Factors affecting technological innovation commercialisation support success in SMMEs in South Africa

Research Report

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DECLARATION

I declare that '**Factors affecting technological innovation commercialisation support success in SMMEs in South Africa**' is my own work and that all sources that I have used or quoted have been indicated or acknowledged by means of complete references.

Signature

22 December 2023

Date

ABSTRACT

This study outlines the factors affecting technological innovation commercialisation support success of technological innovations for the survival of Small Micro and Medium Enterprises (SMMEs). Technological innovation support, especially financial assistance, was found to be essential and venture capital support was considered to be critical for pre-commercialisation and commercialisation of technological innovations. The main research objective was to explore the factors that influence accessing of support at the early-to-mid stage for commercialisation success. The data was collected through a qualitative research methodology by interviewing SMMEs involved in the development and commercialisation of technological innovation and professionals involved in supporting SMMEs in the technological innovations sector. The key findings include considering previous funding support, early engagement of the stakeholders, involvement of industrial and businesspeople in the management team and its effect on reputation. As well as the critical influence of technical validation reports including marketing research. The support structure of the family and friends especially at the business infancy. Other important factors that were found to influence competitive advantage are market size, flexibility and scalability of the technological innovation. Another key finding was that innovation management is essentially part of project management. A comprehensive business plan should package market assessment, intellectual property (IP) commercialisation plan and business model intended to be adopted. Revenue generation was found to be a key contributor to stimulating support from venture capital firms. It was recommended that a quantitative study with only SMMEs who previously successfully attracted venture capital funding which focuses on approaches SMMEs can adopt to increase the likelihood of receiving venture capital support. Limitations of this study include the participation of professionals and/or SMMEs who have not applied or have insight into venture capital and thus are not able to provide full participation, especially towards venture capital support.

Keywords: Technological innovation; commercialisation; pre-commercialisation; funding support; non-funding support, venture capital.

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This research report, I dedicate to my son Kabelo aka Master Shifu and hope it will motivate you to acquire knowledge and further your studies in future.

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COMMONLY USED ABBREVIATIONS AND ACRONYMS

DTI	Department of Trade and Industry
DTIC	Department of Trade Industry and Competition
DST	Department of Science and Technology
DSI	Department of Science and Innovation
IDC	Industrial Development Corporation
IP	Intellectual Property
NSEA	National Small Enterprise Act (Act No. 12 of 1996)
NSI	National Systems of Innovation
NYDA	National Youth Development Agency
SARIMA	Southern African Research and Innovation Management Association
SBL	School of Business Leadership
SEDA	Small Enterprise Development Agency
SEFA	Small Enterprise Funding Agency
SMME	Small, Medium and Micro-sized Enterprises
STI	Science, Technology, and Innovation
STP	Seda Technology Programme
THRIP	Technology and Human Resources for Industry Programme
TIA	Technology Innovation Agency
UNISA	University of South Africa

CHAPTER 1: BACKGROUND AND PROBLEM STATEMENT

1.1 Introduction

According to the Intellectual Property and Technology Transfer at Publicly Funded Research Institutions report (DSI, SARIMA, NIPMO & Kisch IP, 2021) formation of start-up companies for the commercialisation of technological innovation is crucial for economic growth and expansion. Start-up companies usually have similar characteristics, comprising a single or few individuals, age of operation, total assets, size of labour, capital and annual turnover (Sityata, 2019). This study explored the factors that influence technological innovation commercialisation and support success in small, medium and micro enterprises (SMMEs) in South Africa.

1.2 Background to the Study

Commercialisation of intellectual property (IP), in the African continent and internationally, by developed and developing countries is considered an essential driver for economic development (Makwinya, 2022). Various countries, including South Africa, have put in place programmes, funding and policies to enable start-up companies to commercialise IP. However, it appears that such interventions do not always yield the desired outcomes (Department of Science & Technology (DST), 2019). The South African government has considered technological innovations a potential economic growth driver. It has proceeded to implement programmes and policies to assist SMMEs in commercialising technological innovation. However, these interventions along with those of private institutions such as venture capital investors have not yielded the desired outcomes (Makwinya, 2022). SMMEs still experience challenges in accessing financial and non-financial support to enable them to develop and commercialise IP. Access to funding is a broad challenge for diverse SMMEs not only for SMMEs intending to commercialise technological innovations development, pre-commercialisation and commercialisation projects (Makwinya, 2022; Bezuidenhout, 2018; Sityata, 2019).

Most start-up companies are SMMEs. In South Africa, SMMEs are defined in the National Small Enterprise Act 12 of 1996 (NSEA), as a small enterprise which is described as a separate and distinct business entity managed by one owner or more predominantly carried on in any sector or subsector of the economy. NSEA generally characterises SMMEs according to the sector, class size (which includes medium,

small, very small and micro) depending on the sector, number of paid employees, turnover and gross assets value (excluding fixed property).

Bvuma and Marnewick (2020) simplified the characterisation of SMMEs as:

(i) Very small enterprises comprise fewer than 10 to 20 employees, a turnover of between less than R200,000 to R500,000 and gross assets of less than R150,000 to R500,000 (Bvuma & Marnewick, 2020);

(ii) Small enterprises comprise fewer than 50 employees, turnover of between less than R2 million to R25 million and gross assets of less than R2 million to R4,5 million; and

(iii) Medium enterprises comprise fewer than 100 to 200 employees, less than R4 million to R50 million and gross assets of less than R2 million to R18 million depending on the industry (Bvuma & Marnewick, 2020).

Due to the nature of SMMEs, it is generally challenging to get funded especially by commercial banks because they usually lack tangible assets (Department of Small Business Development (DSBD), 2023). To assist SMMEs with funding, the South African government through its various entities has implemented alternative funding and other support programmes targeting various sectors. According to SME South Africa (2022), the entities which provide SMMEs funding and other support services include the following:

(i) Industrial Development Corporation (IDC) which is a national development finance institution that offers funds under different IDC programmes including the Technology Venture Capital Fund which targets technological innovations and other programmes. IDC programmes also include Khoebo Innovation Promotion Programme which focus on assisting local SMMEs to commercialise locally developed technological innovations at early stage preferably grassroot innovations;

(ii) Small Enterprise Finance Agency (SEFA) which provides financial and business support to SMMEs in various sectors under various programmes. None of SEFA programmes specifical targets SMMEs in the technological innovation category;

(iii) Small Enterprise Development Agency (SEDA) which offers development, support and promotion of SMMEs and does so under various programmes. SEDA programmes include the SEDA Technology Programme (Stp) which is responsible for supporting SMMEs in the technology innovation sector including technology transfer, business incubation and quality support services;

(iv) National Youth Development Agency (NYDA) which offers microfinance grants and non-financial business development to youth entrepreneurs to encourage greater participation of youth in business ownership. NYDA does not have a specific programme that targets SMMEs in technological innovation;

(v) National Empowerment Fund (NEF) which provides funding and non-financial support for black empowerment. NEF does not have a specific programme targeting SMMEs in technological innovation;

(vi) Technology Innovation Agency (TIA) which provides financial and non-financial support to SMMEs and other entities such as higher education institutions involved in technological innovation projects. TIA programmes include the SEED Fund, technology development and pre-commercialisation support fund which are directed at SMMEs in technological innovation; and

(vii) The Department of Trade, Industry and Competition (DTIC) and its subsidiaries are involved in financial and non-financial support for the promotion of amongst others economic, black empowerment and consumer protection. DTIC generally has a wide variety of SMMEs support programmes of which its Innovation and Technology Funding instrument is the Technology and Human Resources for Industry Programme (THRIP).

Department of Small Business Development (2023) also lists types of non-government entities involved in financing SMMEs it includes amongst others venture capitalists, angel investors, crowdfunding, corporate and banks. Regardless of the initiatives by the South African government innovation levels in SMMEs remain inadequate (Matekenya & Moyo, 2022). According to Matekenya and Moyo (2022), innovation funding is a major challenge for SMMEs technological innovation. In the list above TIA

is the only entity specifically involved in the funding of technological innovation this indicates that fewer opportunities are available for SMMEs in technological innovation. Regardless, of the identification of technological innovation as an essential driver it appears that TIA is the only one of the entities that is specifically involved in the funding and supporting of technological innovation for commercialisation. In the other institutions mentioned above such as SEDA and IDC technological innovation funding and support is not their primary role. Therefore, TIA becomes an ideal research site for this research project of exploring factors for success in attracting financial and non-financial support by SMMEs in technological innovations, further description of TIA is provided in this report.

As mentioned in the Department of Small Business Development (2023) venture capital funding model is ideal for supporting technological innovation towards commercialisation. Venture capital support is considered to be ideal since it also include non-financial support (Le Roux & Pretorius, 2015). This support may be in the form of assisting with obtaining further funding and participating in the SMMEs management amongst others (Du & Cai, 2020; Bezuidenhout, 2018; Oni, 2017). It would be desirable to also explore how SMMEs in technological innovations have successfully and/or can successfully attract funding from venture capital support towards further development and if possible, commercialisation of technological innovation.

In this study, SMMEs included those companies founded by the inventor(s) of technological innovations and/or have a licence agreement from an inventor and/or spin-off companies formed from a university or research institution. The companies selected to form part of this study were formed mainly for the development and/or commercialisation of technological innovation.

1.3 Problem Statement

SMMEs in technology development and commercialisation can have a great impact on the economic development of South Africa and ultimately reduce unemployment. In recognition of the potential, the government and private sector funding, such as venture capitalists and angel funders, have implemented support interventions to encourage and enable these SMMEs to develop and commercialise technologies.

Regardless of such support interventions it appears that most SMMEs have failed to access such support to develop and commercialise IP or technologies.

The successful commercialisation of technological innovation drives economic development and ultimately creates employment. However, it is not clear what challenges SMMEs face in accessing financial and non-financial support to develop their IP and successfully commercialise technological innovations.

1.4 Aim of the Study

The purpose of this study was to explore how SMMEs in South Africa can successfully access governmental and private sector support for the development of IP and the commercialisation of technological innovations. The outcomes of this research project may provide an understanding of the factors that influence the successful funding of technological innovation development and commercialisation in South African SMMEs. This knowledge may be useful to SMMEs, public, and private institutions involved in funding technological innovations development and commercialisation by SMMEs.

1.5 Research Objectives

The following research objectives were addressed:

(i) Explore the factors that influence how SMMEs at an early stage of technological innovations successfully access financial and non-financial support from support institutions.

(ii) Determine the considerations SMMEs should prioritise in preparation for accessing financial and non-financial support during early-stage development in preparation for pre-commercialisation and commercialisation levels.

(iii) Determine how SMMEs may best position themselves to successfully access pre-commercialisation and commercialisation venture capital funding for their technological innovations.

1.6 Research Questions

In order to address the research objectives, the following research questions needed to be answered:

(i) What factors influence the successful access to financial and non-financial support for early-stage technological innovations by SMMEs?

(ii) What considerations should SMMEs prioritise in preparation for accessing financial and non-financial support during early-stage development in preparation for pre-commercialisation and commercialisation levels?

(iii) How should SMMEs best position themselves to successfully access pre-commercialisation and commercialisation venture capital funding for their technological innovations?

1.7 Significance of the Study

This study adds to the body of knowledge on innovation by exploring factors that facilitate access to financial and non-financial support for early-stage technologies by SMMEs in South Africa. The study also identifies the opportunities for technology development, technology transfer and commercialisation which would lead to effective development and ultimately commercialisation of technological innovations by South African SMMEs.

1.8 Definition of Key Terms

Start-up company: A company in the early stages of the life cycle of technological innovations (The Department of Trade & Industry (The DTI), 2016).

Technological innovation: Refers to a new invention or improved technology that is developed to be taken to the market (The DTI, 2016).

Commercialisation: Refers to a process of converting technological innovation for market preparedness through the creation of a tangible product, securing funding to market or sell and activities towards market readiness to breakthrough the marketplace Brant and Sibanda (2018) and its final stage funds are spent towards marketing, promotion and advertising (The DTI, 2016).

Pre-commercialisation: Refers to the commercialisation phase when technological innovation is converted into a market-ready product, or when technological innovation is licensed or assigned to a company for its manufacturing and marketing (The DTI, 2016).

1.9 Research Methodology

1.9.1 Overview of the research process

This study intended to examine factors that lead to successful access to financial and non-financial support from both private and public institutions for technological

innovation development and commercialisation projects. The study explored the key success factors for accessing support from funding institutions including venture capital firms. It examines factors SMMEs should consider prior to approaching funding institutions. The selected sample comprised of SMMEs and professionals working in supporting SMME involved in the technological innovation sector. The methodological choice for this research study was qualitative research methodology and it was in the form of qualitative surveys which were conducted with a selected sample (Saunders, Lewis & Thornhill, 2019). The qualitative research methodology is valued since it is rigorous and methodical, seeking to yield meaningful and useful results from the selected sample which lead to answering the research questions (Nowell, Norris, White & Moules, 2017). A thematic analysis was used to analyse the data gathered and ethical approval was obtained in line with UNISA Policy on Research Ethics.

1.10 Outline of Chapters

Chapter 1 – introduces the topic of the study and provides an overview of the problem statement. It also provides summary of the research methodology and of the scope of the study.

Chapter 2 – discusses literature review of the study. It provides the theoretical basis for funding and non-funding support. It lays-out the discussion of literature on venture capital funding.

Chapter 3 – outlines the research methodology implemented to investigate the research objectives. It also lays-out the approach adopted for data collection and analysis.

Chapter 4 – presents the findings from the data collected and discusses the outcomes of data collection. It also indicates how the findings align with the research objectives.

Chapter 5 – it provides an overview of the research findings and conclusions drawn from the study findings. It also presents the recommendations and highlights the limitations of the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Chapter Summary

This chapter aims to identify and discuss factors for successful commercialisation as proposed by the available literature. It also discusses the investment criteria for venture capital support. The relevant concepts were identified and discussed. A conceptual framework was presented indicating the various factors that impact SMME technology commercialisation success, including funding and non-funding support, market factors and technological advancements.

2.2 Small Micro and Medium Enterprises

SMMEs are considered to have the potential role of growing economies in both developed and developing economies (Sitharam & Hoque, 2016; Leboea, 2017; Du & Cai, 2020). However, regardless of this acknowledgement by the government and the industry including the banking sector, access to funding remains low. It appears that potential funders consider SMMEs as high risk and therefore lending to SMMEs is avoided unless collateral is provided by the SMME or its owner (Leboea, 2017; Du & Cai, 2020). Lack of financial support is one of the major inhibiting factors to the growth of SMMEs (Leboea, 2017; Du & Cai, 2020). Previous studies have shown that access to funding for SMMEs is critical for their survival and growth (Msomi *et al.*, 2022). Access to funding will enable businesses to grow economies, reduce unemployment, increase profits and revenue and improve business continuity (Sitharam & Hoque, 2016; Leboea, 2017; Heikkilä, 2018; Bushe, 2019; Celliers, Schachtebeck & Diniso, 2021). The limitation to SMMEs' survival and growth due to lack of funding is acknowledged and it is evident in the case of the commercialisation of technological innovations by SMMEs.

2.3 Technological innovation

Innovation is considered an economic driver in developed and developing countries (Chetty, 2016; Bezuidenhout, 2018; Heikkilä, 2018). Innovation is considered to be a driver for financial returns, improving competitiveness and response to marketplace changes (Mazzarol, Reboud & Soutar, 2011; Chetty, 2016; Bezuidenhout, 2018; Heikkilä, 2018). Technological innovation can be interpreted as a process of transforming an idea into a new product and/or new services and/or new process and

could improve production, solving marketplace needs and/or problems (Brant & Sibanda, 2018). The novelty of technological innovation has the consequence that it should be protected under intellectual property (IP) protection systems to enable the realisation of its full potential. As a result, various IP protection systems can be utilised to protect innovation, including patent applications, design applications, confidentiality and non-disclosure and copyright (Brant & Sibanda, 2018)

Technological innovation is created by SMMEs to solve a challenge and make a product or service a solution, and the success of its commercialisation is not certain (Heikkilä, 2018). Typically, these SMMEs can be described as problem-solving driven, and market evaluation assists in determining the potential success of commercialisation (Heikkilä, 2018). The usual life cycle of technological innovation includes the developmental and commercialisation phases (South Africa Medical Research Council (SAMRC), 2018; Thosago, 2011; Heikkilä, 2018). The developmental phase comprises pre-seed (idea generation) and seed (prototyping) (Heikkilä, 2018). The commercialisation phase comprises various steps which are pre-commercialisation whereby the product and/or services according to the technological innovation are launched and initial marketing takes place, and thereafter rapid growth which includes entering the marketplace and starting to generate revenue. The last step is an expansion whereby new products and/or services are created as well as entering the new marketplace and international markets (Heikkilä, 2018). All these various phases and steps require funding and non-funding support as mentioned in various previous studies (Thosago, 2011; Chetty, 2016; Heikkilä, 2018). The technological innovation as described within the venture capital sector comprises of the following stages (Nduzululeka, 2012):

(i) Seed Capital – funding for market research and technological innovation development;

(ii) Start-up capital – setting up of offices, registration of IP, capacitating the SMME;

(iii) Developmental capital – pre-revenue or pre-commercialisation which is intended to get the launch the SMME and make it profitable; and

(iv) Growth capital – post-revenue also called commercialisation phase is directed at expanding activities to improve profitability, developing new

product lines or technologies, accelerating production or entering to further markets (new and/or foreign markets).

In this study, stage (i) and (ii) are considered to be early stages of the technological innovation and stage (iii) is considered to be pre-commercialisation or mid-stage. Stage (iv) is considered late stage however this stage was not investigated in this study.

2.4 THEORETICAL BACKGROUND

2.4.1 Commercialisation of Technological Innovation

The effects of the commercialisation of technological innovation include increasing wealth and the potential to increase employment and it requires funding and non-funding support to enable and encourage technological innovation by SMMEs (Heikkilä, 2018; Kato, 2021). Commercialisation is key to the technological innovation cycle (Mazzarol *et al*., 2011; Heikkilä, 2018). It is a process of connecting technological innovation to entrepreneurship for the realisation of economic value (Bezuidenhout, 2018). Within the university and/or research institution settings commercialisation include various activities up to the formation of a spin-out company or licensing to an external third party (Chetty, 2016; Bezuidenhout, 2018). In the case of SMMEs as external third parties or the spin-out company the commercialisation of the technological innovation would include the manufacturing and direct sale of the products and/or services (Heikkilä, 2018). Revenue from the commercialisation of technological innovations can include licence fees, evaluation fees, milestone payments, royalty income, outright sale of IP in the technological innovation and direct sales of products and/or services according to the technological innovation (South Africa Medical Research Council (SAMRC), 2018). Other forms of commercialisation can be dividends, the sale of shares, or the sale of the entity commercialising the technological innovation (SAMRC, 2018)). The assessment appears to be any form of benefit sharing or revenue-sharing system that the owner of the IP shares in the successful commercialisation of the technological innovation in the marketplace (SAMRC, 2018).

