits	University of the Witwatersrand
YP/ UG	Young Professionals/ University Graduates

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ABSTRACT

South Africa's participation in the global trend of the Fourth Industrial Revolution (4IR), has grown to include almost every business segment and is set to influence every conceivable aspect of all industries. This 4IR era, which is blurring the lines between the digital, physical, and biological spheres, began as an initiative to combat challenges faced by the manufacturing sector. Today, however, it is characterized by a blend of technologies and can be somewhat daunting to many organisations, not to mention individuals in general. South Africa's National Development Plan (NDP) highlights the fact that together with social development, there is a dire need for bridging the gap of skills shortages, especially in disadvantaged communities (Kraak, 2004).

This social entrepreneurship research investigates the extent that skills development hubs in disadvantaged communities can assist in the alleviation of poverty, by bridging the gap of skills in 4IR areas that will be essential for equipping Africans to be at the forefront of technological advancements. The research focused on the development of Africa 4IR training hubs, targeting initially, the main economic hubs of Gauteng province and then expanding throughout South Africa.

Technological skills are deemed to be in short supply in South Africa and filling this skills gap could invariably alleviate unemployment and poverty, especially amongst disadvantaged communities. The projections and proposal for the need of training hubs through this research is based on findings drawn from existing literature and from interviewing young professionals, university students, corporate managers and entrepreneurs.

Using institutional theory as a lens, this research aimed at investigating the role of skills development hubs in equipping disadvantaged communities in South Africa. Additionally, it provided a suitable collaborative framework that involved all relevant stakeholders from the context of social entrepreneurship. Also, to start low cost training hubs and develop competencies required in the era of the Fourth Industrial Revolution through public-private partnerships.

SUPPLEMENTARY INFORMATION

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DEFINITION OF KEY TERMS AND CONCEPTS

4IR: It refers to the digital age technologies such as Robotics, Artificial Intelligence (AI), further Machine Learning (ML), and the Internet of Things (IoT). This definition also extends to how these are changing the world and how we do things on a daily basis (Schwab, 2016).

Robotics: Robotics is the technology dealing with and the handling of robots. Robots are machines that are programmable and perform autonomous tasks us with less real-time instructions; these robots can also interact with the physical world via sensors and actuators (Owen-Hill, 2017).

AI or Artificial Intelligence: AI is the technology dealing with machine intelligence. Computer programs with the technology to perform tasks usually performed by human beings. AI is used in various ways in the modern world. Common examples of the use of AI algorithms include Google searches, recommendations by Amazon's search engine, and Satellite Navigation route finders. AI replicates to a certain extent, the way humans think (Vural Özdemir, 2018).

ML or Machine Learning: The ability for robots or system programmes to identify objects or situations from previous scenarios and then take decisive action or carry out tasks appropriately. This ability builds on what has already been programmed into the machine or robot and is a learning process, hence the term Machine Learning (Owen-Hill, 2017).

SE or Social Entrepreneurship: There are many definitions for SE, however one of the commonly accepted definition is that it is the use of social innovations to solve social problems and bring about social change, regardless of whether the motive is commercial or not (Martin, 2007). Another definition can be the process by which citizens build or transform institutions to advance solutions addressing social problems; such as poverty, illness, illiteracy, environmental destruction, human rights abuses and corruption; in order to make life better for many (Bornstein & Davis, 2010).

CHAPTER 1: INTRODUCTION

1.1 Introduction

The unemployment rate in South Africa is extremely high and the lack of crucial skills is a major contributing factor. Many individuals in rural areas, townships and informal settlements have very basic or no formal education at all. Access to quality education has always been a challenge and stems from the inequalities created by the former apartheid regime. The process of addressing these problems has been extremely slow and as a result, rural communities, townships, and informal settlements have been neglected to a certain extent. Education is a basic human right and individuals and organisations should hold governments responsible for providing this rights to its citizens (Hlalele, 2012).

The B-BBEE or Broad-Based Black Economic Empowerment compliance policy in the South African Information Communication and Technology (ICT) sector was implemented to redress historical inequalities. In the national integrated ICT policy, B-BBEE is positioned as a driver for sectoral growth and an imperative compliance directive for operating a business (Thabela-Chimboza & Chigona, 2019). However, there is still a notable dire dearth of skills and this research project intends to take much needed software development training into disadvantaged communities and in so doing, providing opportunities to individuals, who otherwise would have never had such opportunities. This would enhance job creation and contribute towards the National Development Plan's (NDP) goal of poverty alleviation and unemployment reduction (National Planning Commission, 2013).

The unemployment amongst the youth, aged between 15 – 24 years, was sitting at 55.2% in Q1 of 2019 as specified by STATS South Africa (SA, 2019). STATS SA stated on their website, that due to the high levels of unemployment, unscrupulous individuals are preying on the vulnerability of the unemployed and offering fake jobs for large sums of money, defrauding innocent job seekers.

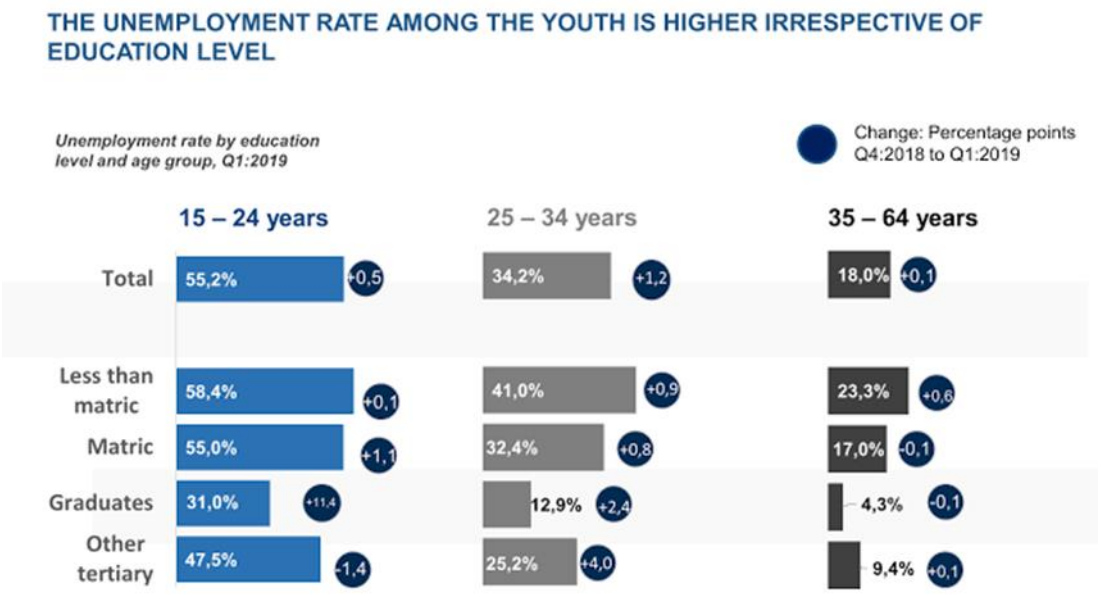


Figure 1.1: Youth unemployment rate as at 1st quarter 2019.
(Source: STATS SA)

Skills development is an educational process that begins by the identification of the skills gap and the assessment of the extent of this skills shortage, its effects and where it is most prevalent (IGI Global, 2020). Upon attaining understanding of this needed skill, plans for the developing and honing of the skill are made and implemented. To develop the skills of their people and better equip them for the current world of work, governments and educational institutions erect and fund skill development hubs (World Bank, 2020). The hubs' sole mandate is to educate all that enrol on the specified skills and present them as better equipped graduates at the end of the program, that will now be able to take on specific jobs in the market (IGI Global, 2020).

1.2 The Problem Statement

Individuals from underprivileged backgrounds, residing in previously disadvantaged communities, , have not had access to quality technological education and infrastructure due to the historic spatial planning (Berrisford, 2011). This reality has led to unemployment and continued poverty in these societies. It is difficult for people with underprivileged backgrounds to access the skills required by corporate organisations. Additionally, as the world moves on to a more technological future, these individuals' hope for employment and a better life look even more meek. With the fourth industrial revolution in full effect, previously routine jobs that they would be able to occupy are

now being done by robots, with even more jobs sure to follow the same pattern in the next coming years.

This research explores if the development of skills development hubs will provide disadvantaged communities the skills required for the fourth industrial revolution. Although the government has tried to respond to the effects of the changing market of work, previously disadvantaged communities remain behind and without much hope. The targeting of these communities is of paramount importance, as millions of South Africans reside in those areas and do not have the options many in the middle class do. The country requires an economy which meets the needs of all its people and their companies in a sustainable manner. This will be essential in order to equip South Africans to be at the forefront of technologies such as Robotics, Artificial Intelligence (AI) and further Machine Learning (ML) and Internet of Things (IoT) (Ferrein, 2012).

1.3 Purpose of the Research

The purpose of this research is to investigate the role of skills development hubs in equipping disadvantaged communities in South Africa to gain competencies required for the Fourth Industrial Revolution (4IR). The intention is to study the extent at which skills development hubs will assist in the alleviation of poverty in disadvantaged communities, in bridging the gap of skill shortages in 4IR critical skill areas across the ICT sector specifically.

According to Greg Dees (1950 – 2013), who often referred is to as the father of social entrepreneurship education; social entrepreneurship provides social change, creating new combinations of people and resources that significantly improve society's capacity to address problems (Bornstein & Davis, 2010). Even two decades after the end of apartheid and the first democratic elections, South Africa remains a country with high levels of inequalities in education (Branson, 2012).

The highest labour market priority should be that of human resource development and education in skills and competencies needed in a society in transition. Legal effects have become a BBBEE necessity and moral obligation. The moral obligation relates to empowering employees, making them better employees by assisting in productivity and

personal growth. Prioritising can ensure this commitment and providing skills training, which in turn will help build morale as well (Juggernath, et al., 2011).

The research purpose is to examine the role of skill development hubs in previously disadvantaged communities and the extent at which these can prepare South Africans for the realities of the fourth industrial revolution. The outcomes of this research and implementation of the social project can also possibly change the mindset of South Africans towards coding or programming through inclusive training.

1.4 Research Questions

The following research question were formulated to assist in investigating the role of skills development hubs in equipping disadvantaged communities in South Africa to gain competencies required for the Fourth Industrial Revolution (4IR).

i. To what extent are young professionals or university graduates aware of the 4IR?
ii. What are the current 4IR skills needed by corporate managers and entrepreneurs?
iii. What are the 4IR skills currently lacking in the South Africa's disadvantaged communities?
iv. In what ways could the disadvantaged communities be encouraged to upskill themselves for the 4IR?
v. What is the impact of skills development hubs in developing 4IR competences in disadvantaged communities?

1.5 Delimitations

Technologies that are considered for skill enhancements and knowledge, and that share in this research work, are based on current economic trends across the globe. Hence, the study is limited to Robotics, Artificial Intelligence and Machine Learning technology aspects of 4IR ICT skills. This research is not concerned with other expert areas of Science, Technology, Engineering and Mathematics (STEM) academic disciplines.

1.6 Significance of the Study

The democratically elected government, post-Apartheid, enacted some of the most progressive legislative measures. These Acts include the Employment Equity Act (1998) (EEA), Skills Development Act (1998), and Promotion of Equality Act, as well as the Broad-Based Black Economic Empowerment Act (BBBEE) (2003). However, legislative or institutional regimes may reflect a 'carrot and sticks' outcomes compliance, rather than a commitment approach (Horwitz & Jain, 2011).

