Collaboration between State-Owned Enterprises and technology-based Small Medium Enterprises: Assessing the impact on SME performance

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in Entrepreneurship and New Venture Creation

Student: Cocky Tarusarira

Student No: 1623544

Supervisor: Dr Diran Soummoni

Wits Business School

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ABSTRACT

The importance of technology-based Small and Medium Enterprises (SMEs) in most economies cannot be underestimated. Their contribution, through high impact growth that is brought about by their innovative ability is felt through the job creation, contribution to the gross domestic product (GDP) and it is evident that support of such enterprises by government to ensure sustained growth is not only beneficial to the individual businesses but also to the growth of the economy. Existing literature points to the fact that government support through policy, financial and other factors result in improved performance of these firms which in turn, assist in their sustainability in the long run.

In the American, Asian and European environments a lot of literature exists on the study of the performance of these tech-based SMEs. In Sub-Saharan Africa, however, the study of these enterprises is sparse and the technology-based industry is still in its infancy. This may be due to the fact that most of the economies are subsistence and most of the SMEs in these countries are survivalist in nature, unlike in the more technologically-advanced economies. In the South African economy, the country recognises the importance of these enterprises and appreciates the need to support them to ensure that their growth and sustainability are protected and maintained. The promulgation of policies aligned to supplier development and localisation is evidence for that.

This study focuses on the performance of technology-based SMEs that are doing business with state-owned enterprises (SOEs). The variables examined are SMEs Entrepreneurial Capacity and Technological Capacity of these firms and their impact on the performance of the technology-based SMEs doing business with SOEs in South Africa.

The study involved diligent selection of technology-based SMEs on the Treasury Department's customer supplier database, commonly referred to as the CSD, that are actually doing business with SOEs. A total of 263 firms responded to the survey. Exploratory factor analysis was performed to estimate the underlying

variables and factor loadings. The correlations between Entrepreneurial Capacity and Technological Capacity and SME performance measurements were examined. The mediating effect of Absorptive Capacity on the relationship between Technological Capacity and SME performance is also examined.

The findings indicate that Entrepreneurial Capacity does have an impact on the performance of technology-based SMEs in the South African SOE environment. This is consistent with existing literature. The study also found that there is a positive impact of SME technological Capacity on SME performance as a result of doing business with SOEs. This is also consistent with existing and reviewed literature, together with the researcher's preliminary assumptions during the course of the study.

The findings of the study, however, did not find any mediating effect of Absorptive Capacity on the relationship between Technological Capacity and the SME performance. The results do not support the researcher's assumed position that there is a mediating role of Absorptive Capacity on the relationship between Technological Capacity and technology-based SME performance.

The evidence generated from this study contributes to the sparse extant literature on the performance of technology-based SMEs in South Africa. The study will assist policy makers who use SOEs to implement SME growth and sustainability policies.

DECLARATION

I, **Cocky Tarusarira**, declare that this research report is my own work, unless where stated otherwise through references and acknowledgements. This report is submitted in partial fulfilment of the requirements for the degree of Master of Management in Entrepreneurship and New Venture Creation (MMENVC), Wits Business School, Parktown, Johannesburg. This report has not been submitted before for any degree or examination at the University of Witwatersrand or any other university.

Cocky Tarusarira

Signed at ……

On the ……..Day of……...2019

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“It always seems impossible until it’s done.” These words are attributed to Nelson Mandela in 2001, though there is no record of him having said that, I believe in them. Whether he said them or not is beside the point, the point is they resonate with my feelings when I first set foot into classroom no.3 at Wits Business School. I was filled with trepidation to the point of disorientation. This feeling followed me until the beginning of the second module when I went to the programme manager and asked for her honest opinion if I should continue with the course and she told me to hang in there. I did, and here I am, still standing.

For that I am thankful and forever grateful. I am thankful to the following people:

I am truly indebted to Meisie Moya for telling me I had to do it and not to give up; if not for her, I would be one of the statistics of the people who fell on wayside.

My supervisor, mentor and advisor, Dr Diran Soumonni, for agreeing to take me under his wing even though he was not under any obligation to do so and believing that he could perform a miracle on me. His unwavering patience, constructive criticism, selflessness, wisdom and unparalleled knowledge and above all this, his grace, kindness and humility kept me grounded and focused until I could see the finishing line. This report would not be a reality without him. In Swahili they say “Mungu abariki mtu huyu”

To the statistician, who worked tirelessly and at short notice to respond to my questions and concerns, I say thank you till my next research.

To all the Small and Medium Enterprises involved in technology who participated in this survey, the enthusiasm, the phone calls, the messages of support, I thank you. This research report is yours; I just put it together for you. I hope we will do something similar together in the near future.

Colleagues and an Angel who helped me get all the contact information of the SMEs doing business with State Owned Enterprises.

To my wife and children, my mother, who is my rock and the strongest woman I know (Enety Chiyangwa), and my late father (Jeremiah T. Chiyangwa) who taught to me to never stop pushing boundaries and to never be deterred by the possibility of failure but rather to be motivated by the prospect of success and to never stop learning.

DEDICATION

This research is dedicated to my mom and my late father, who I think about every night and day. In my heart I will always keep afresh memories of you that give me the strength to believe, the strength to proceed. Cannot imagine all the pain I feel, would give anything to hear half your breath.

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1 CHAPTER 1. INTRODUCTION

The contribution of SMEs towards economic growth through contributing to the gross domestic product (GDP), in any economy the world over, cannot be underestimated. SMEs in the technology sector are of special interest since, their strength and competitive advantage are deemed to be key determinants of economic growth and sustainability (Rubini & Podetti, 2017) through their potential to grow rapidly as firms and hence, they are termed rapid growing firms.

The performance of these SMEs is of paramount importance to the socio-economic well-being of the country. They contribute to the entrepreneurial ecosystem through the creation of jobs, innovative solutions and products to the entrepreneurial ecosystem. For these technology-based SMEs to thrive, they cannot operate in isolation or silos. They depend on support from, and interaction with other players. In this study, the interaction between technology-based SMEs and government-owned enterprises was examined. The government has an important role to play in supporting technology-based SMEs through technological support programmes, supplier development programmes, legislation, patenting and licencing systems, and the protection of intellectual property.

The government makes use of such enterprises to implement and enforce legislation aimed at supporting SMEs such as those in the technological space. This also partly reflects on the relationship and principle of the triple helix system where the government, industry and learning institutions interact with the intention of creating a mutually beneficial three-way relationship (Slaper & Hall, 2011). This has resulted in the government creating policies that support these SMEs to enhance their performance. The practice is global in nature and is utilised to support the growth of technological companies. In countries like Japan, such government-driven support systems have been used to create ecosystems that have resulted in SMEs growing into very large corporations, which are now contributing extensively to the gross domestic product (GDP). To ensure that

such policies are implementable, the South African government is using its State-Owned Enterprises (SOEs) as the vehicles to spearhead this drive. This has resulted in the creation of collaborations between the SOEs and these SMEs. SOEs serve as enablers of government policies.

This study analysed the collaboration between the SOEs and technology-based SMEs (also referred to as New Technology Based Firms or NTBFs) through the broader lens of the National Entrepreneurship System (NES) (Acs, Autio, & Szerb, 2014). The NES study investigates technology on two levels, the individual level and the role of institutions (Autio & Acs 2010; Phan 2004).

The performance of SMEs in South Africa has been measured mostly in financial terms (Kirsten, Vermaark, & Wolmarans, 2014). The measurement of non-financial factors such as innovativeness, technological transfer and market growth have not attracted much interest from scholars so far in the South African environment. Governments implement SME policies through SOEs as they have the largest supply chain systems and budgets (Dacha & Juma, 2018) in most economies.

1.1 Theoretical background to the study

The study has theoretical roots in Joseph A. Schumpeter's works, and in particular, the Theory of Economic Development. In this work of Schumpeter, he praises the individual entrepreneurs for setting up new firms to contribute to an industry's innovativeness. This has come to be referred to as the Schumpeter Mark I perspective, that was followed by the Theory of Creative Destruction (Schumpeter, 1943) through the popular Mark II Theory (Malerba & Orsenigo, 1995). In this theory, Schumpeter postulates that the status quo is disrupted and new methods of production or transportation, the new markets, and the new forms of industrial organisation are created by capitalist enterprises. In Schumpeter Mark II, stable environments with relatively high entry barriers characterise industries. In Mark II theory, innovations are generated and developed by large established firms only. Fontana et al. (2012) draw on the 2005 works of Malerba

in which he says that in a Schumpeterian Mark II, industries' technological competition assumes the form of what he called "creative accumulation". In his book, *'Capitalism, Socialism, and Democracy'*, Schumpeter instead suggested that large incumbents are best positioned to contribute to an industry's innovativeness (Schumpeter A. J., 1942). The existing firms are introducing innovations by means of a process of progressive consolidation of their technological capabilities along well-established technological trajectories at this stage.