The requirements for the commercialisation of technological innovation generally include IP protection, marketing and sales, regulatory applications and/or approval for the launching of products and/or services (Chetty, 2016; Heikkilä, 2018; Mwasi &

Alouch, 2023). As well as the need for maturing the technological innovation towards commercially ready products or services which can include prototyping, demonstration and deployment. All these processes towards preparing for the commercialisation of technological innovation require funding and non-funding support remains limited. In cases where it is available, there appears to be a challenge in obtaining access to such funding and non-funding support. As discussed in Bezuidenhout (2018) it appears that SMMEs have a challenge of accessing venture capital funding. Venture capitalists usually consider funding technological innovations as riskier due to the likelihood of relatively long period to receive a return on investment (Block, Fisch, Vismara & Andres, 2019). Venture capital investment may be best suited for later stages of technological innovations than early-stage development (Block *et al*., 2019).

2.4.2 Licensing of Intellectual Property

Department of Science and Innovation (2022) in commercialising research outcomes creation of spinoffs companies is one of the strategies. As a result, the number of spin-offs increased by 64% between 2011 and 2017 a total of 77 spin-offs were created, and of those companies, 72 were still in operation in 2018 (Department of Science and Innovation, 2022). These are SMMEs that were licensed or assigned IP generated from universities or science councils. It appears that there is no record-keeping of SMMEs which were created solely for the creation and commercialisation of IP by inventors outside of the university and/or science councils. These indicate a market that is generally ignored by the South African government whereby SMMEs in technological innovation are not monitored or their success in commercialisation.

2.4.3 University Commercialisation of Technological Innovation

Commercialisation of research output in South Africa and globally is a phenomenon that is negatively impacting on technological innovation lifecycle (Bezuidenhout, 2018). As a result of this challenge technology transfer offices were established at South African universities, regardless of these offices commercialisation is still modest (Bezuidenhout, 2018). In this study, Bezuidenhout (2018) barriers to commercialisation at universities were found to comprise of:

- The requirements for additional support from the university management and policy red tapes towards entrepreneurship at universities;

- Communication and collaboration between universities and industry; and
- Funding from venture capitalists and reconsideration of venture capitalist risk appetite.

Some of the suggested solutions include joint efforts to identify commercialisation barriers and seek targeted solutions to them (Bezuidenhout, 2018). As mentioned in this study, venture capital funding is considered essentially for the commercialisation of technological innovations. It appears that in South Africa there is limited activity in this regard. In Bezuidenhout (2018) it was discussed that IDC should play a critical role in nurturing the venture capital funding environment.

2.4.4 SMMME Commercialisation of Technological Innovation

Commercialisation can be considered as the integration process of processes and activities towards economic value realisation of technological innovation which leads to the generation of income (Thosago, 2011). Successful commercialisation requires that there is addressing of market needs that benefit or solution to a problem which significant and identifiable. It must also be unique, and that uniqueness must be communicated through marketing and sales. The market must be of sufficient size and require the benefit and/or solution according to the technological innovation (Thosago, 2011; Heikkilä, 2018). Lack of funding is considered the major inhibitor to successful commercialisation (Chetty, 2016; Heikkilä, 2018; Mwasi & Alouch, 2023; National Advisory Council on Innovation, 2010).

2.5 Factors for Commercialisation of Technological Innovations

Department of Science and Innovation (2022) spin-off companies usually fail due to poor business models, lack of funding for growth, competitive pressures and lack of management skills. Other factors that impact successful technological innovation development and its ultimate commercialisation include environmental conduciveness, regulatory, organisational and technological advancements and lack of access to local and international markets (Motjolopane & Ruhode, 2021; Bushe, 2019; (Ncube & Zondo., 2022; Sitharam & Hoque, 2016). In South Africa, the crime and corruption rate are increasing, and it is now considered a critical factor in the growth of SMMEs (Sitharam & Hoque., 2016) and by implication to commercialisation of technological innovation as well. Marketplace factors that impact technological

innovation include the everchanging customer needs and its orientation including the increasing competition (Heikkilä, 2018). These marketplace factors are influenced by access to available information, changing needs, and requirements to serve un-served customers (Motjolopane & Ruhode, 2021).

2.5.1 Enablers for Commercialisation

Most research studied barriers to commercialisation emphasised an intention of these studies to explore mainly enablers for commercialisation in particular access to funding which has been identified as the main contributor to the success or failure of commercialisation. In Chetty (2016) various enablers were identified however this study focused on commercialisation within the university settings. In this study, enablers which were identified which are considered to be relevant for SMMEs include the involvement of researchers in the commercialisation to enable further development of technological innovation. Further, recommends the use of technology showcase events, and innovation awards and competitions including the use of media such as news outlets for promoting South African innovative contributions. Ideally, these showcase events and innovation awards and competitions should include funding and networking opportunities to enable further development of technological innovations (Chetty, 2016). Furthermore, this study identified training programmes for researchers as potential enablers. This is supported by views expressed in Dzimba (2021) whereby it discussed entrepreneurial education on accessing and applying for funding and other business skills. Thus, it is recommended that entrepreneurial education be considered for SMMEs especially those in technological innovations since they are generally scientists and engineers. Of which most have not undertaken any training on entrepreneurial education. As mentioned, in some studies, technology transfer offices of universities usually don’t have any business training or at least commercialisation (Chetty, 2016; Bansi, 2016). Thus, they are generally not capable to offer training to researchers in universities or SMMEs owners on business skills. In Chetty (2016) it is furthermore recommended the establishment of technological innovation incubators which can open opportunities for technical and enterprise development advisory services (business support) (Chetty, 2016).

The above findings and recommendations are corroborated by findings in a study done in Zimbabwe (Makanyez, Mabenge, & Ngorora-Madzimune, 2023). This study tested

enablers of innovativeness which ultimately contribute to commercialisation. The identified enablers included firms' capital resources (financial and physical), research and development, and human intellectual enhancement including on-the-job training. Further, government support and institutional policies that is the government creating an enabling and encouraging environment, whereby funding – special loans and grants to encourage innovation. Furthermore, the protection of IP means sufficient and effective protection of creators' rights through various approaches including enforcement. Also, furthermore information sharing and its uses.

2.6 Funding and Support of SMME

Funding is indicated as the main contributor to commercialisation of technological innovations in South Africa (Bansi, 2016; Bezuidenhout, 2018; Bushe, 2019; Celliers *et al*., 2021; Makanyeza *et al*., 2023). It is not just the lack of funding that presents a challenge to financing SMMEs but also high transactional costs, high failure rates, and lack of sufficient collateral (Du & Cai, 2020). Another challenge with access to funding identified includes delay in receiving funding into the bank account from the date of application and/or approval (Department of Science & Technology (b), 2019; Dzimba & Van Der Poll, 2021). Department of Small Business Development (2023) list some types of government and non-government entities involved in financing SMMEs the list includes venture capitalists and business incubators which are discussed further below and also offer business support and advisory. Other types of supporters of SMMEs include angel investors, crowdfunding, corporate, and banks (W&RSETA, 2022; Department of Small Business Development, 2023). These mentioned funding entities use different criteria even in the same entity different criteria can be applied when deciding to support or not to support. Thus, it would be necessary for SMMEs need access to funding and non-funding support to first familiarise themselves with available potential supporters and study their criteria. This may be considered to be time-consuming. This issue may require SMMEs to seek the services of those skilled and knowledgeable about seeking external funding. This is illustrated by studies which recommend the use of business support or enterprise advisory services found at venture capital firms and universities' technology transfer offices as discussed in this report.

2.6.1 Funding of technological innovation

According to Matekenya & Moyo (2022); Bansi (2016); and Bezuidenhout (2018), funding is a major challenge for SMMEs' technological innovation. There is a need for funding and non-funding support for the development and commercialisation. This need is present regardless of the nature of the entity whether it is a university, science council, spinoff, or SMME. However, the need for access to funding is more essential for SMMEs who would be commercialising the technological innovation. As indicated in various previous studies obtaining funding is among the top barriers to commercialisation. Although, there are various governmental and non-government interventions however funding remains inaccessible through these entities especially SMMEs (including spin-offs) (Celliers *et al*., 2021). The inaccessibility also relates to funding not being available at the desired level or access being delayed which can be caused by limited knowledge of how to access such funding (W&RSETA, 2022). Venture capital funding can be used at various phases of the technological innovation lifecycle from development up to commercialisation (Oni, 2017; Du & Cai, 2020). Venture capital has been considered to nurture the commercialisation of technological than to nurture the development of it (Kato, 2021). Thus, there has to be consideration of optimizing access to venture capital funding for funding the commercialisation of technological innovation in South Africa. It appears that the South African government has implemented funding and non-funding support that may be considered to at least be sufficient for the development of technological innovation (Department of Science and Innovation, 2022). In a country like South Africa, it may be reasonable to focus venture capital on the technological innovation sector mainly toward commercialisation since they also provide business support (Kato, 2021; Celliers *et al*., 2021). This is due to the limited funds available to venture capitalists in South Africa. Generally, financing options include government and government agencies through grants, loans, and equity. Business and personal credit cards, loans, overdraft, funds from family and friends (Nyide & Zunckel, 2019). External funding come through private equity, venture capital, business angels, banks (debt financing) and asset financing (Nyide & Zunckel, 2019**;** Bamata & Govender, 2019).

2.6.2 Government Funding and Support

Regardless, of the identification of technological innovation as an essential driver it appears that TIA is the only national government entity that is specifically involved in the funding and supporting of technological innovation. In the other institutions mentioned above such as SEDA, SEFA and IDC, technological innovation funding and support are not their primary role. As such TIA becomes an ideal research site for this research project. In Department of Science & Technology (b) (2019), it suggested that funding levels should not only be increased but efficiencies in the decision to fund should also be improved. Although, there are multiple funders for SMMEs it was found that SMMEs still prefer government funding which may be in the form of grants and loans (Ndweni, Mocwaledi, Mahlangu, & Schachtebeck, 2019).

2.7 Non-government funding

2.7.1 Self-funding

Self-funding may be in the form of personal loans and savings (Ndweni *et al*., 2019). Funding of SMME usually commences with the founders' personal loans and savings, followed by funds from family and friends. Usually, SMME founders don't prefer external financing (Nyide & Zunckel, 2019; Muller & Sensini, 2021). In Muller & Sensini (2021) it was found that profitable SMMEs prefer using own funds obtained as profits to finance investments or growth. Thus, it appears that when presented with an option SMMEs prefer using their own funds for growth. This may lead to some SMMEs not applying for funding and non-funding support. Thus, losing on the opportunity to benefit from the available support.

2.7.2 Banking Sector

The banking sector is not ideal for financing early stage SMMEs due to its business model which usually requires collateral or current cash flow of which requirement most SMMEs don't meet (Mynhardt, 2020). In a study conducted for the banking sector it was found that factors that contribute to poor access to funding from banks include applying the wrong type of funding; unbankable business plans, and poor financial management skills, as well as none use of SMMEs support services offered by banks (The Banking Association South Africa, 2018). It was mentioned that SMMEs usually apply for funding with weak or missing financial information, insufficient collateral and

weak cashflow and poor credit rating (The Banking Association South Africa, 2018). Lack of collateral and high interest rates makes bank financing an undesirable financing for SMMEs (Nyide & Zunckel, 2019). Another issue of bank financing is SMMEs not having authenticated financial information (audited financial records) (Nyide & Zunckel, 2019).

2.7.3 Crowd funding

Crowdfunding is a funding method whereby a large number of audiences provides relatively small amounts which are then combined to fund a project (Biancone, Secinaro & Kamal, 2019). Those who invest do so under any of the one or a combination of the following crowd-lending, equity, reward, and/or donation (Shneor, Zhao, and Flaten., 2020); (Biancone *et al*., 2019). Crowdfunding is a result of Fin-tech, which is an innovation in finance made possible by technology. It works by facilitating the meeting of different potential investors and the SMME, the potential debtor (Biancone *et al*., 2019). The process includes collecting of the request, selection of debtors by investors or by evaluation, (preparatory activities and crowd sourcing processing), managing of payments between the parties usually through a third-party company (implementation of funding phase) (Biancone *et al*., 2019).

2.7.4 Private Equity Funders

The South African venture capital market was birthed out of the private equity market, which began in the 1980s due to developments in the international and domestic markets (Nduzululeka, 2012). Through the adoptions of the South African democratic government such as the establishment of Black Economic Empowerment which stimulated buyouts, and empowerment deals thus intensifying the private equity market (Nduzululeka, 2012). Other adoptions included the establishment of entities such as IDC which had business units dedicated to venture capital and private equity (Nduzululeka, 2012). The source of funding in the private equity and venture capital includes government, financial services providers (banks and insurance entities), high net worth individuals (business angel), private companies, pension and empowerment funds, and undisclosed sources (SAVCA, 2021; Nyide & Zunckel, 2019). Like venture capital, angel investing is also considered distinct from private equity, and it may be studied separately (Kirihata, 2022). However, in this study, angel investing is considered along with venture capital. The funding sources of PE may be argued from

local and international funds (SAVCA, 2021; Portmann & Mlambo, 2013; Urban, 2022). The venture capital market has grown to such a level that is visually studied separate from the full private equity. In paragraph 2.8 below venture capital funding which is further exemplified.

2.8 Venture Capital

Generally, SMMEs are unable to raise funding through conventional means such as through public markets and debt financing through banks (Msweli, 2015). Venture capital firms usually take up a significant portion of equity as well as management control which compensate them to invest in SMMEs (Msweli, 2015). Venture capital support usually offers both funding and non-funding support. Professional support can be ongoing unlike funding support (Le Roux & Pretorius, 2015; Du & Cai, 2020). It can be defined as an investment system which connects inventors with good ideas for solving market problems with willing investors. Venture capital support enable firms to charge management fees and investors to expect a return on their investment (Gomper, Gornall, Kaplan, & Strebulaev, 2020). Usually, venture capitalists have an invested interest in SMMEs. They don't only offer funding but also provide continuous support which includes assisting in raising further funding, developing of commercialising strategies, attracting relevant stakeholders i.e., customers and hiring of staff (Le Roux & Pretorius, 2015; Du & Cai, 2020; Bouzahir & Ed-Dafali, 2018).

Evidence is that SMMEs who receive venture capital support have a lesser failure rate than those who don't receive it ((Du & Cai, 2020; Oni, 2017; Kato, 2021; Heikkilä, 2018; Faria & Barbosa., 2014). The non-funding support element of venture capital firms is what differentiates venture capitalists from other forms of funding such as government and banks (Le Roux & Pretorius, 2015). SMMEs which received venture capital funding are likely to attract external financing, increase employment, have higher opportunities to go public, grow faster, have better governance and more innovative than those who did not receive venture capital (Le Roux & Pretorius, 2015; Kato, 2021). Although, there are conflicting arguments venture capital funding is considered to be desirable for the commercialisation of technological innovations by SMMEs (Faria & Barbosa., 2014; Kato, 2021; Du & Cai, 2020; Heikkilä, 2018; Bezuidenhout, 2018).

The ability of venture capital to growth of SMMEs is evidenced by previous international SMMEs that received initial support and have grown to become self-sufficient and even large companies among others Apple, Microsoft, and Google (Kato, 2021; Du & Cai, 2020; Gompers, *et al*., 2020). These large companies were previously start-ups and received venture capital support which enabled them to grow to become large companies which we know today. However, in developing countries like South Africa, it appears that venture capitalists' ability to grow SMMEs has been limited. In the study Kato (2021) it was found that there is a research gap for venture capital in developing countries. The same study recommends that governments of developing countries should seek to develop and improve venture capital and increase venture capital access and awareness among SMME owners. Kato (2021) also suggests that there is a financing deficiency in the African continent. This deficiency can be attributed to the African venture capital market being only recently started, almost 5-8 years as of 2022 thus it is still in the infancy stage (Dunn, 2022).

In a South Africa study, it was recommended that the IDC through their venture capital programme, Technology Venture Capital Fund, should play an active nurturing role as discussed in Bezuidenhout (2018). In Kato (2021) government co-investment for venture capital is recommended and the South African government appears to have already initiated some programmes for co-investment. IDC Technology Venture Capital Fund is a co-investment between DTIC and IDC. Another, factor that requires attention is for SMMEs to have investable transactions (Bezuidenhout, 2018).

It is likely that if SMMEs can address the below mentioned factors, multiple factors including the building of a balance management team and approaching venture capital at the relevant stage of development. When these factors are diligently chosen, they may be able to effectively access venture capital. It may even be beneficial for SMMEs to demonstrate access to the market through initial sales of the technological innovation, where possible, to demonstrate the need for the product or services by the market to illustrate investable transactions. In addition to the scientific/engineering well-resourced team to balance it with business skilled team members. In consideration of the above discussions, value-addition support offered by venture capital firms may be more valuable specifically at early stage than its funding itself.

2.9 Venture Capital Phases

Venture capital funding can be used to fund seed stage, start-up phase or at expansion (Msweli, 2015). The expansion phase can be split into first ramp-up funding, second new market entering funding, third bridging funding, and forth buyout funding (Allahar, 2014). According to a United State study, Gompers, *et al*., 2020, the venture capital decision process usually includes the following various stages: deal sourcing; potential applicant selection; company (or technology) valuation; deal structuring; post-deal value-addition business support; and exit. It also indicated that in addition to the multiple factors in valuation, most firms also use multiple estimation techniques which include net present value or discounted cash flow assessment techniques, and internal rate of return. In this study, it was found that many venture capitalists provide value-addition business support to their investees which includes strategic guidance, access to further funding, hiring of board directors and staff, and operations. According to Bouzahir & Ed-Dafail (2018) the last steps of an investment process can further be described as follows:

(i) investment management is a step whereby the venture capital firm provides project implementation monitoring and evaluation, may also provide business development services (non-funding support); and

(ii) continuous monitoring and value-addition support which include post-investment activities includes supporting the company's management and preparation of future investment.

The last two steps have been identified by various previous studies as the critical support that leads to venture capital funding to be considered more preferred for the growth of SMMEs over other types of funding (Le Roux & Pretorius, 2015; Bouzahir & Ed-Dafail, 2018; Bezuidenhout, 2018; Du & Cai, 2020; Kato, 2021).