It is very sad to notice that the unemployment rate amongst South African youth is more than 51% and this also attributes to the skills shortage in many business areas. Corporate institutions are struggling to fill positions that did not exist just a few years ago, such as in the field of AI. As a result, institutions such as banks can expect to pay a 20-30% premium, when they do find suitable candidates. Emerging specialist technologies change how businesses operate, innovate, scale and profit through technological implementations, such as Artificial Intelligence, as well as alleviate unemployment and poverty in disadvantaged communities.

This skill shortage dilemma is prevalent across most organisations. Organisations regard outsourcing as the only solution and therefore do not invest in any time to train staff, for the specialised roles that are crucial to sustainability. This creates an opportunity for outcome-driven training hubs, competency development and value driven mentoring of the broader talent pool. Further, the creation of such opportunities ultimately will contribute to the solving of the skill challenge across the country.

1.7 Conclusion

In South Africa, like in most social entrepreneurship cases, the unemployment crisis, along with the skills shortage, presents both the solution and the challenge. It all depends on whether this is viewed as an opportunity or a problem or both. This chapter of the study lays the foundation for a sustainable social entrepreneurship strategy, investigating the role of skill development hubs. These hubs will contribute in providing skills in South Africa to gain competencies, required in the Fourth Industrial Revolution (4IR).

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In general terms, industrial revolution is termed as the development that fundamentally changes the society and economy (Bloem, 2014). The development indicates a rapid and fundamental change, with major alterations occurring within a relatively short period. This chapter reviews all the most relevant literature pertaining to the fourth industrial revolution. In further sections, the chapter also touches on social entrepreneurship and skills development aspects. These concepts are both generic to the world and specific to the South African context.

2.2 Context of Study

South Africa is still one of the countries with a high level of inequality, scoring 63.4 on the Gini index. National poverty levels are extremely high. About 31% of South Africa's population lives below the national poverty line (CIA 2020). This research project aims to unpack how the skills development hubs could equip disadvantaged communities in South Africa to gain competencies required for the 4IR. Software skills are amongst the scarcest skills in South Africa and the need to address this scarcity is of utmost priority (Muller 2018). At present, 4IR technology related programming or coding are extremely daunting concepts to many individuals. The development of training hubs can help lay the groundwork for alleviating poverty and unemployment in this 4IR era, to help prepare for the impact of the Fifth Industrial Revolution (5IR), expected to start by the end of 2020 (Paschek, Mocan and Draghici 2019). Once the results are obtained from this research, the training hubs would be initially piloted in locations such as Soweto, Sharpeville, and Gomora Informal Settlements, to see its effectiveness.

2.3 Industrial Revolution

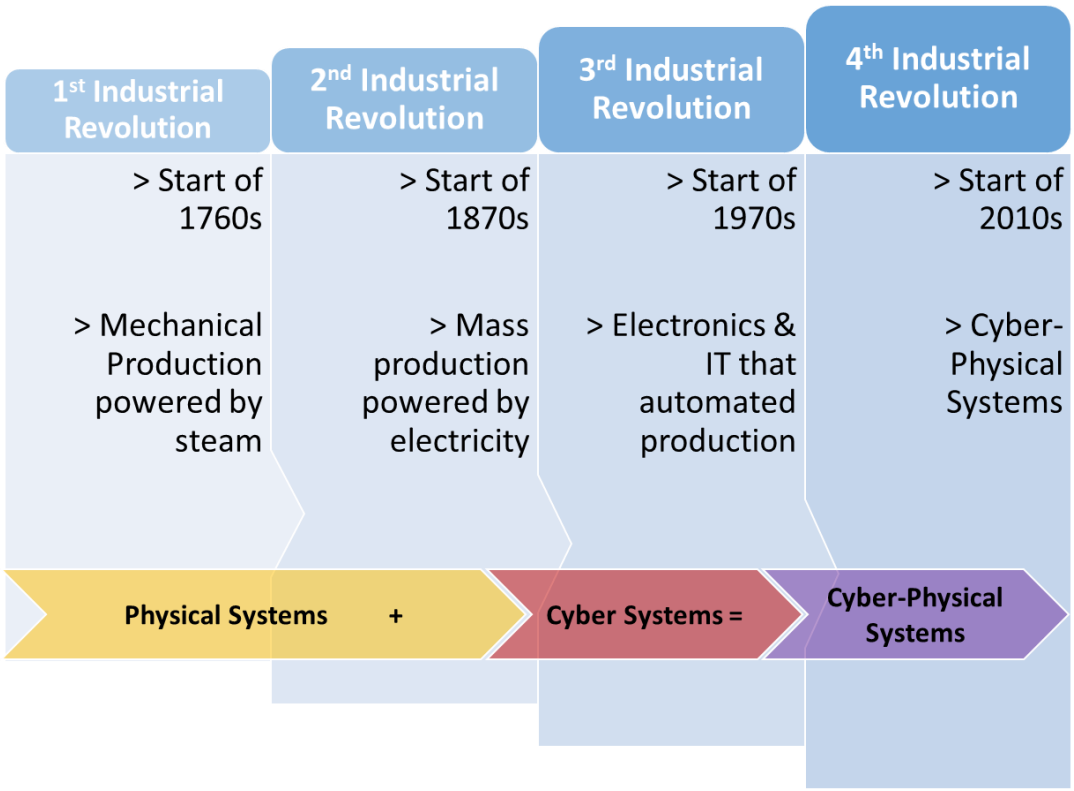


Figure 2.1: Different stages of Industrial Revolution
(Improvised from Bloem, 2014)

Industrial revolution is a continuous process and can be categorised into 4 stages as shown in Figure 2.1, with each one having its desired benefits and limitations to the socioeconomic status (Bloem, 2014):

- The *1st Industrial Revolution* started towards the end of the 18th century, with the emergence of the commercial steam engine by Great Britain (Rabeh Morrar, 2017).
- The *2nd Industrial Revolution* started at the start of the 19th century, with the introduction of the conveyor belt. The United States was the leader, revolutionising communication with the invention of the telephone (Bloem, 2014; Rabeh Morrar, 2017).
- The *3rd Industrial Revolution*, started in the 20th century, with the internet transforming the world with the digital automation of production, through electronics and information technology.

- The *4th Industrial Revolution*, started in the 21st century, connecting the physical and virtual worlds. In other words, physical systems and cyber systems combined to form a world of cyber-physical systems.

As much as a tech-savvy workforce is important, research does suggest that industrial revolutions across the globe such as the 4IR, are major change drivers in all sectors and that skills development should not be restricted to a specific workforce. The changing needs of the economy requires that skills sets be amended to meet the needs of the organisations. Unfortunately, skills development in South Africa is not as dynamic and adaptable (DHET, 2019a).

The Department of Higher Education and Training of South Africa (2019) announced the re-establishment of the Sectoral Education and Training Authorities (SETAs) from the 1st April 2020 to 31st March 2030, within the new SETA landscape. The SETAs are tasked with managing skills development needs across various sectors, where graduates should be equipped with life skills to enter the world of work with ease and quickly become productive (DHET, 2019b).

2.4 Fourth Industrial Revolution (4IR)

As a recent consequence of the IoT contributing to the new business services to develop and connect the physical and virtual worlds, the world is at the beginning of the *4th Industrial Revolution* (4IR) (Bloem, 2014).

Schwab (2016), points out that the 4IR is not comparable to the previous three revolutions because of the great speed with which innovative and disruptive technologies are emerging, and these technologies are fast spreading across the world (Schwab, 2016). In the coming decades, technologies like Artificial Intelligence (AI), Robotics, IoT, Autonomous Vehicles, will transform the entire fabric of the world economy, its communities and the human identity as a whole (Schwab, 2017).

There is a great responsibility on government and institutions to design new business models of demand and supply, reshape production and consumption, along with

transportation and delivery systems that will enable the citizens to fully grasp the speed at which4IR is progressing.

According to Bloem (2014), 'Cyber-Physical Systems' are the basis for intelligent network systems and processes, which signifies the broad integration of production, distribution and sustainability, leading to customer satisfaction and scaling (Bloem, 2014).

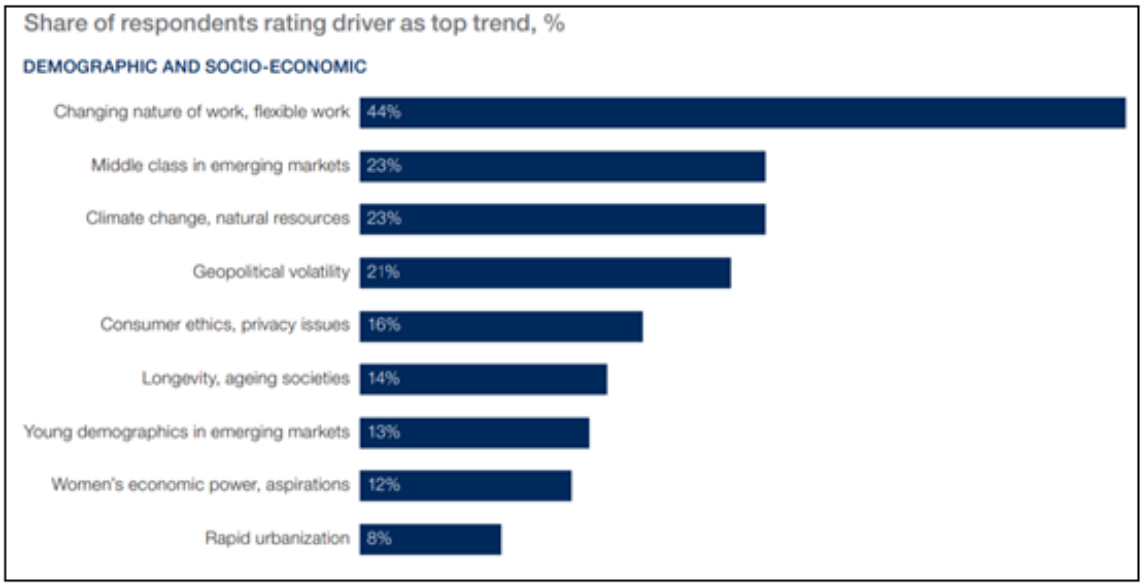


Figure 2.2: Demographic and Socio-economic drivers of current business models (Source: Schwab, 2016)