The large incumbents in this study are the SOEs. The impact of their contribution to the industry on innovation was assessed through their collaboration with technology-based SMEs. Technology entrepreneurship has long been proven and accepted as one of the most significant drivers of sustainable economic growth and development, Doh & Kim (2014).

This study attempts to evaluate the confluence of Schumpeter's Mark I and Mark II theories, namely where the entrepreneur and the large established firms come together (Dolfsma & van der Velde, 2014).

In South Africa, Government policy has also been instrumental in ensuring that technology-based SMEs stand a chance of survival, growth and ensuring that their performance is not compromised. For example, the Industrial Development Corporation in 2017 established a New Industries Strategic Business Unit (SBU) with the primary objective of providing support and incubating upcoming industry value chains and enabling technologies that have the potential to make a significant impact on South Africa. The Industrial Development Corporation has identified and focused on "six industry value chains (energy storage, fuel cells, gas beneficiation, renewal energy inputs, medical devices and natural products) and two enabling technologies (additive manufacturing and nanotechnology) based on their financial and developmental return attractiveness and potential competitive advantage" (Industrial Development Corporation, 2017). Thus, there is a need to study the impact of Government collaboration or support through

SOEs on the performance of technology-based SMEs on their innovativeness, technological transfer and all aspects that enhance SME performance.

1.2 Context of the study

How should the government of South Africa use its SOEs as implementers of its policies in support of technology-based SMEs to improve their performance and chances of survival and growth? Government financial and non-financial incentives are significant drivers to boost technological development in the industrial sector (Doh & Kim, 2014). Extant literature from China and Malaysia has shown that a strong emphasis of government support on the technological development can contribute significantly to a firm's growth (Guan & Yam, 2014). In countries like Malaysia, research has shown that government involvement in SMEs promotes higher business performance (Shamsuddin, Ismail, Sarkawi, Jaafar, & Rahim, 2017). This study aimed to investigate the impact of the government's involvement on the performance of the SMEs with a specific focus on those in the technology space.

In the South African environment, the government has developed policies that are designed to support the development and performance of SMEs. Most of these policies are in the form of supplier development and localisation programmes that are implemented through State-Owned Companies. Because of these government-led programmes, this study focuses on the technology-based SMEs that are involved through these programmes. The impact on their performance from participating in these programmes is assessed. The impact of these collaborations or government programmes is viewed through the notion of National Systems of Entrepreneurship (Acs et al, 2014).

1.3 Problem statement

There has been collaboration between State-Owned Enterprises and Small and Medium Enterprises with the aim of enhancing the performance of the latter, but the impact of this collaboration has not been measured or is not known.

1.4 Research purpose, research question and aims of the study

The research aims to assess the impact of the collaborative relationships of technology-based Small to Medium Enterprises with State Owned Enterprises have influenced the performance of the earlier. The performance factors that have been identified for the purpose of this study are; Innovation, Technology Transfer (Absorptive Capacity), and Profit performance. The research aims to establish whether these SMEs performance indicators have been impacted in any way as a result of their collaboration with South African state-owned enterprises (SOEs).

Extant literature focuses on the influence of Government Financial support and Government Non-Financial Support of SME performance (Yang, Mohammad, Mohammad, & Hamid, 2018). The studies are mostly global in nature with the latest being in China, Malaysia (Shamsuddin, Ismail, Sarkawi, Jaafar, & Rahim, 2017) and most of the Asian countries (Guan, 2014) and very little research exists in the South African context with specific reference to the technological sector. This study aims to highlight the following:

Sub problem 1: The impact of the relationship between Government Support through Supplier Development Programmes on Entrepreneurial Capacity.

Sub problem 2: The impact of the relationship between Government Support through Supplier Development Programmes on SME technological Capacity.

Sub problem 3: The mediating effect of SME absorptive Capacity on the relationship between Government Support (Supplier Development Programmes) and SME technological Capacity.

1.5 Definition of Terms

1.5.1 State Owned Enterprises (SOEs)

These are state enterprises falling under the oversight of the Department of Public Enterprises. This study's focus is on five selected entities out of all the portfolio of enterprises managed by the Department of Public Enterprises in South Africa.

1.5.2 Small to Medium Enterprises (SMEs)

This is defined by the United Nations Industrial Development Organisation (UNIDO) in terms of the number of employees by giving different classifications for industrialised and developing countries (Elaian, 1996). Amongst the industrialised nations, an SME is defined as a firm with 100-499 workers. The classification given for developing countries is as firms with 20-99 workers. For the purpose of this study, the UNIDO SME definition for developing countries is used.

1.5.3 Collaboration

This is defined by Gray (1991) as a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible. In this study, this broader definition is adopted and used.

1.5.4 Performance measurement

Moullin (2002) gave the definition of performance as the evaluation of how well organisations are managed and the value they deliver for customers and other stakeholders. This is the definition that is used in this study in reference to performance measurement for SMEs.

1.5.5 Technology-Based SMEs

This refers to Mechanical, Electrical, Instrumentation and Control Engineering, and Information and Communication Technology disciplines that were predominantly the domain of big established firms prior to 1994, and subsequently applied to SMEs for the purpose of this study.

1.5.6 National System Entrepreneurship (NSE)

Acs et al (2014) first coined this narrative which refers to a system that recognises the character of country-level entrepreneurship. The authors also posit that this system recognises that, although embedded in a country-level context, entrepreneurial processes are fundamentally driven by individuals.

1.6 Contribution of the study

The research could assist the owners of the SMEs in the technological sector to evaluate whether the collaboration with SOEs has been beneficial to their business. This study gives an indication from the viewpoint of the intended beneficiaries.

Secondly, the research could assist SMEs in the technology in considering other strategies that could enhance their performance outside their relationship with state-owned enterprises. Sustainable growth and performance of SMEs will require more than reliance on SOEs.

Third and lastly, the research could assist at informing policymakers about which of the identified performance indicators are not being addressed by the current policies. This will, hopefully, lead to an in-depth root-cause analysis and an appropriate corrective plan of action.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

There is an explosion of public sector interest in high-growth entrepreneurship and new technological firms have fuelled exciting new developments in policy such as the New Industrialist and Supplier Development and Localisation programmes. Technology-based SMEs face a plethora of challenges in trying to get well established and to continue to survive in developing economies. Governments acknowledge their importance to the economy and also their challenges. One of the solutions identified to assist these SMEs to face their challenges is through entering collaborative relationships with them using SOEs as the vehicles of choice to implement policies that are designed to help improve or sustain the performance of these technology-based SMEs.

2.2 Literature background

Existing literature is reviewed in this section of this study.

2.2.1 Conceptualising technological entrepreneurship, collaboration and performance.

The origins of technological entrepreneurship can be traced back to five centuries ago, that is, as early as the 17th century (Barreira, et al., 2015). Technological development and innovation has been strongly associated with the industrial revolution and the birth of new industries and development and growth of existing ones. This has resulted in a greater contribution to the economy of most countries that pursue this phenomenon. In an economy such as South Africa, such contributions lead to wealth generation for those who involve themselves in the pursuit of such benefits. Other social and economic benefits such as job creation and contribution to the gross domestic product of the country are also realised.

Individuals with technical skills who have the potential to become entrepreneurs are often referred to as technological entrepreneurs (Lee & Wong, 2002). Existing research papers have coined various terms to refer to technological entrepreneurship. Terms used are technology entrepreneurship, technical entrepreneurship, techno-entrepreneurship and technopreneurship and host of other definitions (Barreira, et al., 2015).

A definition often quoted by researchers is that by Allen and Stearns (2004) which defines technological entrepreneurship as a style of business leadership that involves identifying high-potential, technology-intensive commercial opportunities. Gathering resources such as talent and capital, and managing rapid growth and significant risk, using principled decision-making skills are also part of this phenomenon.