2.10 Investment Criteria for Venture Capital Support

Factors that primarily impact venture capitalist funding decisions to support SMMEs include entrepreneurs' skills, abilities and character, and this includes previous prior experiences, interpersonal skills, and ability to network, previous successes and failures (Gompers *et al*., 2020; Celliers *et al*., 2021; Mwasi & Alouch, 2023). As well as product and services and financial considerations (Celliers *et al*., 2021). Further

relevant factors for decision-making include current profitability, breakeven, revenue growth, track record of the team, business model and value-add of the product or service, and scalability of the company (Block *et al*., 2019). Generally, scalability and other factors like the business model and value-add of the product or service are given higher preference over current profitability (Block *et al*., 2019).

According to Msweli (2015) SMMEs to be able to attract funding from venture capital firms should pose (i) a bankable business plan, (ii) effective internal ethical systems, (iii) good governance and financial structures, and (iv) entrepreneurial spirit of the management team to foster novelty and innovation. Other factors which influence venture capital financing include (v) return on investment, (vi) market attractiveness, (vii) investment lifecycle and exit point (Celliers *et al*., 2021; Bouzahir & Ed-Dafail, 2018).

As found by Bansi (2016), technological innovations created with the market in mind are likely to succeed at commercialisation. According to Mwasi & Alouch (2023) also mentioned that technological innovation should consider their stage of development when seeking venture capital funding. According to Kato (2021) patenting was found to have an impact on supporting decisions for SMMEs in technological innovation commercialisation. Other relevant factors include environmental conduciveness, regulatory, organizational, and technological advancements, and access to local and international markets (Jaoui, Amoussou, & Kemese, 2022).

SMMEs should consider and familiarise themselves with multiple factors in preparation to apply for venture capital support. The multiple factors which venture capital firms usually consider for success in accessing support should be created and articulated prior to approaching. SMMEs should work on preparing themselves for support application by putting in place certain items i.e., developing governance and financial compliance systems, ethical enforcement, and monitoring systems.

2.10.1 Bankable business plan

SMME should have good understanding of complicated application procedures and the financial preferences of the funding institutions. A business plan is usually the best tool to capture the financial preferences in order to inspire an approval a potential funder (Bamata & Govender, 2019). During screening phase, the business plan is evaluated to determine the expected turnover and profitability that the SMME can

create (Dauderstädt, 2013). The business plan should include description of the technological innovation (product and/or process and/or service), market features, business model, and team of the entrepreneurs, and financial characteristics (Bamata & Govender, 2019; Sangwan, 2023). The financial characteristics includes revenue forecasts, cost structures, and expected profitability which is used to determine the capacity for growth (Sangwan, 2023). This business plan will then undergo due diligence where it will be analysed for strategic alignment between the venture capitalist and the SMME (Sangwan, 2023; Dauderstädt, 2013). The business plan will also include amount of funding required and the potential and existing funders of the capital (Bamata & Govender, 2019). If minimum requirements are meet a deal is likely to be structured (Bamata & Govender, 2019); Sangwan, 2023). In case that the SMME can meet the requirement of the evaluation criteria such as unique value proposition, technology innovativeness or novelty, minimum set internal rate of return, financials, risk assessments and the potential exit strategy (Dhochak & Sharma, 2016; Sangwan, 2023). Entrepreneurs should in preparation of the business plan or proposal identify critical evaluation criteria of the investor (i.e., venture capital). In order to be able to better describe and communicate clearly the evaluation criteria (Van Deventer & Mlambo, 2008).

2.10.2 Uniqueness of Technological innovation

The technology innovation elements include the uniqueness of the technology, existence of IP protection (such as patent), the technology edge, and the potential profit margin on sale per item (Urban & Moreno, 2022). Although IP protection is not essential for all industries, it is still a critical measuring for innovation. In this study, we focus on technological innovation to which IP protection is relevant however the degree of relevance differs across industries (Leth & Olsen, 2021). In terms of technological innovations, various assessments can be undertaken to determine the novelty/innovativeness of the product or process for product market fit (Sangwan, 2023). The assessment will also take into account whether the minimum viable product has been developed yet such as availability of a prototype (Dauderstädt, 2013; Sangwan, 2023). These assessments may include IP due diligence, which may include patent novelty, inventiveness as mentioned in Kollman & Kuckertz, 2009, legal assessment, and any other IP related risks, where relevant (Leth & Olsen, 2021).

Another assessment which may be argued should conducted during funding assessment of specifically technology innovation is IP valuation (Karius, 2016). However, this assessment is habitually conducted when royalties are determined (Heberden, 2011). Financial institutions should acquaint themselves well with IP valuation for assessment of IP potential earnings ((Heberden, 2011; Radauer, 2020). In Leth & Olsen (2021) it was found that variation in accounting practices have resulted in variation of results, and that sales growth is a better offers a better valuation (Leth & Olsen, 2021). We argue that IP valuation should form funding assessment although. However, we did not identify a specific funding entity in South Africa which conducts IP valuation. Regardless, of the consideration of IP valuation to be essential for determining the value of the technological innovation/SMMEs (Leth & Olsen, 2021).

2.10.3 Governance and financial structures

The study in Bouzahir & Ed-Dafali (2018) proper governance systems is an essential criteria for the success of SMMEs and was identified as critical to venture capital funding decision. According to Le Roux & Pretorius (2015) successful SMMEs had developed structures wich included tax and VAT registration, bookeeping services, formal company registration. Also, implemented control and record keeping system. A well structured governance system enables for communication between investors and the SMME (Bouzahir & Ed-Dafali, 2018).

Usually, to be fundable SMMEs should meet certain governance and financial requirements including complying to SARS i.e. tax compliance and company registration, and proper credit history (Bamata & Govender, 2019). Generally, SMMEs have unstructured and unsystematic ethical process which tend to erode trust. Effective internal ethical processes and standards are considered to minimise risk ((Bamata & Govender, 2019); (Msweli, 2015)). Thus, appropriate internal ethical information such as description of information on appropriate decision making, and control mechanism (Bamata & Govender, 2019) are regarded by venture capital firms to minimise uncertainty for expectation of return on investment (Msweli, 2015). Decision making process and skill of the entrepreneur enables for fast and appropriate decision (Bamata & Govender, 2019).

2.10.4 Entrepreneurship

In Ncube & Zondo (2022) it was found that entrepreneurial skill of the SMME management is essential to growth when combined with creativity and the market conditions. According to Portmann & Mlambo (2013) the important investment criteria according to venture capital in relation to the entrepreneur includes honesty and integrity, good knowledge of the sector, and the desire to succeed. In relation to venture capital the whole management team not just the individual entrepreneur is considered (Portmann & Mlambo, 2013). Venture capital firms also considers a good track record of success and their excellent management skills and experience (Portmann & Mlambo, 2013). The management skills and problem-solving capabilities of the entrepreneur(s) and/or management team are also taken into account because they enable fostering of novelty and innovation ((Msweli, 2015; Sangwan, 2023). Venture capital firms also take into account entrepreneurs hardwork and flexibility, reputation, capability to intense and sustained effort, high risk appetite to succeed (Portmann & Mlambo, 2013). In Gompers *et al* (2020) and Bouzahir & Ed-Dafail (2018), it was found that venture capital firms rank entrepreneurs and management teams in higher regard than product and technology. Entrepreneurs who succeed are usually intentional in differentiating the business offering, and on how to grow the SMME based on a strategy (Le Roux & Pretorius, 2015). To succeed entrerpeneurs should also master the business and its products as well as understand costing basics of the business offerings (Le Roux & Pretorius, 2015). According to Bouzahir & Ed-Dafail (2018) the entrepreneur team is ranked sometimes higher than the product and market attractiveness. Especially, prior experience in running start-ups, industry experience, functional diversity, management and research (Bouzahir, & Ed-Dafail, 2018). In the study (Msomi & Olarewaju, 2021) it was found that budgeting and financial awareness of entrepreneurs in essential for SMME sustainability. Thus, the SMME management must not merely skilled and experienced in technical skills for example technological innovation management but must also have financial awareness to be able to access funding (Msomi & Kandolo, 2023).

2.10.5 Market Attractiveness and return on investment

SMMEs that succeed have clear growth plans, understand their competition well, compete using differentiation to expand in the market (Le Roux & Pretorius, 2015).

They are usually willing to forego short term profit in favour of long term plans. They seek to satisfy their customers and respond to changes in customers' needs (Le Roux & Pretorius, 2015). In order to expand effectively they also develop networks and support services such as with the suppliers and distributors (Le Roux & Pretorius, 2015).

For a project to be considered it should be expected to have good market acceptance and high internal rate of return (Van Deventer & Mlambo, 2008). There should be high valuation projections, likelihood of good market acceptance, less or no regulatory restrictions, need of the product or process in the market (Van Deventer & Mlambo, 2008). The other criterial market factors is the experience of the management team/entrepreneur in the specific market, open access to the market, and less competitive market conditions (Van Deventer & Mlambo, 2008; Msweli, 2015).

2.10.6 Investment lifecycle and exit point

Venture capitalists invest in projects in expectation of the return on their investment, which can be sale of shares or repayment of a funding amount plus interest (Dauderstädt, 2013). According to Portmann & Mlambo (2013) is critical that the product has a working prototype or developed product for venture capital firms. The level of development towards commercialisation is critical for risk and return of investment (Van Deventer & Mlambo, 2008). Continuous monitoring and value-addition is undertaken with the end goal in mind which is to cash-out. The cash-out potential is the return on investment and its potential is accessed based on the interdependence of the potentials of the market need of the product, competitive advantage of the product and the level of its development, sufficiently high internal rate of return, and entrepreneurs' management (Bouzahir & Ed-Dafail, 2018); (Portmann & Mlambo, 2013). Venture capital cash-out potential is evaluated also based on how it will quickly exist the investee company (Bouzahir and ed-Dafail, 2018). According to Dauderstädt (2013) it was found that exit strategy is not necessarily a success factor to venture capital process. It was found that pre-investment and holding phase have strategic value. Further, according to Dauderstädt (2013) the common exit modes include (i) initial public offering sale of the shares held on the stock market, (ii) repurchase of shares by the entrepreneurs or the company,

(iii) sale of shares to an investor or another company, (iv) sale to a funding entity, and (v) write-off of the investment.

2.11 Non-funding support

As mentioned above in paragraph 2.8 above investment management as well as continuous monitoring and value-addition support are critical non-funding support provided by venture capital. This support may also be described as business development support which has been found to be beneficial to the growth of SMMEs. Because it helps with the operation and strategies of the SMMEs. Below we discuss non-funding support.

Non-funding support include incubation, industrial hubs, technology development initiatives such as technology platforms, technology stations, as well as private technology innovation development consultants (prototyping engineering companies) which specialise in developing technological innovations for others for a fee. Some of these non-funding supports are exemplified further in paragraph 2.11.1. to 2.11.3. below.

2.11.1 SMME Incubation

Based on the consideration of value-addition support offered by venture capital firms. It would be reasonable to consider SMME business incubation as an alternative to venture capital firms based on the above discussions. Business incubation can be described as entities which are created with the objective of accelerating through entrepreneurial business support, access to relevant stakeholders, creation of start-up conducive environment and in some cases access to infrastructure (Lose, 2021). The Business incubation intends at SMMEs coming of the incubator will be equipped with necessary business skills, commercialisation, and technology transfer. Thus, they can create revenue and are capable of surviving and grow (Lose, 2021). appears to be different types of incubators service offerings which includes providing physical workstations, business support, access to local and/or international market, development of business plans, and administrative and secretarial support systems (Lose, 2019). In this study, development of business incubators at universities to assist aspiring graduates to start businesses (Lose, 2019) and hopefully such graduates will go on to create sustainable SMMEs and some students may even have an opportunity

to commercialise their own research outputs. The development of university incubators would likely increase university entrepreneurship.

2.11.2 Angel Investors Non-Financial Support

Angel investing is usually high net worth individuals investing in SMMEs which they believe in and may be able to offer training and expertise to the business (Mynhardt, 2020) (OECD, 2016); (Urban & Moreno, 2022). According to South African studies, it was found that angel investors were considered to be more involved in the SMMEs they invest in than venture capital firms (Jones & Mlambo, 2013); (Urban & Moreno, 2022). The South African tax system currently does not offer tax incentives to angel investors even tax incentives regime for venture capital investing has been discounted as of 30 June 2021 (SARS (South African Revenue Service), 2023). Regardless of the potential that angel investors may offer the South African Reserve Bank does not yet offer them tax relief. The greater evolvement of the angel investor in the SMME whereby the offer their business expertise and business networks can be of greater value than the funding itself ((Mynhardt, 2020; OECD, 2016; Urban & Moreno, 2022)).

2.11.3 Venture Capital Non-Financial Support

As described in Dauderstädt (2013), venture capital support includes financial and management support. Management support includes participation on boards and committees in order to guide and impact positively on performance. This continuous management support includes activities, financial and business operations and strategic advice support on the overall business activities and operations (Dauderstädt, 2013). The support provided by venture capitalists is strategic and crucial for venture capital success.

2.12 National System of Innovation

The national system of innovation (NSI) can be characterised as the dynamics of the flow of information and the network of research and development institutions in the global and national context for the development of technological innovations and their commercialisation (Bengt-Åke, 2010); (OECD, 1997). It assists in understanding the causal linkage between the elements of science and technology (Manzini, 2012). NSI is a conceptual framework for understanding and shaping the operation of the technological innovation landscape within an economic system. It relies on

interdependence between technical and institutions ((Manzini, 2012). In Manzini (2012), the NSI was concluded to comprise of a network of interacting elements which include policies, institutions, and organisations of which their synergy leads to improvement of innovation.

The understanding of the NSI offers a solid basis for collaborating individual efforts in the sector of science and technology to enable innovation in an economic system (Manzini, 2012; Asmara & Kusumastuti, 2021)). None of the elements of the NSI can act as a single actor to run the whole of the NSI (Asmara & Kusumastuti, 2021). Creation of an effective NSI is one of the main responsibilities of the government to initiate, direct, and promote the innovation ecosystem through the creation of policies, funding, and establishment of institutions for research and development (Asmara & Kusumastuti, 2021; Ndweni *et al*., 2019).

2.12.1 Government Role in the National System of Innovation

Government through government policy and incubation hubs create an enabling environment and also offers actual funds (Ndweni *et al*., 2019). The interconnection of roles of government are illustrated in Figure 2.1 and relate to the creation of an enabling environment for the development and commercialisation of technological innovations (Asmara & Kusumastuti, 2021; Eggink, 2011). Any of these roles may at first appear disconnected upon further analysis becomes more connected and critical to the whole system. For example, the availability of skilled and qualified professionals in science, technology and in research management through the role of human capital development. It becomes evidential critical for all the other government NSI roles. Further example, access to financial support will enable the adequate undertaking of research and development projects as well as the commercialisations of the research outputs i.e., technological innovations. These examples of interconnection support what is already mentioned in paragraph 2.11. above. The interconnection of the roles of government in the NSI is illustrated in Figure 2.1 below:

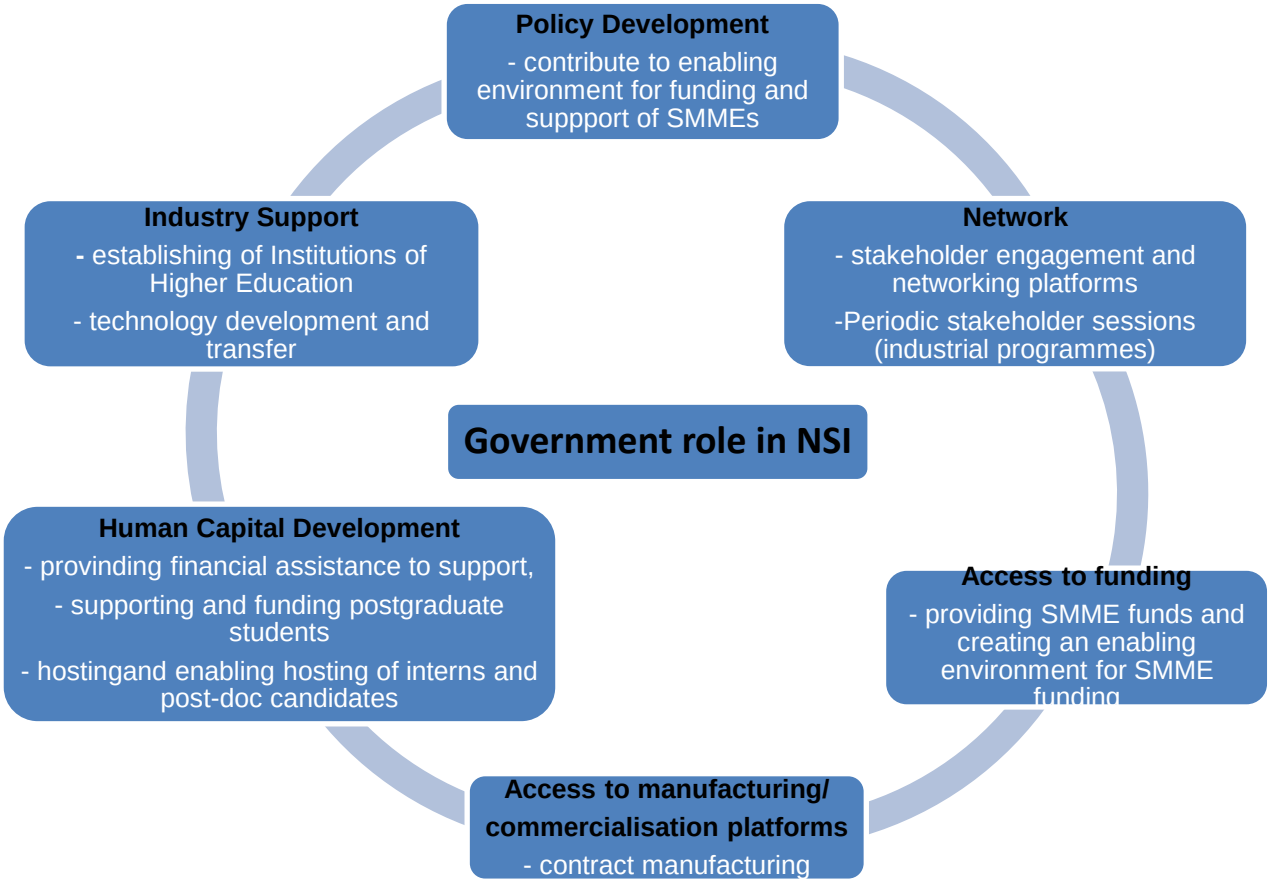

Figure 2.1: Role of Government in the NSI (Adopted from Eggink, 2011)

2.12.2 National System of Innovation in South Africa

The South African government has implemented various policies and acts to strengthen the NSI. The NSI can be regarded as a set of interacting institutions, and policies for the realisation of socio-economic goals and objectives (National Advisory Council on Innovation, 2010). A white paper was adopted in 1996 now updated as provided in the recent white paper, (Department of Science & Technology (b), 2019), as well as Research and Development Strategy in 2002, and 2008 the Innovation Plan, Intellectual Property Rights from Publicly Financed Research Act (IPR Act), and TIA (Brant & Sibanda, 2018). As set out in the National Development Plan, SMMEs are considered as key instruments for socio-economic and likely elements to resolve high unemployment, inequality, and poverty levels (Matekenya & Moyo, 2022). The Research and Development Tax incentives were introduced and appear to be favouring mainly large companies than SMMEs (Matekenya & Moyo, 2022; OECD, 2021). In Matekenya & Moyo (2022) it was recommended that more support should be provided to SMMEs to assist SMMEs with lower growth. According to Lukhele &

Soumonni (2020) innovation has two modes, firstly, focusing on the promotion and commercialisation of research and development; and secondly, creating an enabling environment by focusing on business strategies and knowledge sharing.

