

Exploring the role of South African business incubators in creating sustainable SMMEs through technology transfer

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Mini-dissertation submitted in partial fulfilment of the
requirements for the Master degree of Business
Administration at the North-West University

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Graduation May 2018

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ABSTRACT

The contribution of small, medium and micro enterprises (SMMEs) to economic growth, job creation, social stability and poverty alleviation is well established. However, South Africa experiences high failure rates of SMMEs within the first three years of establishment, where access to market is a key challenge. Although innovation is an enabling factor in creating sustainable and competitive SMMEs, there is a lack of access to local patents and technologies. At the same time, universities aim to commercialise research through the technology transfer offices. This research study explores the role of business incubators in creating sustainable SMMEs through technology transfer.

A phenomenological qualitative study was conducted, where business incubator managers and managers of technology transfer offices were interviewed. A common view on what technology transfer means, how it impacts SMMEs and factors that limit the technology transfer process was evident. These include lack of funding for early stage technology development, complex commercialisation processes and lack of reciprocal transfer of knowledge.

The research study concluded the need for strategic partnerships between business incubators and technology transfer offices, co-development of technologies to ensure market readiness, funding and business incubation support to SMMEs to receive technologies being transferred.

KEYWORDS

Business incubator, technology transfer, research commercialisation, SMME sustainability, university research, entrepreneurship

DEDICATION

I dedicate this research to my late mother, Lutchmi Gopaul (1938-2017), who supported me throughout my times of studying, but is not here to see me finish it. Despite losing her, I have been able to complete this degree because of the values she has instilled in me - tenacity, courage, determination and commitment. Thank you mum for imparting these invaluable life lessons to me.

ACKNOWLEDGEMENTS

I thank God, for giving me the strength, wisdom and insight to deal with the obstacles I had to face, even when it felt like all the odds were against me. My faith is unwavering.

To my husband Leon and my children Kapisha and Tahir, your love, support and patience with me is what has helped me to maintain my focus. I am not the only one who has made sacrifices to achieve this goal. You have been an important part of my journey and I thank you for this.

To my mum-in-law, Shama, I appreciate your kindness, care and help. You supported me in every way that you could, without expecting anything in return and always having my well-being at heart. I will always be grateful to you for this.

Tracy, thank you for your empathy, guidance and understanding when I needed it the most. You are more than just a manager, you are a leader in its true sense.

Prof Stéphan van der Merwe, I will always be grateful to you for your continued support, encouragement, guidance and active interest my research. You challenged my thinking which enabled me to grow intellectually. Thank you.

Finally, I would like to thank the participants of this study, whose contribution added significant value to this research.

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LIST OF ABBREVIATIONS

Term	Definition
DST	Department of Science and Technology
GDP	Gross Domestic Product
IP	Intellectual Property
ISP	Incubator Support Programme
NIPMO	National Intellectual Property Management Office
SEDA	Small Enterprise Development Agency
SMME	Small Medium and Micro Enterprise
the dti	The Department of Trade and Industry

CHAPTER 1

NATURE AND SCOPE OF THE STUDY

1.1 INTRODUCTION

During the past eight years, South Africa continued to see a rise in the rate of unemployment (Taborda, 2017:1). It is common practice for children to attain education through schools and higher education facilities, after which an attempt is made to secure a job. Due to the general capacity and capabilities of large businesses in comparison to Small Medium and Micro Enterprises (SMMEs), one would expect the large businesses to create more employment opportunities. Ayyagari, Demirguc-Kunt and Maksimovic (2011:3) point out that whilst large businesses demonstrate high productivity, it is the SMME sector that creates the opportunities for new jobs.

SMMEs have been identified as a key driver in economic growth, job creation and poverty alleviation (Chimucheka, 2013:785). Studies have shown the significant contribution of SMMEs to the Gross Domestic Product (GDP) of South Africa (Luiz, 2011:5; Ngek & Smit, 2013:94). Nonetheless, the Department of Trade and Industry (the dti) highlighted the high failure rate of new businesses in South Africa, with up to 40% failing in the first year and 90% within the first 10 years of existence (South Africa, 2008b:46). Almost 10 years later, the situation is no different. In 2011 Fatoki and Smit (2011:1414) described the failure rate of SMMEs as one of the highest in the world. At present, Bruwer and Van den Berg (2017:8) continue to report high failure rates of SMMEs. The need to create sustainable SMMEs is therefore evident, for the economic benefit of the country and to allow SMMEs to reap the benefit of their investments.

The reasons for the high failure rate of SMMEs is potentially due to many factors. Bruwer and Van den Berg (2017:7-8) inferred that the “harsh” economic environment of South Africa resulted in the lack of sustainable SMMEs. Herrington, Kew and Mwanga (2017:6) outline a number of reasons, both positive and negative, for which more than 50% of businesses are discontinued. Lack of financing and lack of profitability accounted for 62% of businesses being discontinued.

Although some may be of the view that the South African economic climate may not be conducive for businesses, or lack of financial support may result in SMME failure, these challenges can be overcome by SMMEs having a sustainable competitive advantage. Thompson, Strickland, Peteraf, Janes, Gamble and Sutton (2012:7) describe sustainable competitive advantage as being able to meet the needs of the customer more effectively or more efficiently, regardless of how the competitors try to surpass the business's efforts. Should an SMME have such a sustainable competitive advantage, investors will be more willing to fund the business, thereby addressing the issue of lack of funding. This research is based on the view that if a customer's needs are constantly being met, despite the economic conditions, the customer will always return for the product or service offering. Essentially, a sustainable competitive advantage can be achieved if the SMME focuses on resolving a customer's problem.

Talebi, Rezazadeh and Nobari (2016:2) describe the importance of business model innovation to allow SMMEs to become more sustainable. Rambe and Agbobli (2015:86) have shown a significant positive correlation between innovation and performance indicators in SMMEs, albeit the agricultural sector of Vryburg, South Africa. Colombelli, Krafft, and Vivarelli (2016:16-19) have shown that innovative start-ups have a better survival rate than non-innovative counterparts. The authors further emphasise the importance of technology transfer offices, incubators and process innovation in support of creating innovative start-ups and fostering competitiveness.

In South Africa, technologies are being generated at universities across the country, but is currently not necessarily being accessed by start-up SMMEs to enhance their competitiveness (Ndabeni, 2008b:214). The universities are attempting to commercialise the research through the establishment of technology transfer offices (South Africa, 2017:15). At the same time, the business incubators in South Africa have been established to support the start-up and sustainable growth of SMMEs. However, it is uncertain as to whether the business incubators are collaborating with the technology transfer offices to create sustainable SMMEs. This research study will survey universities with established technology transfer offices and business incubators, with the intent of

understanding the role that business incubators can adopt in bringing the two sectors together.

The rest of this document is structured as follows: Chapter one will present the scope of the research study, followed by Chapter two providing a review of the available literature on the research topic and/or literature related to elements of the topic. The research design and methods will be summarised in Chapter three. Thereafter, the results are presented and discussed in Chapter four. Chapter five closes with conclusions and recommendations.

1.2 PROBLEM STATEMENT

The problem statement is centred around three main constructs, the potential impact of merging these constructs, but the lack of a platform to do so.

The first construct deals with the sustainability of SMMEs in the South African context. It is well known that SMMEs are a key driver in economic growth, job creation and poverty alleviation (Chimucheka, 2013:785). However, SMMEs experience a high failure rate (Arbidāne & Tarasova, 2016:95; Bruwer & Van den Berg, 2017:8; Löfsten, 2016:21). The survey conducted by Herrington *et al.* (2017:28-29) describe the main reasons for businesses exiting South Africa as lack of profitability and lack of access to finance. The authors further explain the threat of sustainability of SMMEs due to them being active in over-traded markets that has inherently high rivalry and low profit margins. Whilst the authors noted the need for innovative capabilities in SMMEs to become more competitive and by implication, more sustainable, the concern in the decrease in the innovation levels in the SMME sector from 2014 to 2016 was also raised.

At the same time, in order for SMMEs to grow, there is a need to compete in the mainstream economy, which implies SMMEs need to compete with large businesses. Kleynhans (2009:42) describes how large businesses are competitive due to continued upgrading of technology. Smaller businesses, on the other hand, conduct little research and do not use technology to its full potential. The author, furthermore highlights the

inability of SMMEs to conduct research and development (R&D) and recommends that SMMEs be supported with R&D and implementation of modern technology. Colombelli *et al.* (2016:16-19) have shown that innovative start-ups have a better survival rate than non-innovative counterparts.

The second construct looks at the support provided by business incubators in South Africa and the challenges experienced in doing so. Masutha and Rogerson (2014b:148) describe the development of the business incubator landscape, the most recent being the launch of the Incubator Support Programme (ISP) by the dti in 2012. The intention of these business incubators is to develop sustainable SMMEs and ultimately support local communities and strengthen local economies (Masutha & Rogerson, 2014b:148; South Africa, 2014:1). Research conducted by Mas-Verdú, Ribeiro-Soriano and Roig-Tierno (2015:796) in understanding the role of business incubators on business survival, revealed that business incubators on its own is not enough to influence the survival of businesses. Factors such as business size, market sector and degree of innovation are also factors that influence business survival.

The third and final concept deals with the generation of intellectual property (IP) at South African universities but the challenges experienced in commercialising this intellectual property. Bansi and Reddy (2015:194) found that although universities are generating intellectual property, including technology-based IP, there are challenges in registering, transferring and commercialising such IP. Alessandrini, Klose and Pepper (2013:3-9) point out the opportunity of technology transfer being an additional revenue source for universities. However, through their research, the authors identified some challenges impeding the transfer of technology. These include “*inadequate interaction with entrepreneurs and industry partners*” and “*a lack of seed funding*”.

South Africa has therefore seen the establishment of the technology transfer offices at the universities and the establishment of public and privately owned business incubators, with both sectors aimed at supporting the sustainable growth of SMMEs (Ndabeni, 2008b:219). Yet, there is not enough integration between all efforts from the different sectors.

The problem arises due to each of these sectors addressing their challenges independently of each other. Universities need to collaborate more with entrepreneurs to commercialise the IP that is generated. However, Booyens (2011:75) found that the collaboration between SMMEs and universities are not strong, even though SMMEs require support with R&D and implementation of modern technology to create or enhance their competitiveness. It is therefore hypothesised that business incubators can play a role in bringing these sectors together. Little research has been conducted in the role of business incubators in creating sustainable and competitive SMMEs through research commercialisation (Aggarwal, Siddiqialali, & Kumar, 2012:47; Bulsara, Gandhi & Porey, 2010:13; Lalkaka, 2002:168; Tejumade & Johnston, 2012:8).

Less research was found on the topic relevant to the South African context (Ndabeni, 2008a:260). Previous research has addressed several aspects of the topic separately: (1) the role of business incubators in SMME development (Labiak, Gauthier & dos Santos., 2014:357; Masutha & Rogerson, 2014b:143; Mas-Verdú, *et al.*, 2015:793), (2) sustainability of SMMEs (Bruwer & Coetzee, 2016:207; Iwu, 2017:234) and (3) patent commercialisation (World Intellectual Property Organisation, 2009:10; Park, Ree & Kim, 2013:736). However, (Ndabeni, 2008a:267) clearly states the benefit of business incubators as a convergence platform to commercialise research and create innovative SMMEs.

If business incubators can converge the need to commercialise IP with the need to make SMMEs more sustainable and competitive then communities will benefit from job creation, economic development, and poverty alleviation. Hence, this research study will investigate the role of business incubators in creating sustainable SMMEs through technology transfer.

1.3 RESEARCH OBJECTIVES

The research objectives of this study are discussed in this section.

1.3.1 Primary objective

The primary objective of the study is to explore the role of business incubators in creating sustainable SMMEs through technology transfer.

1.3.2 Secondary objectives

The secondary objectives of the study are to:

- Review the most recent literature on business incubators that support commercialising of research generated from university.
- Understand the challenges faced by universities in transferring its research to individuals or businesses.
- Test the willingness of universities to transfer technologies to SMMEs through business incubators.
- Investigate the awareness and understanding of technology transfer offices by business incubator managers.
- Make practical recommendations on how business incubators can play a role in creating competitive SMMEs through the transfer of technology from universities.

1.4 SIGNIFICANCE OF THE STUDY

The results from this research will help business incubator managers and managers at the technology transfer offices at universities, in identifying possible synergies between business and universities. It will also assist the managers of SMMEs in reviewing their business strategies with the intention of positioning the business to be more competitive, which will improve their probability of being more sustainable.

In previous studies (Park *et al.*, 2013:736; Siegel, Waldman, Atwater & Link, 2004:128-140), research was conducted at businesses in the form of surveys, to gather data on variables such as number of patents, number of SMMEs and number of business incubators, as well as interviews to test the barriers to transferring technology from universities to industry. This research will focus on two types of institutions i.e. business incubators and universities with technology transfer offices.

In doing so, this research topic will increase the knowledge base in the field of business incubators and entrepreneurship, and will stimulate a shift in thinking about the current business models of business incubators. It will also allow universities to review their research commercialisation models. Research in both sectors is currently conducted independently of each other. This research topic will link the two fields, which can trigger innovative research of addressing the various challenges experienced in each field of expertise. From a practical viewpoint, business incubator managers will have confident data on which can form the basis of discussions with various universities, to explore possible synergies.

1.5 SCOPE OF THE STUDY

In the next section, the scope of the study will be defined.

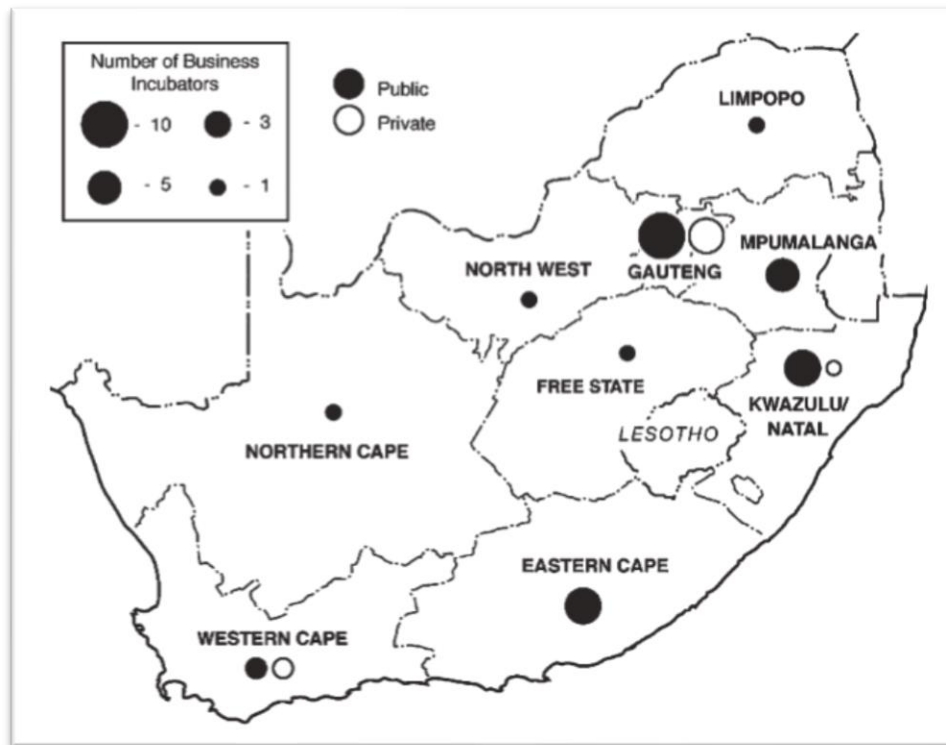
1.5.1 Field of the study

The field of research is limited to entrepreneurship and technology transfer, with particular focus on exploring the potential role business incubators can play a role in supporting the transfer of technology from universities.

1.5.2 Geographical demarcation

Public and private business incubators are located across the country. The location of these business incubators is shown in Figure 1.1.

Figure 1.1: Geographical location of business incubators in South Africa



Source: Masutha and Rogerson (2014b:149)

The size of the circles shown in Figure 1.1 is representative of the number of business incubators. The larger the circle, the greater the number of business incubators. It is evident that more than 50 business incubators are located across the country. The black circles represent the public owned business incubators whilst the white circles represent the privately-owned business incubators. There are more publicly-owned business incubators than privately owned. The publicly-owned business incubators are government's attempt to support the establishment of SMMEs across South Africa. However, the authors also illustrate the concentration of the business incubators in the urban regions, where Gauteng hosts two-thirds of the incubators (Masutha & Rogerson, 2014b:149).

1.6 RESEARCH METHODOLOGY

Whilst quantitative research approaches focus on quantification and analysis of data, qualitative research approaches focus more on the emphasis of words and an inductive

approach to the relationship between theory and research (Bryman, Bell, Hirschsohn, Dos Santos, Du Toit, Masenge, Van Aardt & Wagner, 2014:31).

The philosophical approach of interpretivism is used to gain a deeper understanding of complex problems from the perspective of humans (Chowdhury, 2014:434). It is a philosophy that helps one to understand the social world through meaningful interpretations of the experiences and beliefs of the people that are part of the everyday activities (Chowdhury, 2014:436).

In carrying out this philosophical approach, the Phenomenology research approach allows the researcher to question how individuals make sense of the world around them. This inherently implies that the human action is meaningful and the researcher needs to interpret these actions (Bryman *et al.*, 2014:15).

The number of business incubators and technology transfer offices do not warrant a quantitative study. Furthermore, the collaboration between business incubators and technology transfer offices is not evident in literature for South Africa. Given the exploratory nature of this research, it is therefore logical to pursue a qualitative study. This study will utilise an interpretivism philosophy and a phenomenology research approach, whereby an in-depth understanding will be gained based on the experiences of the individuals involved in the two areas of interest.

There are two phases to this research study. The first phase is a literature study followed by the empirical research. Bryman *et al.* (2014:41) recommend eight basic steps in conducting qualitative research, which include:

- Deciding on the research topic.
- Conducting the literature review.
- Choosing a qualitative research design.
- Selecting relevant sites and subjects.
- Data collection.

- Analysing and interpreting data.
- Conceptual and theoretical work.
- Writing the report.

1.6.1 Literature study

The literature study focuses on research related to technology transfer, business incubators and SMME sustainability. The reader will gain an overview of the SMMEs in South Africa and of business incubation. The purpose of the technology transfer offices will be discussed, as well as what makes SMMEs sustainable. Finally, the potential to bring these different areas together and create value will be discussed.

In the quest to access knowledge in each of these areas, a search leading electronic journal databases was conducted, including EBSCOHost, Google Scholar, SAePublications, NWU Digital Theses and Dissertations, Proquest and ScienceDirect. The search was also extended to articles, reports and varied publications. It should be noted that the search was in no way limited to these databases.

1.6.2 Empirical research

Goulding (2004:302) describes the phenomenological process as one where the only source of data is that of the individuals that have experienced the phenomenon. The experiences of the individuals are taken as “fact” and it is for this reason, the main instrument of data collection is the interview of individuals that have been purposively sampled. The following sections outline this process in more detail.

1.6.2.1 Sampling theory

Robinson (2014:2) describes the approach to sampling in qualitative research with four key points. These points centre around the understanding the sample population, deciding on a sample size, determining the sampling strategy and finally sourcing the sample.

In determining the sample population, it is important to note the inclusion and exclusion criteria. These criteria set the boundaries for the sample population. The

comprehensiveness of this set of criteria determine homogeneity of the sample population. The more homogeneous a sample is, the more likely it is to generalise the findings (Robinson, 2014:4)

1.6.2.2 Study population and sampling

A non-probabilistic, purposive sampling approach was used. The sample population includes the business incubators and technology transfer offices in South Africa. For the purposes of this research, a study population comprising of managers of business incubators in South Africa and managers of technology transfer offices at the universities for the year 2017 was chosen. The next two sections provide more detail on this.

1.6.2.3 Business incubators

The unit of analysis is a way in which data is structured for analysis. By appropriately defining the unit of analysis, the researcher has a better understanding of what the sample size should be (Silverman & Solmon, 1998:272). The unit of analysis is therefore the business incubators and the technology transfer offices.

There are more than 50 business incubators in South Africa with most of them falling under the ambit of the SEDA (2004:1). Business incubators have the primary focus of supporting the establishment and start-up of businesses. The existing incubators in South Africa provide support across the sectors from small scale to advanced manufacturing. The typical support that can be expected from a business incubator include business networking, shared services and financial assistance amongst others (Masutha & Rogerson, 2014a:143). The SMMEs received this support for the duration of the incubation period, which lasts anything between three to 36 months. Whilst most incubators provide office facilities, some incubators provide equipment and raw materials enable the SMME to manufacture. The outcome of any business incubator is to support the SMMEs such that the businesses can continue growing after graduating from the business incubator.

The business incubator managers were interviewed to explore the awareness and understanding of technology transfer offices. In addition, the business incubators view on what makes SMMEs sustainable was sought.

1.6.2.4 Technology transfer offices

There are 26 public universities in South Africa of which 13 have technology transfer offices (Alessandrini *et al.*, 2013:5). Some of these offices were established as early as 1999, with most of them having one full time staff member (Alessandrini *et al.*, 2013:5). It is however expected, that after eight years of the implementation of the Intellectual Property Rights from Publicly Financed Research and Development Act (51 of 2008), more technology transfer offices probably exist today. According to the Act, the function of the technology transfer offices is in essence, to protect and commercialise intellectual property (IP). Alessandrini *et al.* (2013:15) have found that technology transfer is active across various sectors from health to the built environment.

The managers of the technology transfer offices were interviewed to understand their willingness and readiness to collaboration with business incubators to support their effort to commercialise the technologies.

1.6.2.5 Data collection

Data was collected through telephonic semi-structured interviews with the managers of the business incubators and managers of the technology transfer offices. The interview guide consisted of three to six semi-structured questions that guided the responses that were relevant to the research topic. Where the interviewee did not disclose sufficient information on the topic, follow up questions were asked. The interview guides (Appendix A & Appendix B) were first piloted, whereby one manager from each sector was interviewed. The questions were then reviewed and finalised before interviewing the remaining respondents. In this way, the researcher ensured all aspects related to the topic would be addressed by the questions.