Empirical evidence has shown that firms often enter collaboration agreements not necessarily on the basis of their current technologies, but of what they have the potential of producing in the future. The management of collaboration needs, therefore, to exist within a strategic framework (Dodgson, 1994). Harrison and Barringer (2000) - posit that “firms tend to have a portfolio of reasons for alliance formation, such as cost minimization, risk sharing, and learning, rather than just one reason”. Alliance formation is synonymous with collaborative partnership. The authors go on to posit that factors such as dependence on external resources or pressure for legitimacy can lead organisations into difficult alliances, in spite of the disadvantages that often exist. This has a direct impact on the performance of the Small to Medium Enterprises engaged in a collaborative relationship. Even if the advantages seem to outweigh the disadvantages, there is the risk of loss of proprietary information (Sawers, Pretorius, & Oerlemans, 2008). Inter-organisational relationships require the combined efforts of two or more organisations, there are disadvantages to participation in inter-organisational relationships that must be carefully weighed and managed by the parties involved.

Todeva and Knoke (2005) discuss co-operative agreements. They defined these agreements as “Contractual business networks based on joint multi-party strategic control, with the partners collaborating over key strategic decisions and sharing responsibilities for performance outcomes”. Collaboration can be seen as a means by which large multinational firms can indirectly receive government assistance for Research and Development, thereby further distorting competition. Furthermore, shared technological development may be argued to produce a technology to a standard of the lowest common denominator, rather than the best achievable, objectively.

The above view is echoed in the Department of Trade and Industry’s Black Industrialists policy (2017) amongst others, whose main objectives are:

- “Accelerate the quantitative and qualitative increase and participation of black industrialists in the national economy, selected industrial sectors and value chains, as reflected by their contribution to growth, investment, exports and employment;
- Create multiple and diverse pathways and instruments for black industrialists to enter strategic and targeted industrial sectors and value chains”.
- The National Development Plan (NDP) also recognises “the importance of improving the quality of the economy for the purposes of both sustainability and impact on inclusion”.

The B-BBEE (Act no. 53 of 2003), Amendment (2013), clearly states that “the Government’s fundamental objective is to create a transformed adaptive economy that is characterised by high levels of growth, job and enhanced economic participation by the majority of the population”.

The Government has introduced the Preferential Procurement Policy Framework Act (2000) upon realising that it possesses a significant amount of purchasing power. This was necessitated by the need to expand its base of suppliers to achieve broader economic developmental goals, given its economic significance.

The Act alludes to the fact that public expenditure has the potential to influence the economy in terms of production stimulation and consumption on a grand scale. This makes public procurement one of the key strategic drivers for industrial development objectives in the Industrial Policy Action Plan.

The policy aims to support entities that will:

- “Expand their current operations or businesses to become major players in the domestic and/or global markets within 10 years of being in the programme;
- Start a new operation or business that can enable them to become major players in the domestic and/or global markets within 10 years of being in the programme; and
- Acquire an existing or new business that can enable them to become major players in the domestic and/ or global markets within a specified period.”

Collaboration has become an established aspect of innovation strategy, Caloghirou et al. (2003). Current literature highlights that technological complementarity of partners, concrete development of innovations, and the need for technology monitoring are important motives for forming strategic alliances (Hagedoorn & Schakenraad, 1994; Dyer & Singh, 1998).

James et al. (2014) write about manufacturing sub-contracting relationships. The authors posit that small firms supply components and sub-assemblies to large companies. As part of this process, large companies frequently transfer technological, manufacturing and quality control knowledge to their small suppliers. Stable relationships can develop which are mutually advantageous. State owned enterprises in South Africa have, in an attempt to comply with legislation on supplier development and localisation policies, embarked on using this strategy amongst the various strategies that they are implementing in this regard. State-Owned companies, such as Eskom Holdings and Transnet, have

implemented these manufacturing sub-contracting relationships for the supply of some of the spares and consumables used in their operations.

2.2.2 Absorptive Capacity

Cohen and Levinthal (1990) argue that the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends is critical to its innovative capabilities. They label this capability a firm's absorptive capacity and make the assertion that it is, to a large extent, a function of the firm's level of prior relevant knowledge and experience. In the context of this study, the absorptive capacity of the SMEs in this study is their ability to learn from the new environment processes, procedures and technological advances to which they were not previously exposed.

In this study, the mediating effect of SME absorptive Capacity on the relationship between Government Support through Supplier Development Programs and SME technological Capacity is investigated. This is done in a South African context.

2.2.3 Technology-based SME Performance

SMEs owners/managers place an emphasis on the need to ensure that their businesses are run in ways that enhance the value of their business. Determining how that is done will not only enhance their performance but also ensures that their businesses or firms have a competitive advantage. Technological performance of SMEs has been defined broadly and differs from sector to sector.

2.2.4 Entrepreneurial Capacity

This has been defined by various scholars, but they all seem to converge at one confluence point, which is the ability to exploit new opportunities. Entrepreneurial capacity has been defined as the skill that individuals have to spot, recognise and absorb opportunities (Claryssea, Tartari, & Salter, 2011). This characteristic has

been touted by many researchers in the entrepreneurship space as a vitally important trait for an individual to become an entrepreneur (Nicolaou et al., 2008; Shane & Venkataraman, 2000).

2.2.5 Technology Transfer

Technology transfer has been described in a simplistic way as any process that aims at transferring technological know-how from a donor firm to a recipient (Khalil, 2000; Buratti & Penco, 2001). In the context of this study, the SOEs are synonymous with the donor firm while the SME is the recipient firm. In developing nations, technology transfer is an essential factor in the industrialisation process (Filatotchev, Liu, Buck, & Wright, 2008).

The topic of technology transfer has become an important theme for practitioners, policymakers and academics. Global changes and progress are generally attributed to the development or introduction of new technologies. This has made this technology transfer a subject of greater interest in the present day more than ever before.

Acquisition and utilisation of new technology from an external source can contribute significantly to the success of technological firms, both large and small (Palviaa et al. 2002). Global evidence from research across many countries and firms, has demonstrated that there is an increasing appreciation in which the long term ability to master technology and to manage and generate technological change is a determinant for competitiveness and capacity to grow (Guan et al. 2005).

In this study, the relationship between small firms and the large established SOEs is examined to assess if there has been any meaningful transfer of technology to the smaller firms in the South African context.

2.3 First hypothesis discussion

The literature reviewed on the subject of collaboration for this study converges on a common position with regard to its effects and impact on SME performance. Tobiassen and Pettersen (2017), postulate that collaborative partnerships give the SMEs an opportunity to have access into new technologies and stay competitive in ever-changing global markets. The authors further assert the importance of SMEs in, recognising the benefits of collaboration with customers, and especially those who are technological leaders. Entrepreneurial capacity of an enterprise enables them to recognise those benefits and capitalise on them for their own benefit to ensure or improve on their performance.

Strategic technological collaboration firms transfer patented knowledge and a pool of unique resources, as well as employees' skills into collaborative R&D projects, and that sometimes achieve technological innovation with extensive product application that produce market pay-outs for all partners (Todeva & Knoke, 2005). Therefore, to sustain innovativeness and a higher competitive edge in today's rapidly changing environment, firms must develop R&D collaboration with public research institutes to reap the benefit of the combined partners' competencies and knowledge to develop new joint-technological solutions (Belderbos, Cassiman, Faems, Leten, & Van Looy, 2013). Accordingly, developing an R&D partnerships with other research institutions allows firms to minimise the cost burden of R&D and share the risk of failure with co-partners, thus enhancing the efficiency of the participants' innovation process (Briggs, 2015). Government involvement in SMEs promotes higher business performance. (Shamsuddin, Ismail, Sarkawi, Jaafar, & Rahim, 2017).

Hypothesis 1 H1: Entrepreneurial Capacity has a positive impact on SME performance.

Null Hypothesis 1 H0: Entrepreneurial Capacity has no positive impact on SME performance.

2.4 Second hypothesis discussion

The lack of networking capabilities by SMEs can be overcome through collaboration with customers or clients who have the ability to play multiple roles, e.g. innovation partner and provider of the international networks that are important for commercialisation. All this is summed up as the technological capacity of an enterprise (Hite & Hesterly, 2001).

The authors above argue that it may be beneficial to collaborate with research institutions. These institutions may be customers at the same time who are involved in fundamental research and can be vitally important for ground-breaking innovations. This requires managers who are able to communicate and to build trusting and lasting relations with research institutions, as cited by López et al. (2015).

SME managers or owners should be proactive; consciously seeking out appropriate collaboration partners and not leaving this responsibility to government and policy enforcers to develop their businesses. This is what the enterprise development programmes aim to do, amongst other objectives.