Department of Science & Technology (b), (2019) acknowledges the role of government funding role in the less desirable areas including the level of development i.e., basic, applied, and experimental research, through funding of the National Research Foundation focusing on the higher education sector (National Advisory Council on Innovation, 2010). Government funding on research includes focusing on undesired specific sectors such as Bio-Economy i.e. health, especially at the early stages of research and development and its importance is emphasised (Department of Science & Technology (b), 2019); National Advisory Council on Innovation, 2010). Furthermore, acknowledges the need for public and private sector collaboration (Department of Science & Technology (b), 2019).

According to the National Advisory Council on Innovation (2010), three key objectives of government for the NSI include setting up entities and policies to give effect to NSI, ensuring interaction and collaboration of these entities among themselves, and agreeing on a set of goals and objectives for the future sought which is South Africa continues to strive. Various entities including research institutions, universities and funding entities exist in a system along with SMMEs for the development and commercialisation of technological innovation.

2.13 Conceptual Framework

A conceptual framework for successful commercialisation of technological innovation.

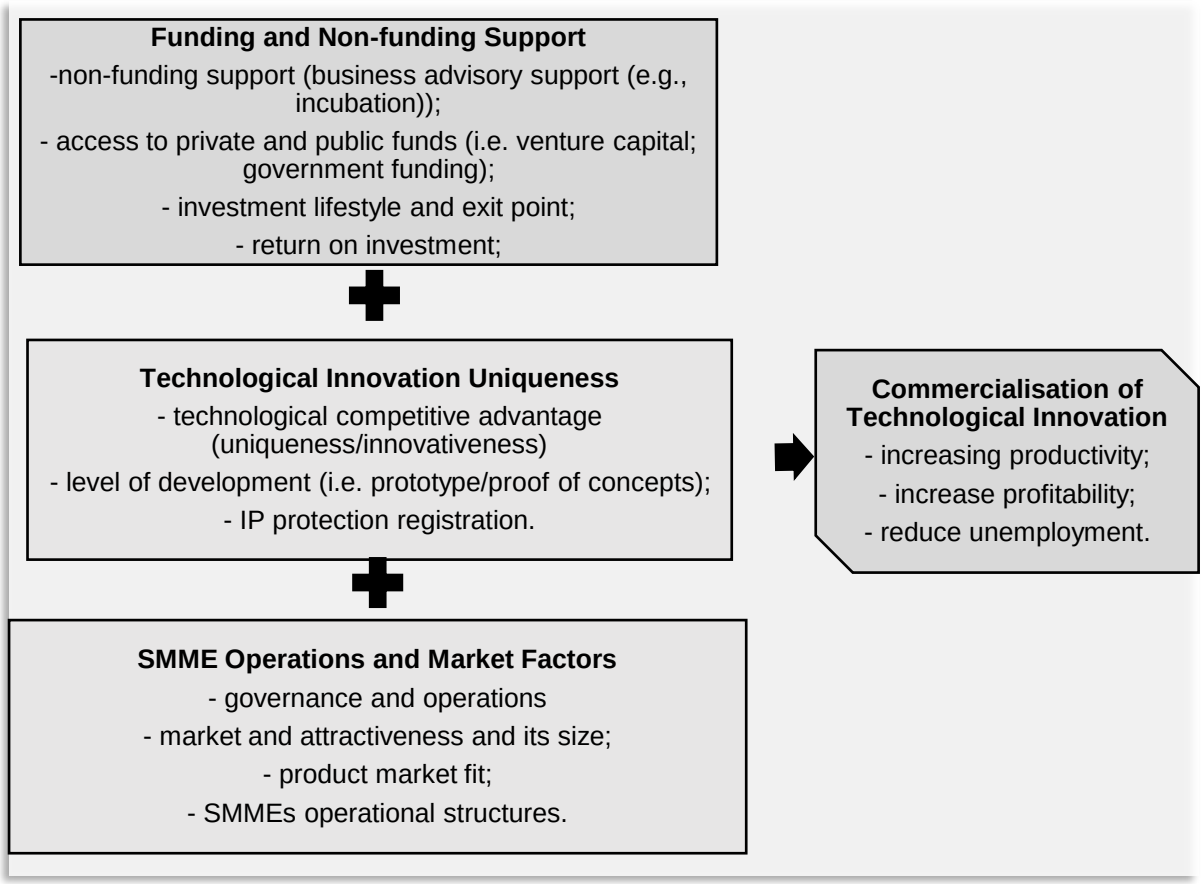

Figure 2.2: Factors for successful commercialisation (Adopted from Msomi *et al*., 2022).

This conceptual framework relates to successful commercialisation. Successful commercialisation which includes high income and revenue generation and better return on investment. As recognisable from the above successful commercialisation essentially include 3 (three) critical components funding and non-funding support, technological innovation uniqueness, and SMME operations and market factors of which all must be present for commercialisation to be successful. Funding and non-financial support refer to various components including financial; business support in the form of business incubation and venture capital support; early-stage support for establishing the company operations. As well as long-term support for SMMEs' survival and growth.

Technological innovation includes a balance of problem-solution fit, technological and product or service improvement and enhancement, and effective IP protection. Market factors refer to significant market size; availability of willing customers; and less restrictive market entry requirements.

According to the integrated view of existing literature on the technological innovation landscape and factors for commercialisation. Based on the review it appears that there is a clear requirement of funding and non-funding support for successful commercialisation of technological innovations. The funding and non-funding support for commercialisation is limited regardless of the recognition of commercialisation as a possible driver of economic value. It appears that funding and non-funding for commercialisation are limited due to the nature and likelihood of failure and thus no return on investment in some cases. However, regardless of the limited funding some SMMEs have been able to access funding and non-funding support towards commercialisation of their technological innovation.

2.14 Conclusion

In the literature review conducted venture capital support was identified to be critical for the successful commercialisation of technological innovations. It was covered that business support and/or enterprise development support as an essential component to venture capital support. It was identified that it is a potential enabler for enabling further accessing of funding. That is indicative that this is what led to the ultimate consideration of venture capital support as critical for successful commercialisation of technological innovation. Other criterions which were found to be essential for commercialisation included technological innovation uniqueness and market factors as well as SMME operations. These criterions are interconnected and integral for the ultimate successful accessing of funding and non-funding support. Commercialisation of technological innovations which would ordinarily lead to increased profits, stability, and increased employment. This chapter presented the integrated view of existing literature on the technological innovation landscape including the NSI and factors for commercialisation. Funding and non-funding support was identified as one of the most critical components for commercialisation including venture capital support. The next chapter discusses the research methodology that is used to answer the research question in this research study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology that was used to address the research objectives. It discusses the rationale for the qualitative research approach as utilised in the study, the research site and gaining access to participants. As well as the data collection and analysis methods and ethical considerations as well as the research quality.

3.2 Summary of Research Process

The research process commenced with conducting of literature review and its results were to develop the research objectives and interview guide. The research interview guide and consent forms were developed and were shared with potential participants. Once, ethical application was approved. The identified potential participants were professionals at funding institutions or technology transfer professional, as well as founders and management of SMMEs. These participants were sent the interview guide and consent form inviting them to participate in an interview and were requested to sign the consent form.

3.3 Rationale for Qualitative Research Methodology

The study followed an interpretivist research philosophy since it intended to explore human behaviour and to make sense of social experiences (Saunders, Lewis & Thornhill, 2019). It is the relevant approach for this study since it enabled the researcher to discover understandings and worldviews of participants and their contribution to the aim of this study (Saunders *et al*., 2019). Qualitative survey was selected as a method suitable for data collection since the research is centred on discovering the viewpoints of SMMEs involved in technological innovations to stimulate support. The interview guide included open-ended questions which enabled the researcher and the participants to engage with each other (Saunders *et al*., 2019). Qualitative research methodology is suited to a deep understanding of a social setting or activity as viewed from the participants' perspective. The emphasis is on exploration, discovery, and description. It attempts to make sense of or interpret the phenomena and experiences of participants which are then given meaning (Bloomberg & Volpe, 2019). Its ability to understand social settings and activity through

discovery and exploration was chosen as a research approach to study the research objectives and to answer the research questions. Exploration is a means to ask open questions to discover what is happening and to gain insights into the research objectives (Saunders *et al*., 2019). The quantitative research approach was inappropriate for this study because it would not enable an in-depth discovery and understanding of the factors that stimulate support.

3.4 The Research Setting

The selected research setting is the Technology Innovation Agency (TIA). TIA is a national public entity created to bridge the innovation chasm between research, development, and commercialisation. TIA provides funding to research and development which can originate from higher education institutions, science councils, public entities, and the private sector (which includes SMMEs). It focuses on technology development, from proof of concept to pre-commercialisation. Using the following funding programmes: The Seed Fund, the Technology Development Fund and the Commercialisation Support Fund. The objective of TIA is to support the South African government in stimulating and intensifying technological innovation. To improve economic growth and the quality of life of all South Africans by developing and exploiting technological innovations (TIA, 2021). The researcher approached TIA requesting access to the research site which was granted. A letter by TIA granting permission to collect data at TIA for this research project signed by an Executive of TIA is attached hereto as Appendix F. Ethical application approval was granted, and the researcher utilised existing contacts to gain access to specific participants.

3.5 Study population

The population includes SMMEs involved in technology innovation development and commercialisation and also industry experts involved in the sector for funding and supporting SMMEs. The sample was selected from the population based on its direct experience with the phenomena relating to access to support by technological-based SMMEs (Leedy & Ormrod, 2015). Also, its ability to provide insightful views on the factors for successful accessing of support in the technological innovations' setting (Saunders *et al*., 2019).

3.6 Sample Selection

Sampling is a process of selection of participants, and it uses probability and non-probability sampling (Connelly, 2016). Purposive sampling methods was adopted and are considered the suitable choice for this type of research project since the participants should be purposefully selected to be able to obtain insightful views (Saunders *et al*., 2019). Also, the participants should be selected based on their ability to assist in providing information on the phenomenon under study (Leedy & Ormrod, 2015).

A typical sample of 10 participants through qualitative surveys was carefully selected (Leedy & Ormrod, 2015) to ensure that the relevant perspectives of the participants are discovered and explored. A balanced combination of SMMEs and industry experts involved in financial and non-financial support of technological innovations development, pre-commercialisation and commercialisation was selected. In qualitative research methodology, a smaller size is mostly preferred since it is concerned with discovering and exploring the perspective of the participants (Sityata, 2019). Therefore, the sample in the study was a targeted total of 10 selected participants, the sample was considered sufficient based on allocated time and availability of resources (Leedy & Ormrod, 2015). Preferably, the sample was to consist of at least 5 SMMEs and at least 5 industry experts.

3.6.1 Participants in the Study

The initial sample comprised of a total of 10 (ten) identified potential participants who had agreed to participate in this study which came from 5 (five) professionals (employed in technology development corporation support and a funding institution) and 5 (five) SMME founders who previously received funding from innovation hub or a funding institution. However, only 7 (seven) participants completed their participation, comprise of 5 (five) professionals and 2 (two) SMME founders. The other 3 (three) SMMEs identified did not participate and later provided their individual reasons to the researcher. The number of participants was satisfactory as we considered previous qualitative studies, which had participations of between 5 to 10 participants. In those studies, such numbers of participants were found to be sufficient and to yield considerable findings (Thosago, 2011; Nduzululeka, 2012; Bezuidenhout, 2018)). The seven (7) participants enabled the aim of this study to be achieved.

3.7 DATA COLLECTION

The qualitative survey approach for data collection was chosen. This research approach provides the researcher with an opportunity to gain in-depth discovery and exploration to address the research questions similar to other approaches of qualitative methodology without facing some of the challenges and disadvantages of such approaches. The qualitative survey was supported by semi-structured interviews to further explore the responses of the participants in cases where there is a need for more detailed responses and explanations if there is a need for such additional interviews with the participants who indicated their willingness to take part in those interviews. In these previous studies, Seixas, Smith & Mitton, 2017; Ondrejková & Halamová, 2022; Marko, Thomas, Robinson & Daube, 2022, qualitative surveys were used for the collection of data. Further, non-probability sampling methods were used in these studies, therefore non-probability sampling method is considered a suitable choice and was used in this study. This sampling method requires that the participants should be purposefully selected to be able to obtain insightful views (Saunders *et al*., 2019). In this study, SMMEs owners involved in technological innovation development commercialisation and industry experts involved in the support of technology innovations were be selected for participation.

3.8 Data Collection Methods

An interview guide was developed as illustrated in Appendix E for utilisation by the various types of participants. Secondly, the interview guide was distributed to founders of SMMEs, technology transfer professionals and professionals at funding institutions to explore and describe their views and experiences about the factors that affect access to support for technological innovations development, pre-commercialisation and commercialisation. The participants were contact telephonically to invite to participate in the research. The participants were emailed the information and consent form to sign as well as the research interview guide to be filled.

3.8.1 Advantage and Disadvantage of the Qualitative Survey

Survey research strategy is not necessarily limited to quantitative but can also be used in qualitative surveys (Braun *et al*., 2021; Hewson, 2017). A qualitative survey is useful when the intention is to determine the diversity of the research topic within a given population and it mainly establishes the meaningful variations within the population

(Braun *et al*., 2021; Jansen, 2010). The qualitative survey is useful when the topic under study was under-explored or unexplored (Braun *et al*., 2021). Advantages of the qualitative survey, include, firstly, offering openness and flexibility to address research questions because it allows access to people's views, experiences, or material practice through representational or meaning-making practices (Braun *et al*., 2021). Further, it also allows diversity to hear the range of voices and sense-making is especially useful when the topic is unexplored or under-explored. It also, furthermore, can give a voice to participants who might choose not to participate or are unable to participate in face-to-face interviews, and enhanced candour effects (Braun *et al*., 2021; Hewson, 2017). This research approach may also give cost and time saving especially where the limited resource such as the researcher's time, finances, etc (Braun *et al*., 2021; Hewson, 2017).

Disadvantages of the qualitative survey usually can comprise a mixture of self-filled questionnaire which are supplemented with interviews. In order, to provide further adequate depth and richness (Braun *et al*., 2021). Use of only questionnaire can have an impact on trustworthiness that may arise due to misunderstandings, ambiguities and superficiality, biased samples and reduced control unlike with quantitative survey approaches (Hewson, 2017). Furthermore, technical expertise level demands however recent developments and the existence of a range of tools assist in reducing this advance and assist in the proper implementation of qualitative surveys (Hewson, 2017).

3.9 DATA ANALYSIS

Qualitative survey data is fairly descriptive. However, it is possible for the data analysed to go beyond description to provide richly theorised and interpretative data. In this study, qualitative data was collected by the use of open-ended questions and thereafter the participants' responses were analysed to describe the themes discovered (Martinez & Ramirez, 2023). Various studies of qualitative research where the perception of participants is studied have used thematic analysis ((Martinez & Ramirez, 2023), (Labra, Castro, Wright & Chamblás, 2019; Enthira, Yusnita, Azizulyadi, Asma' & Siti Nur'afifah, 2022).

The data was analysed using thematic analysis to describe the common themes in the participants' responses. According to Saunders *et al*., (2019), thematic analysis is

undertaken by using the following steps which include: grasping large and disparate qualitative data; integrating the related data, identifying key themes and/or patterns for further exploration; producing thematic descriptions; developing and testing explanations and theories from the patterns and relationships; and drawing and verifying conclusions from the thematic patterns. Thematic analysis is flexible and can be adapted for objectivist and subjective positions based on the assumptions adopted for the interpretation of the data collected (Ryan & Bernard, 2003). Thematic analysis is also useful since it is an independent research methodology adopted for data collection (Saunders *et al*., 2019).

The advantages of thematic analysis include being highly flexible and can be modified for the needs of the study, providing rich and detailed data, and offers a more accessible form of analysis (Nowell *et al*., 2017). It is also useful for examining the perspectives of different participants and the generation of unanticipated insights, summarising key features of large data sets, forcing a well-structured approach to data analysis and assisting in the production of a clear and organized report (Nowell *et al*., 2017). The thematic analysis also has disadvantages which include a lack of substantial literature when compared to other qualitative research methods, it also does not enable the researcher to make claims and formulate theories (Nowell *et al*., 2017).

3.10 Ethical Considerations

According to Jakoet-Salie (2022) two key ethical considerations for researchers are honesty and confidentiality. Therefore, in reporting the outcomes of this study was always verified and the truth is presented in an unbiased manner. Where literature belonging to third parties' appropriate referencing was used. Researchers are bound to conduct research in a manner that potential harm is minimised (Bloomberg & Volpe, 2019). To ensure the minimisation of harm, participants should be informed about the purpose of the study and consent should be obtained (Bloomberg & Volpe, 2019). The researcher should ensure voluntary participation, privacy and confidentiality must be ensured (Bloomberg & Volpe, 2019; Saunders *et al*., 2019).

Thus, the privacy of participants must be kept by collecting anonymous information, ensuring that the collected information is always kept confidential. Anonymity refers to excluding identifying information of the individual participants in the study, and any

other information that may be used to link the individual responses to the participants' identities. This may require the use of assigned codes or pseudonyms instead of using actual names of participants (Bloomberg & Volpe, 2019). In this research project, potential participants were informed of the purposes of this study and that participation is voluntary. The participants' identities are kept anonymous and confidential thus the participants' right to privacy is preserved. The researcher took appropriate measures to ensure that no physical or psychological harm is caused to participants. Therefore, this study intends not to raise any ethical concerns.