Data was collected between June and October 2017. All interviews, which lasted approximately between 15 to 40 minutes, were conducted in English and was recorded, with prior permission of the interviewees. All interviewees were asked identical questions and in the same order. The researcher manually transcribed verbatim responses of all interviews.

1.6.2.6 Data analysis

According to Bryman *et al.* (2014:336), coding is the starting point in qualitative analysis. It is the researcher's interpretation and re-presentation of the verbatim transcripts. While this is a way of condensing large volumes of data, the authors highlight the importance of keeping the context under which the data was collected in mind. Bryman *et al.* (2014:337) and Grosseohme (2014:9) point out the importance of reading and re-reading the transcripts, together with listening to the interview recordings.

Coding allows the researcher to organise the volumes of data such that themes or patterns arise from the data, resulting in the researcher being able to perform a thematic analysis. Thematic analysis in qualitative research is a flexible way to identify, analyse and describe these patterns or themes. This form of analysis relies on the insight and knowledge of the researcher to determine what counts as a theme. Bryman *et al.* (2014:350) further describe the two ways in which thematic analysis can be conducted, that being either inductive or deductive. The themes in a deductive approach stems from a theoretical framework, whereas those derived in the inductive approach originate from the data itself.

The transcripts generated from the interviews were checked for accuracy, coded by the researcher. An inductive thematic analysis approach was used to analyse the data. The emergent themes were correlated with existing literature. Saturation was reached when no new information emerged from the following interviews.

1.7 ASSUMPTIONS

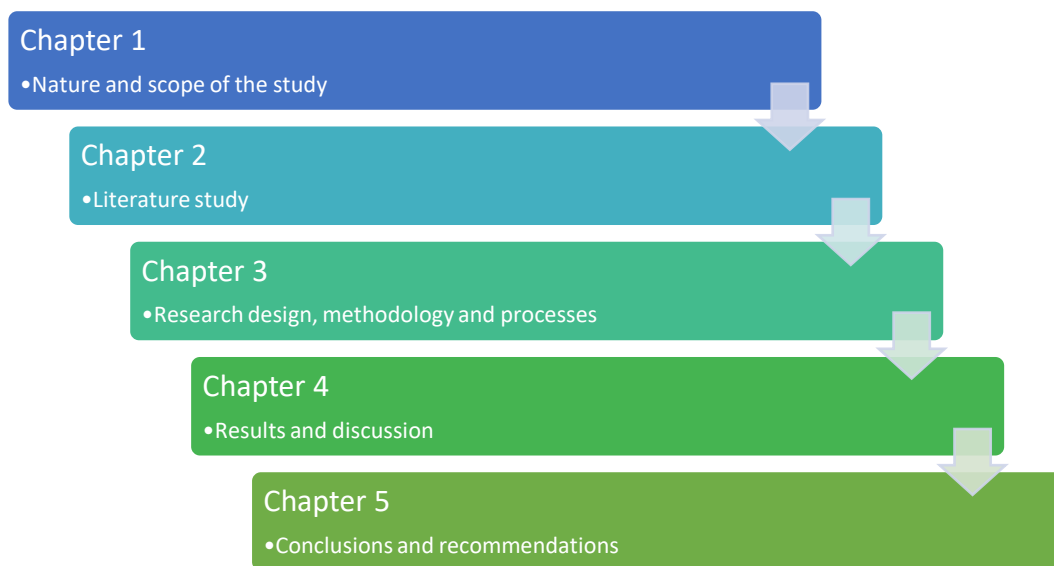
In conducting the research, some assumptions will be made, more specifically because the concept is still new to South Africa. These assumptions are:

- business incubators will continue to exist in the future and their target audience of SMMEs will remain
- business incubators have existing and/or future capacity and resources to support intellectual property growth of SMMEs
- Technology transfer offices are operational and intend to invest resources into transferring technology to the community
- Policy regarding technology transfer offices will remain in the near future

1.8 LAYOUT OF THE STUDY

The research report will be structured as outlined in Figure 1.2.

Figure 1.2: Outline of the research report



Source: Own compilation

The detail of each chapter is discussed below.

Chapter 1: Nature and scope of the study

This section introduces the study. This includes, amongst other things, the problem statement, research objectives, scope of the study and the research methodology employed. The limitations and layout of the study is also discussed.

Chapter 2: Literature study

The literature review will firstly define the key components related to the proposed study. An overview of the relevant published literature will be provided, for which the constructs related to the proposed study will be critically discussed.

Chapter 3: Research design, methodology and processes

The research design will outline a step by step process on how the entire research was conducted. The methods used to sample, collect data, analyse and interpret data will be describes in detail. This will allow future researchers to replicate the study if required.

Chapter 4: Results and discussion

The results will be presented and discussed in this section, including the use of visual tools such as diagrams and tables.

Chapter 5: Conclusions and recommendations

In this chapter, conclusions will be drawn from the empirical research. Furthermore, recommendations to business incubators and technology transfer offices will be made, supplemented with action plans. Finally, the achievement of the research objectives will be discussed and future research will be suggested.

1.9 CHAPTER SUMMARY

This chapter provides the reader with an introduction to the research topic and objectives. The scope of this research is outlined, whereby the reader understands not only the field of the research but also the geographical reach. The exploratory nature of the research and the interest in the meaning of the data rather than the quantity being collected, justifies the phenomenological approach to the research. Whilst the study population, data collection and analysis are explained to the reader, the limitations and assumptions of the study must be noted. Finally, the layout of this research report is shared. In the next chapter, the reader will be presented with an overview of the literature.

CHAPTER 2

LITERATURE STUDY

2.1 INTRODUCTION

SMMEs contribute to the Gross Domestic Product of an economy (Nkwinika & Munzhedzi, 2016:75; Robu, 2013:87) but also experience high failure rates, estimated at 70 to 80% in South Africa (Lekhanya, 2015:412). Nonetheless, SMMEs are considered important in introducing competitiveness into the market, as well as launching new products and services (Robu, 2013:86). This is due to the impact of such SMMEs on the national economy (Robu, 2013:86). This literature study will provide an understanding of the SMME sector, the support programmes in place and knowledge based opportunities, within the South African context. In addition, it will also provide an understanding of the technology transfer initiatives at universities, and the challenges thereof.

The literature study will firstly provide an overview of the SMME sector in South Africa. The definition of SMMEs, as well as the resulting contribution to the economy will be discussed. The reader will not only gain an understanding of the challenges faced by most SMMEs, but also the current status of the sector. In addition, the factors that make SMMEs sustainable will be shared. The support structures to SMMEs, in the form of business incubators, will be discussed. Business incubation will be defined and the reader will come to understand the typical support services provided to the SMMEs through business incubation programmes. The business incubation landscape in South Africa will be outlined.

In another sector, the establishment of technology transfer offices at the universities and the intention thereof will be explained. This will be substantiated by defining what constitutes intellectual property and how this creates value. Finally, the integration of each of these sectors and the value thereof will be discussed.

2.2 OVERVIEW OF SMMEs IN SOUTH AFRICA

In this section, the South African SMME landscape will be outlined.

2.2.1 Definition of SMMEs

It is firstly important to define what an SMME is, albeit a complex task. There is no single definition of an SMME. The definition varies across industries depending on the focus. Abor and Quartey (2010:219-220) outline the challenges in defining an SMME across industries and countries. The authors reviewed literature, as well as definitions established by various international organisations, such as the European Commission and UNIDO. Thus, the conclusion was that there is no general consensus on what defines an SMME. This finding is further supported by the research of (Robu, 2013:85) where the author could not find a universal definition of SMMEs and found that each country had different approaches.

The National Small Business Act of South Africa (102 of 1996) (South Africa, 1996:2) define small micro and medium sized enterprises according to the different sectors. However, the official definition of a 'small business' is "*a separate and distinct business entity, including co-operative enterprises and nongovernmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or sub sector of the economy mentioned in column I of the Schedule*" (South Africa, 1996:15).

According to the Act, in the agricultural, retail, wholesale trade, catering, transport, finance, and community sectors, micro businesses are defined as having fewer than five employees and a total turnover of up to R50m (South Africa, 1996:15). Very small businesses employ less than 10 people and have a turnover of up to R5m. The upper limit for turnover of small businesses is R25m, and employ less than 50 people. The largest business within this definition is the medium business employing up to 100 people and a turnover of less than R50m (South Africa, 1996:15).

For the purposes of this research, SMMEs refer to all formally registered businesses with an annual turnover of less than R50m and employing less than 100 people.

2.2.2 Contribution of SMMEs to the economy

Robu (2013:86-87) refers to SMMEs as the backbone of an economy, across the globe. In countries such as China and the United States of America, SMMEs can contribute up to 60-65% of GDP. The author further states that up to 70% of all global jobs are created by SMMEs. Swart (2010:10) supports this view by stating that SMMEs across the globe should not be ignored as it will help economies to recover, especially in developing countries.

In the South African context, research over the years (SEDA, 2016:5; South Africa, 2008b:94) have shown that the SMME sector can contribute anything between 27 to 42% of the GDP. The contribution to economic growth and the potential to create jobs, is the basis of the rationale to support SMMEs in South Africa (Amra, Hlatshwayo & McMillan, 2013:3).

SEDA (2016:31) deem the SMME sector as important in not only creating jobs, but also a key driver for innovation, whilst contributing to economic growth. A comparison between 2008 and 2015 shows that even though the growth of SMMEs of 3% over the period was lower than economic growth of 14%, the contribution to GDP by the sector increased from 33% to 42% (SEDA, 2016:31). Chimucheka (2013:784-786) and Mutoko (2014:28) outline the positive impact SMMEs have on job creation, poverty alleviation, social stability, economic growth and sustainable development. In trying to understand the role of SMMEs in local economic development in South Africa, Nkwinika and Munzhedzi (2016:81) concluded that SMMEs play a role in stabilising the economy, more specifically the local rural municipalities.

South Africa has drafted the national development plan with the aim of eliminating poverty and addressing inequality by 2030 (South Africa, 2012:14). With this in mind, support to SMMEs was identified as one of the objectives in achieving the five percent economic

growth rate required per year to create sustainable jobs (South Africa, 2012:28). It is the view of Nkwinika and Munzhedzi (2016:80) that public and private sector must support the development of SMMEs, as this in turn will grow markets, create jobs and alleviate poverty. More importantly, SMMEs create a linkage between small and large businesses, which are viewed as attractive to foreign direct investors (Kongolo, 2010:2289).

Kongolo (2010:2289) explored the role of SMMEs in providing meaningful contribution to the economy and found that the SMME sector creates majority of a country's new job opportunities. It is most likely for this reason that Chimucheka (2013:784-785) reiterates the South African government's effort to develop SMMEs with the intent of creating more jobs, alleviating poverty, addressing equity, bringing about social stability, and creating economic growth.

The research of Ayyagari, Demirguc-Kunt and Maksimovic (2014:75) investigated the contribution of small business to the growth of developing countries. The study sample targeted 49 370 businesses in 104 countries that were surveyed from 2006 to 2010. The authors found that small businesses contributed to job creation more than large businesses (Ayyagari *et al.*, 2014:83). The authors are of the view that the SMME sector should be a priority sector. In addition, the authors highlight the importance of policies to improve entrepreneurship and innovation.

2.2.3 Challenges faced by SMMEs

Though the value of SMMEs in contributing to economic development is well understood, these businesses face many challenges. Ndege (2015:92) studied 133 businesses in the Vaal region, and found that lack of access to finance, lack of entrepreneurial skills and lack of mentorship monitoring and evaluation programmes are the key challenges facing entrepreneurs. A study by the Bureau of Economic Research on behalf of SEDA (2016:7-10) identifies the challenges faced by entrepreneurs as access to finance and markets, poor infrastructure, labour laws, crime, skills shortages and inefficient bureaucracy. Luiz (2011:65) identifies several major obstacles faced by SMMEs in South Africa which includes lack of finance, cost of labour, overregulation of trade, complexities of the tax

system, lack of access to tenders, inadequate infrastructure, and lack of demand for products.

In 1995, the dti drafted a white paper on national strategy for the development and promotion of small business in South Africa. In this paper, the constraints that small businesses face was highlighted as (South Africa, 1995:12):

- Finance.
- Legal and regulatory.
- Access to markets.
- Affordable business premises.
- Access to appropriate technology.
- Quality business infrastructure.

Whilst these are legitimate problems faced by SMMEs, the problems may differ across the various sectors and SMME to SMME. Furthermore, the cause of these problems may result from internal or external factors. More recent literature still raise the same challenges, as those stated in the white paper almost 22 years ago (Mutoko, 2014:29). The author further emphasises the importance of access to markets to prevent failure of SMMEs. Rogerson (2013:135) identifies this challenge as one of the major causes of failures in business.

The high failure rate of SMMEs in South Africa is evident in that most SMMEs rarely survive beyond three years after establishment (Maleka & Fatoki, 2016:1). The lack of access to finance is one of the key challenges experienced by SMMEs (Abor & Quartey, 2010:224). Access to finance at different life stages of a business is critical, as it creates the potential for investment in new ventures, continuous improvement and innovation (International Trade Centre, 2015:41). However, the commercial banks often consider SMMEs as “high risk” borrowers due the lack of collateral, lack of credit history and relaxed management styles (International Trade Centre, 2015:59).

Mahadea and Pillay (2008:436) allude to the high regulatory hurdles faced by businesses in Africa as compared to other regions. The authors further indicate the impact of taxes and regulations on SMMEs, as it either consumes too much of time due to the need to keep accurate records; or increases expenses, resulting in lower cash flows. The labour laws of South Africa make it difficult for recruit and dismiss employees. Kongolo (2010:2293) stated generic challenges such as lack of interest, finance and management skills, low production capacities, access to markets and appropriate technology. The author further identified securing customers, accessing finance, and dealing with government bureaucracies as critical challenges for SMMEs based in Johannesburg and Durban.

Maleka and Fatoki (2016:309) found that although the South African government have created several agencies to support SMMEs, there is a general lack of awareness of this support amongst SMMEs. Over and above this shortcoming, Phillips, Moos and Nieman (2014:91) further allude to the perceived lack of trust of SMMEs in external agencies. The shortcoming extends further into the lack of alignment between the service offering of the agencies and the financial and non-financial needs of the SMMEs. Mago and Toro (2013:26) is of the view that it is rather the lack of awareness of the programmes than the failure to implement that results in poor utilisation of such.

Chimucheka (2013:793-794) discuss the resources required by SMMEs to ensure performance and prevent failure of the SMME. These resources relate to human resources, financial resources, physical resources and information resources. Cant and Wiid (2013:714) explored the macro environmental factors and marketing variables that affect South African SMMEs. The authors found that crime, legislation, interest rates, inflation and unemployment are key macro factors. The marketing factors included pricing strategies, low demand for product and location of the business. SMMEs must deal with these factors on a daily basis.

Worku (2015a:250) studied the profitability of more than 400 SMMEs over a five-year period, with the aim of identifying barriers to SMME growth and sustainability. The key

challenges were related to either policy, educational or financial (Worku, 2015a:257). Ngek and Smit (2013:3047) emphasise innovation one of the key drivers of success for SMMEs, more specifically in South Africa. This view is supported by Ndabeni and Rogerson (2017:92) that identified the lack of resources, capacity and infrastructure as a challenge in developing innovative technologies. The authors further emphasise the lack of awareness of the actual impact innovation has on SMME development and competitiveness.

2.2.4 The current South African SMME sector

The SMME sector in South Africa is governed by the following legislation (Njiro & Compagnoni, 2010:152):

- National Small Business Amendment Act 26 of 2003.
- National Empowerment Fund Act 105 of 1998.
- Preferential procurement Policy Framework Act 5 of 2000.
- Broad-Based Black Economic Empowerment Act 53 of 2003 (the new codes were implemented in 2013).
- The Accelerated Shared Growth Initiative for South Africa.
- The National Youth Development Agency Act 54 of 2008.

The national providers of SMME support programmes include (Njiro & Compagnoni, 2010:153):

- Department of Trade and Industry.
- Industrial Development Corporation.
- Khula Enterprise Finance Ltd.
- National Empowerment Fund.
- National Youth Development Agency.
- Small Enterprise Development Agency.
- Tourism Enterprise Partnership.

According to the Global Entrepreneurship Monitor (Herrington *et al.*, 2017:5), the policy makers of South Africa have to urgently intervene to grow the economy. Creating a more enabling environment for SMMEs is a key priority that has been identified. However, the country is faced with a declining rate at which businesses are being established. The sector has experienced a decline of 26% since 2015, making it one of the lowest rates of all the economies that have participated in the study (Herrington *et al.*, 2017:6). On the contrary, whilst innovation levels declined since 2015, South Africa has sustained its position of being more innovative than its African counterparts.

In reviewing the status of SMMEs in South Africa, SEDA (2016:1) summarised an overview, which is indicated in Table 2.1.

Table 2.1: Overview of SMMEs in South Africa

Key Indicators	2015 Q2
Number of SMMEs	2 251 821
Number of formal SMMEs	667 433
Number of informal SMMEs	1 497 860
SMME owners as % of total employment	14%
% operating in trade & accommodation	43%
% operating in community services	14%
% operating in construction	13%
% operating in financial and business services	12%
% contribution to GDP	42%
% black owned formal SMMEs	34%
% operated by income group <R30 000 per annum	7%

Source: Adapted from SEDA (2016:1)

With more than two million SMMEs estimated to exist in South Africa, approximately 30% of these are formal SMMEs and contributed 42% to GDP. At the same time, there is a steady increase in the number of liquidations or deregistration of businesses since early 2000 (South Africa, 2008b:88). The exact causes are not yet known, however, given the many challenges faced by SMMEs in trying to start-up or sustain its operations, there is

an obvious need to change the SMME environment to allow for the creation of more sustainable SMMEs.

The small business survey by Grundling and Kaseke (2010:7) looked at the geographic distribution of SMMEs and found, 24.1% in Gauteng and 20.3% in KwaZulu-Natal. Only 50% of the SMMEs added value to the product before selling, and 70% operated from residential premises (Grundling & Kaseke, 2010:10). Creating just over 11 million employment opportunities, the majority (94%) of SMMEs employed less than five people each, whilst 40% were start-up businesses (Grundling & Kaseke, 2010:17). SMMEs operate in different industries including manufacturing, farming, mining, tourism, retailing, construction and service amongst others (Chimucheka, 2013:783)

The growth in unemployment has heightened the focus on SMMEs (Chimucheka, 2013:783). SMMEs contribute to the economic growth, and in addition to this the public and private sector also recognises the opportunity for SMMEs to create jobs and reduce poverty, more specifically for the historically disadvantaged groups (Chimucheka, 2013:784). Despite the impact of SMMEs have on economic growth, Maye (2014:2) points out that operating an SMME is risky and difficult, therefore resulting in a high failure rate of SMMEs.

The research of Maye (2014:2) revealed that only 37.8% of the adult population in South Africa believes there are good opportunities to start a business. This is a much lower than the average of 74.5% in other sub-Saharan countries. Similarly, South Africa's belief that sufficient capabilities existed to start a business, was much lower than the sub-Saharan average of 78.9%. South Africa is ranked 61 out of 65 economies, as one of the lowest rates of established businesses (Herrington *et al.*, 2017:6). The ease of doing business in South Africa has also declined, ranking 43 out of 189 countries (Herrington *et al.*, 2017:43)

2.3 CREATING SUSTAINABLE AND COMPETITIVE SMMEs

In this section, the factors that make businesses successful will be discussed.

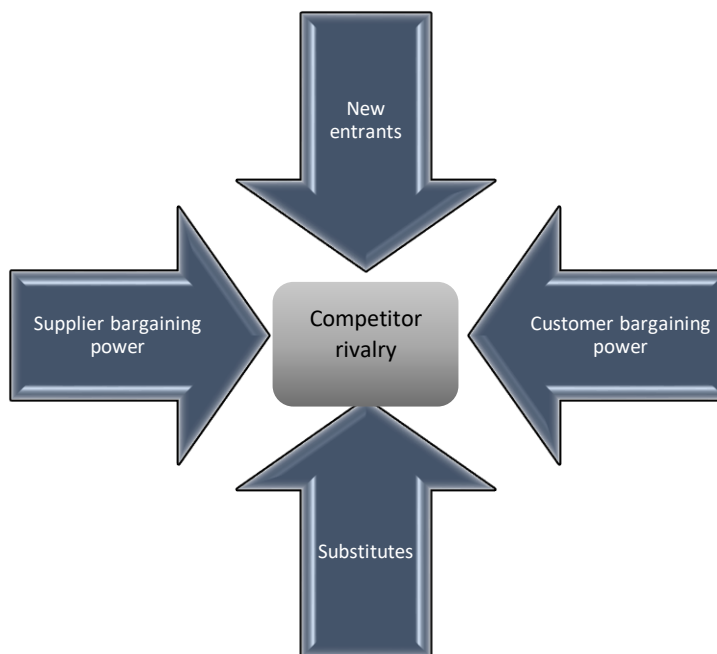
2.3.1 Defining business sustainability

As part of the research to identify sustainability indicators that link cash flow to business sustainability, Brouwer (2012:232) also researched the holistic understanding of business sustainability. The author concluded that the definition of business sustainability is simple, namely it is about sustaining existence. The research identified balanced stakeholder engagement, transparency, economic efficiency, creativity, and ability to change as components of business sustainability.

2.3.2 Defining competitiveness

Before trying to understand what makes SMMEs competitive, it is first important to understand what is competitiveness and why is it important. This concept is best described by Porter (1985:5) of the five competitive forces that determine industry profitability, as reflected in Figure 2.1.