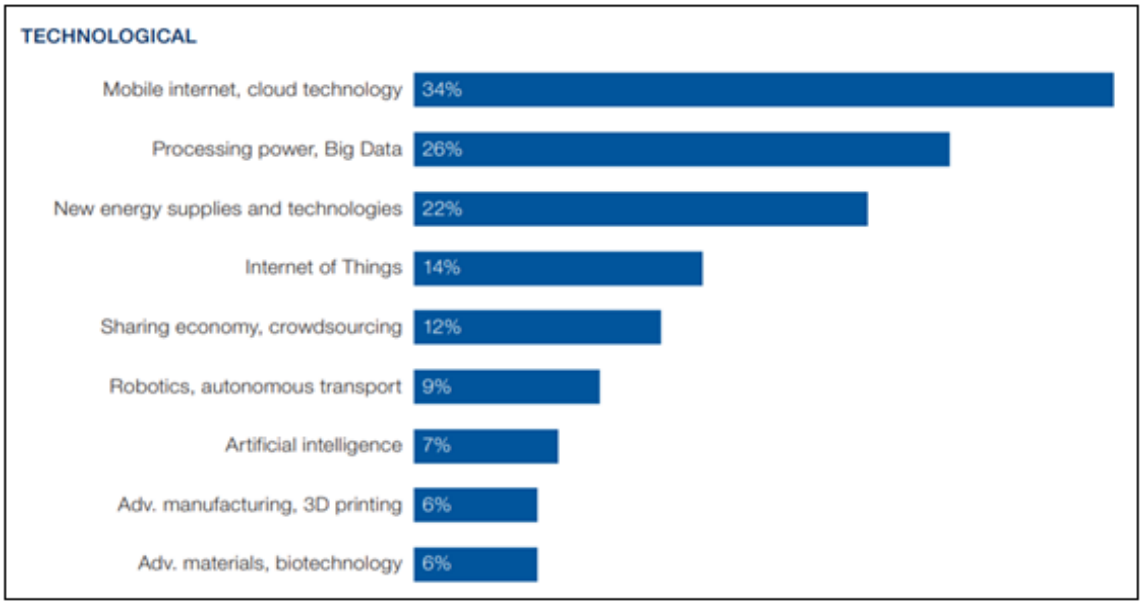


Figure 2.3: Technological drivers of current business models (Source: Schwab, 2016)

The World Economic Forum survey (2016) reports technological disruptions to be the major drivers of industrial change in the years leading up to 2020. The Figures 2.2 and 2.3 illustrated above, provide the list of the major industry drivers of change and disruptions to business models brought by the 4IR as identified by the senior executives in the survey, ranked according to the share of respondents who expected each trend to be among the top trends impacting their industry by the year 2020 (Schwab, 2016).

2.5 Social Entrepreneurship

Howard Bowen (1908 – 1989) wrote his seminal book 'Social Responsibilities of the Businessman', claiming that the obligations of the businessman are to pursue those policies, to make those decisions, or to follow those lines of action that are desirable in terms of the objectives and values of our society. As a result, the field concerning the role and responsibilities of business in society has grown significantly (Bowen, 2013).

The last three decades have also seen the rise of research across academics on social entrepreneurship (Choi, 2014). Numerous researchers have different opinions regarding how good social entrepreneurship is from a research topic point of view or if it is just a buzz word (Dacin, 2011). Hoogendoorn (2010) opinionated that the research focus of social entrepreneurship should focus towards empirical research rather than conceptual exploration. The existing perspectives and themes presented over the years should now provide a brief idea for the practical focus, from the point of skill development, instead of just conceptual focus (Hoogendoorn, 2010).

Academics and economists agree that social entrepreneurship promotes healthy competition in the economic environment, resulting in increased productivity and efficiency due to the focus on service value, as well as increased employment rates due to the focus on societal value (Porter, 2002). Further, according to Porter, Sachs, and McArthur (2002), most people support the notion that entrepreneurship is becoming a pivotal element in the well-being and development of communities and societies.

One of classical definitions of social entrepreneurship and the social entrepreneur is provided by Greg Dees (2011), who says that social entrepreneurs play the role of change agents in the social sector. They adopt a mission to create and sustain social value as well as recognise and relentlessly pursue new opportunities to serve that mission. These are ambitious individuals who engage in a process of continuous innovation, adaptation, and learning. They act boldly without being limited by resources currently at hand and exhibit a sense of accountability to constituencies, by providing services and products that are required in society.

Many organisations such as Impact Amplifier, OneWorld Health, UnLtd South Africa, and the Schwab Foundation for social entrepreneurship, have legitimised the field of social entrepreneurship through their successful endeavours (Peredo, 2006). Many such organisations across the world have made notable strides in poverty eradication and social upliftment (Shaw, 2007). From the concept of social entrepreneurship comes the characteristics of a social entrepreneur. An entrepreneur is a subset of a business owner (Dey, 2006).

An entrepreneur is an individual, who despite the risks of early adoption, initiates change and exploits in-progress change by identifying and seizing opportunities to alter the status quo. Entrepreneurs improve commercial markets, whereas social entrepreneurs improve social conditions (Wood, 1991).

Social entrepreneurs strive to create and spread social value through innovative means (Hoogendoorn, 2010). Such an entrepreneur is a mission-driven individual who uses a set of entrepreneurial behaviours to deliver a social value to the less privileged or for communities as a whole, all through an entrepreneurially oriented entity that is financially independent and self-sufficient, or also through public-private partnerships for long term sustainability. Corporates, if managed efficiently and ethically, can be powerful vehicles for growth and inclusive development. Swain (2014), on the other hand also ascertains that in many cases collaboration between different bodies, including public-private partnerships, is often the only answer to achieve economies of scale. However, such collaboration is not straightforward (Swain, 2014).

Social entrepreneurs seldom strive to gain profit. However titles such as Corporate Social Responsibility (CSR), Philanthropy and Social Activism are not part of the social entrepreneurship definition as they are exclusive to each other (Abu-Saifan, 2012). While philanthropist and individual characterisations of social activists are valued in society, they are not to be confused with social entrepreneurs (Battilana, 2006). Commercial and social entrepreneurs are of different types in practise. Social entrepreneurs, as the focus of this study entails, are divided into the three types mentioned below, based on the work done by a plethora of researchers. These types are similar in essence, however unique in definition (Hayek, 1945;Schumpeter, 1942; Kirzner, 1997):

- *Social Bricoleur*: Social bricoleurs outline entrepreneurship as a localised undertaking where the entrepreneur possesses the tacit knowledge to intervene at specific local situations in order to solve specific and episodic situations with limited resources (Austin, 2006). This type of social entrepreneurship is a result of first-hand experience and exposure to societal problems (Butt, 1992), and seeks to identify and solve local problems and maintain a local focus (Kirzner, 1997).

- *Social Constructionists*: Social constructionists identify gaps in the market and attempts to address them though jointly constructed shared understandings (Butt, 1992). They are more socially alert to such gaps and thereby find opportunities (Kirzner, 1997). Social constructionists have a wider market focus unlike Social Bricoleur (Butt, 1992). However, Social constructionists' solutions to local problems can also be leveraged to address problems in other wider contexts (Weerawardena, 2006).

- *Social Engineer*: Social engineers focus on centralised planning of changing the mechanisms of society in order to achieve large scale social impact (Zahra., 2009). Social engineers focus on broad-scale issues that are often understood and acknowledged by the society at large (Dixon, 2007). However, creative destruction can be seen in social engineers, who attempt to create social businesses to replace those solutions currently provided by the existing institutions (Schumpeter, 1942).

The idea of social entrepreneurship has also gained popularity in South Africa and the increasing embeddedness of this social phenomenon can be noticed in different fraternities as well (Steinman, 2010). An inclusive corporate sector lies firmly at the heart of a functioning society.

LifeCo UnLtd South Africa, on the other hand, recognises social entrepreneurs as "passionate people who are committed to deliver sustainable solutions to social challenges in South Africa".

The history of social entrepreneurship in South Africa, can actually be traced back to the Apartheid era, where civil societies and social activism emerged (Steinman, 2012). However, the last 20 years has seen the rise in popularity and developments with many emerging social ventures and implementation of new policies (Steinman, 2010).

Organisations have a key role to play in South Africa's transformation and development. To name a few, the Trade Association of the Southern African Natural Products Industry (Steinman, 2012) was established in 2001. The Centre for Social Entrepreneurship and the Social Economy (CSESE) by the University of Johannesburg was established in 2010. The Social Enterprise Academy Africa (SEAA) was established in 2012. These organisations were all developed with the aim of fostering the growth of the social sector (Littlewood & Holt, 2015).

According to Horwitz & Jain (2011), there are definite links between entrepreneurship development, employment, and economic growth. Research on small, medium, and micro-enterprises (SMMEs) and the education and skills development of 'survivalist' business entrepreneurs, shows that there is a positive relationship between educational and skills training of an entrepreneur and the propensity for that enterprise to create employment. Tertiary-educated adults have a greater potential to create jobs than those who have not completed high school.

The evidence from the Global Entrepreneurship Monitor (GEM) project is that the likelihood of such firms arising from survivalist entrepreneurial activity, or among entrepreneurs who have not at least completed secondary education, is low. The South

African schooling system is failing to provide most of its learners with the basic knowledge and skills needed to start a business. Education and training is therefore a key determinant of a country's entrepreneurial capacity and represents a concerning skills gap based on historical inequality in education, which has not yet been adequately addressed (Horwitz & Jain, 2011).

2.6 Skills Development

There are new models, services, and products that simultaneously meet social needs (Marolt, et al., 2015) and can be expressed by one or a combination of the following: law, regulation, behaviour, service, business model, perception, organisation, or technology (Abbott, 2014). Over the coming years, the 4IR will transform the way we live and work, with newer technologies as well as with the need for skilled people and advanced processes. Cassoojee (2015) and Kemp (2016) identified that technology is about risk, but risks that can reap fruits. Human Resources practitioners stress on the impact of advanced robotics and autonomous transport, artificial intelligence and machine learning, advanced materials, biotechnology and genomics on employment and skills (Cassoojee, 2015; Kemp, 2016).

These disruptive changes to business models across the world will have a significant impact on the economy and the education system of a society. It is critical for businesses, governments and individuals to build an efficient future workforce as well as to build the current workforce through talent strategies, to successfully manage this transition and alleviate undesirable outcomes, whether in the case of job creation, labour productivity or even widening the skills gaps in the system (Schwab, 2016).

2.7 Professional Skills in South Africa

Socio-economic forces, increasing technological trends and disruptions to the operating models of businesses, can quickly change the dynamics of the global demographics and employment landscape (Schwab, 2016). South Africa's last place ranking in a cooperative labour employee relations survey shows that the country has the most militant working class in the world; and the relationship between workers and their bosses is ranked the worst out of all the countries surveyed.

The future workforce in South Africa needs to make a shift in the skill sets to keep pace with these developments (Venter, 2016). Without formulating actions today to urgently build a workforce with future proof skills and manage the near-term transition, governments and businesses will have to cope with ever-growing unemployment and inequality, and with a shrinking consumer base respectively.

Schwulst (2016) identifies the upsurge of innovation hubs in the current era as a support system to the technological innovations and targeted towards incubating and supporting bold new ideas (Schwulst, 2016).

There is also an increase in number of companies exploring new ways of upskilling staff that extend beyond universities or institutes of technology. Newer skilled, younger professionals are replacing the senior public sector technology workers, who leave the agencies. This changing scenario forces technology leaders to reconsider their approach to talent management. Public sector leaders are also turning their attention to transformative technologies and expect the workforce to deliver value from (White, 2015).

The education system has proven unequal to the task of recognising individual talent and the ability to necessitate new knowledge that empowers individuals with valuable assets moving forward (Rossi, 2015). Redesigning schools and the retraining of teachers who will need to drive the use of technologies in institutions of learning, to give quality education, is required to fill gaps and create jobs in the emerging market of South Africa (Kemp, 2016). The African philosophy of education and the enactment of Ubuntu justice such as in the case of Educational Ubuntu, is possible through practical coaching and skill training, keeping in mind the aspect of teaching for change elaborated. Such andragogical or pedagogic encounters have the potential to stimulate critical, deliberate, reflective technology training and skill development amongst young professionals and university graduates (Waghid, et al., 2018).