Recent research indicates that a nation or region's innovation policies can contribute to or hinder innovation and economic prosperity (Wolff, 2002). The impact of government financial incentives on enterprises' innovation performance was examined during China's critical economic transition era in the 1990s. In the South African environment, these incentives are mostly channelled through the supplier development programmes implemented through the various SOEs. Recent research findings show that all financial incentives of governments were unrelated to the patents of either high-tech or general firms and affected the patents of these firms negatively, although not to a significant degree. Support from the government does not only help to access scarce resources but also

facilitates small firms in start-up, growth and creating a sustainable position in a turbulent market (Hansen, John, & Tarp, 2009). This indicates that the centrally-planned funding system in the 1990s was ineffective for enhancing technological progress for Chinese manufacturing firms (Guan, 2014). Government financial and non-financial incentives are deemed as significant drivers to boost technological development in the industrial sector. In return, this development can bring a positive change in SMEs' innovativeness to sustain a competitive position (Doh & Kim, 2014). The second hypothesis of this study arises from this, in relation to the technological capacity of SMEs as a result of their support or collaboration with the SOEs in South Africa.

Hypothesis 2 H1: Technological Capacity has a positive impact on SME performance.

Null Hypothesis 2 H0: Technological Capacity has no positive impact on SME performance.

2.5 Third hypothesis discussion

The ability of an SME to learn from big or established firms allows the SMEs to leapfrog stages in the learning curve. The established firms have the resources required to either acquire or develop technological capacity at a faster rate than small, less resourced firms. Scholarly arguments have been put forward in order to determine SMEs' capacity to absorb external knowledge, together with the capacity generated from in-house R&D activity (Muscio, 2007). Without the opportunity to work or collaborate with large firms, this capacity to absorb the external knowledge is difficult to test.

Some scholars have argued that the collaboration between small and large firms is actually imperative if the survival and growth of both parties is to be sustained. There are areas of strength from both parties that can be leveraged for mutual benefit and for the benefit of technological growth (Cohen & Levinthal, 1990). Collaborations of this nature allow small firms to acquire technology and

knowledge faster and cheaper by leveraging on the abundant resources that are mostly possessed by large firms. The reverse may also be true in some instances where the large firm is able to acquire knowledge and technology from the smaller firm through these collaborations. This latter situation has been a cause for concern for smaller firms as this makes them dispensable to the large firms once they (the large firms) have absorbed and probably perfected the technology and knowledge from the smaller firms.

A firm's absorptive capacity assists it in identifying more available knowledge flows and using them to enhance their competitive advantage. In studies in developing countries, similar to South Africa, such as Malaysia, it has been proven that the technological capacity of small firms improves a great deal where collaborations are encouraged and fostered by the government through supplier development programmes (Shamsuddin, Sarkawi, Jaafar, & Rahim, 2017). The absorptive capacity on its own cannot have a direct impact but rather functions in a mediating role on the relationship of the supplier development programmes and the technological capacity and SME performance. This leads to the third hypothesis of this study, which is;

Hypothesis 3 H1: Absorptive Capacity mediates the relationship between Technological Capacity and SME performance.

Null Hypothesis 3 H0: Absorptive Capacity does not mediate the relationship between Technological Capacity and SME performance.

2.6 Conceptual framework of hypotheses

The model below summarises the basis of this research which puts the State-owned Enterprises and the Small to medium Enterprises (SMEs) together in the form of a collaborative relationship through the various supplier development and localisation programmes. The research establishes whether these collaborative relationships have had any impact on the performance of the SMEs involved in

these programmes. The performance measures have been outlined for the purpose of this study and have been broken down into variables as shown in the conceptual model below. These variables form the basis of the questionnaire that was used for data collection and that was sent out to the SMEs that participated in this study.

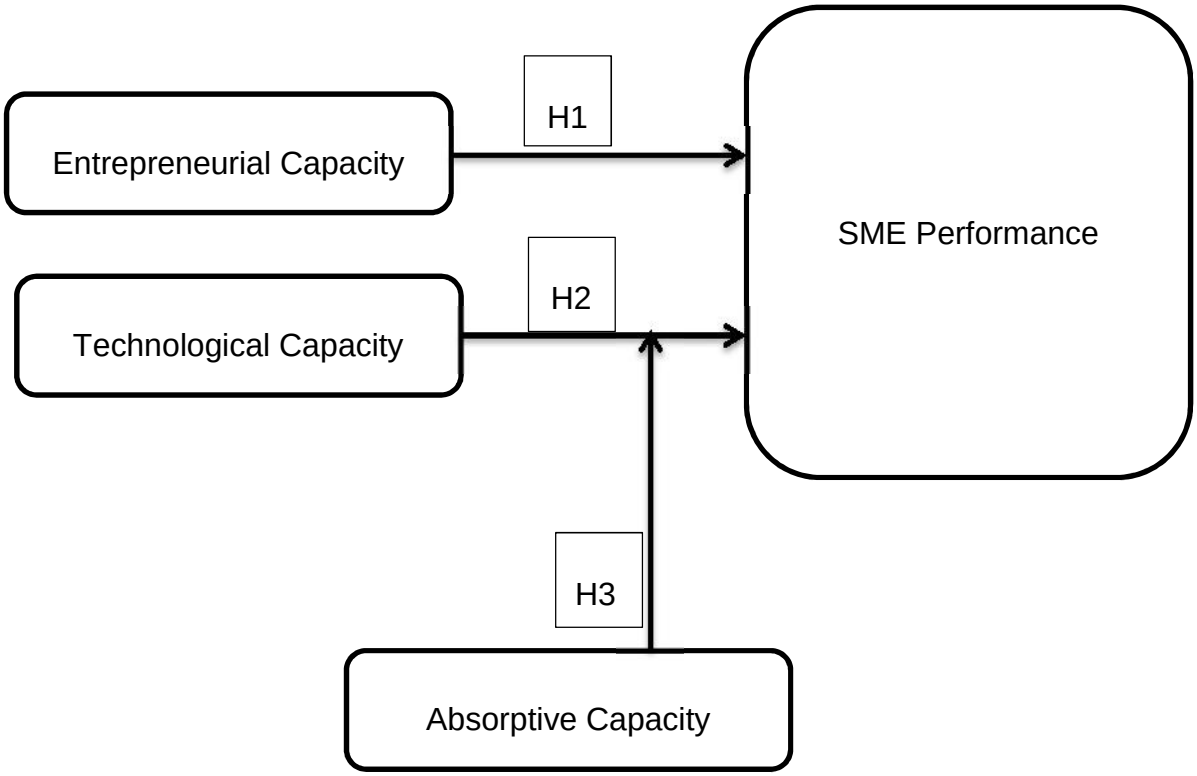

Figure 1: Research Model

Source: Adapted from Yang, Mohammad, Mohammad, and Hamid (2018)

2.7 Conclusion of Literature Review

The purpose of this review was to view the different types of collaboration and government support to technology-based SMEs through SOEs. The literature reviewed is primarily composed of studies within the past five years, and in developing economies. The literature reviewed indicates that some governments do not necessarily use their SOEs but rather deal directly through special purpose agencies to implement, support and monitor technological SME support programmes and performance.

Extant literature and studies carried out by researchers indicate that some of the programmes and policies have not had a meaningful impact on some aspects of the performance of technology-based SMEs. This subject of research is vitally important as at its core is the objective of assisting SOEs become better collaborators and implementers of government-driven SMEs support programmes. This could potentially allow the SMEs to grow beyond doing business with SOEs by expanding into other markets. Policy makers could become better at creating policies responsive to the need of the intended beneficiaries. This could result in the easiness of implementation of policies from the perspective of the implementing agencies. The study also points to how South Africa compares to developed countries such as Norway and the United States. Such countries are regarded to be at the forefront of innovation in different industry fields and aim to promote productive entrepreneurship by providing entrepreneurs with stable policies and a supportive entrepreneurial ecosystem in the form of a National Entrepreneurship System (Ács, Szerb, Lafuente, & Lloyd, 2018).

3 CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the research and methodological approach, and the framework that provides answers to the research questions. The chapter is discussed under the following headings:

Population and Sample
The research instrument
Procedure for data collection
Data analysis and interpretation
Validity and reliability of research

3.2 Research Paradigm

A quantitative research paradigm was applied to this study. Quantitative research has the advantage of explaining phenomena by collecting quantitative data which is analysed using mathematically based methods (Muijs, 2004). This study seeks to establish the relationship between dependent and independent variables of collaboration and performance and the use of this quantitative paradigm.

This research method provides answers to the questions starting with how many, how much, and to what extent are answered to a reasonable degree (Rasinger, 2013).