Figure 2.1: Porter's five competitive forces that determine industry profitability



Source: Adapted from (Porter, 1985:5)

These five forces influence the price, cost and required investment required by a business and therefore determine the profitability of the business. The bargaining power of buyers determine the prices a business can charge for its products and/ or services. The bargaining power of the suppliers determine the cost of raw materials into the business. Whilst trying to sell at the highest price and source materials at the lowest price, businesses need to be cognisant of other potential replacement products, or any new competitors in the market. The intensity of rivalry influence the cost of competing, whilst the threat of new entrants sets limit on prices Porter (1985:5).

Chimucheka (2013:787) emphasises the importance of SMMEs understanding the dynamics of the competition in the industry. Failing to do so will result in failure to access markets. The Porters five forces model is used to determine the competitiveness and profitability of the industry (Chimucheka, 2013:788; Hove & Masocha, 2014:255-256):

- *Rivalry amongst competitors*: this is most the important and strongest element within the SMME sector. Competitors adopt several different strategies to sustain or grow the market position. These strategies include lowering prices, improving customer services, and enhancing product quality. New technology can also result in businesses finding it difficult to differentiate the current product offering. As a result, rivalry increases and profit margins are reduced, thereby making it difficult for SMMEs to compete, especially with larger businesses (Hove & Masocha, 2014:256).
- *Threats of new entrants*: If the barriers to entry are high, businesses will find it difficult to enter the industry. However, large businesses use high barriers to entry as an advantageous tactic to prevent new businesses from entering the industry. Nonetheless, new business can enter the industry with high quality products and services due to new technologies. Technology can assist SMMEs in improving distribution channels on the internet, through which geographical and physical boundaries are removed. As long as there is a new business entering the market, the competition amongst rivals will intensify (Hove & Masocha, 2014:256).

- *Threats of substitute commodities*: the introduction of new products in an existing commodity market, will impact the demand for the product. SMMEs will have to compete for the customer demand (Hove & Masocha, 2014:256).
- *Customer bargaining power*: customers will always want lower prices and higher quality products. Their bargaining power is typically higher when there are more suppliers than customers (Hove & Masocha, 2014:256).
- *Supplier bargaining power*: suppliers typically raise prices or reduce the quality of the commodity being supplied. The bargaining power of suppliers is usually higher when suppliers are concentrated or are a critical source of a component of the final product (Hove & Masocha, 2014:256).

When SMMEs understand the industry structure, it becomes easier to choose a strategy that will improve sustainability by improving performance or improve market position through the presence of a sustainable competitive advantage (Hove & Masocha, 2014:257).

2.3.3 Factors that make businesses sustainable and competitive

Research conducted by Ligthelm (2010:148) revealed a number of factors that impact business sustainability. These include adjustment of the product offering to include new products, improving productivity, lowering labour costs, managing pricing strategies and focusing on customer service. The author further emphasised the importance of adapting the business model to ensure continuity of the business in competitive markets (Ligthelm, 2010:149). All of these factors are governed by entrepreneurial behaviour, hence Ligthelm (2010:150) concludes this to be a key predictor of small business sustainability.

Naidoo and Urban (2010:235) investigated the impact of operational skills on business sustainability, a topic that is believed to be less explored. The authors are of the view that technical and industry-specific competencies are pivotal to business sustainability. The authors further stressed the potential for businesses to develop a sustainable competitive

advantage if the technical and industry-specific competencies are combined with entrepreneurial skills.

In investigating the determinants that impact the decision to diversify, Leza, Rajan and Kuma (2017:30) highlighted the negative impact of start-up capital on such a decision. The authors therefore concluded access to capital as a factor that impacts sustainability of SMMEs, apart from product diversification. The research of Bruwer and Van den Berg (2017:8) concluded that the overall conduciveness of the South African economic environment in all likelihood impacts the sustainability of SMMEs.

Döckel and Ligthelm (2005:61) showed that business size and age impact growth and by implication sustainability. Hove and Masocha (2014:260) found that an increased uptake in technological marketing will increase SMME competitiveness.

According to the Global Entrepreneurship Monitor (Herrington *et al.*, 2017:28), the sustainability of businesses are impacted by lack of marketable ideas and trading in sectors that are overpopulated. As a result, competition is high, profit margins are low and therefore sustainability is negatively impacted.

Halme and Korpela (2014:548) researched the resources required to carry out innovation, which the authors defined as a new business model, service or product that has been implemented or noticeable improved. It was found that industry knowledge is an important resource to unlock other resources in support of business sustainability. However, in the event of limited resources, SMMEs can still implement innovative business models (Halme & Korpela, 2014:559).

Urban and Sefalafala (2015:260) explored what entrepreneurial capabilities are required for South African businesses to compete internationally. Their rationale for this study is based on the need for business to seek international markets to stay sustainable and competitive, as domestic markets are highly competitive. The authors also noted the need for a combination of risk-seeking, proactive and innovative behaviours to successfully

implement such a strategy. Entrepreneurial capabilities were identified as human, social and technology capabilities (Urban & Sefalafala, 2015:263). Furthermore, it was found that to be successful internationally, the business must be continuously innovating new products.

Shree and Urban (2012:195) conducted a similar study to that of Urban and Sefalafala (2015:260), however the focus was on internationalisation of South African SMMEs. The authors found that SMMEs require funding and a skilled labour force to enable internationalisation of the business. On the contrary, research conducted by Ramukumba (2014:31) found that SMMEs did not view the constraints of skilled workers or competitive pricing as significant, provided the quality of the product was good. The SMMEs were of the view that a good quality product will result in repeat customers and as a result other challenges could be overcome. The author, therefore, states the need for continuous access to knowledge and information such as innovative technologies, should SMMEs wish to stay competitive and sustainable (Ramukumba, 2014:35).

2.3.4 Making SMMEs sustainable and competitive through innovation

Thus, SMMEs also find it difficult to compete against large enterprises, something that the South Africa (2008b:140) acknowledges and recommends that specific interventions are required. Based on the researcher's experience in supporting SMMEs, the potential to create competitiveness lies in the introduction of innovative technologies within the SMME sector. Previous literature (Colombelli *et al.*, 2016:21) also supports this notion, and believes product and process innovation is required in a new business to not only allow it to be competitive, but to also increase the chances of survival.

Creating and sustaining competitiveness in the current dynamic global markets is a demanding task for an SMME (Tustin, 2015:90). Today's fast changing needs from customers and the demand for decreasing product and service development time, impacts the strategies of most businesses to move away from internally developed technologies to technology transfer, in order to sustain its competitive advantage (Park *et al.*, 2013:736). In Russia, the transfer of technology to SMMEs for development and

commercialisation is becoming more popular than using the SMME as an intermediate step in the commercialisation of the technology with larger businesses (Arroio & Scerri, 2014:88).

Implementation of innovation is key factor to be competitive (International Trade Centre, 2015:45-46). The authors highlight the strong correlation between export potential and innovation, where product innovation in particular is important for SMMEs. However, SMMEs lack clear intellectual property rights strategies. This shortfall can be addressed by forming linkages with other businesses and public research institutes (International Trade Centre, 2015:46). Whilst in developed countries, this relationship centres on developing new technologies, the focus in developing countries is the adoption of technologies and improvement of existing capabilities.

In addition to the need to the demanding task of being competitive, there is a recent school of thought developing that typical start-up businesses will no longer provide the economic development that is sought after through SMMEs. Shane (2009:143) argues the need for the establishment of high growth and high productive businesses to impact economic development, especially in wealthier countries. It is further argued that the myth of addressing economic objectives through the establishment of typical start-ups, is not only a United States phenomenon, but it also experienced in 34 countries in the Global Monitor dataset.

This view is in direct contrast to the studies conducted in South Africa (SEDA, 2016:31; South Africa, 2008b:94), where the economic impact of SMMEs is noted. This could be explained by Shane's argument that economic impact will be higher in poorer countries. This argument is based on correlations done between the rate of formation of new SMMEs and economic growth, across different countries (Shane, 2009:143). It is then worth noting the need to establish high growth and high productivity SMMEs because as the wealth of South Africa increases, it is these types of businesses that will positively impact the economy. High growth and high productivity can be achieved by implementing competitiveness into the business.

Introducing new technologies into the business, is one of the ways in which businesses can create a competitive advantage. However, this comes with its own challenges. In reviewing the issues faced by SMMEs, Abor and Quartey (2010:224), state that SMMEs generally licence in foreign technologies due to the difficulty in obtaining local patents. The authors go on to suggest supporting SMMEs in enhancing productivity with simple, inexpensive, and adaptable technologies by promoting technology transfer.

The study conducted by Pretorius, Millard and Kruger (2005:63) concluded that whilst SMMEs have an internal view of being creative and innovative, there is a lack of implementation skills. However, the need for SMMEs to apply innovation to find new opportunities in products, markets, and process, is noted by the authors.

Tustin (2015:87) underlines the lack of access to local patents as one of the factors impacting sustainability. The author outlines the difficulty SMMEs experience in accessing local technology, and as a result licence foreign technologies, but with minimal ownership. (Ndabeni & Rogerson, 2017:87) are of the view that innovation activities of SMMEs must be enhanced, potentially through accessing the knowledge and technology developed by universities.

Mohalajeng and Kroon (2016:8) are of the view that businesses should embrace innovation as it contributes to creating a competitive advantage. This view is supported by Okanga and Groenewald (2017:45) that emphasise the need for SMMEs to develop a strong innovative culture if these businesses are to remain sustainable in the manufacturing sector.

2.3.5 South African support to SMMEs

Since the development of the Small Business Development Policy in 1996, South Africa has embarked on various initiatives to support SMMEs through a conducive environment. As a result, the country saw the establishment of several institutions that were intended to support SMMEs with financial and non-financial support (Ayandibu & Houghton, 2017a:54; Molapo, Mears & Viljoen, 2008:27).

Njiro and Compagnoni (2010:150) embarked on a study to identify all the SMME support programmes available in South Africa. Most of the institutions providing such support were found in Gauteng and Western Cape. National, provincial, non-profit, for-profit and private institutions were identified across the country, all of which serving a common approach to supporting SMMEs (Njiro & Compagnoni, 2010:156), namely:

- Provision of transfer of knowledge and skills.
- Assistance with start-up activities, including sourcing funds.
- Provision of networking opportunities.
- Ongoing mentoring and coaching to ensure business sustainability.

The agencies of the Department of Trade and Industry include the Centre for Small Business Promotion and the National Small Business Council. Support programmes of the Department of Trade and Industry are also administered by institutions such as Khula Enterprise, and Small Enterprise Development Agency (SEDA). All of these programmes are meant to enable the growth of SMMEs (Ayandibu & Houghton, 2017:54-55). Unfortunately, it has been found that only 38% of entrepreneurs are aware of the Small Enterprise Development Agency.

The Small Enterprise Development Agency was established with the intent of providing SMMEs with business counselling, advice, training, information, and networking (Molapo *et al.*, 2008:28). In addition, the institution provides training on government procurement processes and tenders, access to technology and enhancing skills. Khula Enterprise, on the other hand, was established to enable SMMEs to access finance through commercial banks, by providing loan guarantees (Molapo *et al.*, 2008:29).

The Manufacturing Advice Centres were instituted to provide support to SMMEs in the areas of accessing finance, improving productivity, managing human resources and marketing; and development of quality assurance systems (Molapo *et al.*, 2008:31). The Technology Station in Chemicals (TSC) located at the Tshwane University of Technology

was established with the intent of helping SMMEs improve competitiveness by exposure to high levels of technology and promoting technology transfer (Ndabeni, 2008a:88).

In 2004, the National Small Business Act of 1996 was amended and the strategy to support SMMEs was based on three pillars. Firstly, entrepreneurship was to be promoted. Secondly, the SMME environment was to be strengthened. Lastly, the competitiveness and capacity of the SMMEs were to be enhanced by focusing on competitiveness, quality, business incubation and technology transfer (Molapo *et al.*, 2008:36).

Tustin (2015:87) argues that the exact number of SMMEs is unknown, therefore the contribution to GDP is a speculative number. The author is of the view that this lack of understanding hinders the support strategies to SMMEs, albeit policy or support programmes. The empirical research revealed the lack of a “*single source of information*” as one of the main reasons why there is a low uptake of support programmes and facilities. The establishment of a centralised agency that co-ordinates all SMME support programmes was therefore recommended, which should include funding and research endeavours (Tustin, 2015:88).

Despite the vast support programmes that have been established in support to SMMEs, Peters and Naicker (2013:22-23) found a lack of awareness and utilisation of these initiatives. Even though lack of access to finance is a major obstacle for SMMEs, the survey revealed a lack of awareness of the two primary funding institutes Khula Enterprise and Umsombomvu Youth Fund. SMMEs also viewed the support programmes as bureaucratic, thus being the primary reason for the lack of utilisation (Peters & Naicker, 2013:23).

2.4 OVERVIEW OF BUSINESS INCUBATION

In this section, the concept of business incubation will be discussed.

2.4.1 Definition of a business incubator

There are a number of debates regarding the definition of business incubation (Masutha, 2012:11). Chandra (2009:6) define a business incubator as “*an organization that*

accelerates and systematises the process of creating successful enterprises by providing a comprehensive and integrated range of support, including: Incubator space, business support services, and clustering and networking opportunities.”

Despite the varying definitions of business incubators, the essence of business incubators centres around reducing the high mortality rates of businesses in both developed and developing countries (Lose, Nxopo, Maziriri & Madinga, 2016:132). More specifically, in South Africa, business incubators support the growth of new and existing businesses (Lose *et al.*, 2016:132).

2.4.2 International business incubation landscape

Brazil has demonstrated significant growth in the number of business incubators in the country, to approximately 400 over a 20-year period. With a focus on economic development, job creation and poverty alleviation, various business incubation models have evolved over time. Brazilian incubators are believed to display the broadest scope of incubation models in comparison to other countries. These models can be summarised as follows (Chandra, 2009:13-15):

- **Technology Incubators:** These incubators are usually associated with and supported by the universities, with its primary focus on technology. Areas of specialisation are typically found in these incubators, for example biotechnology (Chandra, 2009:13).
- **Traditional Incubators:** These incubators are typically targeted at dealing with the social objectives of the communities, such as unemployment. These types of incubators are typically set up by private entities to create new businesses in industrial sectors that are traditional to the region (Chandra, 2009:13).
- **Cooperative/ Social Incubators:** These incubators were established with a strong emphasis on addressing poverty through job creation. Universities and government worked closely together, where government funded the incubator, whilst

universities trained and transferred skills and knowledge to the cooperatives. These incubators support entrepreneurs that are born out of necessity, in contrast to the technology incubator where entrepreneurs that are born out of opportunity, are supported (Chandra, 2009:14).

- Cultural Incubator: These incubators support the start-up and growth of businesses in the field of culture, such as music, arts, and photography. Entrepreneurs in the incubation environment, are unique in that the motivating factor for being in business is for love as opposed to money. Therefore, the support required is specialised (Chandra, 2009:14).
- Private Incubator: These incubators are typically funded by venture capitalists and/or information technology professionals. Capital is invested in the client firms (Chandra, 2009:15).
- Corporate Incubators: These incubators are usually housed within the environment of a large business, with the aim of starting new selective businesses, to reap the benefits of innovation (Chandra, 2009:15).

Arbidāne and Tarasova (2016:223) researched business incubators in Latvia, and found that the business incubators not only assisted entrepreneurs with start-up and growth, but also in becoming more innovative. In exploring the relationships required for the success of SMMEs in business incubators, Rubin, Aas and Stead (2015:21-22) found three key areas, that being (1) technological, (2) market and (3) financial. The two sources of technological knowledge were from universities and other SMMEs in the business incubator. The business incubator manager was the source of market and financial knowledge.

2.4.3 Business incubation in South Africa

Business incubation is a new concept in South Africa (Buys & Mbewana, 2007:357; Masutha, 2012:59). Starting with only four business incubators in 2004, an additional 47

were established by 2013, of which the majority were publicly owned. The primary aim of the publicly owned business incubators was to promote economic participation of disadvantaged communities. In contrast, the publicly owned business incubators focused on creating small businesses that were economically viable (Masutha & Rogerson, 2014a:50).

Rogerson (2016:22) reviewed the international policies related to business incubation and identified best practices for the South African context. The research was focused on four sectoral issues, namely climate change, gender, culture, and agribusiness. The authors concluded that policy must recognise the need for business incubation support for the services sector (Rogerson, 2016:27).

Business incubators in developing countries are found to focus on the physical structure as the value-add to SMMEs. On the contrary, business incubators in developed countries, also places emphasis on the intangibles value propositions. These include business networking, marketing plans and business plans inter alia (Akçomak, 2009:23). The author further argues the impact business incubators have on reducing the probability of start-up failures, thereby stimulating the need for the establishment of more incubators across the globe.

Masutha (2012:10) explains the primary purpose of business incubation as creating enterprises that are innovative, financially, and operationally independent, and globally competitive. This is achieved by business incubators creating the access to targeted business and technical support services. The author goes on to explain the four phases of business incubation in South Africa, with the Incubation Support Programme (ISP) launched by the national Department of Trade and Industry (the dti) being the most recent phase (Masutha, 2012:44). After interviewing policymakers, more than 50 business incubator managers and 30 SMMEs from the business incubators, the author found variation in the size and type of incubators (Masutha, 2012:139). Some were sector focused, such as chemicals, construction, or agriculture, whilst others were set up for mixed use. Further differences include virtual incubation versus physical incubation, with

the largest physical incubator accommodating 64 SMMEs. The largest virtual incubator supports 300 SMMEs (Masutha, 2012:81).

Whilst the need for business incubation is understood, such programmes also experience challenges in sustaining its operations (Lose & Tengeh, 2015:14344). The authors researched the challenges faced by business incubators in the Western Cape, which include (Lose & Tengeh, 2015:14351-14353):

- Lack of clear end dates for the incubation programme.
- Lack of sufficient operational requirements of the business incubator.
- Insufficient support from private industry.
- Reliance on government funding to remain sustainable.
- Lack of advanced technological facilities.

Business Partners (2016:2) describe 38 business incubators and support programmes in South Africa, majority of which are privately owned. The support to SMMEs range from business development support to funding. The services provided by each business incubator and support programme is outline with the associated cost.

Majority of South African business incubators are publicly owned and predominantly found in large cities (Masutha & Rogerson, 2015:227). The authors investigated two privately owned and two publicly owned business incubators located in the urban areas. The authors concluded that whilst public business incubators are focused on skills transfer and job creation, private business incubators place emphasis on maximising profitability and annual turnover (Masutha & Rogerson, 2015:237).

Dubihlela and Van Schaikwyk (2014:267) are of the view that the increasing number of business incubators in South Africa is the right kind of support for SMMEs and the economy. The authors refer to international cases where business incubation has shown the ability to create innovative businesses, thereby increasing SMME chance for survival and success (Dubihlela & Van Schaikwyk, 2014:268).

In summary, business incubation in general, provides SMMEs with access to physical facilities to enable start-up of businesses. It also provides a safe space in which the SMMEs can learn and grow to become sustainable. This learning and growth takes place through the networking between SMMEs and industry partners. Since the inception of the ISP by the dti, the department received 225 applications for the establishment of business incubators across the country. Unfortunately, only 48 applications were approved (Reporter, 2015). Nevertheless, the number of applications demonstrates the perceived value and need for more incubators in this country.

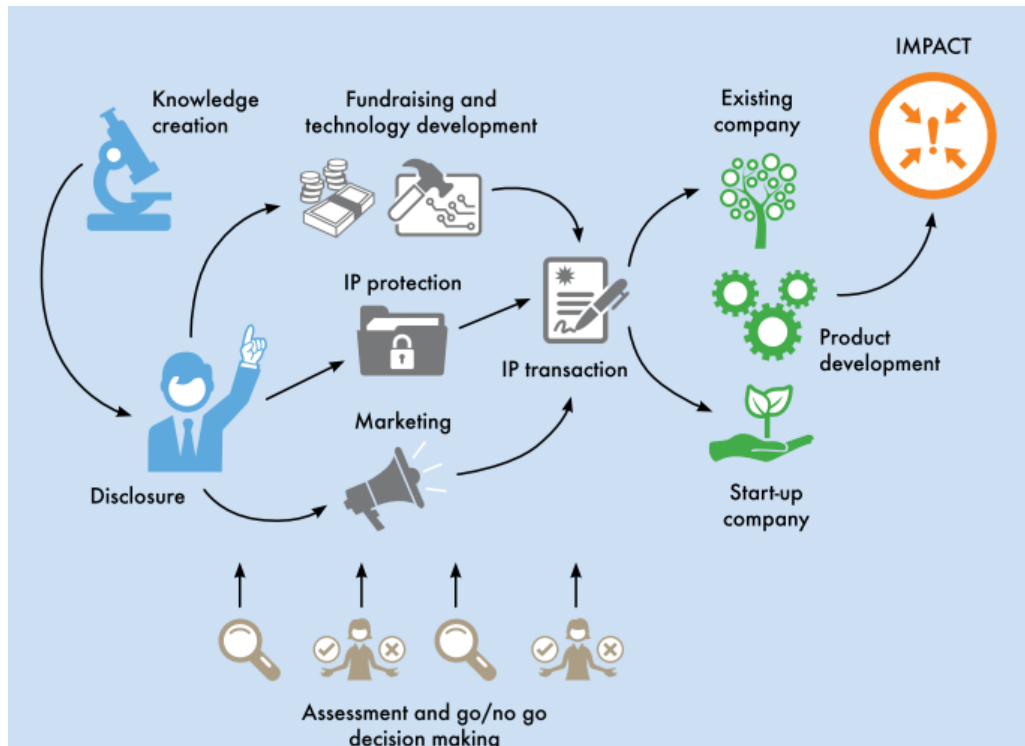
2.5 TECHNOLOGY TRANSFER

This section is focused on the technology transfer offices at universities in South Africa.

2.5.1 Key concepts of technology transfer

Lin (2003:328) defines technology transfer as the transfer of knowledge, skills and technologies embodied in physical objects such as processes and machines, as well as people. The South Africa (2017:13) define technology transfer as the process of “*translating promising ideas into products, processes and services in the economy*”. The process of transferring technology is outline in Figure 2.2.