According to Waghid (2013), much of the literature on the African philosophy of education juxtaposes two philosophical strands as mutually exclusive entities: traditional ethno-philosophy on the one hand, and 'scientific' African philosophy on the other.

While traditional ethno-philosophy is associated with the cultural artefacts, narratives, folklore and music of Africa's people, 'scientific' African philosophy is primarily concerned with the explanations, interpretations and justifications of African thought and practice along the lines of critical and transformative reasoning. These two alternative strands of African philosophy invariably impact understandings of education in different ways: education constituted by cultural action is perceived to be mutually independent from education constituted by reasoned action (Waghid, 2013).

2.8 Need for Training Hubs in South Africa

The 4IR is a new rulebook referring to technological forces and innovations that presage to disrupt and transform lives in South Africa in unthinkable, but potentially positive ways, blurring the lines between the digital, physical, and biological spheres. One area of opportunity is in the production of autonomous or semiautonomous machines being a significant market share capturing option. Progress across the world has reached a space where highly skilled jobs are as susceptible to replacement by automation as ones which do not require much education or training. In many government domains, ranging from defence and intelligence, to public safety, agriculture, environmental protection, and public transportation, automation and related skills development has become an area of focus in recent times (White, 2016).

As identified by Herrington & Kew (2018) from Global Entrepreneurship Monitor (GEM), the economic and social costs of unemployment and widespread low-quality jobs, is of considerable concern, especially amongst the youth of South Africa. Unemployment within the youth population is estimated to be over 40% and, in some areas, as high as 80%.

This means that some young South Africans may never experience employment during their lifetime, which represents a huge potential waste of human resources and talent. The poor education system is the primary reason for this, as the South African school system does not prepare young people adequately for the realities of the labour market (Herrington & Kew, 2018).

Kuseni Dlamini (2016) avers that in order to change this scenario, South Africa requires a well-co-ordinated effort by the government, together with businesses, as well as labour and civil society (Dlamini, 2016). Most importantly, it needs both political leaders and corporate heads who understand what the 4IR means to workers, who are abreast with the developments, who can envisage what opportunities it holds as well as what will be needed in terms of skills knowledge and attitude to capitalise on it. These leaders must show the way, must motivate and coach, and must invite everybody along so that it's a win-win situation for everybody involved (Dlamini, 2016).

Additionally, Naude (2017) mentions that in the past, African entrepreneurs were involved in industrial policy making, whether it's on state-owned enterprises policies, foreign investment policies, or even trade policies. As a result, even though most African entrepreneurs today are self-employed workers, limiting to certain services and trade sectors that could have had the potential to expand, the existing literature and past experiences stress on dimensions of entrepreneurship that can change the above challenges (Naudé, 2017).

Kolb (2014) proposed an experimental learning cycle for effective education, and argued that as a person matures, the motivation to learn is internal. This creates the feeling of self-satisfaction, enjoyment and confidence in having control and choice over what is learnt and achievement of self-actualisation (Kolb, 2014). Both Knowles' Theory of Andragogy and Kolb's Experiential Theory, advocate the principles of constructivism, which will be considered in this research study as well, since they are relevant to this research context whether considered from the philosophy of andragogy or pedagogy point of view.

Considering the dangers of regulatory and government capture, and even more serious forms of destructive entrepreneurship, Hausmann and Rodrik (2003) proposed a flexible industrial policy for entrepreneurs that facilitates cost discovery function and encourages experimentation which is lacked in African industrial policies (Ricardo Hausmann, 2003).

Nelson and Pack (1999) highlighted another dimension of entrepreneur ability that requires entrepreneurs to be Jacks-of-all-trades, with necessary skills sets in both

knowledge and experience (Richard Nelson, 1999). Vocational education, internships, apprenticeships, on-the-job-training and lifelong learning, should be the included aspects in Africa for this dimension. The 4IR should account for entrepreneurial innovation in industry as a result of fast speed of change. Another dimension should focus on increasing the demand for educated labour. This can result in an overall competency improvement and skilled human capital in South Africa. The skilled labour capital can be rapidly expanded only if the country's entrepreneurial ability is high. If not, the returns to financial capital and human capital will be low (Jolanda Hessels, 2014).

2.9 Key Research Variables

To be able to answer the research questions, a number of variables were identified. For people to start studying 4IR skills, awareness of 4IR is important. This makes awareness of 4IR an important variable for this study. The skills that are lacking and required by entrepreneurs and organisations, forms an integral part of the variables that form this study (Link, 2009). Some of these skills include 4IR skills which form part of the variables that are going to be analysed in this research. 4IR skills in the disadvantaged communities could be used to get jobs and to alleviate poverty (Deloitte, 2018). Levels of job creation and poverty alleviation are useful variables in this study.

2.10 Theories and frameworks to inform the study

2.10.1. Theory of Andragogy

(Knowles 2014) This theory delves into prior experience and how adult learners bring in their experiences to guide them along the journey of learning. According to Knowles, adult learners differ from children in the following six ways:

1. Need for Knowledge: Adults need to know "why" they should learn.
2. Motivation: Adults need to know what is in it for them, which then serves as a powerful internal motivation tool.
3. Willingness: Relevance of the knowledge and value drives willingness. Adults need to know "how" learning will help better their lives.

4. Foundation or Experience: Experiences form the foundation for any learning. Adults analyse, rationalise, synthesize, and develop new ideas or tweak old ones through the filter of their experiences.
5. Self-Direction: Adults are self-directed individuals who want to take charge of the learning journey. The feeling of being in control is important to them.
6. Orientation to Learning: Adults learn best and gain confidence when they "do" things, where talk-oriented learning can align with realities and they can exercise their problem-solving ability.

2.10.2. Theory of Transformational Learning

(Mezirow 2011) This theory discusses aspects on how to create 'aha' moments or experiences. Developed by Jack Mezirow in 1990s, the theory is rooted in the belief that learning takes place when the new meaning is imparted to an earlier experience. 'Aha' moments are flashes of inspiration that help see reality in new ways, nuggets of wisdom that have radically changed our mind-sets and created deep insights that changed long-held beliefs and conventions. These are transformative experiences that shift our consciousness.

Such experiences rouse the mind, stir powerful emotions, and leave lasting impressions. Many such events trigger radical changes in thoughts, perspectives, attitudes, and behavioural patterns in the following three stages of learning:

1. Identification of a Dilemma or a Crisis: The realisation that one had all along been holding onto the wrong beliefs or that one does not know what they should have known is often a trigger to dig in and unearth information or review their mind-sets and thought patterns.
2. Establishment of Personal Relevance: This is the personal, professional, social context or answer to the eternal "what's-in-it-for-me" question that inspires people and drives learning.
3. Critical Thinking: Learners are sensible, rational people with minds of their own and it is important to create opportunities for critical reflection. Encouraging learners to re-exam their beliefs and attitudes helps sort through, shed or tweak existing feelings and thoughts.

2.10.3. Theory of Experiential Learning

(Kolb 2014) This theory is about the importance of tying the reality to create meaning. Human beings are shaped by their experiences. For adults, no amount of textbook learning can take the place of the knowledge, clarity, and wisdom that come from experience.

David A. Kolb developed the Experiential Learning Theory in the 1900s, stating that the essence of learning is making sense of experiences. They learn best when they are directly involved with experiencing the learning instead of memorising numbers and definitions from books. This cyclical nature of experiential learning is explained in the following four stages:

1. Concrete Experience (CE): Adults learn best when the learning experience goes beyond the chalk-and-talk routine. Kinaesthetic learning or learning by encouraging physical actions or simulations and learning that evokes strong emotional responses, revealing cause-effect relationships, creating powerful experiences that are not forgotten easily.
2. Reflective Observations (RO): Adults need to engage with and reflect on their experiences to glean insights and acquire knowledge. So, it is critical to not only create opportunities for experience-based learning, but also provide time and space to encourage reflection.
3. Abstract Conceptualization (AC): Success of learning and critical thinking lies in the learner being able to decode abstract concepts from their reflections, generalise these ideas, and realise the relevance to their reality.
4. Active Experimentation (AE): Role-playing activities, internships, and other hands-on tasks let learners apply the learning and thus truly "learn by doing", leading to concrete experiences.

2.10.4 Sustainable Industry 4.0 Framework

There are many synonyms for Industry 4.0 but the one that matters for the purpose of this research is, Internet of Things (Gawankar, 2018). Manufacturing is one of the largest industries in South Africa and one of the skills that are scarce to this industry is IoT (Dlamini, 2017). Giving disadvantaged communities the leading edge, by providing skills development, that is required by manufacturing organisations, would provide world class manufacturing projects and promote investment and attract international investment (Heuwel, 2020). This framework is useful in achieving the objective of addressing the issue of 4IR skills shortage and ultimately poverty alleviation (Mofolo, 2012).

2.9 Conclusion

This literature review covers in-depth discussions around the 4IR, how it influences South Africa as a whole, including its impact on job creation and societal sustainability. Social and economic structures, such as public-private partnerships based Training Hubs can be a major driving force in building and encouraging a society to be equipped with the readiness to face the challenges in the current industrial era. This further leads to a chain of improvements in the economies of scale of the country, leading to the overall development of all sectors in the nation. Social entrepreneurs are essentially entrepreneurs who develop business models based on the notion of creating social value.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Methodology refers to the logistics of the study and is defined by Creswell (2017), as a particular procedure or set of procedures. In line with the definition, the research methodology in this study relates to the body of methods used in data collection, the comparative study, and the critique of the individual methods that are used in a field of inquiry (Creswell, 2017).

This chapter explains the manner in which the researcher navigated through the research methodology, using the three-step approach of posing the question, collecting data to answer the question, and analysing the data (Denscombe, 2014). This chapter provides context to the chosen methodology and discusses specific procedures or techniques used to identify, select, process, and analyse information regarding the research on skill development gaps in South Africa. The discussion starts with the research paradigm and design, the research population, sampling techniques and the designated sample itself. This leads to data analysis related aspects, concluding with the methodological limitation, validity and reliability and ethical considerations.

3.2 Research Paradigm

Research can be defined as an activity of systematic enquiry that seeks new or existing answers to a problem (Walliman, 2011). This study was exploratory and inductive in nature. Exploratory reveals the meaning behind participants' impositions on social phenomena (Creswell, 2017). It is a key tool in understanding the 'why' for research areas that are yet to be clearly defined and established (Saunders, 2012). Explonatory research also gives an understanding of the subject matter by employing descriptive research techniques of describing precisely what the researcher sees and the characteristics of the problem. Additionally, explonatory research further gives an understanding on why the characteristics described are occurring, cites any similarities and patterns related, while also allowing the researcher to make predictions for the future based on this understanding.

A study conducted by Alqam and Saqib (2019) on the impact of the 4IR on SMEs operating in Oman was also exploratory in nature. The researchers were able to uncover hidden themes and perceptions from business owners in the area and presented findings that could inform policy makers on the right changes to make. Likewise, this research sought to uncover hidden themes circling the 4IR and the effects of the proposed training hub as perceived by previously disadvantaged communities.

3.3 Research Strategy

Given that the design of this research is exploratory, the chosen research strategy is qualitative. The objective of the qualitative methodology is to produce in-depth and illustrative information in order to understand the various dimensions of the problem under analysis and therefore improve the quality of recommendations made (Rahman, 2017). Qualitative research is therefore centred around the aspects of reality that cannot be quantified, focusing on the understanding and explanation of the dynamics of social relations (Eyisi, 2016).