3.3 Research Design

The research was quantitative and included cross-sectional studies, through analysis of data collected using online questionnaires. The following advantages were considered in choosing the cross-sectional method: 1) The sample taken was a representation from a whole population. 2) The method was relatively inexpensive and took a reasonable time to conduct; This was based on work by Levin (2006), and 3) There was an intention of generalising from a sample to a

populaton (Fowler, 2009). The respondents were identified through secondary research. A questionnaire was sent to the identified beneficiaries/participants of the various enterprise development programmes for technology-based SMEs doing business with State Owned Enterprises under these initiatives.

Government departments that are involved directly with the State-Owned Enterprises' enterprise development programme who are registered on the Customer Supplier Database (CSD) of the Department of Public Enterprises were approached. The National Treasury maintains the CSD.

3.4 Population and Sample

3.4.1 Population

The population sample was made up of technology-based SMEs collaborating with major State-Owned Enterprises in the technology sector. These technology-based SMEs were identified from the Central Supplier Database which is maintained by the National Treasury of South Africa.

3.4.2 Sample and sampling method

The research focused on a sample of SMEs collaborating with State-Owned Enterprises that are under the Department of Public Enterprises in the disciplines of technology and are registered on the department's Customer Supplier Database (CSD). Owners or Managers of these SMEs were issued with a questionnaire via an e-mail link to the Qualtrics software. The questionnaire required 10 to 15 minutes to complete.

Table 1: Sampling of respondents

Description of respondent type	Number sampled
Technological SME- Manager/Owner	263

(Source: Government Central Supplier Database)

3.5 The research instrument

The research instrument was developed by adopting instruments that had been used in similar but not identical research. Sections sourced these instruments from Kirsten, Vermaark, and Wolmarans (2014) and Vorhies and Morgan (2005) whose Measures of Firm performance were adopted; Cronbach Alpha was 0.66 and Composite reliability was measured at 0.81; these have been modified, tailored and adapted for the purposes and intention of this study. A 7-point Likert scale was used for responses from respondents. Sections from research by Jansen, et al. (2005) were also considered and adapted partially; the questionnaire had a Cronbach's Alpha of 0.87 and Composite Reliability was 0.92 with an average extracted variance of 0.73.

Because of the combination of sections and questions from different instruments, the original validity and reliability may not hold for the combined new instrument. It was therefore very important to re-establish validity and reliability. This was done using data collected in a pilot study carried out by the researcher.

3.6 Procedure for data collection

The researcher collected data from the target population sample through the administration of the research questionnaire. The respondents were contacted via e-mails due the large size of the sample. The questionnaire was made available through a link to Qualtrics software where the survey was stored and could be accessed on the run via smartphones, tablets, laptops and desktop computers without having to print the questionnaire.

3.7 Data analysis and interpretation

The unit of measure was the individual technology-based SMEs and doing business with SOEs. Descriptive statistics, correlation analysis, exploratory factor analysis using principle component analysis and multiple regression analysis were used. Exploratory factor analysis EFA) was used mainly in this study due to its capabilities for refining measures, evaluating construct validity, and in testing hypotheses (Ford, MacCallum, & Tait, 1986). One of the most important reasons for EFA use is that it is more than twice as likely to make high-quality decisions about the factor extraction model and number of factors criteria (Conway & Huffcutt, 2003).The instrument used for this research was a Likert scale from 1-7. This allowed descriptive data to be converted into numeric data. Data was coded, which is the process of reading data and breaking it down into sub-categories and giving labels next to the text. Questions asked allowed the researcher to specify the categories for further analysis. After the data analysis, it is presented by a quantitative display of graphics and charts explaining the statistical findings in Chapter 4 of this report.

3.8 Validity and reliability of research

Reliability and validity are described as tools of an essentially positivist epistemology (Winter, 2000).

Validity means the degree to which a test or measuring instrument measures what it intends to measure. The research instrument was tested during the pilot study on a limited population of targeted respondents. The most cited definition of validity defines it as “An account is valid or true if it represents accurately those features of the phenomena, that it is intended to describe, explain or theorise”, (Hammersley, 1987)

3.8.1 Validity

Blumberg, et al. (2014) define external validity as the data's ability to generalise findings across persons, settings and times. There are different types of validity associated with a research instrument. First, content validity which is the extent to which an instrument measures all aspects of a construct. Second, there is construct validity which is the extent to which an instrument measures the intended construct. Third and lastly, there is criterion validity which is the extent to which a research instrument is related to other instruments which measure the same variables (Heale & Twycross, 2015). The alternative hypothesis is that at least one of the coefficients is not equal to zero: (That is, H_1: $At\ least\ one\ B_i \neq 0, for\ i = 1, 2$).

The regression model would have been invalid if the null hypothesis were true. The results from the ANOVA table show that the p-value of the F-test was 0.000 < 0.05. The null hypothesis is rejected at 5% significance level. The conclusion then confirms that the model is valid. This implies that at least one of the B_is is not equal to zero.

3.4.3 Reliability

The extent to which a research instrument is dependable, consistent, and stable defines reliability. Blumberg et al. (2014) define reliability as the degree to which a measurement is free from random or unstable error. For reliability, analysis and interpretation, this study used Cronbach's Alpha measure. The reliability of scale of each of the five constructs was conducted using Cronbach's Alpha.

Reliability results revealed that there was a good reliability level for each of the constructs Entrepreneurial Capacity (5 items, α = 0.888), SME Performance (4 items, α =0.881), Technological Capacity (5 items, α =0.862), and Absorptive

Capacity (4 items, α =0.834). The Cronbach's Alpha values were above 0.8, which is a fairly high and an indication of a good and reliable scale.

4 CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

The results obtained using the research methodology outlined in Chapter 3 of this report are presented in this chapter. These results explore the research questions and hypotheses posed in Chapter 2 and which emanated from the literature that was reviewed. A revisit of the main problem of this research is that despite the supplier development and localisation policies and programmes put in place by the government through policies and legislation to support SMEs, technology SMEs are not benefitting from these. What is the impact on the performance of SMEs as a result of these policies and programmes? The special focus is SMEs in the technological sector. The research questions arising from this problem are:

1. What is the impact of Entrepreneurial Capacity on technology-based SMEs performance as result of their collaboration with SOEs through government support programmes?
2. What is the impact of Technological Capacity on technology-based SMEs performance as a result of their collaboration with SOEs through government support programmes?
3. What is the mediating effect of SME Absorptive Capacity on the relationship between Government Support (Supplier Development Programmes) and SME Technological Capacity?

There were 263 respondents, but 16 of these had incomplete data. The 16 companies were from the sample. The final sample therefore had 249 Businesses. Figure 2 shows the provinces in which the businesses operate.

4.2 Demographics of Technological SME owners/shareholders

4.2.1 Geographic distribution of Technology-based SMEs

It can be noted that more than half of the businesses had operations in Gauteng (54%), followed by Mpumalanga (16%) and Limpopo (12%).

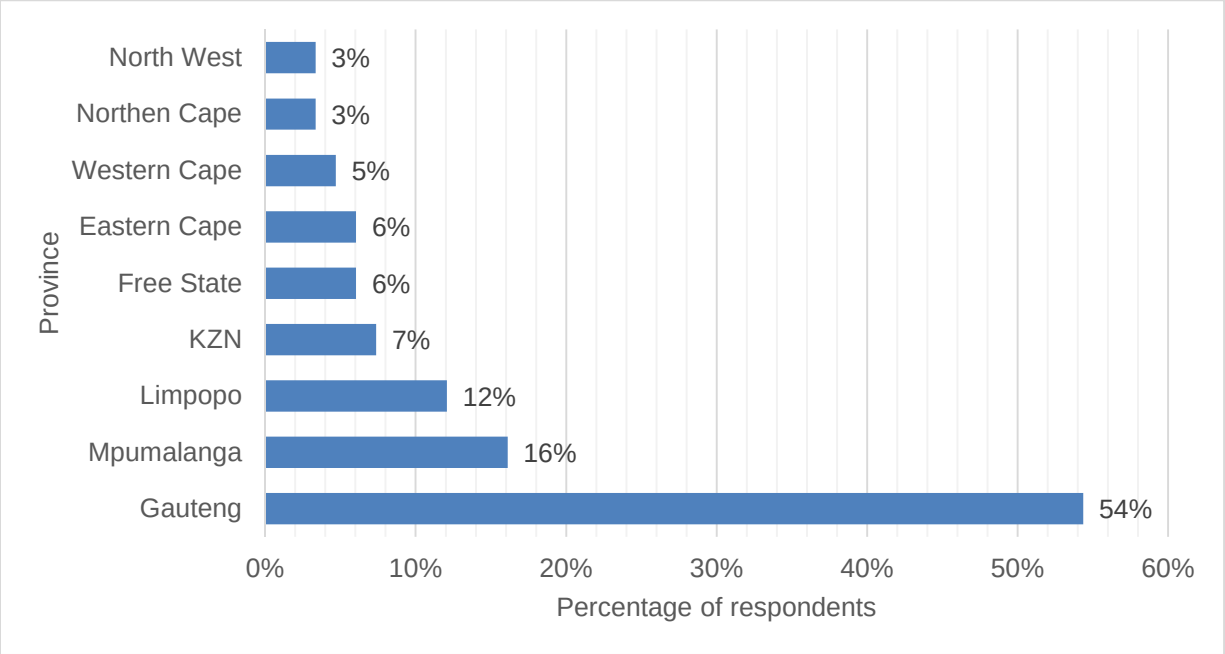

Figure 2: Province

4.2.2 Age distribution of Technology-based SMEs Owners

The age groups of the shareholders of the companies are summarised in the chart shown in Figure 3. A proportion of 45% of the businesses had shareholders in the 36 – 45 years age group, 24% in the 26 – 35 years age group and 15% in the 46 – 55 years age group.