Figure 2.2: The technology transfer process



Source: South Africa (2017:13)

The process outlines how knowledge is created, disclosed, protected, after which funds must be raised to then develop the technology. Following which, the technologies are then marketed, resulting in an intellectual property transaction to either an existing or start-up company. The product development stage is when the product, process or service is developed to ensure revenue can be generated from it. Finally, impact is created in some form of social impact (South Africa, 2017:14).

The Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:2) defines intellectual property as any creation that can be protected by law but excludes publications associated with conventional academic work. Intellectual property includes inventions, designs, plant varieties and marks or logos. Copyrights refers to protection of work related to literary works, music and films amongst others (South Africa, 2015:15). South Africa is not the first country to implement an Act of this nature. Other countries that implemented similar laws include the United States of America, Japan, Germany, United Kingdom, Taiwan and Brazil (South Africa, 2015:9).

Ndabeni (2008a:82) defines innovation as “the commercialisation of something new, which may be a new technology, a new application in the form of a new product, services or process, a new market or market segment, a new organisational form or a new management approach, or a combination of the two or more of these elements”. Halme and Korpela (2014:548) define innovation as product, service or business model that is either new or has been significantly improved.

2.5.2 The purpose of technology transfer offices

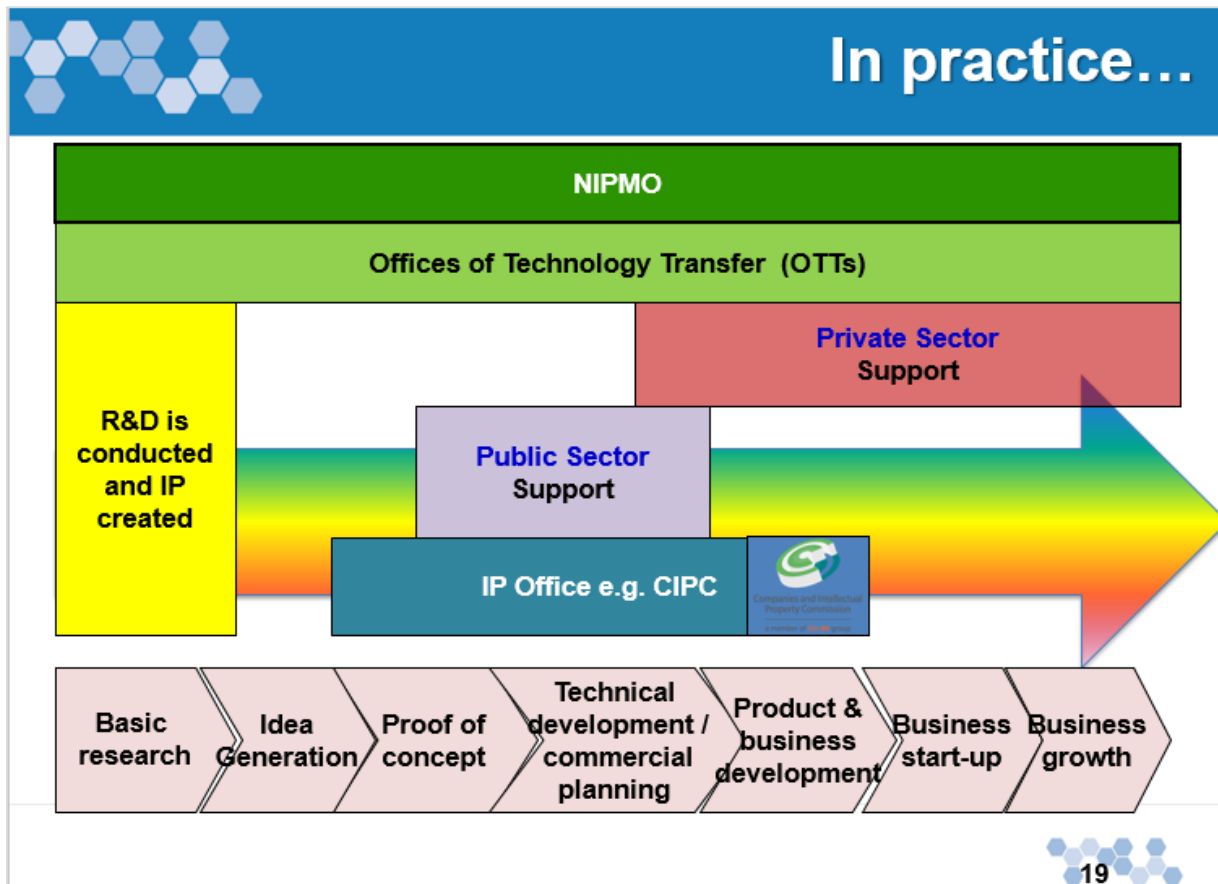
Technology transfer offices are also a new concept in South Africa, which is aimed at supporting the transfer of publicly funded research to the industry. These offices were established because of the Intellectual Property Rights from Publicly Financed Research and Development Act (51 of 2008) (South Africa, 2008a:8), which has the primary aim to:

- Provide for more effective utilisation of intellectual property emanating from publicly financed research and development.
- Establish the National Intellectual Property Management Office (NIPMO) and the Intellectual Property Fund.
- Provide for the establishment of technology transfer offices at institutions.
- Provide for matters connected therewith.

All the above is intended to ensure that publicly financed research and development ultimately provides some benefit to the broader society, be it economically or socially. The Act goes on further to describe the establishment and function of technology transfer offices, as well as the function of NIPMO. One of the key functions of NIPMO is to support the commercialisation of the intellectual property. One of the conditions of the intellectual property transactions is that preference must be given to small enterprises (South Africa, 2016).

The value chain in commercialising intellectual property is outlined by the South Africa (2015:19). This is depicted in Figure 2.3, which also indicates how the various stakeholders can support the process.

Figure 2.3: Value chain of implementing intellectual property



Source: South Africa (2015:19)

While the public-sector funds the research, the development and protection of the research is carried out by the universities, with support from the private sector in commercialising the intellectual property. The entire process is supported by the technology transfer offices, which reports into NIPMO (South Africa, 2015:19).

2.5.3 Institutions implementing technology transfer

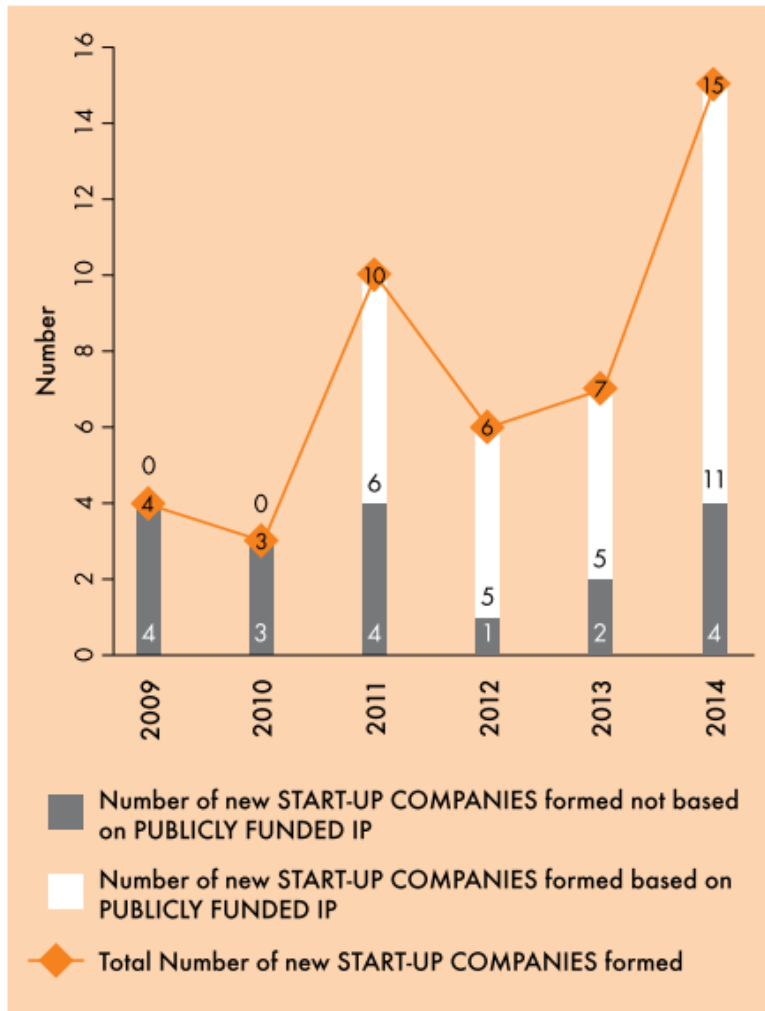
The institutions that are expected to establish technology transfer offices are organisations and individuals that receive public funds. These include higher education institutions, science councils, state owned enterprises, private individuals, and businesses. The Act was promulgated in 2008 and applies to all intellectual property conducted on or after 2 August 2010 (South Africa, 2015:16). Hence South Africa had 6 years generating intellectual property, with potential commercialisation opportunities. In

2015, NIPMO reported a pipeline of 961 disclosures, of which 897 were active. A mere 9.9%, 89 of 897 of the active disclosures were granted intellectual property rights. In the end, 42 disclosures were commercialised and a total of R61 642 363 was invested in funding intellectual property (South Africa, 2015:21).

Rorwana and Tengeh (2015:34) highlight the key role that academics play in the technology transfer process. The academics not only initiate the development of marketable innovative products, the role extends to maintaining the relationship with private companies involved in the process.

The South Africa (2017:2-3) survey to understand the South African context of technology transfer capabilities and the evolution thereof. The survey was the first of its kind and was carried out from 2008 to 2014. It was found that on average 100 new technologies were generated annually between 2011 and 2014 (South Africa, 2017:4). In addition, a total of 45 start-up companies were established, of which 73% were due to the commercialisation of publicly funded intellectual property. The trend of the period is shown in Figure 2.4.

Figure 2.4: Trend of start-up companies from 2009 to 2014



Source: South Africa (2017:40)

Based on this research, there is an increase in the number of start-up companies that are as a result of the publicly funded intellectual property. A single institution contributed to 47% of the start-up formation. This trend is also believed to be underestimated as data from one of the major contributors was unavailable (South Africa, 2017:40). It is believed that some of the technology transfer offices capabilities have not yet matured (South Africa, 2017:45). As a result, the upward trend depicted in Figure 2.4 could be sustained as capabilities of other technology transfer offices mature. This survey shows a marked improvement in the outcomes of the technology transfer offices as compared to when Wolson (2007:1655) researched technology transfer and found the process to be weak.

2.5.4 Creating value through technology transfer

Technology transfer is expected to benefit society in two ways, (1) by improving quality of lives, improving health and securing energy and (2) creating financial returns of at least R260m over the next 5 years (South Africa, 2015:29). Examples of where society has benefited from the commercialisation of intellectual property are (South Africa, 2015:30-34):

- In Gauteng, where a patented Technology, TBCheck, was used to improve the accuracy of 78 000 tests for tuberculosis. The TBCheck spot cards that were developed are currently shipped to more than 20 countries.
- In Limpopo, the in vitro culture conditions under which some *Strelitzia* species were propagated, was optimised and patented in South Africa, Australia, Europe.
- In the Free State, technology stations were established to provide access to rapid prototyping and manufacturing technologies to individuals and SMMEs at an affordable rate. State patients that do not have access to medical funds, can now receive reconstructed limbs and facial features.
- In the Eastern Cape, the Xhosa people were unable to scale up the fermenting of honey. The Rhodes' University developed a continuous reactor for the fermentation of honey, which allowed the creation of a new business. Consequently, 12 people were employed and 380 people were trained as bee-keepers. Markets are now established in Switzerland, the United States of America and South America.
- In the Western Cape, technology a low-cost fire-detection system coupled with a radio-frequency alert device was developed to prevent shack fires in informal settlements.

Although the benefit of commercialising intellectual property is evident, NIPMO have highlighted some challenges in making headway in implementing the Act. Support from senior management, awareness of NIPMO from the public and internal resource constraints are some of the challenges. The two key challenges that of keen interest of the researcher and is relevant to this research study is (1) the lack of availability of

entrepreneurs to take the new technologies to market and (2) de-risking the administrative support during the set-up of a new business.

2.5.5 Barriers to effective technology transfer

Siegel *et al.* (2004:128-140) conducted 55 structured interviews with stakeholders associated with transfer of technology from universities to industry in the United States of America. The authors interviewed managers and entrepreneurs of small and large firms, as well as members of the different disciplines and faculty ranks, including administrators and directors of the technology transfer offices. The authors identified several barriers to effectively transfer technologies, which include:

- Lack of understanding regarding university, corporate, or scientific norms and environments.
- Insufficient rewards for university researchers.
- Bureaucracy and inflexibility of university administrators.
- Insufficient resources devoted to technology transfers by universities.
- Poor marketing/technical/negotiation skills of technology transfer offices.
- University too aggressive in exercising intellectual property rights.
- Faculty members/administrators have unrealistic expectations regarding the value of technologies.
- “Public domain” mentality of universities.

The research concluded that each group of stakeholders has a vastly different view of the outcome of transfer of technologies from university to industry.

Within the South African context Bansi and Reddy (2015:194) found that academic staff did not agree or understand the ownership provisions of the Intellectual Property Rights from Publicly Financed Research and Development Act (51 of 2008). Some even found it to be unreasonable. In addition, the authors found that majority of the researchers were not aware that research that could result in intellectual property. Lastly, the authors found that registration of intellectual property and commercialisation of the research was not a

primary focus of the researchers (Bansi & Reddy, 2015:195). These findings could possibly pose a challenge for the technology transfer offices.

2.6 INTEGRATION OF THE MULTI-DISCIPLINES TO CREATE SUSTAINABLE AND COMPETITIVE SMMEs

Ndabeni and Rogerson (2017:101) are of the view that the opportunity exists for SMMEs to form a closer relationship with universities, to develop technological innovations. Not only will this allow the SMME to access knowledge and technology, it will also contribute to sustainable economic development and elevate the relevance of universities in the economy. The authors further emphasise the important role that knowledge plays in innovation, whereby it enables the acquisition of rare and imitable capabilities; capabilities that will enable SMMEs to successfully compete in national and global markets.

Research conducted by Booyens (2011:75) indicated a weak collaboration between SMMEs and universities, even though universities are viewed to add more to the knowledge base of SMMEs than large businesses.

Afolayan and de la Harpe (2015:142) surveyed SMMEs on how the businesses access information on technologies that can be adopted. The authors found that SMMEs use various means of accessing this knowledge. These include networking, research, internet, vendors, media and seminars. The SMMEs fear that lack of access to this knowledge will prevent the business from improving its operations (Afolayan & de la Harpe, 2015:144). Emerging countries such as Brazil and Malaysia have shown positive impact on the economy by proactively providing access to knowledge, infrastructure and technology to SMMEs. To this end, Afolayan and de la Harpe (2015:144) identify technology incubators as an essential platform to develop and implement innovative ideas by SMMEs.

Developing innovative SMMEs can be attained through the transfer of technology from the research and development sector to SMMEs, however, this process is faced with many challenges (Mazurkiewicz & Poteralska, 2017:457). Some of these barriers are technical in nature or relate to slow reaction of the research institute to respond to market demands.

As a result, spin-off businesses may be established, but these too face challenges. These challenges include the lengthy process of establishing the business, the need for the involvement of the researchers or innovators in the business; and finally challenges with marketing and legal (Mazurkiewicz & Poteralska, 2017:462)

Bansi (2016:291) interviewed technology transfer office managers, to gain a better understanding of commercialisation of university innovation in South Africa. When requested for suggestions on how the university can be supported in commercialising innovation, more than half the respondents suggested that the universities should utilise business incubators and seed funding opportunities (Bansi, 2016:292). The respondents were also of the view that government should establish more business incubators (Bansi, 2016:342). Therefore the author recommended a stronger collaboration between industry partners and the universities (Bansi, 2016:346). This view is further supported by Dubihlela and Van Schaikwyk (2014:268) that emphasise the importance of the collaboration between business incubators and universities.

In researching the influence of private companies in the process of technology transfer in South Africa, (Tengeh & Rorwana, 2017:151-152) found an overwhelming response from the participants on the importance of university and industry partnerships to commercialise innovation. The responses were purely from the academic sector, hence the authors emphasized the need to broaden the research to include the view of private companies.

2.7 CHAPTER SUMMARY

In this chapter, the reader was provided with an overview of SMMEs in South Africa, where SMMEs were defined and the resultant contribution to the economy was discussed. In addition, the challenges faced by SMMEs were highlighted and the current state of the South African SMME sector was outlined. The factors that make SMMEs sustainable and competitive were examined, as well as the support programmes available to SMMEs in the country.

The concept of business incubation was discussed, where various definitions were considered. The reader was introduced to business incubation in the international landscape, to provide a holistic view of how business incubators support SMMEs. The business incubation landscape in South Africa was also discussed.

Another concept of technology transfer was introduced to the reader, where the concept was defined and the channels through which it is introduced into society is explained. The value of technology transfer and the barriers that hinder this process is described.

Finally, the integration of all of the different sectors and the benefit thereof was discussed. This is the basis on which this research is conducted. In the next chapter, the reader will be introduced to the methodology followed in this research.

CHAPTER 3

RESEARCH DESIGN, METHODOLOGY AND PROCESSES

3.1 INTRODUCTION

Business research guides business decisions by collecting, recording, and analysing data in an organised and systematic manner (Chenail, 2011:11). This systematic approach includes designing the research, selection of a research method, as well as selecting the sampling procedure, collecting data and finally analysing the data (Chenail, 2011:13).

This research study adopts a qualitative approach, based on a phenomenological philosophy or methodology. An approach of interpretivism is used to deepen the understanding of the experiences of the managers at the business incubators and technology transfer offices.

In this chapter, the philosophy and research methodology are discussed, for which the rationale is elaborated on. The data collection and data analysis processes are described in detail. The research population and sampling strategies are discussed. Finally, the quality, rigour and ethics of the research process are explained.

3.2 RESEARCH METHODOLOGY

Qualitative research is a broad term that encompasses a number of different approaches to interpretative research (Leedy, 1997:155). This type of research is usually applied when previous experiences are used to extrapolate what needs to be studied in future (Leedy, 1997:156). Such situations include when insufficient information is available on a topic, when variables are not known, or when relevant theory is limited. For the purposes of this research, a qualitative research approach is adopted.

In search for meaning on the topic under research, a phenomenological approach was adopted for this study. This approach is based on a few assumptions which are as follows (Grossoehme, 2014:7):

- Meaning is incomplete and always developing.
- The researcher forms part of the study and the values of the researcher also play a role in the research.
- Bias is inherent in the research.
- The participants and the researcher are sometimes partners and also share knowledge.
- It is important to have a common form of expression.
- Not all participants may share meaning.

Often, the researcher has prior personal experience with the phenomenon and deepens this experience through the research whilst understanding the experience of others (Leedy, 1997:161). It is for this reason that the researcher may not be able to generalise the findings (Grossoehme, 2014:7). It is more important to ensure an accurate presentation of the results is achieved.

Phenomenology is a philosophy and methodology that is typically used to understand complex problems that are not initially implicit (Goulding, 2004:301). The primary goal of phenomenology is to enlarge and deepen the understanding of experiences, without necessarily considering the origin of the experience (Goulding, 2004:302). In order to achieve this, an inceptual process is undergone, where deep questioning takes place, reminiscing and reflective wondering occurs and interpretation of the primal meanings of human experience takes place (van Manen, 2017:819).

Whilst this method is rich in context and deepens the researchers understanding of the participants experiences, it does not allow for generalisability as the emergent themes are incepts and not concepts (van Manen, 2017:819-820). A concept generalises whilst an incept singularises.

Interpretivism, rooted in philosophical traditions such as phenomenology, is an approach whereby the meaning of people's behaviour and experience is sought to be understood (Chowdhury, 2014:433). This philosophical approach is considered to provide contextual

depth, where the researcher tries to view things from the perspective of the participants by considering the ideas and feelings of the participants (Chowdhury, 2014:434).

3.3 RESEARCH POPULATION AND SAMPLING

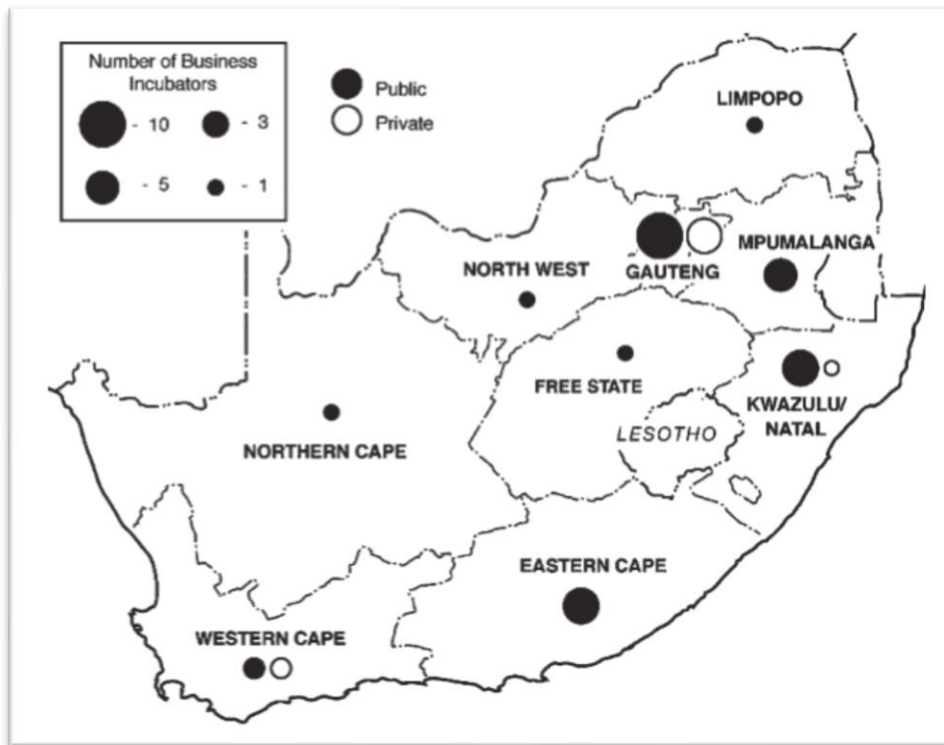
Whilst there are various definitions of sampling, Gentles, Charles, Ploeg and McKibbin (2015:1775-1776) define it as the collection of data from a selection of specific data sources, with the aim of addressing the research objectives. More specifically within a phenomenological study it is restricted to a single type of data source, namely people.