An application for ethical clearance was lodged with the UNISA School of Business Leadership (SBL) Ethics Committee prior to commencement of any data collection activities. Any data collection activities were conducted once the ethical approval was received from the UNISA SBL Ethics Committee on 21 September 2023. A letter of ethical approval is attached as Appendix C, and it was issued with a reference number 2023_SBL_MBA_052_FA-1821. Once, the ethical approval was obtained the potential participants were conducted and requested to participate in the study. The participants were informed that participant in this study is voluntary and anonymity including the confidentiality. During the study, the researcher further adhered to all conditions by the Ethics Committee and the revised UNISA Policy on Research Ethics dated 15 September 2016 and the revised Standard Operating Procedure for Research Ethics Risk Assessment dated 31 October 2022. Throughout the study the integrity, sensitivity and confidentiality were maintained. This approach was maintained throughout the study to ensure trustworthiness of the study.

3.11 Research Quality

For qualitative studies to be considered to have been properly undertaken it should meet the requirements of trustworthiness. According to Connelly (2016) trustworthiness refers to the measure of confidence in the quality of the research project and its criteria include credibility, dependability, confirmability, transferability and authenticity which are further described below:

3.11.1 Credibility

Credibility refers to the confidence in the study that is the degree of truth in the findings, and it requires that standardised procedures be used in conducting the research (Saunders *et al*., 2019). Usually, requires that set standard procedures of a chosen

research strategy be followed when conducting research and that if there are variations justifications be provided (Connelly, 2016). Thus, the researcher was developed their own procedure for data collection using qualitative survey.

According to Saunders *et al*. (2019), the researcher in establishing credibility should look at seeking cooperation from the intended participants and develop relationships with the senior person(s) at the research site. The researcher also explained to the intended participants the purpose of the research project and supplied relevant information (which included interview themes) to the participants before the actual interview. The relevant information also included a description of how their participation will contribute to the research project and how the research project may be beneficial to the sector of providing support to the technological innovation of SMMEs. The participants' anonymity and confidentiality were assured. The identified potential participants were emailed and requested to participate in the research project. The identified potential participants were informed that participation is voluntary and may withdraw from the study at any time.

3.11.2 Dependability

Dependability refers to the stability and recording of all activities for data collection that occur during the period of the study to produce a reliable account of the emerging research outputs (Connelly, 2016; Saunders *et al*., 2019). This requires that as data is collected over time and conditions during the study an audit trail of all process logs and peer-debriefing is kept. This include information such as who was interviewed and observations as well as the decisions made during the study (Leedy & Ormrod, 2015).

In this study, dependability can be tested by providing a detailed audit trail to others to be evaluated, producing reliable justification for others to evaluate. The use of more than one sample group was implemented. In this study, SMME owners and industry experts were invited to participate by way of an interview in this research project. A journal with detailed notes was kept by the researcher. The researcher ensured that an explanation of how data was collected and analysed to show that the findings are dependable (Saunders *et al*., 2019).

3.11.3 Confirmability

Confirmability refers to the degree of consistent findings and the likelihood of repeatability. It includes maintenance of an audit trail of analysis, and methodological memos, which require keeping detailed notes of all their decisions and their analysis (Connelly, 2016). It may also require that others review these notes which can prevent biases from only one person's perspective which may also include conducting participant validation for exploring feedback from participants (Connelly, 2016). The researcher considered issues of biases, three typical potential biases including interviewer bias, interviewee bias and participation bias (Saunders *et al*., 2019). The interviewer avoided questions that may be leading, asked open questions and phrased questions clearly with a neutral voice in order to explore the research questions.

3.11.4 Transferability

It has parallel criteria to external validity or generalisation, it provides a full description of research questions, design, content, findings, and interpretations for the reader to have an opportunity of judging. It also requires that they be transferable and useful to other settings (Saunders *et al*., 2019; Connelly, 2016). It requires providing a rich and full picture to inform readers about the study through a rich and detailed description of the situation (Connelly, 2016). The researcher kept a detailed audit trail which included the questions asked, whether the interview was online or physical, and the time and period of the interview.

3.11.5 Authenticity

Authenticity refers to the degree to which the study fairly and completely illustrates the range of different realities and realities of the participants' life experiences (Connelly, 2016). It is designed to promote fairness by representing all views of the research raising awareness, generating learning, and bringing change (Saunders *et al*., 2019). This criterion necessitates an appropriate selection of participants who can provide rich detailed descriptions, thus providing a full a deep meaning of the phenomenon and increasing the readers' understanding (Connelly, 2016).

The research invited selected two sub-groups of the participants which included SMMEs owners and industry experts/professionals. The selected sample is intended to include an equal number of participants for each sub-group. Participants were asked

an interpretation of their own responses during the interview to allow them to confirm accuracy and validate it. This approach offers the participants an opportunity to correct the assumptions of the researcher where relevant (Saunders *et al*., 2019). Thus, lead to sufficiently good-quality data collection.

3.12 Scope and Delimitation of the Study

The study was limited to selected SMMEs, and industry experts involved in the financial and non-financial support of technological innovations development, pre-commercialisation and commercialisation. Firstly, the selected SMMEs should have been successful at seeking financial and/or non-financial support at a public and private institution at some period in their business life cycle. The chosen research site is accessed through the Technology Innovation Agency, which is a funding agency under the South African Department of Science and Innovation. The choice of this research site was influenced by the researcher's geographical proximity to the site and the study participants given constraints on financial resources and time. Further, the study was limited to SMMEs who have developed the technology from idea generation to at least the prototype phase.

3.13 Conclusion

This chapter discussed the research methodology used in this study. The rationale for the qualitative research approach as utilised in the study, the research site and gaining access to participants were discussed. The data collection and analysis methods, ethical considerations and the research quality were also discussed. The data analysis method employed was both thematic and interpretive analysis to satisfy the research objectives. The findings from the data collected and analysed is discussed in the following chapter.

CHAPTER 4: FINDINGS

4.1 Introduction

The present chapter presents an analysis and interpretation of the collected data using words and graphics. This research study aimed to address three objectives. The first objective is directed towards identifying the factors that influence the successful access to financial and non-financial support for early-stage technological innovations by SMMEs. The second objective of this study is to determine the considerations SMMEs should prioritise in preparation for accessing financial and non-financial support during early-stage development in preparation for pre-commercialisation and commercialisation levels.

The data collected is the experiences and exposure of professionals in funding institutions and development corporation including a SMME founder. This SMMEs founder has previous obtained funding towards the development and commercialisation of technological innovations. These participants were targeted during the sampling process based on their ability to be able to provide personal insights to funding and non-funding support in the technological innovation space. A sample of 10 participants comprising of SMMEs founders/management and professionals were invited to participate although all the identified participants had indicated the willingness to participate only 7 participants ultimately completed their participation. The sample of participants was selected to enable gathering of differing views to get a wider range of perspectives of the potential stakeholders under this study. The findings follow the structure of the themes derived from the literature review as derived from the collected data. The findings were interpreted and compared with the literature review. The first section provides the profiles of the participants. The data collected and presentation of the findings are provided in the second section.

4.2 Profiles of Participants

The participants' profiles can be presented according to Table 4.1 below:

Table 4.1: Profiles of Participants

No.	Level of Education	Sector	Code of participant	Background of the individual participant
1	Honours	Funding institution	1PRFI	Public Funding
2	Masters	Development Corporation	2PRDC	Public Funding & Development Support
3	Honours	Funding Institution	3PRFI	Public Funding
4	Honours	Development Corporation	4PRDC	Development support
5	Certificate	SME	5CESM	SMME Founder
6	National Diploma	SME	6CESM	SMME Founder
7	Masters	Funding Institution	7PRFI	Public & Venture Capital Funding

Section A – Demographics profiles

The profiles of the participants are presented as provided illustrated in the chart.

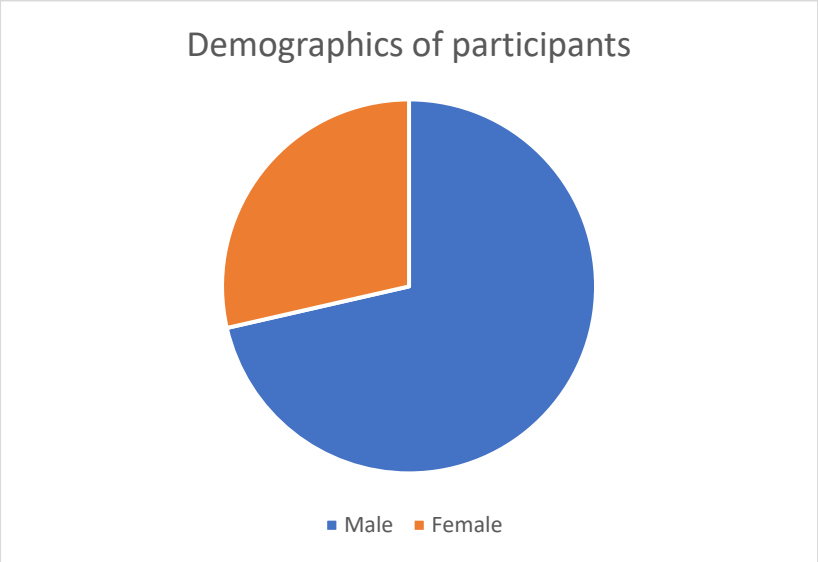

Figure 4.1: Participants profiles

Section B – Level of Education profiles

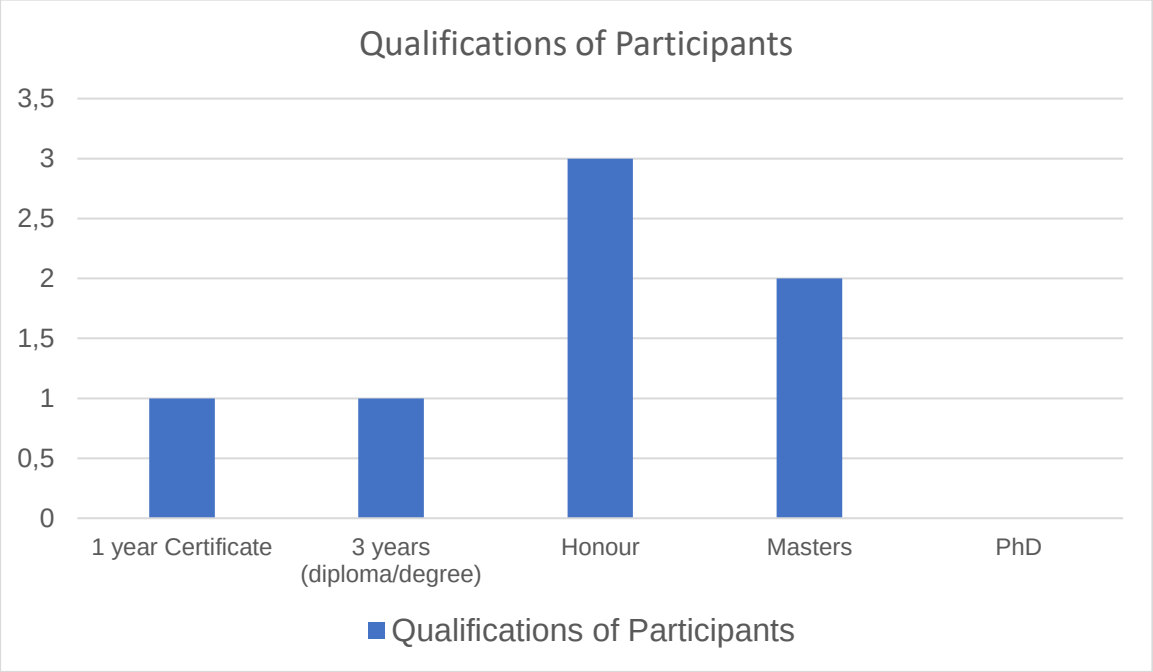

Figure 4.2: Highest Qualification of the Participants

4.3 Data Analysis Processes

Thematic analysis was used which followed steps of other similar studies such as described in Dawadi (2020). The data analysis process entailed both thematic and interpretive analysis. Themes were identified through careful reading and re-reading of transcribed data (Dawadi, 2020). Themes were developed from the literature review and interview responses. Deductive approach was used whereby the data collected was analysed using themes which emerged during literature review (Dawadi, 2020). However, we did not ignore the potential of an unexpected themes which emanated from the collected data.

4.3.1 Steps of Thematic Analysis

The data analysis process commenced with using themes that were derived from literature review and linking the codes that emerge to the codes. The process implemented for linking the codes discovered from the data collected to the themes from literature is illustrated in Appendix F. The connection between the themes and the codes would not be allocated the initial code would not be allocated to theme, a new theme was allocated to it, the new theme emerged is project management.

Step 1: Transcribing the data and generating initial codes

Transcribing includes reading and re-reading of the collected data and writing down the initial codes as understood by the researcher. The data and writing down the initial code are the first steps. Then the data that is considered not to provide insight is disregarded and eliminated. This step enables the researcher to get an understanding of the data collected (Braun *et al*., 2021).

Step 2: Refining initial codes

The second step includes reviewing and refining the initial codes and establishing the connection between the data set. The research relied on the responses of the participants which were reviewed and become familiar with the data. Deductive approach was used which uses themes from literature review to analyse the data collected (Dawadi, 2020). Coding is enabled so as to enable focusing on certain data types. Although, the deductive approach was adopted new codes were not ignored (Dawadi, 2020). Through giving full and equal attention and importance to each data item and discovering interesting aspects emanating from the data.

Step 3: Theme categorising

This stage includes grouping the themes into sub-groupings of the topics. The intention of this step is to discover patterns and relationships from the whole collected data (Braun *et al*., 2021).

Step 4: Reviewing themes

The fourth step a more systematic approach is adopted (Dawadi, 2020). Thus, step 4 includes 2 (two) levels: (i) all the initial themes were extracted and cross-referenced with coded extracts with the themes and compared. The meaningfulness of the themes was also extracted to check if there is a formed a coherent pattern. The coherent pattern should capture the relationship of the coded data (Dawadi, 2020). In level (ii) validation of the individual themes as it relates to the data set is considered and checked to identify if new coded are emerging. As well as to determine whether and how the themes fit together with the overall data (Dawadi, 2020).

Step 5: Defining and naming themes

During the fifth step, researchers assess the themes and their relevance to answering the research questions. The step requires that the researcher evaluates the themes from the collected dataset by further grouping it into sub-themes and connect it to the research questions (Braun *et al*., 2021).

Step 6: Writing the Report

The sixth step takes place after the research has completed the cycle of data analysis whereby themes are defined. The codes defined and the patterns are relationship is established between the data collected from all the participants. The process takes after the research findings have been formulated after understanding of the data was established. Direct quotes are integrated into the report writing to assist the reader to follow the research findings and increase the credibility of the data. Even the interpretation of data which leads to the findings is included (Braun *et al*., 2021).

4.4 Codes and Code Groups

The interview responses from the 7 (seven) participants were analysed using coding and coding groups of the themes as derived from literature review in this study. There were 329 codes that were generated from the data and 11 code groups (themes) that were generated as set out in Table 4.3 below. Table 4.2 shows process used for development the 11 themes from the coded data and these themes are supported by the literature review. In this study's literature review, there is one only (1) theme, i.e., project management, that was not directly deducted from literature. This was discussed in a previous study that innovation management has been developing separate from the main project management. Of the 329 codes that were generated there were 3 (three) significant codes that were key findings within the themes. These codes included: (i) Early engagement which was mentioned by 3PRFI, 5CESM, and 6CESM, (ii) business to business which is mentioned by Participant 7PRFI, and (iii) support structure from family and partner, which is mentioned by 5CESM. These codes were generated as provided in Table 4.2 below:

Table 4.2: Process for Developing Themes from the Data Collected

Document	Quotation	Codes	Themes
Interview Response 4PRFI	"The right team at the right time there were able to start networking early" "Project plan and the deliverables and the milestones of the project actually seemed to build towards that such that at the end" "The milestones should begin to you know bring in issues that actually look at those commercialisation and investment criteria of venture capitalists"	dynamic team, investor confidence, competency, project plan, project management project plan, planning	Management Team Project management
Interview Response 5CESM	"The SMME used various approaches including to attract different customers." "Entrepreneur did a landscape analysis to find out the potential customers once a solution is developed since new customers can be identified. In this case when customer landscape analysis was done new customers were identified." "Customer traction is also developed through customer relationship which must be generated"	Market research, Market evidence, market positioning market expansion, Market-ready product,	Validation Report

Table 4.2 above shows examples of how interview transcripts were coded and themes that emerged from the grouped codes. The themes were deducted from the literature review. The themes are the grouping of codes as illustrated in Table 4.3 below. The themes are used for easier analysis and discussion of the findings.

Table 4.3: Code Generated and related themes

Code	Frequency code per Theme	Theme
comprehensive business plans	5	bankable business plan
revenue projections	6	bankable business plan
cost projections	2	bankable business plan
business plan	5	bankable business plan
business support	22	business support
support structure	1	Business support
technology support funding	9	business support
business advisory support	15	business support
Incubation	2	business support
business preparation	1	business support
private consultancy	3	business support
Investment: Funding	24	business support
business models	9	competitive advantage
industry driven	10	competitive advantage
market-ready product	5	competitive advantage
IP protection	4	competitive advantage
unique advantage	4	competitive advantage
Market access	4	competitive advantage
Price Differentiator	1	competitive advantage
market expansion	12	funding
funding	19	funding
funding support	17	funding
SEED funding	7	funding
technology transfer	5	funding
grant funding	7	funding
funding instruments	6	funding
grants	4	funding
loans	1	funding
equity	1	funding
Development Funding Institution	2	funding
showcasing - competition	3	funding
further funding	8	funding
experts	13	Management team
dynamic team	13	Management team
competency	8	Management team
team dynamics	9	Management team
management	15	Management team

investor confidence	10	Management team
commitment	4	Management team
Board	2	Management team
business people	8	Management team
team history	4	Management team
team experience	2	Management team
industry knowledge	2	Management team
Strategic Thinking	8	Management team
Engagements	6	networking and collaboration
proof of concept	3	networking and collaboration
partners	3	networking and collaboration
business partnerships	5	networking and collaboration
supply chain agreements	1	networking and collaboration
Networking	9	networking and collaboration
Collaborative Decision-Making	3	networking and collaboration
project plan	8	project management
project management	12	project management
private business consultants	2	project management
planning	3	project management
technology management	8	project management
development	2	project management
sustainable business	6	sustainability and socio-economic
business sustainability	5	sustainability and socio-economic
regulatory framework	2	sustainability and socio-economic
green technologies	2	sustainability and socio-economic
renewable energy	1	sustainability and socio-economic
eco-friendly	1	sustainability and socio-economic
innovation	2	technological innovation
technology demonstration	2	technological innovation
feasibility	2	technological innovation
technology development	5	technological innovation
level of development	4	technological innovation

piloting of the technology.	4	technological innovation
Market	10	validation reports
market research	13	validation reports
market evidence	4	validation reports
early engagement	6	validation reports
user-centered design	2	validation reports
customers	2	validation reports
engagement with customers	3	validation reports
performance report	2	validation reports
competitive advantage	13	venture capital investment criteria
Business to business model	1	Venture capital investment criteria
business growth	7	venture capital investment criteria
techno-economic study report	2	venture capital investment criteria
business requirements	3	venture capital investment criteria
investment attraction	5	venture capital investment criteria
investment opportunity	5	venture capital investment criteria
Investor	5	venture capital investment criteria
investment criteria	11	venture capital investment criteria
strict investment criteria	4	venture capital investment criteria

4.5 Research Findings

The aim of this study is to explore factors for stimulating access to funding and non-funding support for technological innovations. A purposive sample of 10 participants who indicated willingness to participate was selected however only 70% of all identified and invited participants did participate in this study regardless of all having indicated willing and intention to participate and respond. The participants who participated came from different background including: Two (2) SMME, three (3) professionals from a funding institution, and two (2) professionals from development corporation who are involved in various stages of technology development and commercialisation.