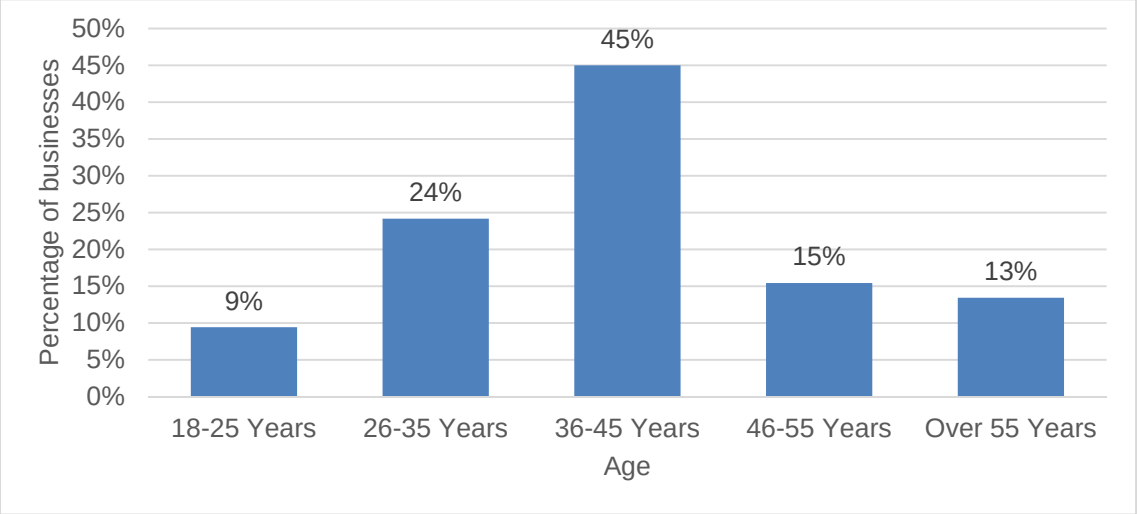

Figure 3: Age groups of shareholders

The sectors in which the businesses operate are shown in Figure 4.

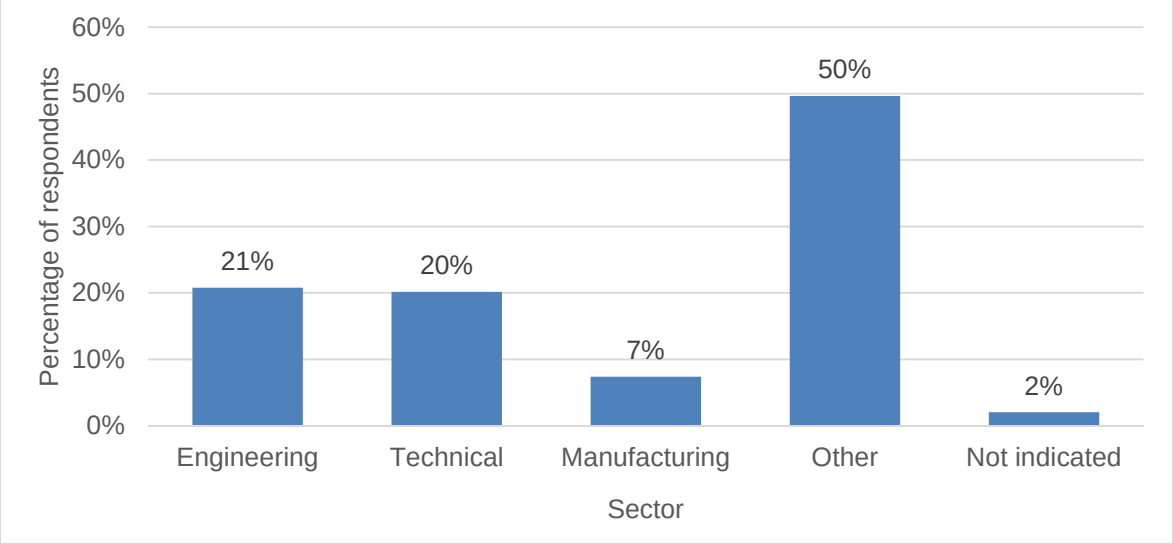

Figure 4: Type of business

4.2.3 Gender distribution of Technology-based SMEs Owners

The gender distribution of the shareholders of the businesses in the sample is summarised below. Most of the businesses had only male shareholders (70%) compared to only 15% that had female shareholders, while 10% had both male and female shareholders.

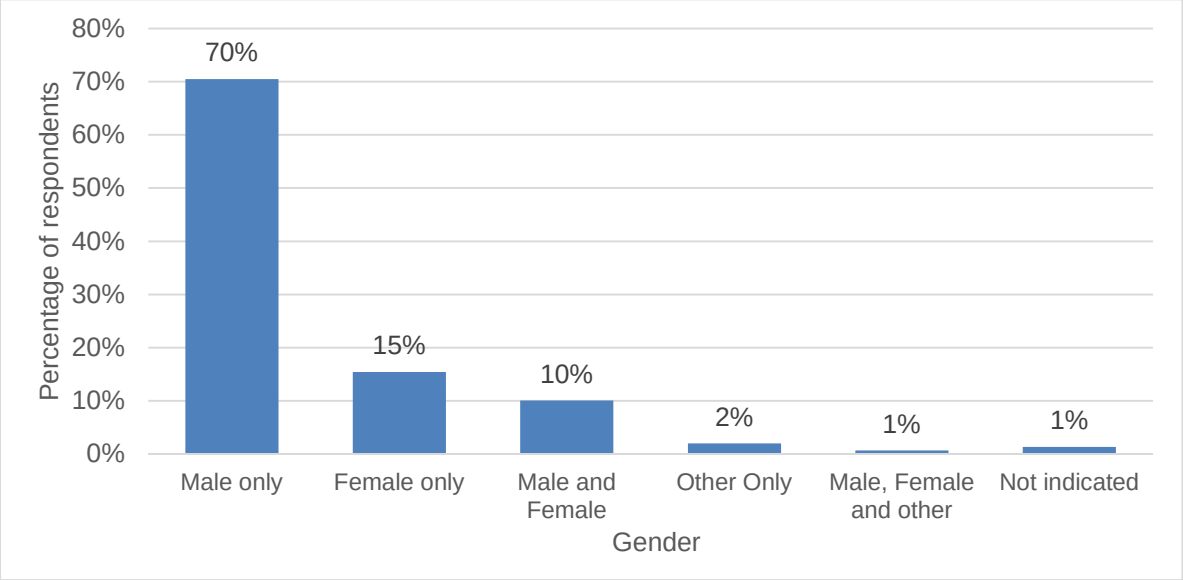

Figure 5: Respondent gender

4.2.4 Ethnicity distribution of technology-based SME owners

Distribution of the businesses by ethnic group of the shareholders is summarised below. One business may have both a White and a Black business shareholder. The assessment was to establish whether there was a shareholder of a certain ethnic group or not among the shareholders of a company. Four in every five businesses had a Black owner while 17% had a White owner and 5% had an Indian owner.