In conducting research, one of the first key concerns is defining the research population (Robinson, 2014:2). The criteria used to either include or exclude participants from the study must be clearly understood. Such criteria improve the homogeneity of the research population, which can be determined by various parameters such as demographic homogeneity, geographical homogeneity, physical homogeneity, psychological homogeneity or life history (Robinson, 2014:2). For the purposes of this study, homogeneity was determined based on the life history of the participants.

3.3.1 Research population of business incubators

Public and private business incubators are located across the country. The location of these business incubators is shown in Figure 3.1.

Figure 3.1: Geographical location of business incubators in South Africa



Source: Masutha and Rogerson (2014b:149)

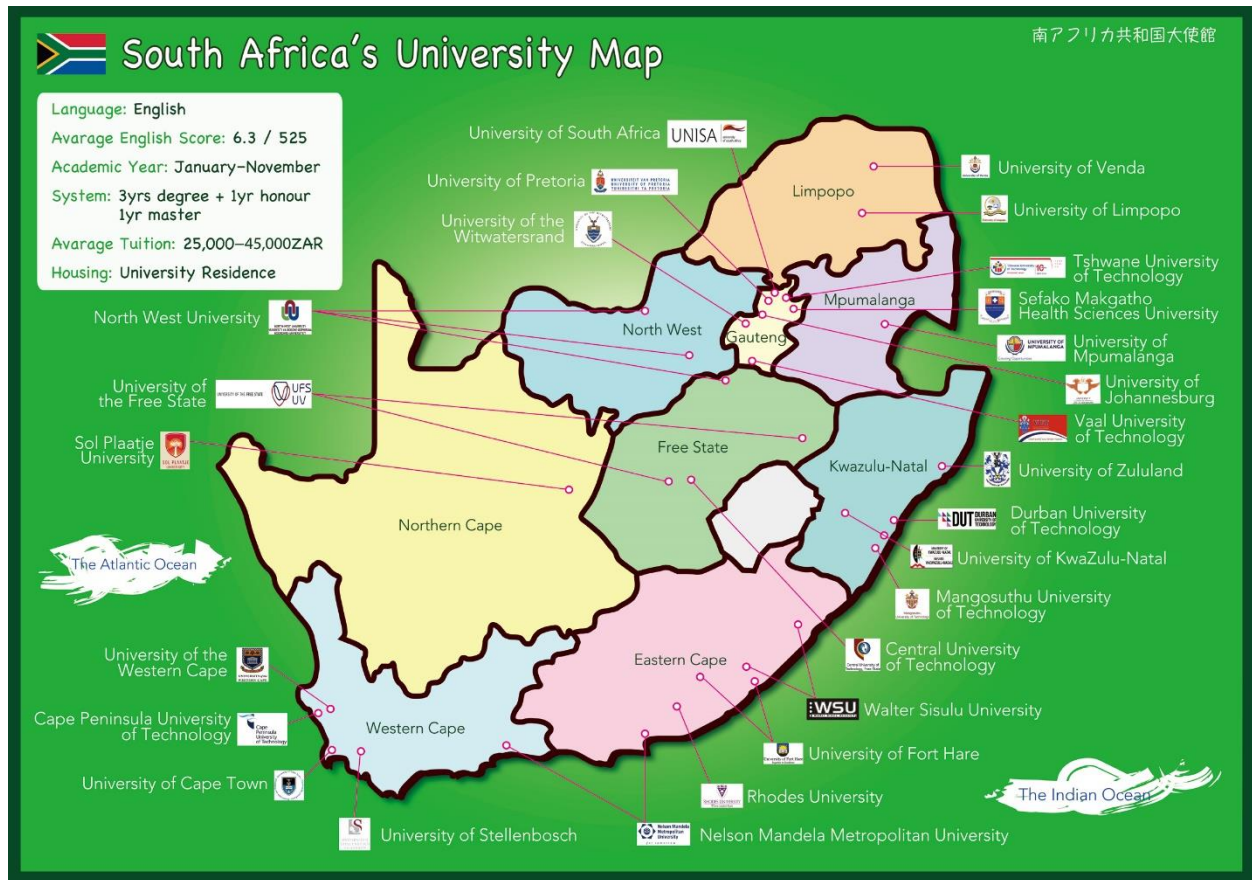
As can be seen from Figure 3.1, more than 50 business incubators are located across South Africa. There are more publicly owned than privately owned business incubators (Masutha & Rogerson, 2014b:149). This is government's attempt to support the establishment of SMMEs across the country. However, the authors also illustrate the concentration of the business incubators in the urban regions, where Gauteng hosts two-thirds of the incubators (Masutha & Rogerson, 2014b:149).

The stakeholders in a business incubator include the manager, the staff and the SMMEs. The philosophical approach used for this research requires the insights of the business incubator manager and not that of the staff or SMMEs. Hence the business incubator managers were interviewed to understand the perception of how innovation can support SMMEs in becoming more sustainable, as well as how universities can play a role in enabling this.

3.3.2 Research population of technology transfer offices

The geographical location of the public universities in South Africa are shown in Figure 3.2.

Figure 3.2: Geographical location of public universities in South Africa



Source: Anon (2017:1)

There are 26 public universities in South Africa of which 13 have technology transfer offices (Alessandrini *et al.*, 2013:5). Some of these offices were established as early as 1999, with most of them having one full time staff member. More recent research has shown an increase in the establishment of technology transfer offices to 22 by the year 2014 (South Africa, 2017:17). According to the Act, the function of the technology transfer offices is in essence, to protect and commercialise intellectual property (IP). Alessandrini *et al.* (2013:15) have found that technology transfer is active across various sectors from health to the built environment.

The managers of the technology transfer offices were interviewed to understand the scope of technology transfer, the impact on SMMEs and the potential to collaborate with business incubators to support commercialisation of the technologies. The inventors were interviewed as the technology transfer office takes on the liaison role with stakeholders.

3.3.3 Sample population and sample size

In phenomenology, the researcher only has one legitimate source of data and that is the views and experiences of the participants (Goulding, 2004:302). As such, the participant's views are considered as "fact", therefore only participants that have lived the experience are interviewed. Hence sampling is purposive and data collection is in the form of an interview (Goulding, 2004:302).

In qualitative research, the sample size must be large enough to provide meaningful understanding of the experiences of the participants, and at the same time be small enough to manage the data generated (Fugard & Potts, 2015:670). Sample size is therefore based on the judgement of the researcher through the researchers knowledge and experience on the research (Fugard & Potts, 2015:670). Whilst this may be the case a guideline of six to 10 participants is suggested for small projects (Fugard & Potts, 2015:671). Another approach would also be to assess if no further themes emerge, what is known as theoretical saturation (Fugard & Potts, 2015:670). Some studies have indicated theoretical saturation after six interviews, whilst other researchers found theoretical saturation after 12 interviews, with broader themes achieved after six interviews (Fugard & Potts, 2015:670). For the purposes of this study, a total sample size of 10 was chosen, with five from each sector.

A commonly used criterion to determine if the sample size is sufficient is data saturation. After having extensively reviewed the literature, Gentles *et al.* (2015:1782) point out that data saturation in phenomenological studies is something that is not usually achieved. This sets phenomenology apart from other philosophical approaches. The authors further elaborate on the intensity of the engagement with the individuals that can also determine the sample size. Overall, the authors found that it is generally difficult to predetermine the

sample size for a research study. An indication of appropriate sample size for traditional research approaches is provided (Gentles *et al.*, 2015:1783).

Grossoehme (2014:8) highlights the importance of ensuring accurate interpretation of the phenomenon under study. The authors are of the view that although a small sample size is sufficient for this research approach, the accuracy of the study can be enhanced by using a purposive sample. Purposive sampling strategies are more appropriate where, based on the researcher's prior knowledge on the phenomenon, specific individuals may be identified as having more insight or perspectives on the phenomenon (Robinson, 2014:7).

In this study, a purposive sampling approach was used where the managers of the business incubators and managers of the technology transfer offices were targeted. This sample population is believed to have the most experience in the individual sectors, as well as the strategic insight and knowledge to add value to the topic under study.

The contact details of the managers were obtained from the websites of the various institutions and from the researcher's networks. An introductory email was sent to the potential participants, after which some responded and were willing to participate in the study. This process led to participants from different regions, namely Gauteng, Western Cape and Eastern Cape.

A total of six managers from business incubators and technology transfer offices participated in the research. The demographics of the participants are indicated in Table 3.1.

Table 3.1: Demographics of participants

Participant code	Date of interview	Institution type	Gender	Region
TT-1	23.06.2017	Technology transfer	Female	Eastern Cape
TT-2	04.08.2017	Technology transfer	Female	Western Cape
TT-3	25.08.2017	Technology transfer	Male	Western Cape
TT-4	31.08.2017	Technology transfer	Male	Western Cape
BI-1	21.08.2017	Business incubator	Male	Gauteng
BI-2	07.09.2017	Business incubator	Female	Gauteng
BI-3	28.10.2017	Business incubator	Female	Gauteng

Source: Own compilation

The interviewees consisted of three males and four females, with three participants from the Western Cape, one from the Eastern Cape and three from Gauteng. The participants willingly shared information on the topic.

3.4 THE RESEARCH PROCESS

The research process is described in this section.

3.4.1 Data collection

Initially, the recruitment strategy adopted was to contact the sample population based on the existing networks of the researcher. During the process, a second recruitment strategy was adopted whereby, the participants were kindly requested to introduce the researcher to other participants that qualified as part of the sample population. This recruitment strategy is known as snowball sampling (Robinson, 2014:13). Through this process, additional participants were recruited, until this recruitment strategy led the researcher back to the participants that were already contacted.

Data was collected between June to September 2017, via telephonic interviews, which lasted anything between 10 to 45 minutes. All interviews were conducted in English and was recorded, with prior permission of the interviewees. Audio recordings were made using two audio recorders, where the one served as a backup recording.

Although interviews are a commonly used method in obtaining data for qualitative research, Polkinghorne (2005:143) highlights the importance of observational data. Due to the geographical location and availability of the participants, the best form of data collection was telephonic interviews. This made it difficult to collect observational data to derive further meaning from the interviews. However, the tone, speed of speech and vocal expression of each of the interviewees were noted.

3.4.2 Semi-structured interviews

In exploring the experiences of people, one can either utilise a structured interview, where pre-determined questions are adhered to in the interview or semi-structured interviews, where potential follow-up questions can also be asked (Grossoehme, 2014:2). A semi-structured interview was conducted for this research.

Open ended questions were used to try and elicit as much of the experience of the interviewees as possible. As a result, the questions posed to the participants elicited a description of the situation, based on how the participant has experienced the phenomenon (Englander, 2012:25).

The structure of questioning used to interview the business incubator managers is as follows:

- How does the incubator support SMMEs?
- In your view, what makes SMMEs sustainable?
 - a. How do you see innovation playing a role in this?
- What is your understanding of technology transfer or research commercialisation?
- What in your view should the role of universities be in commercialising the research they develop?
- Would you mind sharing your thoughts on how you think universities (*technology transfer offices*) can contribute to the sustainability of SMMEs, specifically related to the research they develop?

The structure of questioning used to interview the business incubator managers is as follows:

- How would you define technology transfer?
- Are there specific sectors in which this technology transfer focuses on?
- What, in your view, is the intent of technology transfer offices?
- How does technology transfer impact small businesses?
- What 3 things can simplify technology transfer to small businesses?
- How would you envisage the incubator supporting the technology offices with regards to capacity?

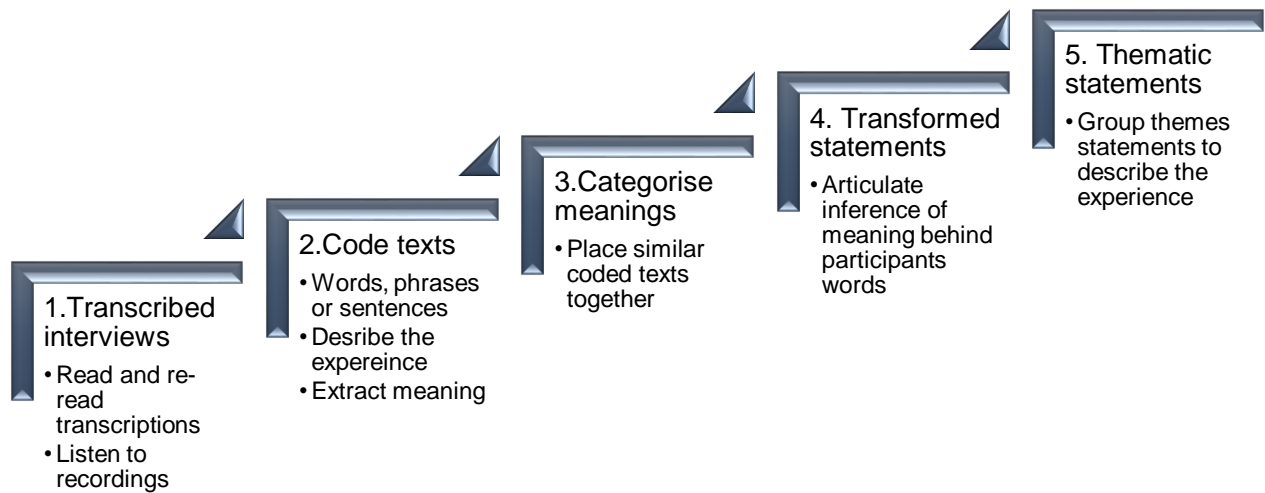
Additional questions followed these semi-structured questions, where necessary. Questions were also asked for clarification following the responses of the participant (Englander, 2012:26). This interview structure allowed the areas of interest to be pursued whilst still allowing the participants to raise issues that was not thought of Chan, Fung and Chien (2013:5). In addition, the researcher is free to explore any new areas of interest that may arise during the interview (Doody & Noonan, 2013:30).

3.4.3 Data analysis

Thematic analysis involves the identification of common threads within and interview of across a set of interviews Vaismoradi, Turunen and Bondas (2013:400). The analysis can be conducted inductively or deductively (Vaismoradi *et al.*, 2013:401). The deductive approach is usually used when the research is compared to previous theory, whilst the inductive approach is applied where the phenomenon has not been dealt with in prior research. Consequently, coded categories are derived from the transcripts.

Grossoehme (2014:9) outlines the steps used to analyse the data from a phenomenological study. These steps are depicted in Figure 3.3.

Figure 3.3: Steps in analysing data from a phenomenological study



Source: Adapted from Grossoehme (2014:9)

The interviews were transcribed manually in Microsoft Word and for the purpose of protecting the privacy of the participants, any information that could be used to identify the individuals were removed (Grossoehme, 2014:9). It was then transferred into Microsoft Excel, where each participant's interview was captured on a separate worksheet. The participant was given a code name, the biographical information was noted and groups of sentences were captured on a separate line. The interview questions were highlighted in blue to ensure the context of the answers were maintained. Once all the transcriptions were captured in the workbook, it was verified by an independent party by comparing the transcripts to the recorded audio. Corrections were made, where necessary.

The first step in the analysis is to attentively read and re-read the transcriptions, as well as listen to the recordings, to obtain a holistic feel for what is being described. This was done a few times, where interviews from the business incubators were read together and those of the technology transfer offices were read together. During this phase, meaningful and recurrent ideas, as well as key issues in the transcripts were highlighted or noted. This included any information that appeared to be unusual or contradictory to the researcher's perspective Vaismoradi, Jones and Snelgrove (2016:103).

The second step involved coding of the text, whereby phrases, words or sentences related to the meaning of the study was highlighted (Grossoehme, 2014:9). Although computer software programmes such as Nudist, Atlas/ti and WinMAX are available to code the transcripts (Ritchie, Lewis, Nicholls & Ormston, 2013:207), the transcripts from this research were manually coded by the researcher. These codes were captured in the second column of the worksheet, for each group of sentences. During coding, the answers were viewed in context of the question that was posed, before the code was allocated. The coding started with a concrete level of abstraction and moving towards an abstract level, whereby the coding had a higher level of generality (Vaismoradi *et al.*, 2016:104).

These words, phrases or sentences were then grouped together into categories in the third step (Grossoehme, 2014:9). Two separate worksheets were created, one for the business incubator categories and the other for the technology transfer offices. A matrix structure was used to capture the codes from each participant under the different categories. An example of the matrix is provided in Table 3.2.

Table 3.2: Example of matrix used to categorise the codes

Participant	Category 1	Category 2	Category 3
	Summarised codes	Summarised codes	Summarised codes
Participant 1	Code 1 Code 2	Code 3 Code 4	Code 7 ...
Participant 2	Code 5 Code 8....	Code 9....	

Source: Own compilation

In this way, the codes could be related back to the individual transcriptions.

In the fourth step, the meaning behind the participants words were inferred and articulated, using the categories and the summarised codes, as indicated fin Figure 3.3. The meaning

and inferences made were confirmed with quotations from interviews. During this phase, the codes were revised and compared to each other (Vaismoradi *et al.*, 2016:105).

In the final and fifth step, the transformed statements are used to derive thematic statements that describe the experience (Grossoehme, 2014:9). This led to plausible themes and aided in identifying which codes are linked. These themes were mapped, where the linkages between the codes were indicated. Thematic maps were established for both the business incubators and the technology transfer offices. Following which, the similarities and differences between the themes were evaluated.

A thematic map is a graphical representation of the relationship between the emergent themes and codes (Vaismoradi *et al.*, 2013:403). Visual representation of the findings can assist in the following way (Ritchie *et al.*, 2013:315):

- Explain complex processes.
- Display relationships between the different themes.
- Effectively summarise the data.
- Display the range of the phenomena.
- Refocus attention to key points.

3.5 ASSESSING QUALITY AND RIGOUR

Although interpretivism is acknowledged for providing contextual depth to a study, it has been criticised for its validity, reliability and generalisability (Chowdhury, 2014:434).

3.5.1 Credibility

Validity refers to whether or not the final outcomes of the research truly portray what it claims to portray (Grossoehme, 2014:3). One of the ways in which this is achieved, is through the use of data that is highly descriptive or makes use of metaphors. The data utilised in this research is considered to be descriptive as the participants used real life examples to illustrate their point. This is true for both sectors. In the case of technology transfer, examples were used to explain what made it successful and what the challenges

were along the way. In the case of business incubators, an example of how the business incubator tested the concept of transferring skills from the university to the SMMEs was provided.

In addition, the conclusions drawn in this study does not extend beyond what is supported by the data (Grossoehme, 2014:7). All conclusions drawn in this study were based on the data obtained from the interviews and the interpretation thereof.

Chan *et al.* (2013:4) propose bracketing as a method to introduce validity to a phenomenological study. To achieve this, four strategies were adopted, which are (1) strategy for mental preparation, (2) strategy for deciding the scope of the literature review, (3) strategy for planning data collection, and (4) strategy for planning data analysis.

With regards to mental preparation, the researcher is required to keep an open mind to the views of the participants and not assume that the answers to the research question is already known (Chan *et al.*, 2013:4). In conducting this research, the researcher was open to different views and thoughts.

The literature review strategy should be such that enough literature is reviewed to justify the research proposal but still maintain the curiosity in the research. An extensive literature review was conducted during this research, which is presented in Chapter two. This was carried out for each of the sectors, namely business incubators, SMMEs and technology transfer offices. In doing so, researcher could identify the challenges and opportunities in each of the areas, thereby allowing the researcher to maintain a level of curiosity to understand the opportunity for all sectors to benefit from an integrated collaboration. More specifically, the literature review provided the researcher with sufficient information to identify the potential role the business incubators can undertake in supporting SMMEs to become sustainable through technology transfer.

The strategy for data collection should be guided by open ended questions with the opportunity to ask further questions during a semi-structured interview (Chan *et al.*,

2013:5). The researcher gave careful attention and thought to the questions for the interviews, in order to allow to participants to share freely. Hence open-ended questions were used. All interviews ended with asking the participants if there was anything else that should be considered. Many of the participants took this opportunity to share additional information or elaborate on answers that were already provided.

The final strategy relating to data analysis suggests that interpretation of the data should be verified with the participants to ensure answers to the questions are rectified and that the researcher has not misinterpreted that data in any way (Chan *et al.*, 2013:5). This was achieved by paraphrasing some of the answers during the interview and asking for confirmation, or by including phrases of the answers in leading into the next question.

All four strategies were adopted during the research process and the results are therefore considered to be credible. In addition, by following these strategies, the objectivity of the research is also enhanced.

3.5.2 Dependability

Reliability refers to the extent to which the final results are repeatable (Grossoehme, 2014:3). The researcher can be considered to bring bias to qualitative research, and at the same time, can also be considered to enhance the research (Grossoehme, 2014:3). The documentation of decisions during the research process will improve the reliability of the study, as it allows future researchers to understand the rationale for decisions that have been taken. A decision register was recorded during this research and is presented in Table 3.3.