4.5.1 Research Objective 1 Findings

The first research objective relates to exploration of factors to access financial and non-financial support by SMMEs at early stages. The sub-themes which emerged include technological innovation, funding and business support.

Technological Innovation

The participants referred to technologies which emanate from information technology, waste management, and sustainability. All the technological innovations mentioned received grant funding at early stages of their development.

Background of the Technological Innovation

All the participants indicated the importance of seed funding at early stages of development. Early-stage funding predominantly came from public funding from institutions such as TIA, NRF, and DSI. Funding at early stages was usually grant funding. The importance of these funding was shown to be enabling the development of proof of concept which led to accessing of further funding which was used to move the development of the technological innovation further.

Participant 1PRFI states as follows:

"*The innovation being developed was on waste beneficiation using invasive species, and the source of funding that was accessed was the technology support funding and innovation development fund from the local municipality.*"

Participant 3PRFI also states that:

"*The technology referred to is a mineral refinement using the electrolysis and project and this project initially received SEED Fund for TIA.*"

As mentioned above, the technological innovations which are described by the participants are directed at solving a certain real-life problem through an innovation or technology-based approach. This is supported by Participant 7PRFI who states that "*The problem having an economic value and some included IP protection in the form of granted patent applications*".

Level of development

It is mentioned by Participant 2PRDC that "*the technological innovation should be de-risked when approaching venture capital firms.*" Venture capital firms prefer to invest in technological innovations that have been de-risked thus at least a working prototype should be developed prior to applying.

Participant 2PRDC further states that:

"*the SMME must be in position to proof that the market readiness for the product. The competitive edge highlighted at the early stage of the development still exist*".

The Participants 5CESM and 6CESM have not yet received venture capital funding there were previously and/or currently being assessed by venture capital firms. They both indicated separately that it was their competitive advantage which attracted the attention of the venture capital. The mentioned competitive advantage included product that is market ready. It was also mentioned that the factor that the SMMEs was already generating revenue from the technological innovation gave the SMMEs an advantage when dealing the venture capital.

Technological characteristics

It is provided that the technology characteristics should include minimal viable product, uniqueness of the technological innovation (novelty and innovativeness), as well as product market fit. Thus, aligning with what is discussed in Sangwan (2023) and Dauderstädt (2013).

This sub-theme is described by Participant 3PRFI as stated follows:

"*If the SMME has got a technology that is well developed which is robust and it has been optimized and it was well tested like it was in this case. The technology having proven parameters and that then then maybe inform you, or maybe that would inform this the SMME and of maybe the commercial built*".

It was further stated by Participant 4PRDC that IP protection should be prioritised "*if applicable, through patents, trademarks, or copyrights is crucial for long-term sustainability*". Generally, if a technological innovation has IP protection third parties are deterred to replicate it and in cases where they option to an infringement proceeding can be used a defence. Furthermore, Participant 2PRDC states that "*the*

technological innovation must be proven for scalability to intended commercial production".

Funding

As mentioned in the statement of Participant 3PRFI as well as described by most of the participants. It appears that the initial funding to the technological innovation development was in the form of grant funding usually SEED funding. As illustrated by the quotation of Participant 3PRFI, "*TIA seed fund which is grant funding provides the initial investment (capital) to come up with a proof of concept*". The initial investment of SEED funding led to the accessing of further funding through Technology Development Fund, and the development of proof of concept. Thus, the type of initial funding provided to a SMME and what was achieved through such funding impacts the frame of mind of a potential further investor(s) towards the project.

Participant 4PRDC stated as follows regarding accessing funding stated that:

"*Key considerations include presenting a clear value proposition, demonstrating market viability and demand, highlighting innovation, outlining feasible milestones, fostering collaborative partnerships, ensuring regulatory compliance, emphasizing social and environmental impact, being investor-ready with a compelling pitch and financial models, addressing and mitigating risks, aligning with government initiatives, educating investors, and showcasing adaptability. Incorporating these elements increases the likelihood of gaining support from both public and private sector institutions*".

It appears that the early stage, grant funding which is usually provided by government or its agents although is not sufficient to finalise the technology development and lead to commercialisation. It is however necessary for the developments to commence. It implies that the SMME should develop reports, project plan, and form relationships with consideration of need for further funding. The SMME can also align its initiatives with the evaluation criteria of the potential funders including venture capital support.

An issue raised in relation to SMME funding is the time lag from application to ultimate final decision and ultimate disbursement of the funding and depositing into the SMME bank account. It was highlighted by Participant 6CESM that the application process to final decision took over 1 (one) year. It took almost 6 (six) months to receive second

tranche of fundings after completing first milestones and submission of the required documentations for processing of the second tranche. This is supported by a study by Dzimba and van der Poll (2022) where similar findings were identified.

Business Support

Business advisory i.e., non-funding support whether it being incubation or by experts which form part of the management team or from the initial funding institution was found to be critical.

Participant 1PRFI states that:

"*The project was incubated into a local Innovation incubation programme to receive support from the technical and enterprise development point of view*".

Also supported by Participant 3PRFI it is provided that:

"*Business support in both the industry as well as also sourcing funding for technology development. It actually gave us some comfort that the technology will not only just be developed and then stay in some carport or maybe in some field somewhere but there are team competences in place to actually push the technology into the market*".

It was found that business advisory has a positive correlation with access to funding. This is supported by a previous study where it was concluded that business support and finance have a positive and significant impact on SMMEs ((Ogujiuba, Eggink & Olamide, 2023). The business advisory was found to be critical to assist innovators who predominately have technical background. Participant 4PRDC sums it up very well as follows: "*In summary, this comprehensive business advisory support significantly amplifies the appeal of funding applications to both public and private institutions, covering diverse aspects from strategy refinement to network building and risk mitigation*".

Participant 5CESM states that: "*The support structure from partner and the family is critical for long-term survival of SMME especially at infancy levels*". This is an indication that support structure is critical for moral support especially when the business is starting off. This statement captures one of the key codes: support structure as a business support by the family and friends was highlighted by

Participant 5CESM as crucial for the long-term survival of the SMME. Although, other Participants don't make mention of this code it is reasonable that it indeed crucial.

4.5.2. Research Objective 2 Findings

The second objective of this study relates to identification of factors that SMMEs should consider prioritizing in preparation for applying for additional funding at early-to-mid stages of technology development. The emerging sub-themes include validation reports; management team; networking and collaboration; and bankable business plan.

Validation Reports

It was found that incorporating the development of technical reports defining the innovation, and its competitive advantage. Reports on feasibility, scalability and performance were found that should be prioritized in preparation for pre-commercialisation and commercialisation funding.

Participant 1PRFI stated that:

One instrument that was considered from our end was any instrument that would seed fund our project to address the early activities of the project and to enable the project to kick start and move along the technology readiness level to enable us to prove a solid proof of concept. The support received at this stage was a pure grant as an enabling instrument that has moved us along the innovation value chain. The instrument that was provided at this stage enabled us to apply and access further funding from private ventures and from government to further develop the technology closer to a commercial stage.

Participant 2PRDC states that:

Evidence that there is a market for the technology innovation has to be developed. Thoroughly research market data and early engagement with potential customers to validate that indeed the market requires of the proposed innovation, and the product is developed to meet their requirements.

Participant 5CESM stated that:

Understanding of the initial prototype. In my experience, market traction becomes important to attract to further funding. Marketing testing was used to get customer feedback for adjustment of the final product.

The responses of the Participants, 1PRFI, 2PRDC, and 5CESM strengthens the view that there must be validation of the technology, and market. Thus, reports which validate the technology and/or the market give a positive attitude to the potential investor. This statement captures one of the key codes: early engagement with the market, investors, and all other stakeholders.

Management Team

The management team should be reinforced and elected at early-to-mid-stage in preparation for pre-commercialisation and commercialisation.

Participant 4PRDC states that:

"*Assembling a skilled and diverse team is crucial, as investors often look for a strong, capable team with the expertise needed for execution (**management team history***)".

and further stated that:

"*Credibility and a track record of success, demonstrated by the management team, heighten the perceived reliability and competence of the business, making it more appealing to both public and private sector entities* ".

Participant 6CESM states that:

"*The SMME has an advisory board who support it. The advisory board comprises of industrial and business experts, The advisory board includes experienced business people and private business consultants. The advisory board can also plays in active and/or hands-on assistant. The advisory board also includes a member who is experienced in venture capital support and provides support in venture capital fundraising. The advisory board has also assisted in the development of governance and operations practices.*"

The majority (six out of seven) of the participants provided that the management team should comprise ideally of competent industry and business people. There was also mention of need to incorporate the management team with people competent in IP commercialisation by Participants 3PRFI and 7PRFI. It is indicated by 3PRFI that the

assembled team should ideally have been working together for a considerable period which serves as an indication of it indicates the commitment of the successful commercialisation of the technological innovation. A dynamic and compete management team is essential for accessing venture capital that must be attended to at early-to-mid stages as mentioned by Participant 5CESM.

Network and Collaboration

According to this theme there has to be network and collaboration between the SMME and the external parties who may be experts, customers, and potential investors. Since these parties will help the SMME to start establishing partnerships early and will assist the SMME to formulate and refine their product and the market. It can help the SMME to identify potential customers than those previously identified.

Participant 6CESM stated as follows:

"*The team composition is very important and its ability to provide business advisory. It comprises of individual business person responsible for business development management and sales, technical skills, and development. In regard to investment criteria including what is missing is for the technology to be piloted with some of the main players in the Fast Moving Consumer Goods (FMCG). Good understanding of competitors and seek an optimal was of operating in that environment. The SMME have been able to attract 2 (two) experienced professionals in root-to-market (logistics) and marketing and sales growth. The 2 (two) experienced professionals took huge salary cuts and have option for the ESOP (Employee Stock Ownership Plan). These demonstrates the confidence the 2 (two) experienced professionals have in regard to the SMME and/or its technology.*"

Networking and/or collaboration was referred to indirectly and directly by all participants. The Participant, 6CESM, indicated that it was able to attract 2 (two) experienced professionals to their management team as employees through networking. These employees are employed in the marketing i.e., root-to-market and sales. These two employees were become part of their SMMEs Employee share scheme as part of their recruitment and retention plan. The Participant have engaged in networking with various parties which ultimately lead to creation of working partnership agreements.

Bankable business plan

To address pre-commercialisation and commercialisation requirements early. These requirements include development of bankable business plan which ordinarily include market assessments, IP commercialisation, defining and refinement of the innovativeness of the technology, and defining and sourcing of human resource expertise. It was mentioned by majority of the participants (5/7) that to attract potential investors and to stimulate successful accessing of additional funding a comprehensive business plan must be developed.

Participant 3PRFI states that:

"A well-constructed business plan that actually entails everything from the technology itself, looking into the market and then looking into financial projections after having taken care of after having taken into consideration all the assumptions of how the particular technology is actually going to be commercialised.

Usually, a business plan is used when applying for funding. A well-constructed business plan should cover components that are essential for funding which would enable the investor to address the investment criteria.

4.5.3 Research Objective 3 Findings

The third objective of this study relates to determining how SMMEs can best position themselves to be able to successful in accessing venture capital funding. The emerging sub-themes includes: - commercialisation; project management; venture capital investment criteria; competitive advantage; sustainability and socio-economic; and regulatory compliance.

Commercialisation

The pre-commercialisation of the technological innovation relates to the initial steps towards getting an entity to enter the market.

Participants 6CESM stated that:

"*Good understanding of competitors and seek an optimal was of operating in that environment. The SMME have been able to attract 2 (two) experienced professionals in root-to-market (logistics) and marketing and sales growth.*"

The Participant 6CESM recruited and employed the two experienced persons (experts) in preparation of fully launching their technological innovation. The technological innovation is currently generating revenue, it already has paying customers, and has loaded customers in only few regions in Gauteng and Western Cape. The Participant 6CESM is currently refining the technological innovation and business model. It intends to launch their technological innovation nationally in South Africa and internationally.

Participant 5CESM states that:

"*The SMME used various approaches including to attract different customers. The approached local eateries during Covid who made pre-orders and thereafter provided feedback. The sales did not grow in this sector when Covid restrictions were lifted. There was already identification of daycare centres as potential customers. The creches worked out since by regulation they required to have at least two washbasins. Through adaptability there was adjustment to the product offering. There was also change is product offering which lead to inclusion of value adding optional educational packages to the commercialisation of the technology.*"

Participant 5CESM has demonstrated adaptability and flexibility in the management team and in the product offering to accommodate a wider range of potential customers. Although, both Participants 5CESM and 6CESM are not yet generating profit there are already generating revenue which that and along with other reasons has led to attracting the attention of venture capital and both are currently at due diligence and/or investment criteria resolution prior to final decision from the venture capital firms.

None of the Participants indicated that the technological innovation under discussion is currently generating profit. Generating of profit and self-sufficiency outside of SMME development funding is the main indicator for commercialisation and now of them was indicated to meet these criteria. However, based on the responses of the Participants, 3PRFI, 5CESM, 6CESM, and 7PRFI the technological innovations which were discussed they intention is to increase revenue and economic growth (business growth).

Project Management

According to Participant 1PRFI the technological innovation outcomes must be clearly defined and addressed to best position the SMME for venture capital funding at the pre-commercialisation and commercialisation levels. Participant 2PRDC provides that the technological innovation should be de-risked when approaching venture capital firms.

Participant 2PRDC states as follows:

"The project required financial support for further development of their initial prototype into market-ready product as well as procurement of a laboratory equipment required for analysis of the products that are manufactured."

This is indicative that a project must be well managed to be able to progress a technology from one technology readiness level.

Participant 5CESM states as follows:

"The project relating to the technology commenced as a result of InterVarsity competition and was supported for an initial R150,000 by the municipality. Received another grant of R200,000 which was used to develop a proof of concept for the technology using 3-D printing. Thereafter, services of a technology station were secured."

The successful and efficient use of the available funds received in one (1) programme led to accessing additional funding.

Participant 7PRFI states as follows:

It is not so much the previous grant funding that was received that impacts the decisions of a venture capital but rather the efficient use of the available funding and the progress that results from the project.

Although project management is what leads to the success in transformation of an idea to a product. There is no ignoring that innovation and project management have been allowed to co-exist as if they are separate field ((Filippov & Mooi, 2010); (Saeed (2021)).

Venture Capital Investment Criteria

The ability to effectively attract venture capital funding is a well packaged application. The application should include well-constructed business plan which covers the technological innovation's scalability and commercialisation readiness. Such a business plan should address financial projections, IP commercialisation strategy, team composition, and competitive advantage. It is expected that the business plan would cover the requirements of investors.

Participant 3PRFI also provides that: *"So, the closer the business plan and all those models are that actually speak now to the technology in the market. In terms of the criteria that are used by the venture capitalist, the better the chance and the more attractive the offering is to the venture capitalist.*".

Participant 5CESM indicated that they were able to attract the attention of venture capital firm specialising in supporting socio-economic technologies. That it was their technologies socio-economic impact that led to them being considered.

Participants 5CESM stated as follows: "*The characteristic that the venture capital firm considered favourable was sales traction and revenue generation which the SMME has already commenced with its undertaking. As well as the socio-economic impact of their technology as it relates to health issues as well as hygiene*."

This is confirmed by the response of 6CESM who uses a business-to-business model for the delivery of the FMCG. It was indicated by the Participant 6CESM that although they deliver to retail stores in townships their customers remain the key players in the FMCG sector. Based on the these finding it would be beneficial for SMMEs to study and have knowledge of the venture capital firms investment criteria prior to applying. So that they can build into their application and business plan alignment with specific criteria of such venture capital firm. Therefore, familiarisation with the venture capital firm will also allow the SMME to apply to a venture capital firm which they fit their requirements. It appears that this approach is applicable to all application to the potential investors.

Participant 7PRFI stated as follows:

"Risk adverse, venture capital firms should consider reducing the strict compliance to their investment criteria which sometimes they decide not to fund SME based on something that may be consider a slight issue requiring revenue generation. This can

be balanced with things such as the demonstration of willing to pay customers. Reduce requirements on strict compliance to ethical and governance requirements since most SMEs are unable to meet such requirements because of the nature of the SME market. Generally, reaching full commercialisation of technological innovation or reaching full potential can take time. Such factors must reconsidered especially in case there are mitigating circumstance"..

Although, venture capital firms develop and use their own investment criteria the general understanding by the Participants, 3PRFI, 5CESM, and 6CESM. It is ideally that the venture capital firms reduce the strict approach to due diligence. As mentioned by Participant 5CESM states as follows: "*The venture capital firms should consider funding technologies which have greater socio-economic impact even if the return on investment may not always be high. They can consider such investments for purposes of improvements and growth in their reputational image*".

Participant 7PRFI further stated that:

"Usually venture capital firms prefer business models which are Business to Business rather than Business to Customer business models".

Business to business model is considered a key code even if it was mentioned by 1 (one) participant. Since this specific participant has experience working for a venture capital firm. It is also supported by the preference of venture capital firm to support SMME of 6CESM which is mainly a business-to-business model.

Competitive Advantage

According to Participant 1PRFI the technological innovation outcomes must be clearly defined and addressed to best position the SMME for venture capital funding at the pre-commercialisation and commercialisation levels.