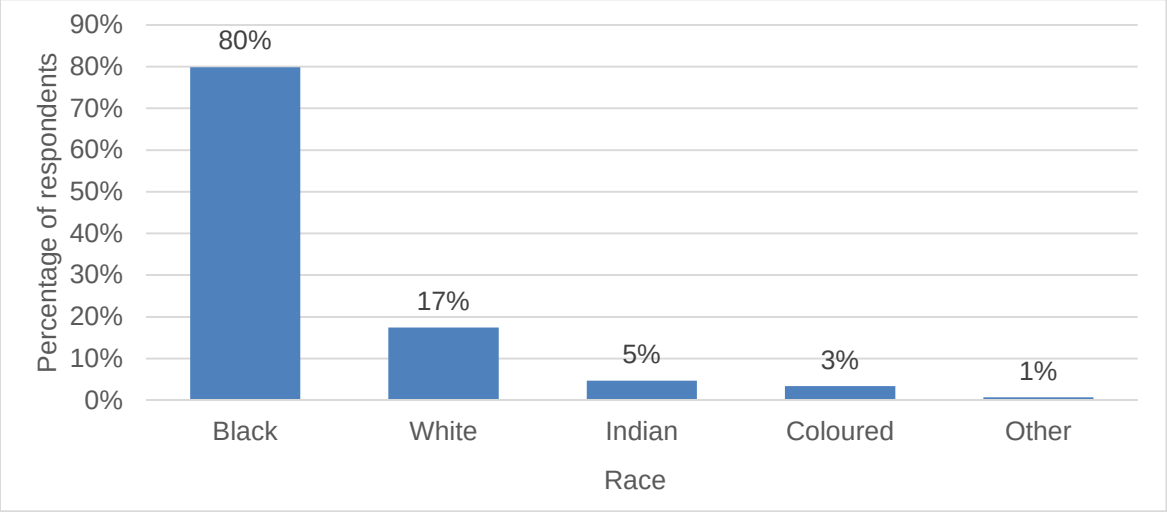

Figure 6: Respondent ethnic group

4.2.5 Educational Levels of technology-based SME Owners

The highest attained level of education for the respondent was established and the results are shown below.

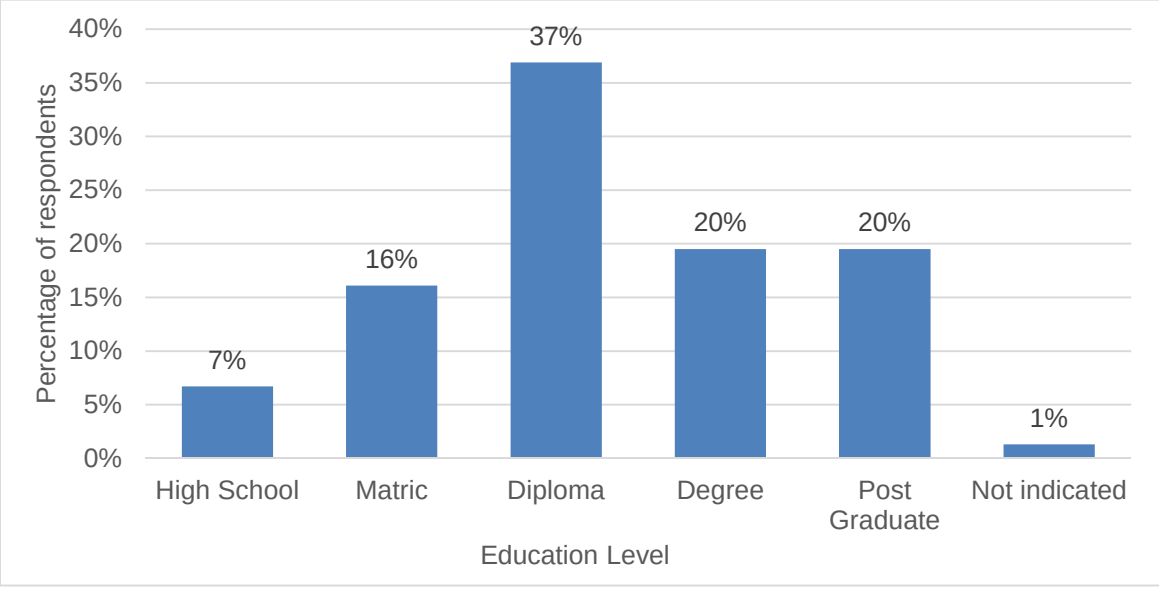

Figure 7: Highest attained education level

4.2.6 Turnover levels of technology-based SMEs

The turnover of the businesses in the sample was established and the results are summarised in Figure 8. Three in every four businesses had a turnover of R1 – R10 million.

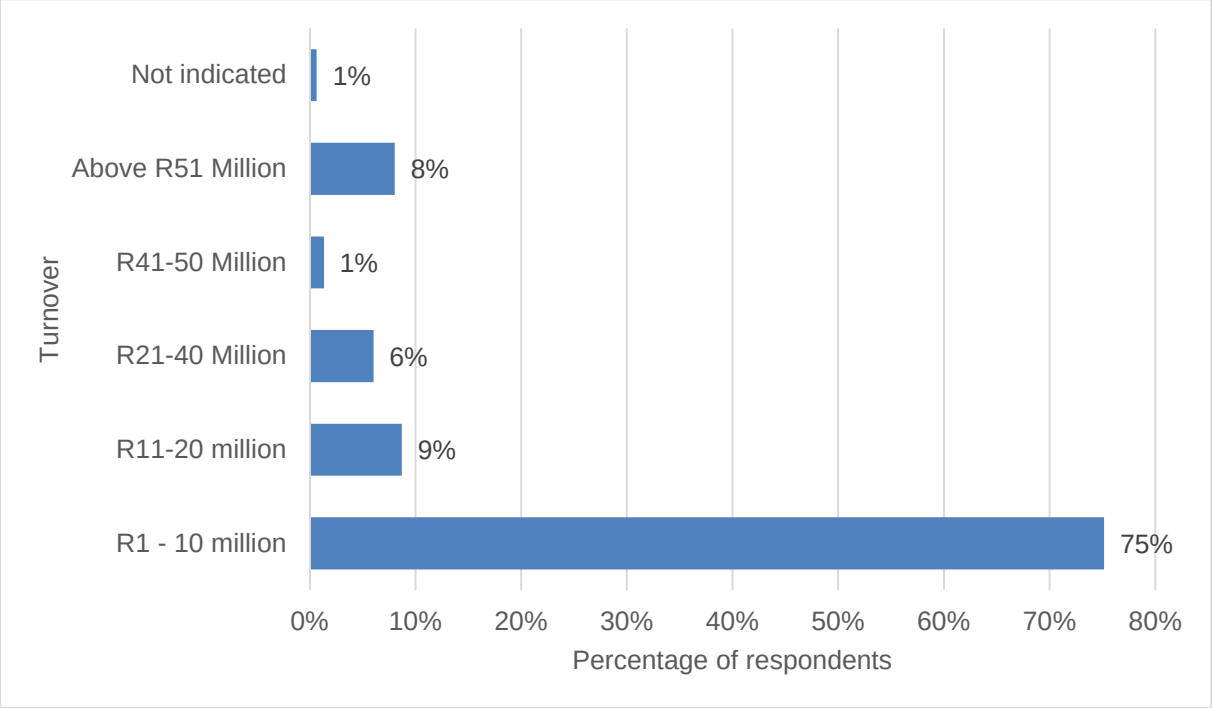

Figure 8: Turnover

4.3 Factor Analysis of Constructs

4.3.1 Measurement Scale

Exploratory factor analysis was conducted for the independent variables put together and also for the dependent variables separately to assess the validity of the scale.

The results for the independent variables are shown below.

Table 2: KMO and Bartlett's Test – Independent variables

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.865
Bartlett's Test of Sphericity	Approx. Chi-Square	1291.042
	df	210
	Sig.	.000

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value of 0.865, is above the minimum required value of at least 0.5. This indicates that the sample was good enough to conduct factor analysis. The Bartlett's Test of Sphericity was significant (p-value = 0.000 < 0.05). This indicates that the items had correlations that were strong enough to enable the conducting of factor analysis.

Table 3: Total Variance Explained - Independent variables

Total Variance Explained							
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.750	41.072	41.072	5.407	38.625	38.625	4.324
2	2.894	20.671	61.743	2.526	18.040	56.664	3.093

3	1.295	9.249	70.992	.951	6.790	63.455	4.422
4	.693	4.948	75.940				
5	.584	4.174	80.114				
6	.577	4.119	84.233				
7	.443	3.166	87.398				
8	.352	2.517	89.916				
9	.303	2.164	92.080				
10	.283	2.018	94.098				
11	.250	1.787	95.885				
12	.214	1.530	97.415				
13	.203	1.450	98.865				
14	.159	1.135	100.000				
Extraction Method: Principal Axis Factoring.							
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.							