Table 3.3: Decision register as recorded during research

Decision	Rationale for the decision
Choice of topic	<p>The researchers experience in the SMME sector, saw the need to create more sustainable SMMEs by creating access to more competitive technologies. The researcher’s exposure to SMMEs found that markets were being saturated with similar businesses, hence SMMEs were finding it difficult to access new markets.</p> <p>The researcher’s previous experience in research and development in the science field, led to the idea that SMMEs can become more sustainable if innovative technologies can be accessed.</p>
Sample population must be limited to managers of the institutions.	<p>Based on the researchers experience in business incubation, collaboration between the technology transfer offices and business incubators was not commonly known. Hence, if the collaboration did exist, then the managers of the institutions were more likely to have greater insight into the challenges and opportunities.</p>
Target population not restricted to a specific region.	<p>The total sample population of universities and business incubators are limited. Furthermore, the availability and willingness of the managers to participant would determine the final sample size. Hence business incubators and technology transfer offices across the country were considered.</p>
Conduct qualitative research.	<p>The number of universities and technology transfer offices are limited.</p> <p>There is high probability that a small percentage will participate in the research.</p> <p>The topic under research is not known to commonly occur, hence it may be new to the participants and more descriptive data will be needed as opposed to numbers.</p>
Exclude the NWU technology transfer office and the business incubator at the researcher’s place of employment.	<p>Due to this being a qualitative research study, the reliability of the research could be doubted, due to potential bias from the two institutions.</p> <p>Any potential conflict of interest was also avoided as at the time this research was initiated, the two institutions were collaborating with regards to the SMME sector.</p>

Source: Own compilation

This decision register will enable future researchers in understanding the rationale for the decisions taken during this research. It will further guide future research designs.

Reliability can be enhanced by testing the interview guide either in test interviews or after the first interview (Flick, 2014:386). The interviews conducted in both sectors were tested with the first interview. The interview was reviewed and amended where necessary, but in keeping with the questions asked in the first interview, to ensure consistency. For all subsequent interviews, the same interview guide was used, where questions were asked in the same manner and in the same order. The results emanating from this research is therefore considered to be reliable.

3.5.3 Transferability

Researchers and readers may not necessarily interpret the emergent themes in the same way. It is for this reason that the transferability of the findings must be enhanced through data saturation, description of the original context of data and the providing the reader with information on the data analysis for further reflection (Vaismoradi *et al.*, 2016:107). Not only was data saturation achieved in each of the individual sectors, it was also achieved across the two sections.

The communication of the findings in Chapter four were presented according to each category. The findings were presented per category, with direct quotes from the interviews. At the end of each category, the interpretation of the findings was discussed. The emergent themes were then presented in a thematic map, to provide the reader with a visual representation of the findings. At the end of the chapter, an integrated interpretation of the themes was discussed. This approach allows the reader to follow the thought process of the researcher and to therefore understand how the researcher arrived at the themes. In this way, the reader should interpret the themes in the same ways as the researcher. The findings from this research is therefore considered to be appropriately transferred to the reader.

3.6 RESEARCH ETHICS

Ethical principles must be applied to business research to ensure integrity of the research (Bryman *et al.*, 2014:120). Some key considerations include any potential harm to the participants, obtaining informed consent, invasion of privacy and deception. Other ethical

considerations include data management, copyright, reciprocity and trust and conflict of interest (Bryman *et al.*, 2014:128-129). The ethical clearance letter obtained from the North-West University is included in Appendix C. The ethical approach used during this research is discussed in this section.

3.6.1 Informed consent

Prior to collecting data, it is important to inform the sample population of the aim of the study, what the participation entails, that participation is voluntary, how anonymity will be dealt with and other information that will assist in making an informed decision (Robinson, 2014:11). The sample population were emailed an introduction letter, which outlined all of these factors and provided an opportunity for the potential participants to grant consent to participate in the study. A sample of the introduction letter is included in Appendix D.

3.6.2 Confidentiality, anonymity and bias

The letter of introduction made participants aware that information was to be treated with confidentiality, and that there was no deception regarding the purpose of the research. The names of the participants from the business incubators and technology transfer offices were not disclosed in the research report. Furthermore, the interview guide was used to ensure the questions asked were unlikely to cause any emotional harm to the participants. The use of open ended questions also ensured that participants shared information freely. All interviews were conducted telephonically, therefore there was no possibility of physical harm.

In an attempt to avoid any potential conflict of interest, neither the technology transfer office at the North-West University nor the business incubator of the researcher's employer form part of the target population.

3.7 CHAPTER SUMMARY

In this chapter, the reader was introduced to the methodology used to conduct the research. A qualitative research approach was used to collect data from the managers of the business incubators and the managers of the technology transfer offices from universities across the country.

The research process was described where data was collected through semi-structured interviews, after which the data was analysed using an interpretive approach. This approach, based on the phenomenological philosophy, was used to derive themes and codes from the transcribed interviews.

The quality and rigour of this research approach was discussed, where the reader was provided with explanations on how credibility, dependability and transferability of this research approach was achieved. Finally, the ethical principles applied in conducting the research were discussed.

In the next chapter, the results of the empirical research will be presented and discussed.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 INTRODUCTION

In this chapter, the reader is presented with the findings from the interviews with the managers from the business incubators and technology transfer offices. This section is structured such that the findings per category are presented and then discussed, for both the business incubators and technology transfer offices. The emergent themes from each of these areas are then presented. Finally, an integrated view of the findings is discussed.

4.2 FINDINGS FROM THE BUSINESS INCUBATORS

The perspectives, insights and experiences of the business incubator managers were sought on various areas related to SMMEs, through the interview process. These areas included how SMMEs are supported by the business incubators, what makes the SMMEs sustainable and understanding the role that innovation and technology transfer play in creating sustainable SMMEs. Each of these areas will be discussed in the following sections.

4.2.1 The role of the business incubator in supporting SMMEs

The business incubators primary role is to capacitate the SMMEs through the implementation of various interventions. These interventions range from the provision of physical incubation, where the SMMEs are housed in the business incubator, to the implementation of business development support. According to respondents, the typical business development support includes, but not limited to, the following:

- Development of a strategy.
- Assistance with legal compliance such as registration with the Unemployment Insurance Fund (UIF), Compensation for Occupational Injuries and Diseases (COID) and similar organisations.
- Implementation of accounting management systems.

- Provision of legal advice.
- Support with contractual issues.
- Accessing funding.
- Facilitate the introduction to the market.
- Development of marketing material.

The business development support is delivered to the SMMEs in a structured manner either through less formal co-working spaces where SMMEs are coached, or more formal physical spaces where the SMMEs receive pre-planned content and development. One of the key interventions was access to funding.

*“...found that some of them do definitely require you know financial assistance....
..... they might have projects that they need to do and they have a lack of
capital. So, we look at (um), getting them interest free loans...”* (Participant BI-3)

Some business incubators were found to be more sector focused and provided access to capital intensive equipment for manufacturing. This included access to workshop space where the costs of utilities such as water and electricity were subsidised. In contrast, other business incubators provided physical office space for SMMEs to conduct its day to day operations. Although each business incubator had different models to deliver the business development support interventions to the SMMEs, it was fundamentally the same. These business development support interventions are consistent with that found in the literature, as described in Chapter two.

Institutions across the country support SMMEs with financial and non-financial interventions (Ayandibu & Houghton, 2017:54; Molapo *et al.*, 2008:27). This support includes (1) transfer of skills and knowledge, (2) assistance with start-up activities, (3) networking opportunities, and (4) mentoring and coaching (Njiro & Compagnoni, 2010:156). In particular, business incubators provided support in areas of technology, market and financial (Rubin *et al.*, 2015:21-22).

It can therefore be deduced from the literature review and the empirical study that business incubators play an important role in supporting SMMEs. This support goes beyond the physical space provided for SMMEs to conduct business activities. The business incubators also provide training and skills development with regards to business acumen. In some instances, financial support is offered either in the form of a grant or interest free loan. SMMEs are therefore equipped with the necessary tools and resources to improve the sustainability of the businesses.

4.2.2 Creating sustainable SMMEs

Each business incubator described what makes SMMEs sustainable. There was agreement between all business incubators that access to market is one of the critical factors in ensuring SMME sustainability.

“...definitely access to market in terms of commercialising as well as linking them with businesses that could buy their products and services...” (Participant BI-2)

“...have to have the market to be able to do the work...” (Participant BI-1)

“...Sustainability in SMMEs is number one they need to have a market. Um. Market is what we found the most difficult. Doesn't help having your product if you don't have a market...” (Participant BI-3)

The SMMEs secure access to the market through linkages with businesses that could potentially buy the products and services. This leads to acquiring contracts with customers in some instances. The business incubators that were owned by large corporates, facilitated the integration of the SMMEs into its supply chain.

The second factor that leads to SMME sustainability is the capacity to produce and deliver the products and services. This ability is also coupled to the SMME improving its business acumen in terms of financial literacy and financial management. In addition, one business incubator explained that SMMEs that offer more innovative products and services are

more likely to be sustainable and improve job creation, as substitution in a supply chain becomes less likely.

“...but when you introduce an entrepreneur that’s focussing on something like artificial intelligence or robotics, which is more technology innovation, then you are improving the job creation statistics as well as the sustainability...” (Participant BI-2)

On the other hand, non-innovative SMMEs are often replaced with another in the supply chain, with a net zero effect on job creation. Hence the need for innovation, to differentiate the products and service offering of SMMEs within industry.

The importance of innovation in SMMEs is also driven by the difficulty in competing with larger more established businesses based in price alone. The established businesses are viewed as having better costing models compared to SMMEs. However, SMMEs, due to its size are more agile, adaptable and can transform faster than larger companies. This presents the opportunity for SMMEs to adopt innovative business models to become more competitive and sustainable.

“...SMMEs have the opportunity of being able to, transform or change with innovation, you know come up with innovative ideas, technology, efficiency, much quicker than what the main industrialists are...” (Participant BI-3)

In addition, these finding support what is found in the literature. Previous literature (Colombelli *et al.*, 2016:21) supports this notion, and believes product and process innovation is required in a new business to not only allow it to be competitive, but to also increase the chances of survival. Tustin (2015:87) underlines the lack of access to local patents as one of the factors impacting sustainability.

What was not evident from the empirical research is how the business incubators actively support the SMMEs in identifying and implementing innovative products and solutions,

knowing well that it will contribute to the sustainability of the SMMEs. It is inferred that the SMMEs are expected to source innovative products without any assistance from the business incubators.

4.2.3 The business incubators' perspective of technology transfer

The business incubators' understanding of technology transfer is aligned to the definition as prescribed by the Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:2), where it is in principle related to the commercialisation of research. However subtle differences in the definition were noted.

The one business incubator viewed technology transfer purely from the view of technology, in terms of the rapid pace at which new equipment or methodologies enter the market.

“... Technology transfer, as the word says is the transfer of technology, especially nowadays, you know like, with cell phones anything new you find a life span of two to three years before the new thing comes in...” (Participant BI-1)

The participant also interpreted technology transfer as the transfer of existing technologies to SMMEs, whilst research commercialisation is taking innovative products to market. However, technology transfer and research commercialisation are actually have the same meaning (South Africa, 2008a:2).

The need for SMMEs to stay abreast of technology trends through the attendance of national workshops was highlighted. It was further emphasised that only the latest technology should be funded, as this constitutes proper technology transfer. A distinction was made in terms of research commercialisation where innovative products are taken to market. The participant was of the view that this is an area where South Africa is failing as compared to China, due to a lack of funding the commercialisation process. As a result, the research is commercialised abroad, where funding is available, and then brought back

to the country in the form of a licence. South Africa becomes a consumer of research that originated in this country.

The second business incubator was aware of the technology transfer offices that exist at the universities and understood it as an environment where students generated intellectual property that require commercialisation. The universities are viewed as having placed rigorous controls on the commercialisation of the intellectual property through the technology transfer offices.

“...think we haven’t had as much innovation being commercialised as we could possibly commercialise because IP almost restricts the commercialisation of innovation but that has been my understanding of TTO from past experience...”
(Participant BI-2)

As a result of this, the participant is of the view that few innovations have been commercialised, resulting in missed opportunities.

Neither of the participants referred to a broader understanding of technology transfer to include transfer of knowledge and skills. The understanding of the definition was primarily centred around technology. The intent of technology transfer was understood as introducing new expertise into the industry and exposing existing businesses to new technologies.

4.2.4 The role of the university in supporting technology transfer

The business incubators are of the view that universities have a multiple role in supporting technology transfer. The first role is to collaborate and establish relationships with industry, for many reasons.

Firstly, this relationship will help to develop prototypes of the technology and test it in the market. The participants are of the view that universities are positioned purely for research and that prototype testing cannot be done only by the university. The industry must form

part of this testing programme, to assess willingness to accept the product or service. In addition, such a relationship will allow the SMMEs to leverage the technical skills of the technology transfer office, and in reciprocation industry and market knowledge is shared by the SMMEs.

“... if we could create partnership between SMMEs as well as TTOs, because technical skills is often what SMMEs miss, and technical guys often miss the business side of what needs to be done for the innovation. So, it’s almost a great match...” (Participant BI-2)

The second role is to establish a talent pool of academic excellence and entrepreneurial ability; as such a talent pool is not readily available in the high technology market. In this way, the talent that is introduced into the SMME industry includes technical and business know-how.

“... so, it will be great if universities will be able to create some sort of a pool for the SMME industry to be able to attract people of like mindedness where you might be doing your engineering degree, however you want to focus on being an entrepreneur and there can be support in that...” (Participant BI-1)

These findings can therefore be interpreted as the universities needing to play a broader role in transfer of technology. A multi-faceted approach must be adopted to ensure successful technology transfer. Whilst the research has highlighted the importance a suitable talent pool that can be introduced into the SMME sector, other facets could include knowledge and skills transfer.

4.2.5 The role of technology transfer in creating sustainable SMMEs

There is a need for SMMEs to have access to equipment and technology in order for SMMEs to be globally competitive, which therefore makes technology transfer important. However, whilst funding was highlighted as an important enabling factor, the process to transfer the technology was identified as a critical factor.

One of the main issues raised, was the potential for a lengthy and cumbersome process to negatively impact the SMMEs. This is primarily due to the process being impractical thereby discouraging SMMEs from participating in the opportunity.

“...all looks good on paper but practically trying to roll that out to every SMME is that it takes too long..... by then the environment has changed..... becomes impractical and sometimes even a destruction...” (Participant BI-1)

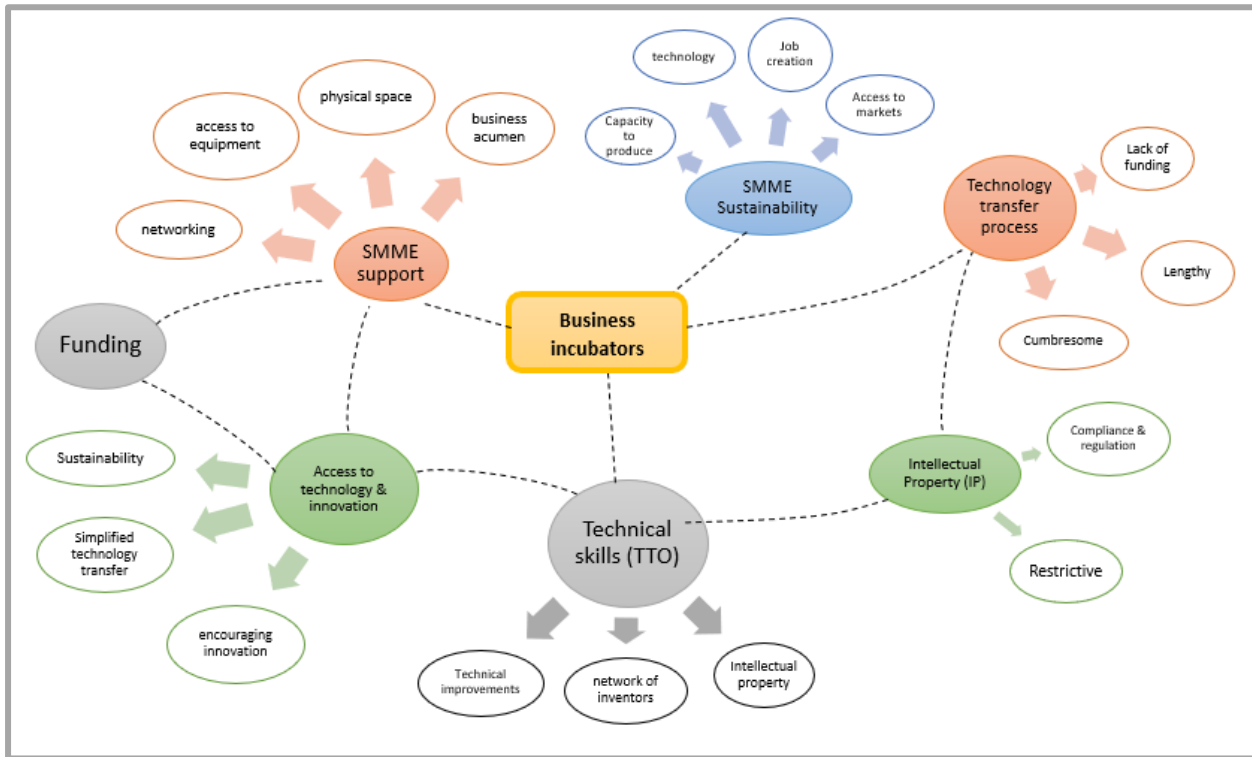
Not only does leveraging the technical skills from the technology transfer office enable the process, it also contributes to the sustainability of the SMMEs. SMMEs often lack technical skills. The technical skills of the technology transfer offices can be leveraged, as SMMEs can tap into the skilled network of masters and PhD students. The one business incubator experimented with this concept by enabling masters and doctorate students to work with SMMEs from a technology transfer point of view, however, the concept was introduced too early to the market, to be implemented.

The common view of the business incubators is that technology transfer contributes to the sustainability of the SMMEs. However, the process is long and tedious. Hence, timing became a key factor. The technology transfer offices need to reduce the restrictions regarding the intellectual property.

4.2.6 Emergent themes

The themes that emerged from interviewing the managers of the business incubators are represented in Figure 4.1.

Figure 4.1: Emerging themes from the business incubator research



Source: Own compilation

Access to market and capacity to produce have been identified as key factors in contributing to SMMEs sustainability. In addition, the business incubators are of the view that access to technology and innovation is just as important to the sustainability of SMMEs. The technology transfer offices can support this by enabling access to technology.

However, one of the major themes identified from this research, is the lack of funding for research commercialisation or technology transfer. Whilst it is believed that there is an abundance of innovative ideas and concepts, the South African environment does not enable these ideas to be commercialised. At the same time, the rigorous and restrictive intellectual property controls at the universities are viewed as an obstruction to the transfer of technology into industry. The process is viewed as being cumbersome and lengthy. As a result, by the time the transfer takes place, it is likely that the environment would have changed. This could possibly eliminate the need for the product or increase the demand for it.

The technology transfer process can be enabled through strategic collaboration between the technology transfer offices and industry. The industry knowledge of the business incubators and the technical knowledge of the universities, allow for co-development of the innovation, thereby making it more suitable for the market. The business incubators understand the markets, whilst the university understands the technical capabilities of the innovation. A joint collaboration will allow the innovation to be prototyped and tested in the market. Ultimately, the successful implementation of the innovation can potentially enable the SMME in becoming globally competitive.

4.3 FINDINGS FROM THE TECHNOLOGY TRANSFER OFFICES

The perspectives, insights and experiences of the technology transfer managers were sought on various areas related to technology transfer, through the interview process. These areas included the intent of technology transfer offices, the potential impact on SMMEs, how transfer of technology to SMMEs can be enabled and the role of business incubators in this sector.

4.3.1 Defining technology transfer

When technology transfer was first introduced, it was focused on commercialisation of technologies based on science and engineering. The primary objective was to protect intellectual property and generate revenue from it by introducing it into industry. Hence as face value, technology transfer is defined as taking university research and transferring it to the public or industry. However, the definition is inclusive of a more complex process.

“...there's a whole lot more involved in technology transfer because one's obviously got to understand whether it's you know (a) IP that is going to be protected, (b) what is the best form of protection, should you be creating a spin- off company or licensing the IP and then maturing the IP..... into a form that can be taken up by companies or industry...” (Participant TT-3)

The technology can be taken up in industry in the form of a spin-off company from the university or through licencing the technology to existing companies. The word “technology” however, does not necessarily imply a physical technology.

“...We refer to it as technology but ...um..., I know in Europe they are moving to innovation, using the word innovation or knowledge transfer...” (Participant TT-2)

“...technology obviously defines us, or limits us and I think that for a university technology transfer office, it becomes broader than just technology...” (Participant TT-1)

In some instances, technology transfer included knowledge, skills and know-how from the social science and humanities faculties, and not limited to science and engineering.

Fundamentally, the findings indicate the definition according to the technology transfer offices, as being the process of transferring early stage technologies to the industry. There, however, appears to be a shift away from purely focusing on the transfer of technology, but rather for the definition to be inclusive of the transfer of knowledge and skill into the industry. This is probably due to the shift in focus from generating revenue to rather having a greater impact on society as a whole.

Technology transfer at the universities also take place through the technology stations housed at the universities. This type of technology transfer takes place in the form of consulting and product development, and is not considered as transfer of intellectual property.

“...that is also technology transfer. It wouldn't be research commercialisation technology transfer because, it, it's more consulting and development...” (Participant TT-1)

There are therefore two means by which technology is transferred to the public. The first being the technology stations and the second is the technology transfer offices. The intent of the Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:2) is interpreted to ensure that publicly funded research is shown to have an impact on society, hence the quest to commercialise intellectual property generated from such research. The technology stations are therefore not considered to be governed by the Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:2), however may potentially provide valuable support to the SMMEs.

The findings indicate a trend in broadening of the initial definition of technology transfer as compared to that defined by the Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:2). The shift in the intent of the technology transfer offices is from satisfying internal university objectives, to meeting the needs of the community and the public at large.

4.3.2 Sector focus of technology transfer

The technology transfer offices align itself to the intellectual property generated from the various faculties of the universities.