This method will often involve the views or internal thoughts and perceptions of participants, and may include data generated using interviews and focus groups. A study conducted by Anito and Morales (2019) that assessed the effects of the 4IR on the educational landscape, utilised a qualitative approach to uncover the ground climate of the education sector as a result of this revolution. The authors were able to uncover hidden themes and answers to complex questions raised by the new reality brought by this advanced technology. Likewise, this study seeks to understand the intricate details of the current perceptions around the 4IR and how training hubs would mitigate the detrimental skills gap. A qualitative study was therefore be fitting for this task.

3.4 Research Design

As defined by Burns and Grove (2003); a research design is "a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings". Bryman (2012) lists five generic research designs, namely: cross-sectional, longitudinal, case study, comparative and experimental. This research will utilise the cross-sectional research design. This was the best choice as it is flexible and allows the

researcher to gather inputs through organic open ended questions where needed. These will birth "descriptions" to formulate themes from the participant's experience. Similar to a study conducted by Ślusarczyk, et al. (2019) that examined the future for the textile industry in the wake of the 4IR, the researcher also employed ths design to answer the research questions of this study.

3.5 Population

The research population is defined as a collection of objects or individuals that have common attributes (Casson, 2005). The population of this study is employers and job seekers in South Africa. The population is a collection of objects or individuals to the research is about. This allows the researcher to infer specific information regarding the analysed data to these individuals or participants. Further, the outcomes of the research may be generalised to this population at large (Lavrakas, 2008).

3.6 Sample

To conduct the research and ensure that the selected sample was credible, the purposeful sampling strategy was used. Maximum variation sampling involves selecting key demographic variables that are likely to have an impact on participants' view of the research topic (Patton 2002). Purposive sampling is one of the most cost and time-effective methods available for limited primary data and is effective in exploring a research topic (Neuman 2020). Patton (2002) describes purposive sampling as a method of sampling where the researcher deliberately chooses who to include in the study based on their ability to provide the necessary data. In this study, students who are either in their final year of education or have recently joined work was majorly selected for this purpose, along with few experienced corporate managers or entrepreneurs who have had experience in recruiting 4IR skilled individuals. Purposive sampling was also used by Nel (2019), when conducting a study on the challenges faced by business communications in English via email in South Africa. The researcher sought out specific persons to be a part of his study, carefully selecting those who would have valuable insight and experience to draw from as they answered the questions.

A sample of ten participants comprised of corporate managers, university graduates and young professionals made up the chosen sample. The criteria used to identify corporate managers and entrepreneurs (age group 31 – 40 yr. old) was that they had to be business owners or corporate managers with a minimum of 2 years' experience at management and decision-making positions in the ICT industry. The criteria used to identify young professionals and university graduates (age group 20 – 30 yr. old) was that they had to be within the age group, starting their ICT careers in newer technologies of the 4IR era or recent university graduates.

3.7 Research Instrument

Research instruments are tools that aid in the assessment or evaluation of the perception of participants. Such can be through interviews designed to obtain data on a topic of interest from research subjects (Wilkinson & Birmingham, 2003). An interview schedule was formulated. Open ended interviews questions were used in the interview schedule. The researcher would be looking for "descriptions" to formulate data from the experiences of the participants (Vagle 2018).

3.8 Data Collection

Interviews were done with each participant and the information collected was recorded and stored on a password protected computers. This was appropriate as it allowed the participants to fully express themselves with the flexibility of time and place (Given, 2008). The interview's open ended nature directed the participants to comfortably articulate their ideas with flexibility and ease. Upon completion, the researcher stored all transcribed interviews in backed up locations for security purposes.

3.9 Data Analysis

The study was qualitative with limited nine open ended interview questions. The well-known models of reasoning, commonly referred to as induction, deduction, and abduction, illustrate the basic thinking behind analysis and provide direction on using data and help understand the phenomenon under study (Bloomberg and Volpe 2015).

Data received in the form of inputs from the respondents were chunked and analysed thematically.

3.10 Methodological Limitations

This research was to study the need of training hubs across Gauteng, limited to ICT skills such as of Robotics, Artificial Intelligence (AI) and further Machine Learning (ML) and Internet of Things (IoT). Participants shared their subjective perceptions and a degree of bias can be expected to be present in the findings. Locations in the Gauteng province that were chosen for this study were limited to only three, namely - Soweto, Sharpeville and Gomora. It is difficult to infer these findings to the rest of South Africa.

3.11 Validity and Reliability

In qualitative research, validity and reliability cannot be established using statistical measures (Noble, 2015). Instead they are established by ensuring the trustworthiness, credibility and quality of the data (Golafshani, 2003). Reliability aspect in this qualitative research study refers to the consistency of measurements of a concept, using an identical measurement procedure and the replicability of the findings.

The validity aspect of a research refers to the integrity or accuracy of the study. Subdivided into three: measurement validity, an extent to which a measure really reflects the corresponding concept; internal validity, which serves to ensure that assumed causal connections between independent and dependent variables are actually responsible for the observed phenomena; and the external validity, which expresses the generalizability of the findings beyond the specific research context (Bryman, 2016).

The researcher made sure that the sample was carefully selected as to represent the population and thus yielded valid results. Beyond the researcher's interpretation, the participants' own language and perspectives were retained. Content validity and internal consistency was ensured by guaranteeing that the research instruments were relevant and even rewording the questions differently when needed. Further, the interview schedule was aligned to the needs of the research.

3.12 Ethical Considerations

The study was conducted within the ethical standards of the Wits Business School. , An ethics application was submitted the Wits Business School Ethics Committee. The Ethics Committee issued an ethics clearance certificate for this study. No individual names or personal details were included in the research report for protection of the privacy of the interviewees and all notes were destroyed at the end of the project. Participation in this research was voluntary. Participants received a detailed explanation of the research as they were being recruited for this research. Participants were allowed to express themselves freely. It was important to pay attention to the conversation, making conclusions and assessments based on reliable evidence and not personal biases (Edwards & Holland, 2013). Every effort was made to convey the participants' responses as accurately as possible. Confidentiality of the participants was maintained. No monetary offers or enticements were made to encourage participation.

3.13 Conclusion

This chapter discussed the research design and sampling techniques used in this qualitative study. The study follows a cross-sectional design and employs an interview schedule as the data collection instrument. Content validity and internal consistency was guaranteed by ensuring that the research instruments were relevant and even rewording the questions differently when needed. For this research, the focus was not on the participants or their identities, but on the insightful inputs they provided to come up with some intelligible outcome during the research study.

CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents the findings of this research. It articulates the research results in terms of the theoretical themes and emergent themes. The phenomenology approach was followed in the data collection, and questions were specific to the key components of the skill needs in 4IR and the desired educational outcomes. The outcomes of the research were analysed and coded from the interview sessions and recorded to arrive at the emerging key themes discussed in the sections to follow.

4.2 Respondents Participation

The interview was conducted with 10 members of the chosen sample of corporate managers, entrepreneurs, young professionals, and university graduates across Johannesburg, Pretoria, and the Vaal area within Gauteng. A total of three managers (CM), two entrepreneurs (ER), three graduates (UG) and two young professionals (YP) gave their consent to participate in this research study.

Participant	**CM, ER, YP or UG**	**YP/UG or CM/ER**
1	CM	CM/ER
2	UG	YP/UG
3	YP	YP/UG
4	CM	CM/ER
5	UG	YP/UG
6	CM	CM/ER
7	ER	CM/ER
8	UG	YP/UG
9	ER	CM/ER
10	YP	YP/UG

4.3 Demographics

The gender distribution of the ten respondents was seven males and three females. This feat is another indication of the disproportionate gender participation in the ICT sector, as the sector is currently dominated by more males. Keeping in mind the ethical considerations, no personal details were disclosed in this research study and all records and transcripts of this study were destroyed after the completion of this research. To keep the respondents' anonymity, they were assigned code names from Participant 1 to Participant 10.

4.4 Presentation of the results

The following four subsections hence present the results from the interview questions through reasoning and deep analysis of the answers from respondents of this research.

4.4.1 Graduates 4IR Awareness and 4IR Skills required by Industry

4.4.1.1. Results of Interview Questions 1-3: asked to YP/UG

The first three questions from the interview sought to open the discussion on the 4IR era and the skills needed for this era. Although the use of the term 4IR or Fourth Industrial Revolution has been in the corporate and academic circles for the last two decades, many respondents have mediocre clarity on this aspect.

When asked about the 4IR, *Participant 2* reported to be '*excited for the future'*, while not expressing any further sentiments on the revolution. Likewise, *Participants 3* and *5* also noted surface level responses *'Extremely important'*, and '4IR is the *digital age'* respectively.

Further, it is very important to make the youth aware of the importance and seriousness with which the rest of the world is moving towards technological advancements and especially the development towards the 5IR. When asked what they considered to be the most important 4IR skills needed in this present age, respondents appeared to be aware of the ICT and technological jargon of the revolution.

4.4.1.2. Results of Interview Questions 1, 4: asked to CM/ER

Participants 1, 4 and *6* all noted Artificial Intelligence to be the most important, whilst *Participants 7* and *9* mentioned network learning, problem solving and data mining. Other skills that came up included business analysis, machine learning, IoT and robotics. The participants were also quizzed on their perception of the competition within the ICT field. They all most reported is as very high. *Participant 7* describing it as '*a difficult field to make a mark in*'.

4.4.2. Upskilling Communities with 4IR Skills

4.4.2.1. Results of Interview Questions 4-5: asked to YP/UG

Most of the respondents mentioned Artificial Intelligence, Machine Learning, Robotics, IoT and Data driven technologies as their interest, as well as areas with limited, skills during the interview. Interestingly, some participants also mentioned that they are *"Lacking in Soft Skills",* a problem that requires a solution apart from *"Corporate Experience", "Work Experience", "Practical Skills not up to the mark",* and *"Practical Knowledge"*. Since the timing during which these interviews were conducted falls during the month of January and February, most of the student respondents were in the transition from undergraduate level to graduate level to postgraduate level in that order. As it was a targeted interview, many respondents did mention Computer Science as the area of focus, however, not yet their forte as they lack confidence in practically using the knowledge gained from university curriculum.

Even though South Africa has some of the top universities of the world and these institutions give their best to train and provide continuous ways to upskill learners, it was understood during the inception of this research that there is the *'practical'* aspect that was missing in most of the university graduates due to self-paced needs and time constraints. Also, since corporates looked for *'experienced'* candidates, it was evident that skill development hubs could play a major role in changing the scenario or the corporate job world.

4.4.2.2. Results of Interview Questions 4-5 asked to CM/ER

Since this research uses thematic analysis to articulate the findings and reporting of the data gathered, questions four and five encourage the participants to share insights into their skills and education or the lack of. While two of the corporate managers and entrepreneurs had a team of ICT professionals with a minimum of grade 12 education, one had highly skilled professionals in their team. The young professionals and university graduates were either undergraduate, graduate, or postgraduate level and had the potential to fill the gaps of the ICT organisations and country at large. This would come through the proposed training hubs.