As stated by Participant 2PRDC it was mentioned that: "*The technological innovation must be proven for scalability to intended commercial production. The SMME must be in position to proof that the market readiness for the product. The competitive edge highlighted at the early stage of the development still exist. Relevant commercial agreements with suppliers, partners and off-takers are in place. The relevant team, systems and procedures are available to deliver the product to the market. The*

business model and initial financial assumptions have been tested to proof economic feasibility of the business".

The above statement and as mentioned by the other participants competitive advantage include product market fit that addresses big customer problems. Availability of minimal viable products and technology uniqueness.

Sustainability and Socio-Economic

Majority (seven of the seven) of the technologies mentioned by the Participant are directed to social impact and the environment. As mentioned by Participant 3PRFI, the factors of venture capital support should also consider is mentioned sustainability and socio-economic.

It was stated by Participant 2PRDC that "*the socio-economic impact of the business; and compliance with all regulatory requirements*" of the SMME should be taken into account when making a funding decision.

Participant, 1PRFI, also mentioned the sustainability contributions such as job creation, empowerment of historical disadvantaged (women and blacks - own emphasis), and the youth. Participant 2PRDC, also mentions sustainability and socio-economic impact of the business. Sustainability is a factor which venture capital firms should start considering favourably in addition to the other investment criteria such high return of investment. The venture capital sector has already started considering impact such as the impact which 5CESM has applied to which focuses on funding of socio-economic driven technologies.

4.6 Discussion of the Findings

None of the participants' views was given higher regard. All the participants' responses were given equal value which enabled for wide range of views of the relevant stakeholders for this field. The participants included different stakeholders in the technological innovation funding and non-funding landscape. The data was collected using seven (7) interviews. The data collection process attempted to gain in-depth information relating to the success factors for accessing funding and non-funding support. The participants who ultimately participated are involved in the technological innovation landscape in a wide range of roles. As professionals and SMME founders

in the technological innovation sector. Thus, their contribution led to varied responses to the research questions and wider insights.

The key findings can be summarised as follows:

(a) **Technological Innovations:** This theme incorporates the sub-themes background of the technological innovation, level of development and technological characteristics. All the respondents indicated the importance of early-stage funding to enable progressing to higher technology readiness levels, or development of minimal viable products. These findings i.e., the level of development including from idea to prototype/proof of concept and even developing of a minimal viable product, IP protection registration and IP commercialisation strategy are similar to what was discovered in literature. As provided in previous studies (Urban & Moreno, 2022; Portmann & Mlambo, 2013; Van Deventer & Mlambo, 2008).

(b) **Funding:** Although government grant funding is essential for commencement of the technological innovation development for producing proof of concept and/or working prototypes. Especially, through SEED Funding as grant funding for the less desirable levels of development i.e., basic, applied and experimental research (National Advisory Council on Innovation, 2010). Further funding including venture capital support is considered to be essential for the further development and commercialisation of the technological innovations. This supported by previous studies Kato (2021); Cellier *et al*. (2021); and Oni (2017). Further funding enables the SMME to form relationship with collaborative partners who may be further investors, industry and business expert, and to build project plans and outcomes with the potential investors (Du & Cai, 2020; Le Roux & Pretorius, 2015.

(c) **Networking and Collaboration:** Early engagement with the main stakeholders (i.e., partners, investors and customers, etc) will enable the inventor to develop the final product/solution using their feedback. It will enable the inventor to consider adding into their project approaches to address the issue. The early engagement and formation of networks and collaboration with industry experts which includes business people is critical. Business people bring into the SMME entrepreneurial skills which is essential providing feedback to the development of the final product and/or business model. Involvement of business people in

the SMMEs enable attracting venture capital funding due to their entrepreneurial skill as provided in Ncube & Zondo (2020); Portmann and Mlambo (2013); Msweli (2015).

(d) **Venture Capital Investment Criteria:** The SMME and/or initial investor should commence its engagement with the venture capital firms early. In order to allow for the resolution of the investment criteria prior to the eventual application. If approached early the SMME may be able to address and resolve some of the major factors of the investment criteria during a prior project to applying to the venture capital using another's investment. The investment criteria generally include unique value proposition, technology innovativeness or novelty, minimum set internal rate of return, and the potential exit strategy (Dhochak & Sharma, 2016; Sangwan, 2023). Applications for funding should identify the critical investment criteria of the potential funder including venture capital (Van Deventer & Mlambo, 2008). Another relevant outcome under venture capital investment criteria is the requirement for revenue generation (Bushe, 2019; Heikkilä, 2018; Sitharam & Hoque, 2016).

(e) **Management Team:** The SMME should consider creating an Advisory Board comprising of industry experts (technical and business) who will not be only bringing with them their qualifications, skills, and experience but which also bring in networks and collaborations. The Advisory Board is considered to be part of governance system and part of the management team and it is critical to venture capital funding decision (Bouzahir & Ed-Dafali, 2018). It assists in improving the performance and confidence of the potential investor in the SMME (Sangwan, 2023; Gompers *et al*., 2020; Bezuidenhout, 2018).

(f) **Validation Reports:** The SMME should consider creating a business model that is flexible to adjust based on the customers. The business solution created may be directed at the specific customers who sometimes may not be willing to purchase it or don't have the decision authority to make the purchase regardless of their own requirements. The SMME should consider using creative market research approaches although the traditional and formal market research reports may still be relevant to potential investors. They are not without shortcomings therefore the SMME should consider other marketing approaches. Such as interviewing different persons asking them about their own annoyance or distress relating to the specific problem. Various validation

reports which determine the novelty/innovativeness of the product or process for product market fit can be conducted (Sangwan, 2023). These validation reports can also assess whether the minimum viable product has been developed yet including determining availability of a prototype (Dauderstädt, 2013; Sangwan, 2023). Other assessments can include IP due diligence, which determines the IP registrability of the technological innovation (Kollman & Kuckertz, 2009) and legal risk assessment (Leth & Olsen, 2021).

(g) **Business Support –** the support structure of the family and friends was found in the data collected. Although it was mentioned by one (1) participant it is reasonable to consider it crucial and applicable to all or most SMME founders. Business support i.e., non-funding support regardless of its source either as management team or initial funding institution was considered to be essential for commercialisation of technological innovation. Thus, the view that business support of venture capital firms is critical for commercialisation of technological innovation as found in literature, Dauderstädt (2013). It should not be considered an isolated feature to venture capital funding. According to Ogujiuba *et al*., 2023, business and financial support have significant influence on the business growth and commercialisation of SMMEs.

(h) **Venture capital investment criteria** - It was also a key finding by majority of the Participants (four out of seven) that venture capital firms use a strict investment criteria. It was discussed that the strict investment criteria were misaligned in consideration of South African environment and SMME sector. The recommendation is for venture capital firms to use a flexible investment criteria. It was indicated that although revenue generation was strict criteria in cases where the is an indication of minimal viable product, demonstrated market share, and indication of ability to enter the market it would be reasonable for private venture capital firms to consider funding. The investment criteria is usually capture in a well-structured business plan. The well-structured business plan will indicate the strategic alignment between the venture capitalist and the SMME/technological innovation ((Sangwan, 2023); (Dauderstädt, 2013)). In cases where the minimum venture capital investment criteria is met a deal is likely to be structured and concluded (Bamata & Govender, 2019).

(i) **Competitive Advantage:** The SMME and the technological innovation must be proven to be scalable and flexible for the commercialisation plan or business

model intended. Usually, an SMME is considered to have a competitive advantage if it has a unique product offering, minimal viable product to solve a large enough problem, and the market size enough to lead to high return of investment. These findings are supported by Sangwan (2023), Urban & Moreno (2022), and Dauderstädt (2013) that assessment of minimal viable product, uniqueness of the technological innovation (novelty and innovativeness), as well as product market fit.

(j) **Project Management:** Although not recorded as such in literature innovation management is essential project management. It was only allowed to develop as a distinct from project management. As mentioned in Saeed (2021) and Filippov & Mooi (2010) technological innovations development and commercialisation are managed using project management approaches. As referred directly and directly technological innovations are managed using project management to define and deliver the outcomes of technological innovation's development, pre-commercialisation, and commercialisation. It is also used for de-risking a project and achievement of project objectives and milestones.

(k) **Sustainability and Socio-Economic:** The participant made mention of sustainability and socio-economic as a factor that venture capital firms should start considering in addition to the high return on investment. SMMEs are considered as key instruments economic growth (Makwinja, 2022). They are also considered to be better suited to deal with socio-economic issues. The socio-economic issues which can best be addressed by SMMEs include resolving high unemployment, inequality, and poverty levels (Matekenya & Moyo, 2022).

(l) **Bankable business plan:** It usually the source of building funding applications. It is usually packaged to include market assessment, IP commercialisation, defining and refinement of the innovativeness, and sourcing of human resources. A business plan should also consider different revenue and business models. A comprehensive business plan was indicated as the establishing document of stimulating attracting of potential investors. During the application evaluation phase business plans are considered. A well-structured business plan should capture critical information such as financial preferences to inspire approval by a potential funder (Bamata & Govender, 2019). Business plan

should also capture information such as expected turnover and profitability that the SMME can create (Dauderstädt, 2013). It also includes the description of the technological innovation, business model, and team of the entrepreneurs which usually is used to address the criteria of the funding institutions including venture capital firms (Bamata & Govender, 2019; Sangwan, 2023)).

(m) **Commercialisation:** Pre-commercialisation activities relate to steps that are undertaken by the SMME in preparation of commercialisation i.e., to start operating the SMME for income generation. Revenue generation without making profit or to be self-sufficient without SMME development funding is considered to be pre-commercialisation stage. None of the technological innovations considered in this study are currently commercialised. Thus, none of the SMMEs considered are profitable yet. However, the SMMEs are currently seeking to refine their products and customer attraction to increase market traction for the business growth an increase revenue through sales. Unavailability of financial support is one of the major inhibiting factors for advancement from pre-commercialisation to commercialisation (Du & Cai, 2020; Leboea, 2017). Thus, access to funding is an enable for commercialisation of technological innovations which led to the survival and growth of the SMME (Msomi *et al*., 2022).

4.7 CONCLUSION

This chapter provides the detailed data analysis method implemented and discusses the research findings. The findings indicate that non-funding support which includes business support, inclusion of technical and business experts in the management teams at early stages to be beneficial for stimulate additional support. The technical and business experts assist in the formulation of the competitive advantage. The competitive advantage which covers the technological innovativeness, scalability and performance as well as market factor such as market size and access. The next chapter commences with presenting summary of the findings followed by the contributions of the study, recommendations, and the limitations.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Chapter Summary

This chapter provides a summarisation of the whole study and how the research questions were answered. The summarisation includes an overview of the literature review, the research methodology and the findings based on the research objectives. It also discusses the contribution of the study and recommendations.

5.2 Introduction

The previous chapter presented and analysed themes that emerged from data collected using an interpretivist research philosophy. The aim of this was identify and explore the perspectives of the participants in regard to key success factors for accessing financial and non-financial support. A conceptual framework was developed of the interlinkages of factors for successful commercialisations and funding and non-funding support was identified as a critical factor for successful commercialisation. As a result, funding and non-funding support at various phases of technological innovation became the key focus of this study. The key success factors to accessing both funding and non-funding support for technological innovation during development, pre-commercialisation and commercialisation studied as set out in the interview guide.

The interview guide developed was discussed with two groups of participants which includes SMME founders and management teams, and the professionals involved in funding and non-funding support sector. The data collected was transcribed and analysed through thematic analysis procedures that included (i) discovering of themes and subthemes, (ii) decreasing the themes to manageable few and important themes, (iii) connecting the themes and codes and (iv) linking themes into understandable theoretical models (Ryan & Bernard, 2003).

The findings were that:

(a) Technological Innovations: This theme incorporates the sub-themes background of the technological innovation, level of development and technological characteristics. These sub-themes all integrate for enabling accessing of further funding towards increased levels of development and pre-commercialisation/commercialisation phases.

(b) Funding: Although government grant funding is essential for commencement of the technological innovation development for producing proof of concept and/or working prototypes. SEED Funding is generally essential for the SMME to form relationship with collaborative partnership and for development of technological innovations from one level of development to another.

(c) Networking and Collaboration: Early engagement with the main stakeholders (i.e., partners, investors and customers, etc) will enable the SMME to develop the final product/solution using their feedback.

(d) Venture Capital Investment Criteria: The SMME and/or initial investor should commence its engagement with the venture capital firms early. In order to allow for the resolving of the investment criteria prior to the eventual application. Further, the SMME must consider a business model that aligns with the investment preferences of venture capital.

(e) Management Team: The SMME should consider creating an Advisory Board comprising of industry experts (technical and business) who will not be only bringing with them their qualifications, skills and experience but which also bring in networks and collaborations.

(f) Validation Reports: The SMME should consider creating a business model that is flexible to adjust based on the customers. The SMME can also consider using creative market research approaches although the traditional and formal market research reports may still be relevant to potential investors.

(g) Business Support – Business support i.e., non-funding support and support structure of family and friends when integrated with financial support regardless of the provider of the support is essential for commercialisation of technological innovation and growth of SMME.

(h) Venture capital investment criteria - It was found that the strict investment criteria were misaligned in consideration of South African environment and SMME sector. The recommendation is for venture capital firms to use a flexible investment criteria.

(i) Competitive Advantage: The SMME and the technological innovation must be proven to be scalable and flexible for the commercialisation plan or business model

intended. It considered a sufficient competitive advantage if the SMME has a unique product offering, minimal viable product to solve a large enough problem, and the market size enough to lead to high return of investment.

(j) Project Management: Technological innovations development and commercialisation are managed using project management approaches and are considered to be innovation management. It is including as well as the de-risking of a project and achievement of project objectives and milestones.

(k) Sustainability and Socio-Economic: Sustainability and socio-economic is a factor that venture capital firms should be considering favourable. Especially when SMME further includes the high return on investment.

(l) Bankable business plan: Is a comprehensive report which includes market assessment, IP commercialisation strategy, and market features. It is essential to be incorporated into an application for support and should cover the investment criteria.

(m) Commercialisation: Pre-commercialisation activities relate to steps that are undertaken by the SMME in preparation of commercialisation. None of the technological innovations considered in this study are currently commercialised. This should be not seen with negative perspective since the process towards full commercialisation is lengthy. The last sections will include the conclusion based the findings and recommendations.

5.3 Introduction to Main Findings

The primary aim of this study was an exploration of how SMMEs in South Africa can successfully access governmental and private sector support for the development of IP and the commercialisation of technological innovations. This study explored factors of funding and non-funding support for the development and commercialisation of technological innovations. The responses were restricted to funding and non-funding support as it related to SMMEs. The overview of the findings of the research objectives are presented below:

5.3.1 Overview of the Findings of Research Objective 1

The participants provided background of technologies which came from varied fields coming from information technology, waste treatment, and sustainability technologies.

All the participants indicated the importance of seed funding at early stages of development. Early-stage funding predominantly came from public funding from institutions such as TIA, NRF, and DSI. Funding at early stages was usually grant funding. The importance of these funding was shown to be enabling the development of proof of concept which led to accessing of further funding which was used to move the development of the technological innovation further.

Business advisory i.e., non-funding support regardless of it being incubation or by experts which form part of the management team or from the initial funding institution was found to be critical. Business advisory was found to have a positive correlation with access to funding. This is supported by a previous study where it was concluded that business support and finance have a positive and significant impact on SMMEs (Ogujiuba *et al*., 2023). Business advisory was found to be critical to assist innovators who predominately have technical background. To address pre-commercialisation and commercialisation requirements early. These requirements include development of bankable business plan which ordinarily include market assessments, IP commercialisation, defining and refinement of the innovativeness of the technology, and defining and sourcing of human resource expertise. Development of a bankable business plan was mentioned by the participants to attract potential investors and to stimulate successful accessing of additional funding. These findings answer the first research objective of the study exploring the factors that influence how SMMEs at an early stage of technological innovations successfully access financial and non-financial support from support institutions.

5.3.2 Overview of the Findings of Research Objective 2

In relation to research objective two which sought to determine the considerations SMMEs should prioritise in preparation for accessing financial and non-financial support during early-stage development in preparation for pre-commercialisation and commercialisation levels, it was found that incorporating the development of technical reports defining the innovation, and its competitive advantage. Reports on feasibility, scalability and performance were found that should be prioritized in preparation for pre-commercialisation and commercialisation funding. These reports may be technical feasibility studies, techno-economic studies which considers effects such project risk analysis, product and market landscapes, competitors' analysis, and financial

projections. As well as accessibility of the particular market, realistic project plan which is executable, and IP commercialisation strategy. It was indicated that the SMME should address sustainability contributions such as job creation, empowerment of historical disadvantaged (women and blacks (own emphasis), and the youth. These factors and similar factors should be indicated and discussed in the business plan or funding application. These socio-economic impact factors usually are considered favourably by some venture capital firms with no mandate to fund socially l impactful technologies. Even those venture capital firms with no social impact mandate are more likely to consider these factors favourably during investment decision making. All the participants affirmed what was found in literature as discussed in (Du & Cai, 2020; Bezuidenhout, 2018) that team composition was critical. Thus, management team composition was found to be essential for accessing early-to-mid stages which are undertaken in preparation for preparation of pre-commercialisation and commercialisation levels.

5.3.3 Overview of the Findings of Research Objective 3

The ability to effectively attract venture capital funding is a well packaged application. The application should include well-constructed business plan which covers the technological innovation's scalability and commercialisation readiness. Such a business plan should address financial projections, IP commercialisation strategy, team composition, and competitive advantage. It is expected that the business plan would cover the requirements of investors. Technological innovation outcomes must be clearly defined and addressed to best position the SMME for venture capital funding at the pre-commercialisation and commercialisation levels. Additionally, the technological innovation should be de-risked when approaching venture capital firms.

Regarding the factors of venture capital support should also consider is mentioned sustainability and socio-economic. The respondents also indicated that management team composition including the entrepreneurial skills is essential for attracting venture capital funding which is similar to literature review as set discussed in Ncube & Zondo (2020); Gompers *et al* (2020) and Msweli (2015). The level of development including prototype and/or proof of concepts, IP protection registration and IP commercialisation strategy are similar to literature. As discussed in Sangwan (2023), and Dauderstädt (2013) that assessment of minimal viable product, uniqueness of the technological

innovation (novelty and innovativeness), as well as product market fit. These findings answer research question three assessing how SMMEs may best position themselves to successfully access pre-commercialisation and commercialisation venture capital funding for their technological innovations.

5.4 Contributions of the Study

The literature review and the research findings for the research objectives contribute to the body of literature as follows:

(i) The study adds to the body of literature on access to funding and non-funding support for SMMEs. More particularly, factors for attracting funding and non-funding support at development, pre-commercialisation and/or commercialisation of technological innovations by SMMEs.