“...faculties work on, well, in diverse industries. So, at tech transfer offices, you can't focus on a specific industry unless your university focuses on a specific industry...” (Participant TT-2)

“...we work at the university and the universities have whatever sectors they are working in..... it's basically delineated by what happens at the universities...”
(Participant TT-4)

However, the definition of technology transfer is a key factor that guides the sector focus of the technology transfer office. For example, the social sciences sector will be included

if knowledge transfer from this sector forms part of the definition. Notwithstanding, science and engineering will remain as focus sectors.

“...the classic tech... (um)... you know, biotech engineering ...(um)...chemistry, that type of thing, I think is still going to be where the focus for tech transfer from the university to commercialisation into small businesses is going to be...”
(Participant TT-1)

In light of the fact that the definition of technology transfer is broadening over time, it implies that more intellectual property will be available to be transferred into industry.

4.3.3 The intent of technology transfer offices

In simplistic terms, the intent of the technology transfer offices is seen to commercialise research.

“...It’s a service to...(um)...mostly our researchers who come up with inventions, commercial ideas, or ideas that have commercial potential...” (Participant TT-2)

The technology transfer offices assist researchers in multiple ways.

“... assist the researchers in identifying the IP... (um)...coming out of the research and to protect it and then very importantly to commercialise it...” (Participant TT-3)

However, this process of commercialisation has inherent secondary intentions. These include:

- Developing the technology until it is ready to be introduced into the market.
- Making a social and economic impact in the city, region and country.
- Making the university more relevant in the industry.
- Establishing relationships with industry partners.

- Complying with the Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:2).

In addition to servicing the researchers, the intent is also to make an impact on society, through the commercialisation of the research.

“... mandate to transfer technology into the marketplace for the benefit of South Africa. So, it's not necessarily to make money for the university but rather to actually have a broader effect in terms of job creation, GDP growth in the economy and those and business creation...” (Participant TT-4)

The intent of the technology transfer offices, as outlined from the empirical research, corresponds well with the expected objectives as described by the Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:2). This intent aligns closely with that of business incubators, whereby the support to the SMMEs will result in a broader impact on society.

4.3.4 The impact of technology transfer on SMMEs

Technology transfer offices play a key role in developing SMMEs, albeit existing businesses to which the technology will be transferred or newly established businesses intending to take high end technology to the market.

In terms of existing SMMEs, technology transfer capacitates the business with capability and knowledge.

“...I think that where one is very closely aligned with the activities of an SMME.... definitely it can help an SMME to grow and establish itself locally and internationally...” (Participant TT-3)

An example of such a situation is when the market requires a product of a specification for which the SMME does not have the capability or knowledge. The university is then

approached by the SMME to support the opportunity, whereby the government funding is available to the university to conduct the necessary research. The resultant technology and knowledge is then transferred to the SMME, at a reduced fee due to the university having access to government funding.

Hence, in this process, the SMME gains new skills, new technology and accesses new market opportunities. All of this is achieved with the SMME requiring less capital and therefore reducing the risk in significantly impacting its cash flow. This kind of support allows the SMME to focus its effort in marketing the business and securing more market opportunities.

One of the key potential benefits to the SMME, through technology transfer, is to be able to compete globally.

“...You know you have instances where particular software was able to be used to design industrial fans and that has actually enabled a local SMME to be very competitive on a global scale...” (Participant TT-3)

At the same time, one of the participants is of the view that high end technology cannot be transferred to SMMEs, but that a new company must be started where the researcher, must be involved in the business. This involvement is rationalised by the need to have continual reciprocal transfer of knowledge and skills.

“...however much you feel the technology will be ready to go into a business and go out into the market, it is never ready. So...(um)...there needs to be a continual process of transfer of knowledge and skills from the university to the company, with feedback from the company saying well this isn't working...” (Participant TT-1)

The participant was also of the view that technology transfer stations are better suited to transfer technology to the SMMEs. This form of technology transfer takes on more of a

consulting and development role, where skills and knowledge are transferred to the SMME as opposed to intellectual property.

The view that intellectual property derived research cannot be transferred to SMMEs was noted and is possibly explained by the perceived lack of technical skills on the part of the SMME.

4.3.5 Enabling technology transfer to SMMEs

Technology transfer is enabled through close collaboration between academia and industry. Although intellectual property generated at the universities is often considered to be ready for commercialisation, this is not necessarily the case.

“...however much you feel the technology will be ready to go into a business and go out into the market, it is never ready...” (Participant TT-1)

There is therefore a need to have continual process of transfer of knowledge between academia and industry, in order to ensure the readiness of the technology to enter the market. The inventor must be involved in the scale up of the technology. In doing so, the inventor works with the SMME in understanding how the technology can be applied in the market. At the same time, the SMME provides insight into the market applications that enable the technology to be fully developed for commercial application.

Another important factor is the need to simplify the commercialisation process. The technologies developed at the universities are in its early stages, and therefore requires input from industry to progress the commercialisation process. However, this process requires legal support, funding and business development support for the SMMEs.

Currently, SMMEs cannot afford the cost of the transfer of the technology.

“...the most difficult part of the technology transfer at this point, and with the small business I'm working with, is that they can't afford the cost of the transfer and the

cost of the transfer typically involves the cost of the IP that we invested in...
(Participant TT-4)

Funding the early stage development is an important factor in enabling the process. In order to improve the probability of funding, legal process of accessing the technologies must be simplified.

“...it helps is that they don’t need to go through all the expenses, and the time and the effort to negotiate a comprehensive licence without understanding whether the technology will work for them...” (Participant TT-2)

Due to the technologies being in early stage development, there are a number of unknowns. This poses a risk to the SMME if full commercial rights to the technology are to be negotiated upfront. If the SMME cannot demonstrate technical and economic viability of the technology, then it will be difficult to obtain funding.

“...definitely a need for sort of funding that can be accessed by the SMME because they may need to continue to scale up and develop things that we’ve been able to demonstrate in the university...” (Participant TT-3)

Hence access to funding will be enabled through a simplified legal process.

4.3.6 The role of business incubators in supporting technology transfer

The technology transfer offices are of the view that business incubators can play a role in enabling technology transfer to SMMEs.

“...so, I think the existence of university linked incubators can really assist us...”
(Participant TT-1)

The technology transfer offices lack the appropriate skills to engage with industry. In addition, these skills cannot be sourced in as it is expensive.

“...technology transfer offices in universities do not have the right skills.....and quite often an industry type skill, you know like somebody from industry, would be quite useful, but we can't afford them...” (Participant TT-1)

A distinction between university incubators and private incubators was made in that private incubators are more experienced in engaging with industry

The technology transfer offices utilise the services of the business incubators based at the universities to support and mentor the entrepreneurs in understanding how to run a business. The technology transfer offices are of the view that potential need for business incubation support could include:

“...a need for an incubator is as high but there could be certain services such as, you know, understanding the market, or you know developing a commercialisation plan, assessing key economics, you know and it's those kind of things, that those, sort of almost specialist sort of skills...” (Participant TT-3)

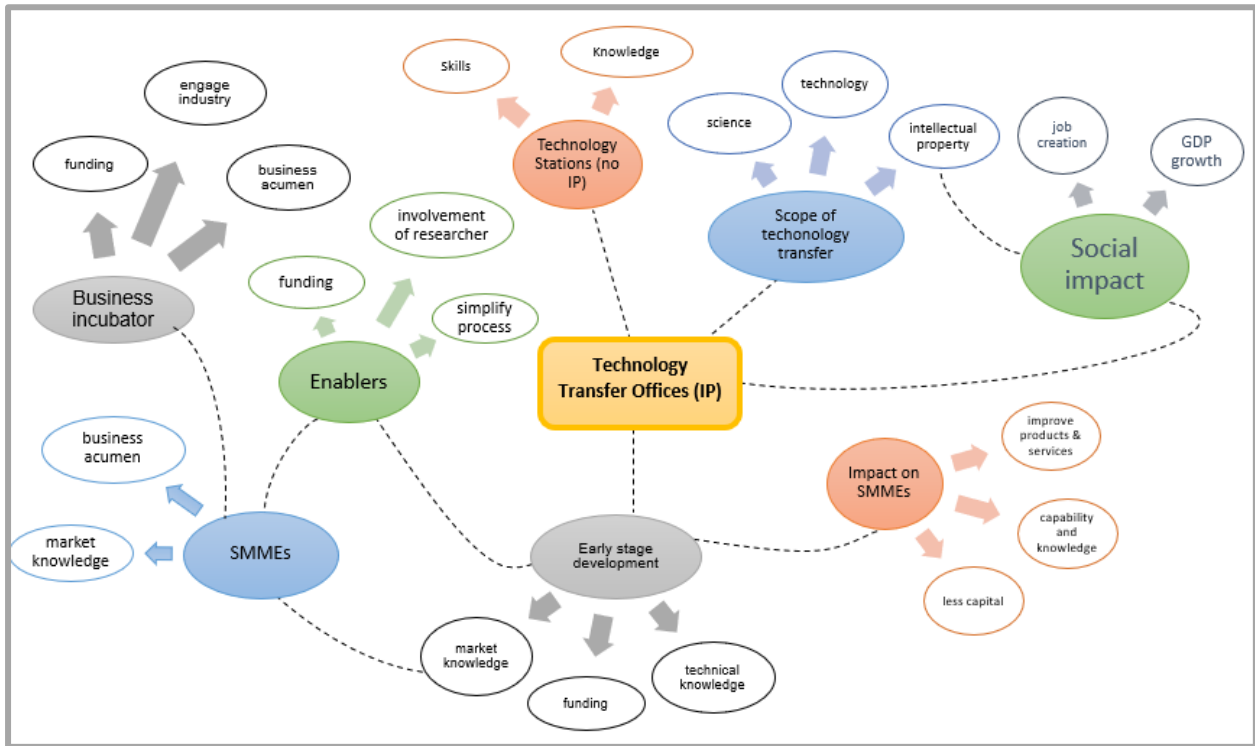
The business incubators can also assist in capacitating the technology transfer offices. The one technology transfer office has been recruiting technology commercial managers during the past few years, to facilitate the transfer of technology. In some instances, consultants are sourced in to bridge this gap. This particular technology transfer office is of the view that business incubators could potentially fulfil this role.

Once the SMME has access to the technology, it has to actively identify where the technology can be applied. This will require resources to do so. Hereto, the business incubator may have a supporting role.

4.3.7 Emergent themes

The themes that emerged from interviewing the managers of the technology transfer offices are represented in Figure 4.2.

Figure 4.2: Emerging themes from the technology transfer office research



Source: Own compilation

In defining technology transfer, it was found that the definition is not limited to science and technology. There is a growing scope of the definition to include transfer of skills and knowledge. At the same time, the transfer of skills and knowledge is defined as the purpose of the technology stations, which does not include the transfer of intellectual property. This is said to be the purpose of the technology transfer office. Be that as it may, the major focus of the technology transfer offices is to transfer technology into the public domain.

In addition, this transfer of intellectual property into the public domain, is meant to have a broader social impact, as compared to the original objective of generating revenue for the university. This impact, which could either reach city, region or national levels, is ultimately meant to create jobs and positively impact GDP growth.

However, transfer of technology is faced with challenges. The first being that the technology is not always ready for the market. This due to the need for three key factors to fully commercialise this early stage development of the technology. This being (1) technical knowledge, (2) funding, and (3) market knowledge.

The researchers or inventors of the technology provide the technical know-how. This experience, skill and competency is readily available from the universities. Funding for the early stage technology development, on the other hand, is not easily accessible. Whilst funding to develop the initial technology is available through various institutions to the universities, funding for the licencing costs and royalties is more difficult to access.

A key component to commercialising the technology, is market knowledge. One viewpoint is that this can be achieved through SMMEs that can contribute towards the advancement of the technology. However, a contradictory view is that technology derived from intellectual property should be commercialised by spin-off businesses, where the researcher is directly involved in the business. And in the case of the SMME, skills and knowledge should be obtained from the technology transfer stations.

With the primary reason being the need for the researcher to be involved in the business, this is still a possibility with SMMEs. Some technology transfer offices have provided examples where collaboration with the SMMEs were successful. At the same time, the view is that SMMEs require support in enhancing its business acumen, a role that can be undertaken by the business incubator. Apart from the involvement of the researcher in the business, other enablers of successful technology transfer include funding and simplification of the commercialisation process. It was noted, that in general, the SMMEs do not necessarily have access to funding to afford the cost of licencing and royalty fees.

4.4 DISCUSSION

It has been established in the literature that innovation contributes to the sustainability of SMMEs. Tustin (2015:87) emphasises the lack of access to local patents as one of the factors impacting sustainability. The author outlines the difficulty SMMEs experience in

accessing local technology, and as a result licence foreign technologies, but with minimal ownership. (Ndabeni & Rogerson, 2017:87) are of the view that innovation activities of SMMEs must be enhanced, potentially through accessing the knowledge and technology developed by universities.

It has been further established that business incubators support SMMEs with business development support to improve the sustainability of business. Dubihlela and Van Schaikwyk (2014:267) are of the view that the increasing number of business incubators in South Africa is the right kind of support for SMMEs and the economy. The authors refer to international cases where business incubation has shown the ability to create innovative businesses, thereby increasing SMME chance for survival and success (Dubihlela & Van Schaikwyk, 2014:268).

What has not been established in the literature, is the role of business incubators in South Africa in collaborating with technology transfer offices, to improve the sustainability of SMMEs. This research contributes to the existing literature by firstly enhancing the understanding of technology transfer in the South African context. Secondly, it explores the role of business incubators enabling the process to create sustainable SMMEs. The business incubators have confirmed that innovation and technology contribute to the sustainability of the SMMEs.

Through empirical research, it is found that business incubators and technology transfer offices have a common view of what technology transfer means, how it impacts SMMEs, and what are some of the challenges that limit the process. This includes lack of funding for early stage technology development, cumbersome and lengthy commercialisation processes and lack of reciprocal transfer of knowledge between industry and researcher.

Another key aspect is the importance of the timing of the strategic relationship between the technology transfer offices and the business incubators. Both parties involved must be ready and willing to collaborate. The business incubators highlighted the need for the technology transfer offices to reduce the restrictions around the intellectual property. This

appears to be the case at some technology transfer offices, where the legal process was simplified. Thus, the SMME could access the technology sooner. This leads to the impression that now may be an opportune time for business incubators to start building strategic relationships with technology transfer offices.

A common theme between the business incubators and the technology transfer offices is that funding to commercialise research, albeit in whatever form, is more readily available abroad than it is in South Africa. As a result, intellectual property leaves the country, only to be imported again as licences. South Africa then becomes the consumer of its own intellectual property. This research highlights the importance for policy makers to ensure the probability of the intellectual property staying in the country is high.

It may be argued that technology transfer should be limited to more well-established businesses as opposed to SMMEs. However, the Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:12) clearly states “*preference must be given to BBBEE entities and small enterprises*”. For this to be successful, a culture and mind-set change may be required on the part of the business incubators and the technology transfer offices. This research has highlighted the potential for both parties to collaborate in supporting SMMEs to commercialise technologies.

The need for a business incubator to support new companies established to commercialise the intellectual property, has been identified by the technology transfer offices. Naidoo and Urban (2010:235) investigated the impact of operational skills on business sustainability. The research found that technical and industry-specific competencies are pivotal to business sustainability. The potential for businesses to develop a sustainable competitive advantage if the technical and industry-specific competencies are combined with entrepreneurial skills, was emphasised. Hence collaboration between universities and industry partners such as business incubators is important provide SMMEs with technical and industry skills.

Whilst university incubators exist and provide such support, the ability of private business incubators to engage industry is a key skill required for successful technology transfer. Hence, whilst the need for the collaboration has been confirmed through this research, the framework of how such a collaboration will work is yet to be determined. This is especially important as business incubators are sometimes sector focused, whereas technology transfer offices are not.

4.5 CHAPTER SUMMARY

In this chapter, the findings from the empirical research were presented and discussed. The findings for the business incubators were presented per area of interest. The emerging themes were then presented in the form of a thematic map, which was discussed. The findings from the technology transfer offices were presented in the same way.

The common themes across the various sectors were found to be (1) funding for the commercialisation process, (2) the need to simplify the legal process of commercialising the technology, and (3) reciprocal knowledge transfer between industry and university. Some differences were found between the two sectors which must be considered if the institutions will collaborate with each other. The first being that business incubators are generally sector focused whilst technology transfer offices are not. Finally, the discussion presented the contribution of this research to the literature.

In the next chapter, the reader will be presented with the conclusions and recommendations based on the findings of this research.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This research has presented the reader with the literature review, as well as empirical findings on the role of business incubators in creating sustainable SMMEs through technology transfer. The findings bring about the conclusions and recommendations presented in this chapter.

The reader is first presented with the conclusions. Thereafter, recommendations for the business incubators and technology transfer offices are posed. Each set of recommendations are followed by an implementable and practical action plan. The achievement of the research objectives is discussed, followed by the limitations of the research. Finally, the reader is presented with the managerial implications of this research and suggested future research.

5.2 CONCLUSIONS

A few conclusions can be drawn from the empirical and literature study. These conclusions are presented in this section.

5.2.1 Strategic partnerships

Business incubators are familiar with technology transfer and likewise, technology transfer offices are familiar with business incubators. Both of the sectors are aware of the existence and value of the others but limited attempt has been made to collaborate for greater social impact, more specifically on SMMEs. Herrington *et al.* (2017:65) emphasise the need for strategic partnerships such a technology transfer, if SMMEs are to remain competitive and sustainable. Therefore, the empirical research, as well as the literature study confirm, the need for closer collaboration between the two types of institutions.

Some technology transfer offices have reduced the restrictions around access to the intellectual property. This is the opportune time to explore building strategic relationships,

prior to any expectations and governance being put in place as to how the relationship should work. The business incubators and technology transfer offices have a window of opportunity to test, adjust and develop a framework that will enhance the sustainability of SMMEs.

5.2.2 Industry partners to co-develop technology

The technologies developed by the universities are not necessarily ready to be introduced into the market. More often than not, it requires co-development with industry input in order to complete the commercialization process, as argued by (Booyens, 2011:75). Even though universities have established technology transfer offices, industry partners are still required to support the process, be it with funding, market and industry knowledge and know-how. It is therefore concluded that industry partners are considered as a key success factor in commercialising the technology.

5.2.3 Funding to enable technology transfer

Whilst the potential exists for SMMEs to uptake the technologies developed, there is a lack of funding for research to be developed to the point where it can be commercialised. The survey conducted by the Department of Science and Technology revealed the need for funding in support of the growing technology transfer sector (South Africa, 2017:41).

In order for the collaboration to work to create sustainable SMMEs, funding support across the value chain is also required. This also includes assisting SMMEs to overcome the barriers in establishing and sustaining business. It is therefore concluded that funding a key requirement for success technology transfer. This is in line with prior research where lack of funding was identified as a major challenge for SMMEs (Abor & Quartey, 2010:224).

5.2.4 The role of business incubators

This research confirms the financial and non-financial support provided to SMMEs by business incubators (Ayandibu & Houghton, 2017:54; Molapo *et al.*, 2008:27).. This support goes beyond the physical space provided for SMMEs to conduct business

activities. The business incubators also provide training and skills development with regards to business acumen. SMMEs are therefore equipped with the necessary tools to improve the sustainability of the businesses.

In addition, it is concluded that business incubators have an important role to play in the successful transfer of technology to SMMEs. Ndabeni and Rogerson (2017:87) emphasised enhancing support to SMMEs by accessing knowledge and technology developed by universities. Therefore, the role business incubators could include supporting SMMEs with commercialisation plans, identifying market opportunities and accessing the appropriate funding to access the technologies. Afolayan and de la Harpe (2015:144) identify technology incubators as an essential platform to develop and implement innovative ideas by SMMEs.

In addition to this, business incubators, more specifically privately-owned ones, can also support the technology transfer offices in engaging with industry partners. The technology transfer offices utilise the business incubators at the university to provide this support, however, these business incubators are not as experienced as that of private business incubators.

5.2.5 Innovation and sustainability

It is concluded that innovation contributes to the sustainability of SMMEs. This conclusion is in support of the research of Okanga and Groenewald (2017:45), where innovation was highlighted as a key factor in SMMEs sustainability. Innovation helps SMMEs to improve its product and service offering. Mohalajeng and Kroon (2016:8) are of the view that businesses that embrace innovation will create a competitive advantage. As a result, such an SMME will be more difficult to replace within the supply chain due to the higher degree of differentiation. Whilst the contribution of innovation to the sustainability of businesses has been established, the role of business incubators in actively supporting SMMEs in identifying and implementing innovative products and solutions, was not evident during this research.

Furthermore, whilst it may be fit for purpose, the transfer of technology to SMMEs should not be limited to technology transfer stations, as the technology transfer offices have access to intellectual property. There is a perceived perception that SMMEs lack the skills to receive such intellectual property, nonetheless, the advantages of innovation in SMMEs has been established.

5.3 RECOMMENDATIONS FOR BUSINESS INCUBATORS

The recommendations that business incubators should consider are presented in this section.

5.3.1 The competitive landscape analysis

Sahin (2017:14) has developed a three-step process model, which is a tool that enables SMMEs to analyse the competitive landscape and develop strategies that will improve the survival rate of SMMEs. All of this occurs within the context of globalisation and technological revolution which creates hyper-competition (Sahin, 2017:2). However, the challenges for SMMEs to implement the tool is highlighted, in that it is time intensive and expensive (Sahin, 2017:13). At the same time, whilst innovation and technology contribute to the competitive advantage of a business, SMMEs find it difficult to implement the technology road-mapping tool. Albeit a tool that allows technology to be aligned with products, market opportunities and business strategy.

The opportunity exists for business incubators to support the SMMEs with such a competitive landscape analysis. This may require assisting the SMME with some of the aspects of the model, and in doing so reduce the time required to follow the process. In addition, where plausible, the cost of market research can be financed by the business incubator. The process model, as a whole, can be adopted by the business incubators in support to the SMMEs to enable them to make more informed decisions. More specifically, the technology road-mapping tool can help SMMEs align the technologies sourced from the universities, to the market needs.