Questions four and five related to the skills expected in this era and the noticeable lack of skills amongst respondents or related expectations. The respondents agreed that organizational success through transformation is based on three milestones – *managerial capacity, innovative technology, and competent employee*s. Lack of skill causes unwanted stress for both the individual as well as the organisation (Atiku 2019).

4.4.3 Roles of hubs to develop 4IR Skills in South Africa

4.4.3.1. Results of Interview Questions 6-8 asked to YP/UG

Questions six to eight helped identify and express the opinions of participants on 4IR skill development as well as acts as the substantial facet of this research. The answers to these questions helped explore whether or not this sample of corporate managers and entrepreneurs and young professionals and university graduates were interested in the existence of skill development hubs providing inclusive training.

Nevertheless, *Participant 3* felt they had the required skills set as well as were practically competent in their desired field and so were not keen on the skill development hubs. The other participants, however, all indicated a need for either refresher or new material courses altogether. *Participant 6* noted that, '*this course would truly help me stand out and set myself apart from my peers.'*

Almost one third of the participants shared the view that training would add value but if it is *'free'* or *'funded'*. This is not much of a deviation from the expected pattern as the participants come from disadvantages communities. On a personal level, it is important for them to seek free training that could help upskill them where needed.

Reflecting on this aspect, there seems to be the mental motivation to join practical inclusive training. However, there is a lack of monetary payment motivation. This is what leads to the question of how young professionals would fund their skills development needs unless there is public-private partnership of sponsors. Even though educational institutions do have their due diligence in imparting knowledge to students, there is still a need for professional expert skills in many areas of ICT which talks to the requirement for skill development hubs.
Most respondents identified with the need for training over and above their job experience and education gained though institutions. Questions 6, 7 and 8 along with the auxiliary question 9 related to this aspect. Government and Universities can be conceptualised as deep authoritative aspects of social structure as well as norms of behaviour and conventions (Akinyoade, Dietz and Uche 2017).

Alternative funding in the form of subsidies and government spending policies would aid in encouraging the development of skills amongst youth especially from the disadvantaged communities. *Participant 6* also noted that the *'policy makers should determine the skill needs and that interventions such as starting low cost training hubs through public-private partnerships could benefit the nation.'*

4.4.3.2. Results of Interview Questions 3 asked to CM/ER

Having made the significant investment of time and money, it is understood that students expect an institutional place with a service mindset and providing just the right amount of practical training, not pushing them to worry about how marks would impact their job opportunities but how the inclusive training could enhance their future.

When asked which of these skills they would like to be trained on, *Participants 1* and *4* quickly reverted, '*Data analytics'* and '*Robotics'* respectively. Other fields to be noted by

the participants include Machine Learning as a subset of Artificial Intelligence, IoT and algorithms. Few participants did not have any specific course agenda in mind to get trained on but did mention *"As per the job"* and *"Whatever the job demands"* as the set of work based skills they expect to be trained on. This also certifies the previous point on public-private partnership, where corporates could utilise these cost effective skill development hubs to train and improve the performance of their employees.

4.5 Conclusion

The focus of this chapter was to document the way the results were presented. This chapter started with the management and analysis of raw data from the inputs provided by respondents. The information was presented thematically. The analysis of the results was aided by the arrangement of data into more understandable sets of themes.

CHAPTER 5: PROPOSED SOCIAL ENTREPRENUERSHIP PROJECT

5.1 Discussion of Research Findings

Apart from briefly studying the skill gaps in South Africa, this social entrepreneurship project is to encourage companies to employ disadvantaged individuals and the skill development hubs will do the training to equip them with the required practical knowledge. The research started with an understanding of adult learning and related theoretical frameworks with Theory of Andragogy being the first to consider. It is important for organisations to understand if learning leads to the required change. This leads to the Theory of Transformational Learning which discusses the perspectives of creating experiences or flashes of inspiration that help see reality in new ways.

Learning is best retained through experiences which seem to be an important trait for learning any new skill. Theory of Experiential Learning advocates that human beings are shaped by their experiences. For adults, no amount of textbook learning can take the place of the knowledge, clarity, and wisdom that comes from experience. People learn best when they are directly involved with experiencing the learning instead of memorizing numbers and definitions from books. This supports the needs for skill development hub to foster practical skills in individuals. Further, to elaborate on this aspect, the following sub sections help relate the thematic findings to the research questions.

5.2 Young professional awareness of 4IR skills required by business

The first research question of the study was to assess the awareness of the 4IR among the young professionals. Although many of the respondents seemed aware of the jargon surrounding the 4IR, much of their knowledge seemed surface level and lacked any real depth. These findings were consistent with a study conducted by Kurt (2019), who posited that the full effect of the 4IR would be worst felt by the marginalized sectors of

society: women, the elderly, the poor and disadvantaged youth. This effect, Kurt posed, was mostly because these groups were the least informed on the evolving world and would be left behind in ignorance, as the world of work transforms.

The findings do suggest that it is important to make young professionals and university graduates aware of the 4IR requirements, particularly those of disadvantaged communities as they do not have any other prevalent sources of information and education. The hubs, when erected at the suggested locations, will be the bridge between the needed knowledge and awareness, and the community that it needs it most. It is imperative for the youth to continuously upskill themselves with latest technology knowledge if they are to cater to corporate requirements and deem themselves valuable in the world of work.

5.3 The 4IR skills required by corporate

When the corporate managers and entrepreneurs were asked which 4IR skills they perceived to be the most sought after by corporates, many of them cited Artificial Intelligence, Robotics, Machine Learning, IoT and Data related technologies. This indicates that, the corporate managers and entrepreneurs are aware of the jargon that relates to the fourth industrial revolution even if they are not particularly skilled in the area.

The question that arises is why the gap between them knowing of the skills and having the skills exists. The research uncovered financing as one of the major bottleneck. This finding is consistent with reports released by both Deloitte (2019) and Mail & Guardian (2019). It states that youth are in great need of assistance to get upskilled from both the big corporations and government. Collaborations between able and willing parties would bridge the current skills gap. Collaborations between the government and big corporations through the funding of social initiatives like the training hub proposed, would provide youths the required access to training in 4IR.

5.4 The initiatives that can encourage the residents of disadvantaged communities to upskill themselves with 4IR skills.

When asked what they believed would encourage the up skilling of residents in the needed areas, most of the respondents believed that the proposed skills development hub would be beneficial to achieve this purpose. The few who disagreed were those who already possessed what they believed to be the necessary 4IR needed skills. The lack of skills can hinder the performance of any organisations and companies do not take risks by recruiting under skilled individuals. This leads to more unemployment in the country but could be alleviated through training hubs providing practical training to job seekers and the much needed confidence in the job world.

Many respondents were seeking a sustainable solution to fill their skill gaps and a low cost. Training Hubs could provide excellence in skill development and training. Learners need a cradle of knowledge to depend on, helping and preparing learners to face the technology demands of the corporate world. This proves that there is a need for social innovation, a relevant institutional champion, and a reliable source of entrepreneurial confidence in South Africa.

It is important to have a suitable small enterprises model delivering education such as this training hubs initiative, but with the help of young job seekers or recent graduates who excelled in their courses or subjects. With minimal mentoring or monitoring, these motivated individuals can function efficiently as trainers and facilitators to deliver training in the form of low cost short and long term courses. Even with high attribution and turnover rate, the training hubs can act as a source of nominal income and employment for all involved if managed efficiently.

This is also a sustainable social entrepreneurship initiative where there is possibility of scaling up such hubs and pace the growth of such knowledge centres across the country organically. This can be done through the support of the government and its partners, which can form hybrid social enterprises to help support the operational costs of the hubs.

5.5 Public – Private Collaboration

The collaborative framework was developed from information obtained in the research and from theory. *Participant 1*, GM of an ICT company, shared his insight into how his organisation interacted with government and various SETAs, in addressing skills shortages. They developed a framework to interact with government and various SETAs. This was in response to the following interview question: Which set of skills skill do you want your team to improve on or get trained on? The participant said: "*The best way to ensure that adequate training is facilitated, is by designing a framework that would create efficiency and collaboration between the various stakeholders*". Morrars Sustainable Industry 4.0 Framework, with a few modifications and after aligning it to the South African context, could be used to ensure collaboration amongst the stakeholders. Figure 5.1 has been adopted from Morrars Sustainable Industry 4.0 Framework.

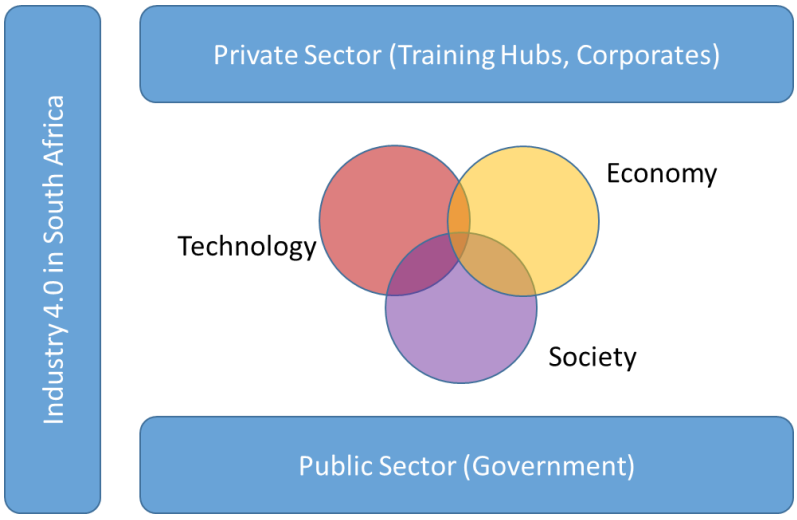


Figure 5.1 Collaborative Skill Development Framework
(Improvised from Morrar, 2017)

This framework shows the interaction between the private and public sectors, in order to bridge the gap with 4IR skills shortages and thereby creating jobs and alleviating poverty.

It is envisaged that this framework will assist in creating a coherent system and is intended to answer the research questions on the economic and skills development

strategy amongst the youth. This study also emphasises that learning and development at training hubs cannot solely be held accountable for the success of skills development interventions, as the prevalence of factors before and after the intervention are a reality including universities, government, and corporates.

Educational Ubuntu should be the foundation of education and the quality that includes the essential human virtues, compassion, and humanity, as well as a way or possibility of alleviating rapidly increasing unemployment in the fullness of time (Lefa, 2015)One of the most important challenges for government, policy makers, corporates and society is how to shift the culture of the industry and society to tackle the set of technology skill requirement associated with this new industrial era while ensuring a sustainable future (Petrillo, et al., 2019). A useful base to start with is using the sustainability concept in its totality, which exceeds the emphasis of meeting the requirements of present generations without compromising the ability of future generations. However, three key pillars – *economic*, *social*, and *technology* – form the bases and key drivers in providing sustainable solutions (Adam, 2006).

The critical success factor in such an inclusive approach is designing a creative platform where stakeholders both providing and receiving training, can work together and come up with a curriculum that suits the needs of both corporates and job seekers at large. This research also examined the future labour market, the skill needs and education realties of young people, including the challenges and opportunities they face as they build their careers and respond to the skills demands of current or prospective employers.

The fifth industrial revolution with AI Revolution and Quantum Computing combining humans and machines in the workplace, is on its way to capture the economies, societies, and technology aspects. Soon there will be a need for governments to play catch up with the pace. This research in a small way contributes to the sustainable decisions to be made to ready the nations for the future.