(ii) The findings add to the literature on NSI in South Africa. In particular, to the role of access to funding. This study contributes a critical aspect that SMMEs can and should develop technological innovations with the expectation that they will seek additional funding. Thus, SMMEs should seek to address the factors of the technological innovation and market prior to approaching the intended funders.

(iii) The findings also indicated the need to network with potential investors early enables in preparation of application and addressing of the investment criteria early. Thus, the investment criteria issues would be addressed during a project prior to seeking additional investment.

5.5 Recommendations

The findings propose the following recommendations:

To SMMEs:

(i) SMME founders should recruit industry experts (technical and business) at early stages of the technological innovation into the management team as employees and/or into the advisory board. This will also contribute to the team history and assist with reputational image when approaching potential funders. The SMME founders can consider offering the industry experts shareholding which is linked to performance. Regardless of the capacity

they occupy in the SMME being either an employee or member of the advisory board.

(ii) SMME founders should commence early engagements with all its relevant stakeholders, including venture capital firms, industry experts, potential customers etc. Intentionally develop networks and collaborations and open feedback communications from these stakeholders. These can assist in the development of the final product/solution according to the technological innovation which is solution driven and market fit. In developing the technological innovation SMMEs should seek to develop a product as informed by market research studies and validated by potential customers.

(iii) SMMEs should develop commercialisation strategies which covers specific customers but adaptable to different customers. The SMMEs should seek developing commercialisation plans that are flexible and scalable which can be adopted and switched between business-to-business and business-to-customer. As when needed based on changes in market factors and customer needs.

(iv) SMMEs should seek obtaining technical validation reports on the performance of the technological innovation in relation to validation market research study. In cases where this approach is adopted the SMME should ensure continuous monitoring and evaluation of the market so that when changes occur, they are informed of such changes early.

To Government:

(i) Public funding investment into venture capital firms to enhance the venture capital firms to invest in risker opportunities. Such as pre-commercialisation and commercialisation of technological innovations.

(ii) Monitoring and evaluation of funds allocated to funding institutions including venture capital firms wherein public funds are invested. Adoption of service level agreements in relation to the periods taken to approve and disburse funding. Such service level agreements should be public so that not only the government but also the public and those seeking funding can hold accountable the funding institutions.

(iii) Government should seek to expand the services offered by enterprise development agency such as incubators. They can enable their own employees to offer non-funding business support services such as assisting SMMEs with filing of applications. The initiative can include allowing and encouraging its own employees to participate in advisory boards of SMMEs which they provided funding even after the funding period. Advisory boards may be essential during the growth and expansion phase.

(iv) Development of networks and platforms for industry experts to make available that skills, networks and experiences to SMMEs. These industry experts would provide non-binding advisory services. The industry experts being technical and business people as well as regulators, legal (IP and contract), financial and potential investors such as business angel funders and Venture Capital Firms.

To further studies:

(i) A quantitative study which explores factors of accessing venture capital funding. Comprising of a sample with only SMME participants whom previously succeeded in attracting venture capital funding. As a result, the participants would be able to fully respond to the factors which enhances the likelihood of receiving venture capital support.

5.6 Limitations of the Study

This study has limitations which we acknowledge as follows:

(i) Accessibility - the SMMEs who indicated their willingness to participate especially through the TIA contact persons. Ended up not participating even after sending numerous follow-up emails. Those who were contacted via telephonic conversations kept on making promises that they willing to participate and when meetings were requested no commitments were made.

(ii) The ultimate option to not honour the invitation by some SMMEs include not having previous applied or received venture capital support. Thus, the considered themselves not adequately exposed to the research objectives

to be able to give insights. Thus, only SMMEs which previously applied for or received venture capital support should have been selected.

(iii) Researcher bias – the researcher is linked to the research site of this study as an employee which mean is already exposed to the field of funding and non-funding support. As a result, may have been biased in the data collection and interpretation thereof. He might have used his own beliefs, background, history and prior understanding in interpreting the data collected. However, care was taken into ensure that the findings were taken directly from the responses of the participants.

(iv) Regardless of the limitations mentioned the data collected data lead to research findings that echoes well with the main themes emanating from literature review. It also provided clarification of the technological innovation's projects should be implemented with an end in mind which is to take a product or service to the market.

5.7 Conclusion

This chapter presented the summary of the findings, conclusions and recommendations of this study. The research findings in this study reflects the literature which confirms that there are approaches which SMMEs can adopt. To ensure that there are best positioned to be able to access additional funding and non-funding support including venture capital support.

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APPENDICES

APPENDIX A: Supervisor Letter of Consent

MBA5929

CONSENT TO SUBMIT MBA RESEARCH REPORT FOR EXAMINATION 2023

Consent is hereby given to:

Student name: Mr Sebina Phochana

Student number: 47836253 to submit his research report in its final form.

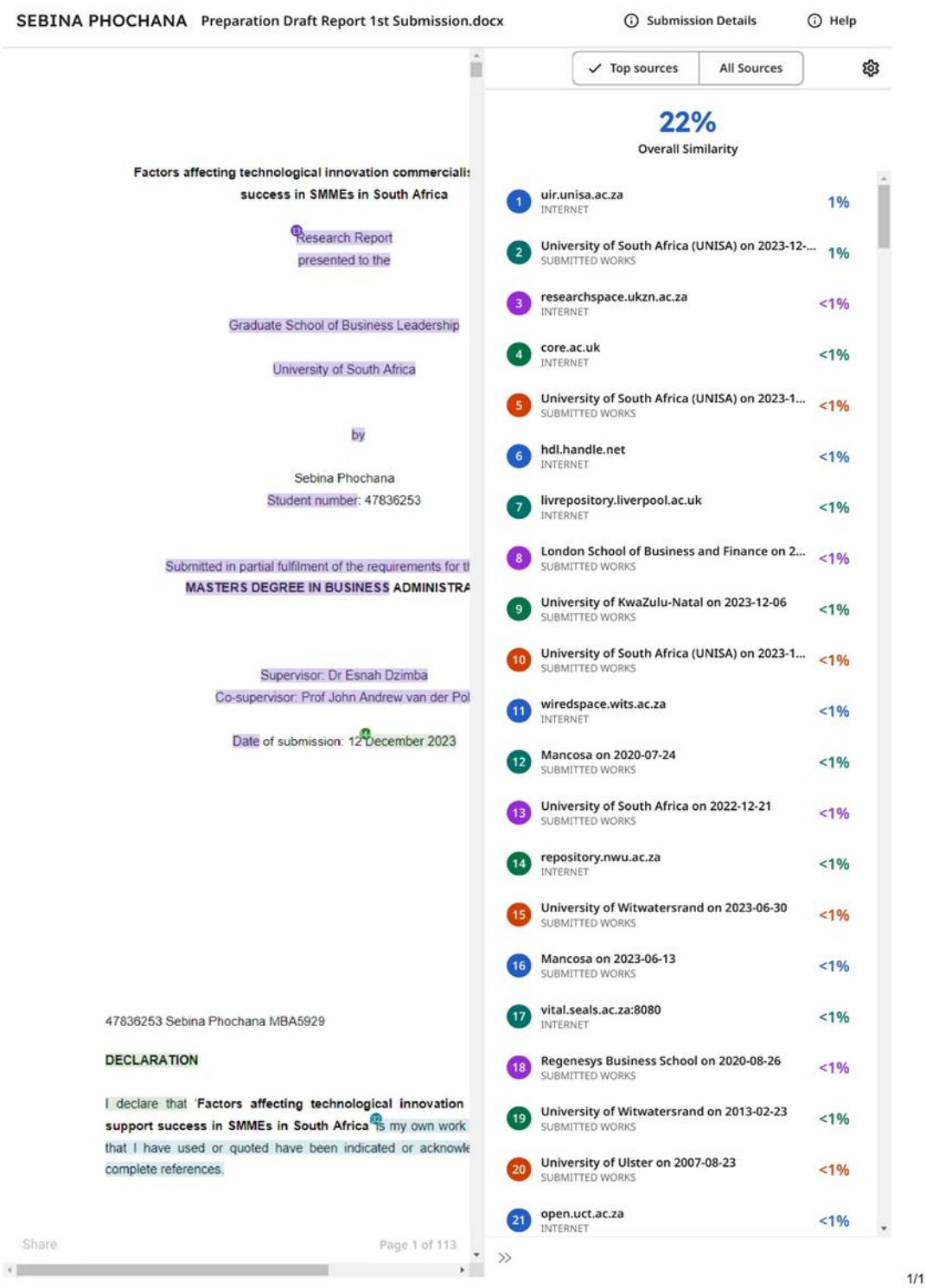
Supervisor Signature: ..... Date: 21 December 2023

Supervisor Name: Dr Esnah Dzimba

The student acknowledges that sufficient feedback was provided by the supervisor and that s/he took the responsibility to attend to the feedback in a way that satisfies the requirements of a doctoral degree on NQF level 9.

Student signature..... Date: 22 December 2023

APPENDIX B: Turnitin Report



APPENDIX C: Ethical Clearance Certificate

Graduate School of Business Leadership_RERC

Ref #: 2023_SBL_MBA_052_FA-1821
Name: Mr Sebina Phochana
Student #: 47836253

Date: 21/09/2023

Dear: Mr Sebina Phochana

Decision: Ethics Approval from September 2023 to December 2024

Researcher: Mr Sebina Phochana

83 Lois Avenue, Menlyn

Pretoria, 0181

47836253@mylife.unisa.ac.za 0815899747

Supervisor: Dr Esnah Dzimba dzimbe@unisa.ac.za

Co-Supervisor: Prof John Van der Poll ; vdpolja@unisa.ac.za

Factors affecting technological innovation commercialisation support success in SMMEs in South Africa

Qualification: MBA - Masters of Business Administration

Thank you for the application for research ethics clearance by the Graduate School of Business Leadership_RERC for the above-mentioned research study Ethics approval is granted for two years.

The **low-risk application** was **reviewed** by Graduate School of Business Leadership_RERC on 18 September 2023 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Graduate School of Business Leadership_RERC .
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires

additional ethics clearance.

7. No field work activities may continue after the expiry date (December 2024). Submission of a completed research ethics progress report will constitute an application for renewal, for Ethics Research Committee approval.

Additional Conditions

1. Disclosure of data to third parties is prohibited without explicit consent from Unisa.
2. De-identified data must be safely stored on password protected PCs.
3. Care should be taken by the researcher when publishing the results to protect the confidentiality and privacy of the university.
4. Adherence to the National Statement on Ethical Research and Publication practices, principle 7 referring to Social awareness, must be ensured: "Researchers and institutions must be sensitive to the potential impact of their research on society, marginal groups or individuals, and must consider these when weighing the benefits of the research against any harmful effects, with a view to minimising or avoiding the latter where possible." Unisa will not be liable for any failure to comply with this principle.

Note

The reference number 2023_SBL_MBA_052_FA-1821 should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,

Prof N Mlitwa
Chair of Graduate School of Business Leadership_RERC
E-mail: wiltonb@unisa.ac.za

Prof P Msweli
Executive Dean / By delegation from the Executive Dean of Graduate School of Business Leadership_RERC
E-mail: mswelp@unisa.ac.za

APPENDIX D: Language Editing Certificate

REF: EDITING OF MBA RESEARCH REPORT

DATE: 20 December 2023

TO WHOM IT MAY CONCERN

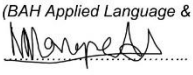
This letter serves to confirm that **Sebina Phochana** (Student Number: **47836253**) submitted his **MASTERS DEGREE IN BUSINESS ADMINISTRATION** research report entitled "**Factors affecting technological innovation commercialisation support success in SMMEs in South Africa**" for language editing to the undersigned.

FOR ANY ENQUIRIES RELATING TO THE ABOVE, PLEASE CONTACT ME ON:

Cell: 0722339433
Email: mmorapedi@gmail.com

Kind regards,
Mafeye Morapedi (Independent Editor)

(BAH Applied Language & Multilingual Studies, BA Contemporary English and Multilingual Studies)



APPENDIX E: Interview Guide

1. **What factors influence the successfully accessing of financial and non-financial support from institutions by SMMEs at early stage of technological innovations?**

Broad Area of Inquiry: Discover the background of technological innovations/projects which were funded and determine the relevant programmes for early stage.

1.1. Please provide a detailed of the background of a project worked on or evaluated which received public and/or private funding and is currently ready for market (or at least at pre-commercialisation phase) and what was the source of initial funding and elaborate how it was accessed?

Please specify and elaborate on the type of innovation, source of funding and type of support provided (Broad areas: Support received (if any): incubation, business advisory; source of funds: own savings, family and friends; personal loans; public funding (government, commercial banks, non-government organizations, venture capital; Debt-financial from commercial and non-commercial banks; or any other).

1.2. According to your experience which factors lead to the successful accessing of funding that an SMME should consider incorporating into their technology innovations or project at early-to-mid-stages for stimulating early-to-mid-stage public and/or private sector institution support?

Explore: Relevance of IP novelty or filings, availability of proof of concept, availability of relevant support programmes, or any other relevant factor.

1.3. In your experience, how does business advisory support (incubation and/or technology transfer, private business consultants (such as experts)) assist in the preparation of funding application and how does it stimulate support from public and private institutions?

Explore: its relevance and contribution towards funding application assistance and project implementation, what and how do you suggest to be the approach to their services.

2. **What factors should SMMEs prioritise in preparation for accessing financial and non-financial support during early to mid -stage development in preparation for pre-commercialisation and commercialisation levels?**

Broad Areas: Explore the factors such as reports, technological innovativeness, or partnership, or any other factor that can stimulate funding.

2.1. What factors should SMMEs consider incorporating and highlight in their application to stimulate support at public and/or private institutions for pre-commercialisation and/or commercialisation levels?

*Please elaborate on matters such as studies conducted: market research studies, validation technical reports, performance report, or any other relevant factor.

2.2. How should SMMEs best position themselves to be able to stimulate venture capital funding toward pre-commercialisation and/or commercialisation?

2.3. How does the management team composition impact the decision-making process for obtaining support from the public and/or private sector?

Investigation: Balanced skill composition (inclusion of technical and non-technical experts, team history, expert consultants, etc.

3. How should SMMEs best position themselves to successfully access pre-commercialisation and commercialisation venture capital funding for their technological innovations?

A broad area of inquiry: Factor that stimulate funding at development and/or success in technological advancement at the commercialisation level?

3.1. In your experience, what are the factors that lead to the ultimate successful commercialisation of technological innovations and what is their level of relevance towards private (venture capital) funding?

Guideline, the response should be traced from a project or technological innovations the participant has knowledge of, probably a project previously involved in.

3.2. Can SMMEs be able to ensure that these factors are addressed during technology development and/or project implementation for the ultimately pre-commercialisation and commercialisation activities (including funding – venture capital)?

3.3. In relation to a project that you previously worked on or have knowledge of what factors led to the success in accessing of venture capital funding and how were these factors dealt with?

Explore: funding amount, previous funding, IP or innovativeness, competitive advantage, established/partnership, product/service revenue generating, etc please specify.

3.4. In your opinion, which factors should venture capital funding institutions consider favourably when making decisions to fund SMMEs?

Explore: IP or innovativeness of the technological innovations, collaborators/partnerships (distributors/suppliers), competitive advantage, regulatory environment, etc.

APPENDIX F: Permission Letter to Conduct Research from TIA

technology innovation AGENCY
Innovating Tomorrow Together

GRANTING OF INSTITUTIONAL PERMISSION FOR RESEARCH

Dear Sebina Phochana

I, Patrick Krappie, the Acting Chief Executive Officer of this company grant permission to collect data at this site for your research project titled "Factors for SMMEs technological innovation commercialisation support success in South Africa".

I grant this permission as the authorized person to so in this company and am aware of the following,

1. The study is conducted as a UNISA researcher and remains the property of UNISA.
2. You cannot use the name of the company in your research project.
3. All data and information collected will be solely in the procession of the researcher.
4. I will not require feedback of the research.
5. The research may be published in the public domain under the supervision of the supervisor.

I wish you the best and success in this research.

Signature: DocuSigned by: BA0D8598D9054AD...

Name: Patrick Krappie

Organisational Title: Acting CEO

Full contact details: E-mail:patrick.krappie@tia.org.za

Number: 012 472 2770

APPENDIX G: Proof of Registration

UNISA university of south africa

2221

PHOCHANA S MR
1036 PAFF STREET
HERCULES
0082

STUDENT NUMBER : 47836253

ENQUIRIES TEL : 0861 670 411
FAX : (012) 429-4150
eMAIL : sbl@unisa.ac.za

2023-08-30

Dear Student

I hereby confirm that you have been registered for the current academic year as follows:

Proposed Qualification: MBA (90070)

CODE	PAPER	S	NAME OF STUDY UNIT	NQF crdts	LANG.	PROVISIONAL EXAM.DATE	EXAMINATION CENTRE(PLACE)
Study units registered without formal exams:							
MBA5929			Integrated Management Project	48	E		

You are referred to the "MyRegistration" brochure regarding fees that are forfeited on cancellation of any study units.

Your attention is drawn to University rules and regulations (www.unisa.ac.za/register).
Please note the new requirements for reregistration and the number of credits per year which state that students registered for the first time from 2013, must complete 36 NQF credits in the first year of study, and thereafter must complete 48 NQF credits per year.
Students registered for the MBA, MBL and DBL degrees must visit the SBL's ESOnLine for study material and other important information.
Readmission rules for Honours: Note that in terms of the Unisa Admission Policy academic activity must be demonstrated to the satisfaction of the University during each year of study. If you fail to meet this requirement in the first year of study, you will be admitted to another year of study. After a second year of not demonstrating academic activity to the satisfaction of the University, you will not be re-admitted, except with the express approval of the Executive Dean of the College in which you are registered. Note too, that this study programme must be completed within three years. Non-compliance will result in your academic exclusion, and you will therefore not be allowed to re-register for a qualification at the same level on the National Qualifications Framework in the same College for a period of five years after such exclusion, after which you will have to re-apply for admission to any such qualification.
Readmission rules for M&D: Note that in terms of the Unisa Admission Policy, a candidate must complete a Master's qualification within three years. Under exceptional circumstances and on recommendation of the Executive Dean, a candidate may be allowed an extra (fourth) year to complete the qualification. For a Doctoral degree, a candidate must complete the study programme within six years. Under exceptional circumstances, and on recommendation by the Executive Dean, a candidate may be allowed an extra (seventh) year to complete the qualification.

BALANCE ON STUDY ACCOUNT: 28706.00

Yours faithfully,

Prof Mpofu
Acting Exec Director (SBL)

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