5.3.2 Access to funding

Access to funding is one of the common business development interventions provided by business incubators. In addition to the current funding support, business incubators can play a role in enabling SMMEs access funding to further develop the research. Given that funding for early stage technology development is may be considered as high-risk funding, the business incubators may bring credibility and confidence to such opportunities.

5.3.3 Congruent SMMEs and technology

There is an opportunity for business incubators to strategically work with technology transfer offices to provide industry input into testing the theoretical viability of the technologies. Subsequently, suitable entrepreneurs can be identified and screened, to ensure capacity and capability to take the idea to market on a practical level. The development of such screening criteria and the selection of entrepreneur can be developed in conjunction with each other.

Furthermore, the business incubators can develop a programme that allows the entrepreneur to be physically housed in the incubator, whilst developing the business technology in collaboration with the university. The university will make the necessary product adjustments based on the feedback from the entrepreneur. The business incubator can support the SMMEs with the market research and testing the viability of the business opportunity. Alternatively, the business incubator could provide virtual support to the SMMEs, until the technology is fully developed and ready for implementation.

5.3.4 The action plan

The action plan that will support the recommendations discussed in this section, is outlined in Table 5.1.

Table 5.1: The action plan for business incubators

No.	Activity	Enablers	Responsible Person	Target Date
1	Co-develop a framework for engagement with technology transfer offices in the region.	Frequent engagement between stakeholders.	Manager	June 2018
2	Brainstorm funding options for early stage technology development with fund partners.	Established relationships with funders.	Manager	Dec 2018
3	Upskill staff in commercialisation process.	Training programmes. Liaison with universities.	Manager	Oct 2018
4	Co-develop screening criteria, with technology transfer office, to match SMME to technology	Key success factors. Viable business opportunity	Manager	Nov 2018
5	Review development support to include virtual support for SMMEs with potential to receive technology	Capacity Networks Competency	Manager	March 2019

Source: Own compilation

Business incubators have the potential to enhance its support to SMMEs, but will require a review and adjustment to its operations. The actions outlined in Table 5.1 are intended to guide the business incubators in reviewing its operations. It is firstly important to develop a framework in collaboration with the technology transfer offices on how the stakeholders will communicate and engage one another. This will require frequent discussions until an agreement is reached. In addition, these stakeholders also need to development screening criteria to identify suitable SMMEs to progress the commercialisation of the technology.

Business incubators will have to capacitate its staff in understanding the commercialisation process, as well as the key elements that make such a process successful. This can be achieved by implementing appropriate training programmes and effective liaison with the technology transfer offices. In reviewing the development support

provided to SMMEs, business incubators must, if necessary, strengthen its networks to enable it to virtually support SMMEs. Furthermore, networks with funders must be expanded on to unlock access to funding for early stage technology development.

5.4 RECOMMENDATIONS FOR TECHNOLOGY TRANSFER OFFICES

The recommendations that technology transfer offices should consider are presented in this section.

5.4.1 Simplified commercialisation process

The technology transfer offices must find mechanisms to simplify the legal process of accessing the technologies before full commercial rights can be negotiated. Seeing that the technologies are not ready for market in most instances, technology transfer offices must critically review the transfer process with regards to two aspects. The first is to shorten the time it takes for an SMME to access the technology. This could be achieved by simplifying the legal agreements such that legal consultants are not necessarily required.

Whilst it is understood that research costs must be recovered in the process, the second aspect deals with the possibility of developing flexible payment options. This could, for example, entail that payment begins once revenue or profit is generated. Simplifying the commercialisation process will be in the best interest of the SMME and the technology transfer office.

5.4.2 Capacity building

The empirical research revealed the need to capacitate the technology transfer offices with the appropriate skills, that being commercialisation of technology. Therefore, if these skills are difficult to source, then it is recommended that the university develop a programme to up-skill students and staff. It would also be beneficial to have an independent professional body to oversee the development and accreditation of this specific skills sector. One of the key activities of such a body will be to ensure continuous availability of the skill.

In addition, there should be a clear growth path for individuals with these skills. It is possible that the individuals will start off at the technology transfer offices and gain research commercialisation skills. However, with close collaboration with the industry, these individuals can then learn business and industry skills, which may provide the opportunity for them to venture into business. Such growth opportunities will attract talent to technology transfer offices.

5.4.3 Scope of technology transfer offices

Given the resource constraints of the technology transfer offices, it is recommended that the definition of technology transfer be confined to the definition as provided by Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008 (South Africa, 2008a:2). If the definition of technology transfer continues to broaden with time, to include transfer of know-how and skills, then the technology transfer offices will find an overlap of activities with the technology stations.

Therefore, the two departments must have clear roles and responsibilities. In this way, resources can rather be allocated to firstly create awareness of the opportunities and secondly finding solutions on simplifying the legal process.

5.4.4 The action plan

The action plan that will support the recommendations discussed in this section is outlined in Table 5.2.

Table 5.2: The action plan for technology transfer offices

No.	Activity	Enablers	Responsible Person	Target Date
1	Co-develop framework for engagement with private business incubators in the region	Frequent engagement between stakeholders	Manager	June 2018
2	Simplify commercialisation process	Legal support Liaison with business incubators.	Manager	Sept 2018
3	Upskill technology transfer offices	Training programmes	Manager	Dec 2018
4	Define a strategy that falls within the definition of technology transfer as prescribed by Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008	Frequent engagement with technology stations.	Manager	June 2018
5	Visit private business incubators in the region	Networks 6 monthly	Technology commercialisation managers	Starting Jan 2019
6	Present available technologies to SMMEs at business incubators	Annual sessions Suitable SMMEs	Technology commercialisation managers	Starting March 2019

Source: Own compilation

There are a number of factors that propel the technology transfer offices in placing publicly funded research into society, ranging from compliance to philanthropy. The challenges in doing so have been highlighted in Chapter four. The recommendations outlined in Table 5.2 provide guidance in overcoming these challenges.

First of all, the technology transfer offices must develop a framework of engagement with the business incubators. Given the need for more industry know-how and insight, there should be a focus on privately-owned business incubators. To begin with, this can be initiated in the local regions but other regions should be explored as well. Once the

relationship has developed, it can be maintained through frequent visits to the business incubators. This also affords the opportunity to present the various technologies available for licencing to suitable SMMEs.

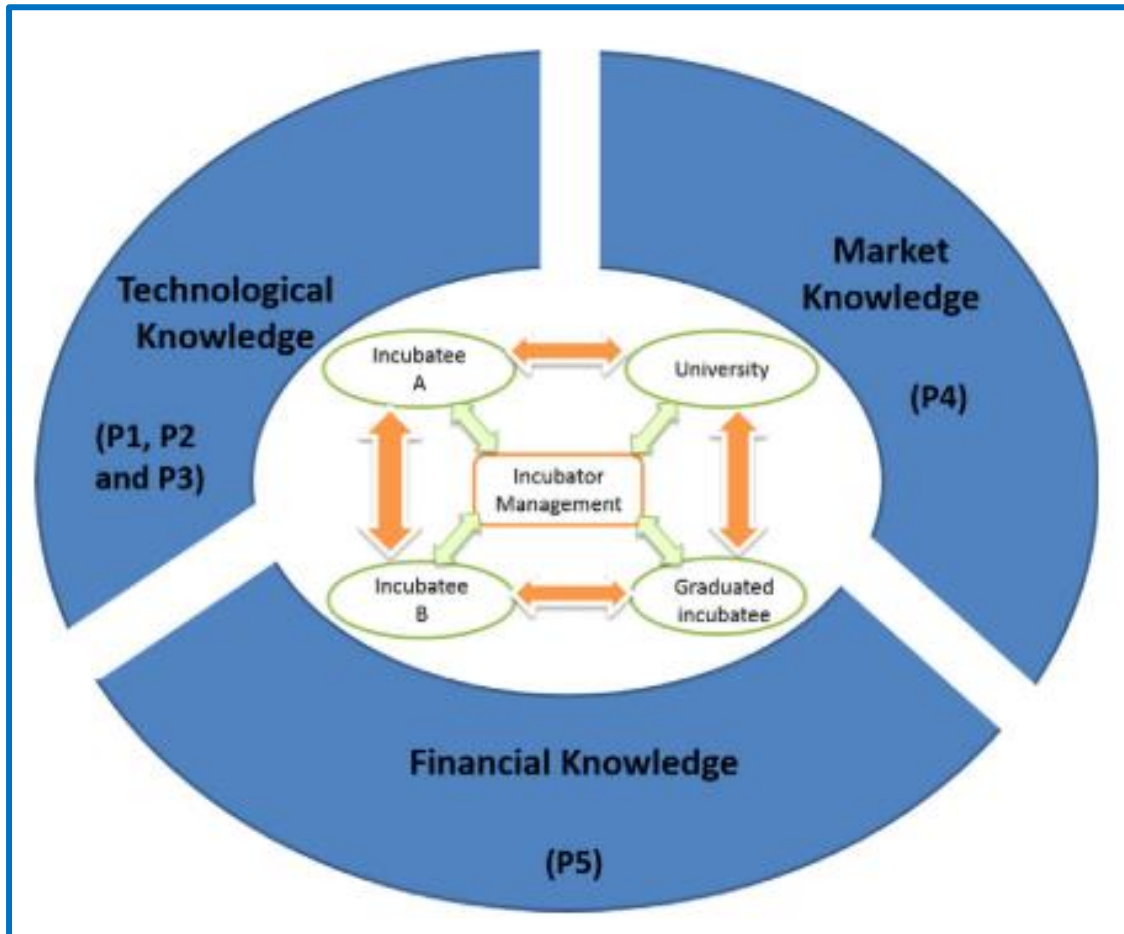
Simplifying the commercialisation process, more specifically the legal requirements, is of utmost importance. This can be achieved by obtaining appropriate legal support, but may also require input from the business incubators to understand the challenges faced by SMMEs. At the same time, technology transfer offices must capacitate itself through the up-skilling of its staff. This may require the need to implement suitable training programmes.

Finally, technology transfer offices must take heed in keeping the roles and responsibilities of technology transfer offices separate from technology stations. This can be facilitated through frequent engagement and alignment with the technology stations.

5.5 AN INTEGRATED MODEL

Rubin *et al.* (2015:21) have developed an interrelationship model that, in addition to the business incubator and university, also considers the relationship with SMMEs that have graduated from the business incubator (Figure 5.1). Whilst the authors are of the view that the model is generalisable to other countries, it is argued that it should be tested first. It is recommended that the South African business incubators and universities test this model, with the aim of creating sustainable SMMEs and contributing to a greater social impact of the country.

Figure 5.1: Interrelationship model



Source: Rubin *et al.* (2015:21)

This interrelationship model as depicted by Figure 5.1 identifies three key stakeholders in the business incubation environment. These are (1) technological knowledge bearers, (2) market knowledge bearers, and (3) financial resources bearers (Rubin *et al.*, 2015:21).

From a technological point of view, knowledge can be obtained from universities or business incubator stakeholders (Rubin *et al.*, 2015:19). SMMEs within the business incubators support each other with technological solutions, but also gain knowledge from universities at different stages in the business development cycle. The empirical research suggests a need for SMMEs to undertake innovative technological solutions from universities, facilitated by the technology transfer offices.

The market knowledge typically resides with incubator management and the SMMEs of the business incubator (Rubin *et al.*, 2015:20). The technology transfer offices identified business incubators as a source of market and industry knowledge. Hence, in an integrated model, business incubators can support both the technology transfer offices, as well as the SMMEs by imparting such knowledge.

Financial knowledge is accessed through the networks of the business incubator (Rubin *et al.*, 2015:21). One of the common business development interventions of business incubators is facilitating access to funding. At the same time, universities also access funding for research development. Hence, in an integrated model, both the business incubators and the technology transfer offices can facilitate funding from development of the technology to commercialisation thereof.

Finally, Rubin *et al.* (2015:21) suggest a model that forms a reasonable foundation upon which an integrated technology transfer model can be developed for South Africa business incubators and technology transfer offices.

5.6 ACHIEVEMENT OF RESEARCH OBJECTIVES

The empirical findings were used to determine if the research objectives were met. The result is discussed in this section.

5.6.1 Primary objective

The primary objective of the study was to explore the role of business incubators in creating sustainable SMMEs through technology transfer.

This objective was achieved in that the need for the business incubator in supporting SMMEs through technology transfer was confirmed. These development interventions, as determined through the empirical research, are:

- Assisting with the development of a commercialisation plan.
- Access funding for early stage technology development.

- Identification of market opportunities for the technology.
- Assistance in conducting a competitor landscape analysis.

In addition to supporting SMMEs, the technology transfer offices have identified business incubators as a stakeholder in successfully commercialising technology. Business incubators bring market and industry know-how and insight to the commercialisation process.

5.6.2 Secondary objectives

The achievement of the secondary objectives is discussed in this section (Table 5.3).

Table 5.3: Discussion of secondary objectives

Secondary objectives	Achieved
Objective 1: to review the most recent literature on business incubators that support commercialising of research generated from university	✓
The literature was reviewed and the key findings were presented in Chapter two of this study.	
Objective 2: to understand the challenges faced by universities in transferring its research to individuals or businesses	✓
The empirical study highlighted the challenges faced by the universities in transferring its research into the public domain. These challenges are presented in Chapter four.	
Objective 3: to test the willingness of technology transfer offices to transfer technologies to SMMEs through business incubators	✓
The empirical study has revealed the willingness of the technology transfer offices to collaborate with business incubators. This willingness is presented in Chapter four.	
Objective 4: to investigate the awareness and understanding technology transfer offices by business incubator managers	✓
The empirical study revealed the business incubators' awareness and understanding of the technology transfer offices. This understanding is presented in Chapter four.	

Objective 5: to make practical recommendations for business incubators and technology transfer offices to enable technology transfer to SMMEs ✓

Practical recommendations for the business incubators and the technology transfer offices are presented in Chapter five.

Source: Own compilation

All secondary objectives were achieved through the empirical and literature study. These are indicated as such in Table 5.3, where the achievement of each objective is explained.

5.7 LIMITATIONS OF THE RESEARCH

Due to time constraints of the research, only a few business incubators and technology transfer offices could be reached. However, due to a qualitative approach to the research study, the interviews provided an in-depth view of the experiences of the managers. Future research that will include more business incubators and technology transfer offices will enhance the findings from this research study.

As presented in Chapter two, the literature on collaboration between universities and business incubators to enable technology transfer to SMMEs, is well established for countries other than South Africa. Hence, the limited literature available for the South African context did not allow for challenges and opportunities unique to this country to be identified. There is therefore an opportunity to develop such literature for the South African context.

5.8 MANAGERIAL IMPLICATIONS OF THIS RESEARCH

The importance of establishing innovative and sustainable SMMEs has been established through this research study. In South Africa, this can be achieved through the support of various stakeholders.

Firstly, business incubators must review and adapt the current models of providing business development support to SMMEs, to include the facilitation of technology transfer. This will require additional skillsets on the part of the staff members, with regards to

technical and research commercialisation. In addition, capacitating the business incubator by strengthening the networks, particularly with regards to funding, is a key requirement. If funding mechanisms for early stage technology development is not in place, then innovation will be lost to the international landscape and licenced back into the country at a higher cost.

Secondly, the technology transfer offices must review its strategy, processes and procedures on commercialising the technologies. If the research generated at the universities are to benefit society at large, then the commercialisation processes must be simplified to transfer the technologies.

Finally, an integrated framework is required for the two sectors to collaborate in creating sustainable SMMEs. This requires the support from policy makers, in that policies for the two sectors should not be developed independently of each other. In creating an environment in South Africa that is conducive for the development of SMMEs, the policies related to business incubators must complement and enhance those relevant to the technology transfer offices. In doing so, the probability of creating more sustainable SMMEs will be improved.

5.9 SUGGESTIONS FOR FUTURE RESEARCH

This research provides an initial view on the potential collaboration between business incubators and technology transfer offices in South Africa. Future research methodology should include a focus group of business incubator managers and technology transfer managers, where the potential for implemented an integrated model may be established.

In addition, the literature on integrated technology transfer models that consider key stakeholders, should be expanded on for the South African context. Research should include testing, verifying and adapting internationally based models. This may be pertinent for a longitudinal research design.

Finally, the focus of this research was to identify the role of business incubators in creating sustainable SMMEs. However, the SMMEs did not form part of the scope of this research study due to time constraints. It is therefore recommended that future research ascertain the SMMEs view on sustainability and readiness to adopt technologies developed at the universities.

5.10 CHAPTER SUMMARY

In this chapter, the reader has been presented with the conclusions from this research study, where the need for collaboration between business incubators and technology transfer offices was iterated. This is motivated by the necessity for SMMEs to be innovative in order to achieve sustainability.

Practical recommendations have been suggested for the both the business incubators, as well as the technology transfer offices. These recommendations deal with the business development support provided to SMMEs by business incubators and the opportunity for technology transfer offices to simplify its commercialisation process.

An integrated model was proffered, which can form the basis upon which an integrated framework of collaboration can be developed for business incubators and technology transfer offices. The key stakeholders and forms of knowledge obtained are described in this model.

Finally, the achievement of the objectives, limitations of the research and managerial implications are discussed. It is recommended that the suggestions for future research be given critical consideration, so as to positively impact society through the creation of sustainable SMMEs.

APPENDIX A: INTERVIEW GUIDE FOR BUSINESS INCUBATOR INTERVIEWS

1. Introduce myself and how the interview will be conducted

- a. Permission to record interview
- b. Introduce my topic and the intent, followed by some questions
- c. I may ask questions to clarify response - if required
- d. Final thoughts / anything you wish to add
- e. Note: you can stop the interview at any time if you wish to do so

2. Introduce the topic:

Exploring the role of South African business incubators in creating sustainable SMMEs through technology transfer

3. Intent of the research:

- a. to explore if business incubators and technology transfer offices can collaborate to create sustainable SMMEs
- b. to explore the role of business incubators

4. Questions

- How does the incubator support SMMEs?
- In your view, what makes SMMEs sustainable?
 - a. How do you see innovation playing a role in this?
- What is your understanding of technology transfer or research commercialisation?
- What is your view should the role of universities be in commercialising the research they develop?
- Would you mind sharing your thoughts on how you think universities (*technology transfer offices*) can contribute to the sustainability of SMMEs, specifically related to the research they develop?

5. Anything you would like to add or think we have missed in the discussion?

6. Would you mind if I contacted you again if I required clarity on any part of the discussion?

7. Thank you for your time

APPENDIX B: INTERVIEW GUIDE FOR TECHNOLOGY TRANSFER OFFICE INTERVIEWS

1. Introduce myself and how the interview will be conducted

- a. Permission to record interview
- b. Introduce my topic and the intent, followed by some questions
- c. I may ask questions to clarify response - if required
- d. Final thoughts / anything you wish to add
- e. Note: you can stop the interview at any time if you wish to do so

2. Introduce the topic:

Exploring the role of South African business incubators in creating sustainable SMMEs through technology transfer

3. Intent of the research:

- a. to explore if business incubators and technology transfer offices can collaborate to create sustainable SMMEs
- b. to explore the role of business incubators

4. Questions

- How would you define technology transfer?
- Are there specific sectors in which this technology transfer focuses on?
- What, in your view, is the intent of technology transfer offices?
 - a. In terms of this (intent) how would technology transfer (intent e.g. impact) small businesses?
- How does technology transfer impact small businesses?
- What 3 things can simplify technology transfer to small businesses?
 - a. a. (if they identify the business incubator as a support mechanism): How would you envisage the incubator supporting the technology offices with regards to capacity?

5. Anything you would like to add or think we have missed in the discussion?

6. Would you mind if I contacted you again if I required clarity on any part of the discussion

7. Thank you for your time

APPENDIX C: ETHICAL CLEARANCE LETTER



NORTH-WEST UNIVERSITY
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05 April 2017

ETHICAL CLEARANCE

This letter serves to confirm that the research project of **RAMRAJ, S** has undergone ethical review. The proposal was presented at a Faculty Research Meeting and accepted. The Faculty Research Meeting assigned the project number **EMSPBS16/06/03-01/06**. This acceptance deems the proposed research as being of minimal risk, granted that all requirements of anonymity, confidentiality and informed consent are met. This letter should form part of your dissertation manuscript submitted for examination purposes.

Yours sincerely

Prof CJ Botha

Manager: Research - NWU Potchefstroom Business School

Original details: Wilms Pretorius(12090296) C:\Documents and Settings\Administrator\My Documents\Briefe MSA(2017)

APPENDIX D: EXAMPLE OF INTRODUCTION LETTER



Letter of Introduction and Informed Consent NWU School of Business and Governance

Investigating the role of South African business incubators in creating competitive SMMEs through technology transfer

Research conducted by:
Ms. S. Ramraj (28160827)
Cell: 081 422 2531
Date: 18 May 2017

Dear [Name]

You are invited to participate in an academic research study conducted by Serenta Ramraj a, Masters student from the School of Business and Governance at the North- West University- Potchefstroom Campus.

The purpose of the study is to investigate the role of business incubators in enabling technology transfer from universities to small medium and micro enterprises (SMMEs).

Please note the following:

- My studies are undertaken in my private capacity and I am currently the manager at the Sasol Business Incubator, however this will change as of 1 July 2017.
- This is an anonymous study survey as your name will not be disclosed. The answers you give will be treated as strictly confidential as you cannot be identified in person based on the answers you give.
- Your participation in this study is very important to us. You may, however, choose not to participate and you may also stop participating at any time without any negative consequences.
- An interview will be scheduled at a date and time suitable for both parties. This should not take more than 60 minutes of your time.
- The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.
- Please contact my study leader, Prof Stephan van der Merwe on 0182991414 or at Stephan.Vandemerwe@nwu.ac.za , if you have any questions or comments regarding the study.

Please indicate that:

- You have read and understand the information provided above.
- You give your consent to participate in the study on a voluntary basis. (Please tick).

YES / NO

Signature: _____

Date of consent: _____

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