Further, this research provided an opportunity to interrogate whether young professionals felt the training and education opportunities they had were appropriate for their current work roles and career aspirations. These insights and perspectives from

young respondents and university graduates, informed and contributed towards vital discussions that strategic partners such as the government, industry, educators, and civil society, need to have in order to manage the transformative impact of the 4IR.

Training Hubs are successful when there is strong public-private engagement leading to organisational economies of scale (Byiers, 2016). Local structures such as Provincial and State Governments vary according to local context. The project is envisaged to start with the public-private partnership for the Gauteng province. After the successful implementation and development of training hubs in Gauteng, it could be extended to other provinces. In response to the interview questions, the consensus by the participants was that a public-private partnership could have a social impact and materialise as successful vehicles for the provision and management of 4IR ready skill training.

This partnership could act as enabling environments to build confidence amongst youth keeping in mind the national principles, governance structures, policies, and stakeholder relationships. This is possible if the training hubs as private sector can partner with the government in managing how the funds are spent for such inclusive trainings as well as enhance the quality and effectiveness of training hubs.

South African law defines a public private partnership as a contract between a public sector institution and a private party, in which the private party assumes a substantial financial, technical, and operational risk in the design, financing, building and operation of a project. They provide better groundwork solutions than an initiative that is wholly public or wholly private. Such partnerships result in faster project completion and reduced delays on initiatives by including measures of performance and therefore of profit

5.6 Management and Organisation

This section details on the Management and the proposed levels of the Organisation to implement such a social entrepreneurship project. Figure 5.2 below is a high level organogram of how such a social enterprise should be working as Training Hubs spread across different strategic locations.

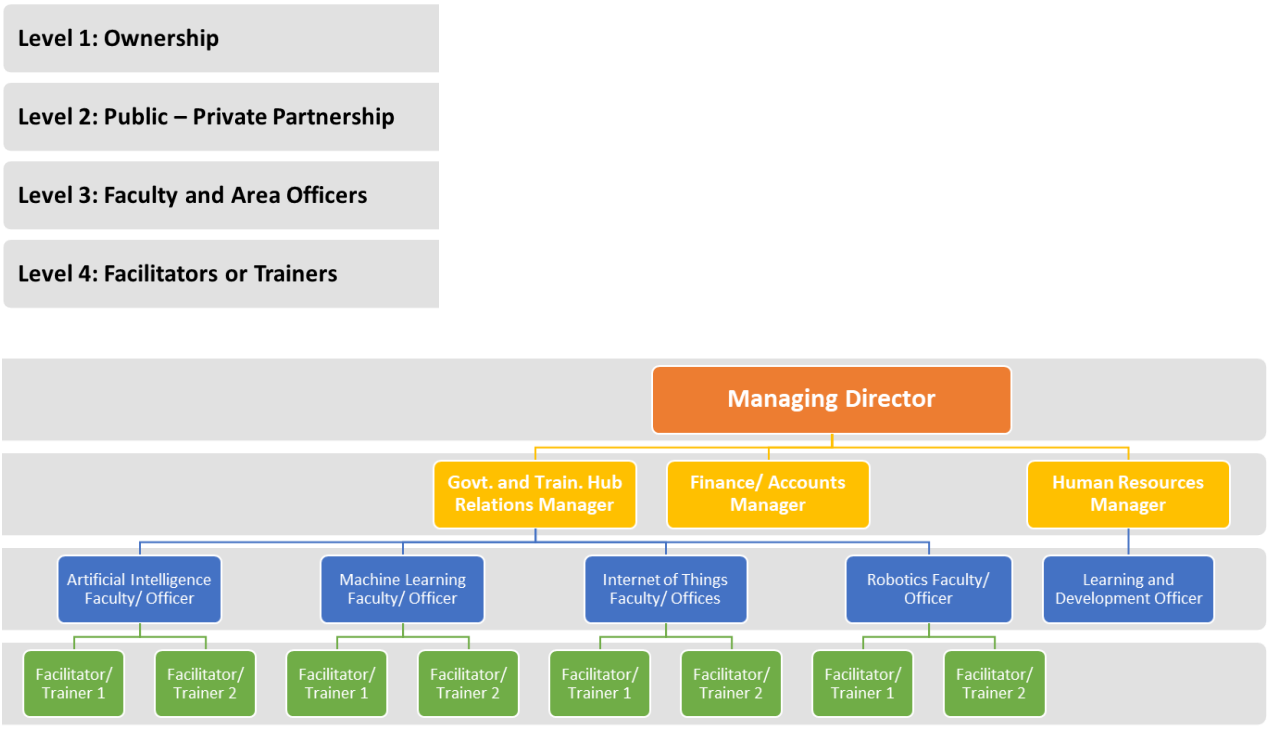


Figure 5.2 High Level Training Hub Organogram

There are four levels of the organogram with the Level 1 being the *Managing Director* directing and controlling the business operations. A Managing Director is responsible for giving strategic guidance and direction to the board to ensure the training hubs and the future network achieves its financial vision, mission, short term, and long term goals.

Level 2 include the important functions of any organisation. A *Relationship Manager* to manage all the stakeholder relationships, funding and developments needs between Government and the Training Hub acting as a coordination portal through which placement arrangement, funding and common educational governance including quality management can all be managed; a *Finance Manager* auditing and managing Accounts including Cash Flow, and Profit and Loss Statements; and a *Human Resources Manager* handling all HR Policies, Governance Structure, Labour Relations, and Learning and Development aspects form part of this hierarchy.

Level 3 would include all the *Faculty and Area Officers* who are ready to share their experience and skills in respective 4IR skillsets areas. These are key corporate people who could be providing centralised mentoring to Level 4 personnel based at different

locations. They are also people who understand the skill needs of the country and have a good understanding of the job market. Level 4 is the group of *Facilitators or Trainers* practical handling training, sharing ICT knowledge and providing individual focus until a learner gathers the expertise to be ready to face the real world satisfying the skill needs of the current era. With minimum number of personnel, the plan of establishing training hubs could be accomplished.

5.7 Social Entrepreneurship Deliverables

Education, Training, and Workforce Development is difficult to coordinate and organise as a general practise. However, the training hub could provide the opportunity to promote professional training and practical exposure based on the needs of the local corporate and community needs. In order to provide quality, efficiency and assurance, the key deliverables of this Social Entrepreneurship project include the following:

- To be the focal interface and coordinator of 4IR education and skill development training in South Africa for disadvantaged communities working as the go-to education provider to companies seeking such partnership.
- To improve South Africa's educational capacity and capability in 4IR skill-sets in primary and community setting through expansion of recognised multi-professional skill learning environments and professional ICT educators.
- To provide stakeholders, especially corporates, with educational support for workforce training and development, recognising disadvantaged individuals and providing scholastic services to their skill needs. This can include performance based contractual arrangements deemed mutually fit by the organisation and the training hub management.
- To significantly reduce educational costs and complexity for both training seekers and funding providers which may include the public and private sectors.
- To function as the single point of contact or support system for conducting workforce training need analysis and providing training to individuals and organisations at reasonable low costs not compromising on quality.

5.8 Financial Plan Proposed Financial Projections

Financials projections can be used as a yard stick to measure sustainability for any type of entrepreneurial launch. The Training Hub as a public-private partnership will focus on providing in-demand 4IR skills training and professional guidance to any learner irrespective of age or experience. The social enterprise will be fully black owned as well and hence will be more focussed on BBBEE compliance and subsiding the training costs for learners from disadvantaged communities.

There are different costs to be considered when determining the sustainability of an organisation but for the simplicity of this research, the Figure 5.3 below provides the high level annual costs. Based on the organogram illustrated in the previous section, these amounts are the estimated costs of running such a training hub in the first year of inception with the involvement and support of investors including Government.

Cost Center	Annual Cost		Percent of Total	Cumulative Percent
Infrastructure Costs	*R*	*50,000.00*	*3.11%*	*3.11%*
Computer Equipments	*R*	*200,000.00*	*12.45%*	*15.57%*
Office Lease	R	96,000.00	5.98%	21.54%
Salaries	R	1,200,000.00	74.72%	96.26%
Operational Costs	R	60,000.00	3.74%	100.00%
Total	**R**	**1,606,000.00**	**100.00%**	

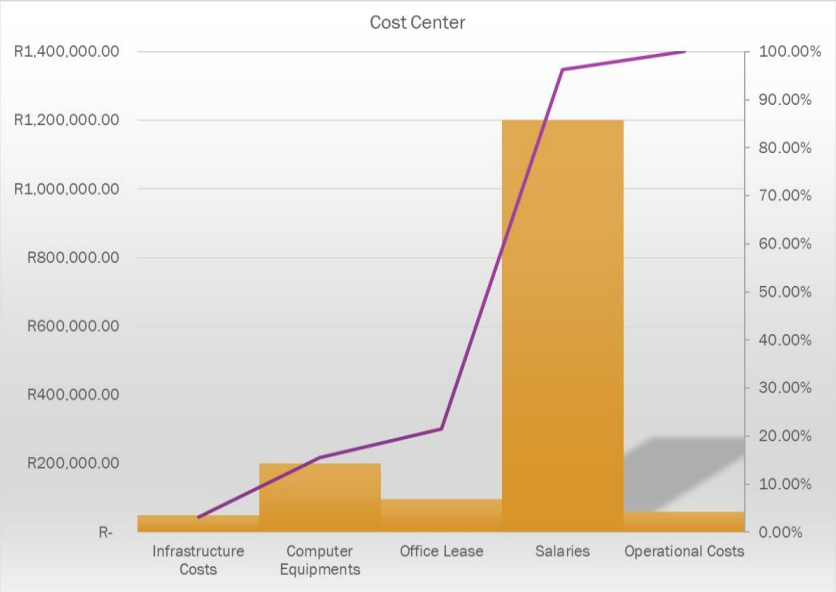


Figure 5.3 High Level Training Hub Cost Analysis

5.9 Funding Requirements and Sustainability

With regards to the funding requirements for the establishment and sustainability of skill development hubs the financial marketplace should consist of various avenues and tools. Funding could be secured through government subsidies, crowd funding, business angels etc. With regards to policies, financial institutions and governments should establish innovative agreements between each other, which allow for social as well as financial returns. Access to capital for social businesses can also be achieved through tools such as credit guarantees.

Providing sustainable finance for social enterprises is critical to their success (Mendell, 2010). As with commercial businesses, social businesses require capital at all stages of their life cycle. However, sourcing funds for social enterprises is challenging, as traditional banking systems do not understand the social enterprise business model and do not want to risk lending to these businesses (Nyssens, 2012). One option for initial capital injection will be through debt via commercial loans which may come at a cost that needs to be analysed to ensure that the cost of the debt does not erode the overall benefits of using this source of funding. A stable and fair financial marketplace is required for social businesses to be successful.

Another option is to use non-profit grants and donations to set up or acquire a for-profit entity. Caution will need to be taken with proper accounting and declaration of the use of the donated funds to relevant stakeholders. The organisation must refer to the new Companies Act for guidance on how funds may be utilised across the two legal forms. The executive management team must be set up to have a balance of both the social and commercial missions.

5.10 Conclusion

In this chapter, the various findings from the interviews were discussed and the emerging themes from these were detailed to arrive at the definite need for skill development amongst disadvantaged communities. The solution to this is a collaborative implementation of the skill development hubs initiative as a social entrepreneurship project and help in generating jobs as well as uplifting communities. The contributions made by social entrepreneurs in the ICT industry including the existence of SETA are instrumental in addressing the skill needs of the 4IR era. Not only are social entrepreneurs tackling issues relating to social inequalities they also create employment through such public-private interventions mentioned in this chapter. The critical success factor for an inclusive approach is designing a creative platform where stakeholders both providing and receiving training can work together and come up with a curriculum that suits the need of both corporates and job seekers at large if such initiatives are pursued.

Training Hubs are successful when there is strong public-private engagement, leading to organisational economies of scale. Education, Training, and Workforce Development is difficult to coordinate and organise as a general practise. Hence, the intent of this social entrepreneurship project is to establish training hubs that function as the single point of contact or support system for conducting and providing training to individuals and organisations at reasonable low costs not compromising on quality. This chapter also proposes a possible approach to providing a sustainable model for funding 4IR and the much needed transformation in the disadvantaged communities.

CHAPTER 6: SUMMARY, CONCLUSIONS, LIMITATIONS, RECOMMENDATIONS AND FUTURE RESEARCH

6.1 Introduction

This section summarises the research study with selective references already mentioned in the literature review and the journey from the initiation to the conclusion of findings forming the major gist of this chapter. Keeping in mind the importance of social entrepreneurship and the need for social entrepreneurs, the study started with an understanding of learning theories with the significance of adult education and concluded with the finding on the need for applied learning touching upon practical training needs and how this can help learners gain the required knowledge, skills and tools to venture into the job world.

6.2 Conclusion of the Study

The study started with the review of existing literature on unemployment and skill needs in South Africa. This was investigated into the understanding of the era of Fourth Industrial Revolution and the skills development in South Africa from a social entrepreneurship perspective. This included aspects of the technology training and skill needs of the corporates and young professionals binding to the unemployment rate in the country.

The chapters that followed then delved into the research through selected number of respondents from both the corporate and the student world, contributing to their understanding on 4IR, the technologies expected to be trained on and the lack of skills effecting community development thereof. This leads to the discussion on the internal aspects of how public-private partnership based training hubs could assist in alleviating this problem of skill needs amongst the disadvantaged communities in South Africa.

As a social entrepreneurship project, the goal was to implement and develop a cost effective training hub or network across South Africa starting with Gauteng province.

The field of social entrepreneurship is gaining prominence as social entrepreneurship demonstrates the ability to drive innovation and solve complex societal problems.

The results began with the management and analysis of raw data from the inputs provided by respondents. The information was presented thematically. The analysis of the results was aided by the arrangement of data into more understandable sets of themes. This delved into the 4IR awareness and skill requirements of graduates and how upskilling communities with 4IR skills could alleviate poverty and unemployment in South Africa. This also emphasised the role of training hubs and how such skill development hubs could contribute to the development of 4IR competencies through public-private partnerships and Government interventions.

Further, the current literature and findings of the research, aids to the proposal of a high level organogram and cost analysis of running such a sustainable social enterprise in the purview of its key deliverables. This also emphasises how governmental policies and innovative thinking form part of the important social entrepreneurship factors. This research along with many other research works mentioned in the previous chapters do suggest that social entrepreneurs aspire to conceptualise and develop businesses that provide solutions to solve social problems and then scale these businesses so that more communities can benefit from the social impact created.

6.3 Limitation of Study

The study interview 10 participants within the Gauteng province. The six corporate managers and entrepreneurs represent the job market; however, this may not be the actual case. This raises the first assumption and limitation of the study.

Additionally, the shortage of research on the perceptions of institutional influences on the scale of social enterprise posed as a limitation to this study. The main limitation of using a qualitative approach is that the findings cannot be extended to wider populations with the same degree of certainty that quantitative analyses can. This is because the findings of the research are not tested to discover whether they are statistically significant or due to chance. Another limitation is that research quality was heavily dependent on the individual skills of the researcher and more easily influenced

by the researcher's personal biases and idiosyncrasies. Also, qualitative research is sometimes not as well understood and accepted as quantitative research within the scientific community. The volume of data also makes analysis and interpretation time consuming. The researcher's presence during data gathering, which was unavoidable, may have influenced the participant's responses.

6.4 Recommendations

There are several gaps in this social entrepreneurship research, especially in the knowledge around skill development, related areas affecting abilities and factors involved in competency development which would benefit for future research that follow the findings of this study.

1. A full cost-benefit analysis including Return on Investment (ROI) of the skill development hubs that cater to disadvantaged communities in South Africa could be very useful to quantify the impact of such a business model.
2. A study on all the previously erected training hubs, and all their strengths and weaknesses. This information will better prepare any new training hub, preventing them from making the same mistakes, and better mitigating any challenges that may arise. This preparedness will be welcome news to any investor that may come on-board.
3. The improvement and use of appropriate samples is another important issue for future research works to tackle, as this study being qualitative, only focused on a relatively small sample size gaining valuable insight from industry professionals.
4. A collaboration between governments and social entrepreneurship researchers may or may not yield more practical outcomes. However, this collaboration would enable a continuous analysis of the needs of social entrepreneurs, resulting in the subsequent integration of these social ventures into national and sub national economic and social policy. Focus areas of this research can include measuring and monitoring of the social impact. It is also suggested that a mutual learning platform for all stakeholders would be beneficial.
5. There is a plethora of existing literature on successful commercial entrepreneurship as well as on failed commercial ventures, including event history analysis and the subsequent strategies mitigating failure. However, there has not been in depth studies made on success and failure stories of social

entrepreneurship ventures, which is something to be considered for future research works.

6. It would be also helpful to capture qualitatively the experiences and perspectives of education partners' currently existing and promoting skill development.

6.5 Suggestions for Future Research

In-depth exploration of all the 4IR technology based skill needs would be very helpful. Further research might compare, for example, training with peer-influencing strategies, leadership role of academic institutions and government might support effective skill development is disadvantaged communities. Future research can be more quantitative driven with larger samples. Additionally, it may be beneficial to investigate through clinical trials, if skill development hubs practically do make a difference or not, to communities.

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APPENDIX A: RESEARCH INSTRUMENTS – RESEARCH PARTICIPATION REQUEST

Wits Business School

WITS UNIVERSITY

Dear Participant,

I am an MBA student at Wits Business School. As part of my social entrepreneurship studies I am investigating the perceptions on latest technology training process, skillset of professionals and education needs in Gauteng Province. The intention is to research if there is a need for Training Hubs to make South Africa technology ready in this Fourth Industrial Revolution era we are currently in.

As part of this research study I would like to invite you to take part in an interaction based interview and share your thoughts and perceptions. This interview will involve answering 9 questions. With your permission, I would also like to record the interview. The interview could face-to-face, telephonic, or by using an video conference facility.

There are no direct benefits from this participation and or no disadvantages or penalties for not participating. You may withdraw at any time or not answer any question if you do not want to. The interview will be completely confidential and anonymous, and any information you give me will be held secure and not disclosed to anyone else. We may stop the activity in case of any discomfort or stress during the interview or resume at another time.

Feel free to contact me in case of any questions later. This study will be included in the research report for academic use. Summary of the report will be sent to you if needed.

Yours Faithfully,

Mohsin Desai
Contact: Mohsin.Desai@students.wits.ac.za

APPENDIX B: RESEARCH INSTRUMENTS – PARTICIPATION CONSENT FORM

Wits Business School

WITS UNIVERSITY

Research: Investigate the role of skills development hubs in equipping disadvantaged communities in South Africa to gain competencies required for the Fourth Industrial Revolution (4IR)

☐ Corporate Managers or Entrepreneurs ☐ Young Professionals or University Graduates

Interview Method Preference:

☐ Face-to-Face Interview (Location) : _____

☐ Telephonic Interview (Phone #) : _____

☐ Online Video Conference Interview (Email address):_____

Participant Consent: I _____ (☐ Name/ ☐ Anonymous) agree to participate in this research project interview/ survey through the method(s) chosen above. I understand what the researcher's topic of study entails and the related interview/ survey activity whether anonymous or otherwise. I would like to proceed with the Interview/ Survey Questions.

Initial/ Signature : _____

Date : _____

APPENDIX C: RESEARCH INSTRUMENTS – INTERVIEW QUESTIONS

Wits Business School

WITS UNIVERSITY

Research: Investigate the role of skills development hubs in equipping disadvantaged communities in South Africa to gain competencies required for the Fourth Industrial Revolution (4IR)

Interview # : _____

Date : _____

Name/ Anonymous : _____

Age/ Anonymous : _____

Gender/ Anonymous : _____

Education/ Degree Pursuing : _____

Profession/ Career Interest : _____

Organisation/ University : _____

Interview Schedule A: Corporate Managers or Entrepreneurs

What is your opinion on the buzz word Fourth Industrial Revolution (4IR)?

What ICT skills does your Corporation or Enterprise need to cope with 4IR era?

What do you feel about the competition in your area of business mentioned above?
What is the education level and skills of your employees?

1. What skills do you think are lacking from your employees?

2. Do you think there is a need for a refresher course/ practical training?

3. Do you feel that additional training will help impact/ improve performance?

4. Which set of skills do you want your team to improve on or get trained on?

5. Any Suggestions or Comments?

Interview Schedule B: Young Professionals or University Graduates

1. What is your opinion on the buzz word Fourth Industrial Revolution (4IR)?

2. What ICT skills do you need to cope with 4IR era?

3. What do you feel about the competition in your area of skill/ education mentioned above?

4. What are your skills and education?

5. Mention on any aspect you strongly realised that you are lacking in particular?

6. Do you think there is a need for a refresher course or practical training?

7. Do you feel that additional training will help impact or improve performance?

8. Which set of skills do you want to improve on or get trained on?

9. Any Suggestions or Comments?

APPENDIX D: RESEARCH CONSISTENCY MATRIX

Research Question (RQ1 to RQ5	**Interview Questions**	**Key Themes**
RQ 1. • To what extent are young professionals or university graduates aware of the 4IR?	1. What skills do you think are lacking from your employees? (A) 1. What is your opinion on the buzz word Fourth Industrial Revolution (4IR)? (B)	4IR awareness
RQ2. • What are the current 4IR skills needed by corporate managers and entrepreneurs?	4. Which set of skills do you want your team to improve on or get trained on? (A) 2. What ICT skills do you need to cope with 4IR era? (B) 3. What do you feel about the competition in your area of skill/ education mentioned above? (B)	4IR skills required by industry

RQ3. • What are the 4IR skills currently lacking in the South Africa's disadvantaged communities?	4. Which set of skills do you want your team to improve on or get trained on? (A) 4. What are your skills and education? (B) 5. Mention on any aspect you strongly realised that you are lacking in particular? (B)	Upskilling communities towards 4IR
RQ4. • In what ways could the disadvantaged communities be encouraged to upskill themselves for the 4IR?	3. Do you feel that additional training will help impact/ improve performance? (A)	Upskilling communities towards 4IR
RQ5. • What is the impact of skills development hubs in developing 4IR competences in disadvantaged communities?	3. Do you feel that additional training will help impact/ improve performance? (A) 6. Do you think there is a need for a refresher course or practical training? (B) 7. Do you feel that additional training will help impact or improve performance? (B)	Role of 4IR hubs

	8. Which set of skills do you want to improve on or get trained on? (B)	