The factor analysis for the items measuring the independent variables retained three factors which explained 63.455% of variance in the initial items in the hypothesised constructs. The Scree plot below shows the eigenvalues for each of the 14 prospective factors.

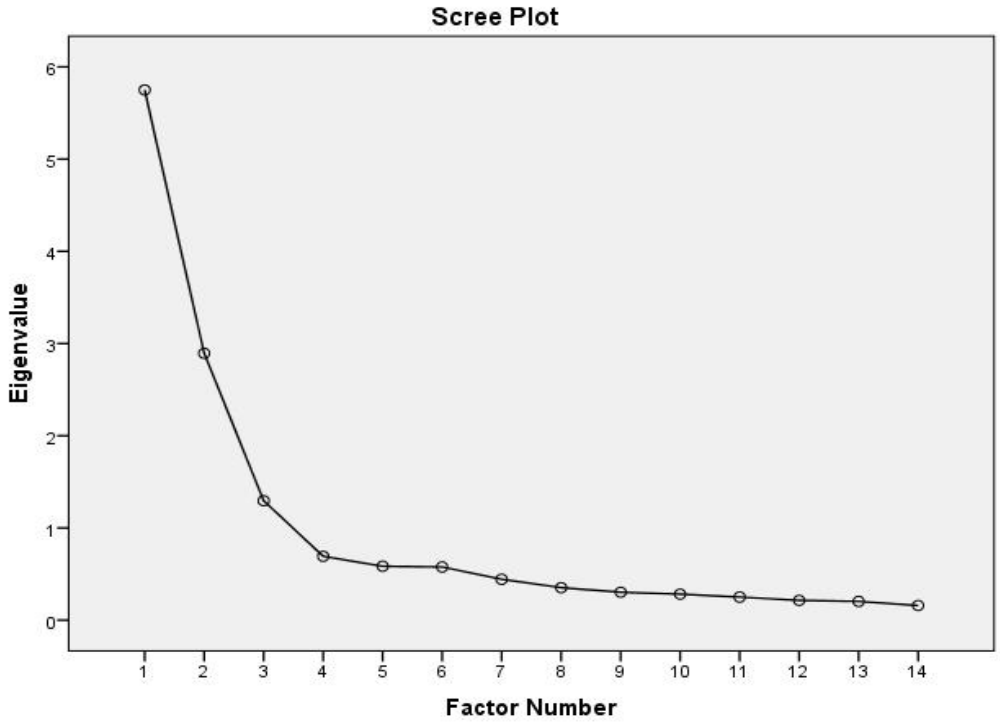

Figure 9: Scree plot- Independent variables

The scree plot confirmed that there were three factors as shown by eigenvalue greater than 1 for factors 1, 2 and 3 and the chart flattens out after the third component. This shows that there were three factors retained as was also shown on the total variance explained.

The factor loadings for items retained within different factors are shown in the table below.

Table 4: Pattern Matrix - Independent variables

Constructs	Pattern Matrix[a]			
		Factor		
		1	2	3
Entrepreneurial Capacity	SP03 There is an adequate number of SOE programmes for new and growing businesses.	.950		
	SP02 SOE programmes aimed at supporting new and growing firms are effective.	.835		
	SP04 The people working for SOE agencies are competent and effective in supporting new and growing firms.	.775		
	SP05 Almost anyone who needs help from an SOE programme for a new or growing business can find what he or needs	.745		
	SP01 A wide range of SOE assistance for new and growing firms can be obtained through contact with a single agency.	.537		
Absorptive Capacity	AS01 In our company ideas and concepts are communicated across-departments.		.838	
	AS02 Our management emphasizes cross-departmental support to solve problems.		.822	

	AS03 In our company there is a quick information flow, e.g., if a business unit obtains important information it communicates this information promptly to all other business units or departments.		.737	
	AS04 Our management demands periodical cross-departmental meetings to exchange new developments, problems, and achievements.		.612	
Technological Capacity	TT01 Our employees have the ability to use collected knowledge from collaborating with the SOEs.			.816
	TT05 There has been improvement of our existing technology due to collaboration with an SOE.			.734
	TT04 There has been transfer of new technologies from an SOE due to the collaboration.			.715
	TT02 Our employees successfully link existing knowledge with new insights.			.666
	TT03 Our employees are able to apply new knowledge in their practical work.			.657
	Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.			
	a. Rotation converged in 5 iterations.			

The items loaded on three independent factors / constructs as was initially hypothesised by the research. The items hypothesised by the research to be under Entrepreneurial Capacity loaded onto that factor, and also those hypothesised to be under Absorptive Capacity loaded onto that one factor.

The minimum factor loading was 0.510 and the highest recorded factor loading was 0.929. This means that further analysis was conducted with three constructs for the independent variables namely; Entrepreneurial Capacity, Technological Capacity, and Adaptive Capacity.

4.3.2 SME Performance

Table 5: KMO and Bartlett's Test - SME Performance

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.798
Bartlett's Test of Sphericity	Approx. Chi-Square	329.539
	df	6
	Sig.	.000

The KMO value of 0.798, was above the minimum required value of at least 0.5. This indicates that the sample was good enough to conduct factor analysis. The Bartlett's Test of Sphericity was significant (p-value = 0.000 < 0.05). This indicates that the items within the SME Performance construct had correlations that were strong enough to enable the conducting of factor analysis.

Table 6: Total Variance Explained - SME Performance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.951	73.772	73.772	2.951	73.772	73.772
2	.531	13.273	87.045			
3	.282	7.041	94.086			
4	.237	5.914	100.000			
Extraction Method: Principal Component Analysis.						

The SME Performance construct retained one factor that explained 73.8% of variance in the initial items in the hypothesised construct. The Scree plot below shows the eigenvalues for each of the four prospective factors.

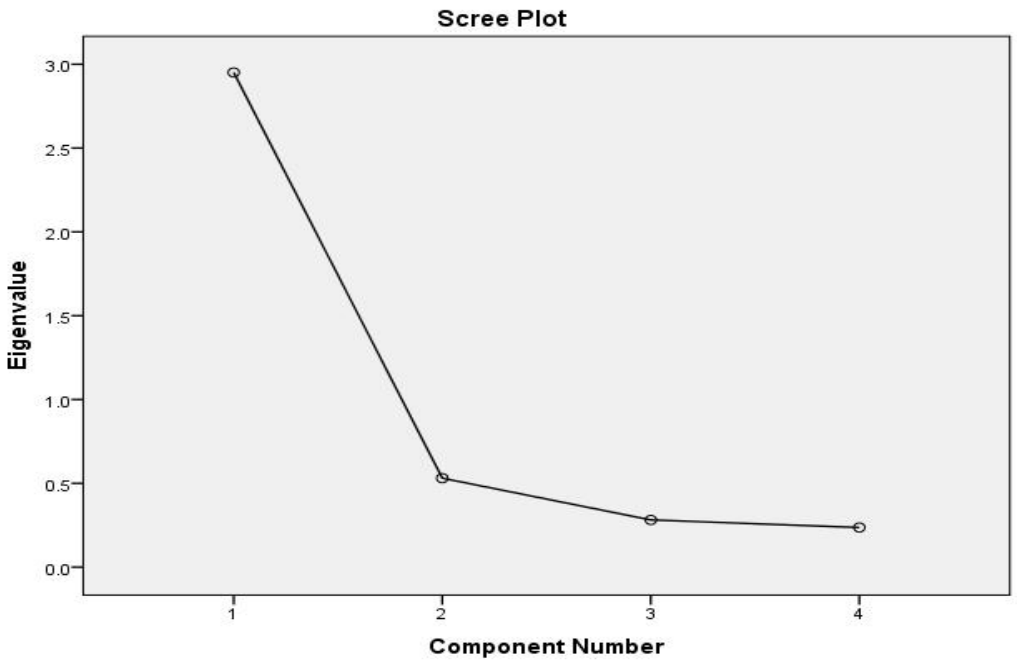

Figure 10: Scree plot - SME Performance

The scree plot confirmed that there was one factor as shown by a very high eigenvalue at component number 1 and the chart flattens out after the first component. This shows that there was one factor retained in the construct as was shown on the total variance explained.

The factor loadings for the various items are shown in the table below.

Table 7: Component Matrix - SME Performance

	Component
	1
FP01 Growth in Turnover	.896
FP02 Return on investment	.878
FP03 Return on equity	.866
FP05 Customer retention	.792
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

The SME Performance construct also retained a factor with a minimum loading of 0.792 and a maximum of 0.896. The values were above the minimum required value of at least 0.4. The results revealed that the items within the SME Performance construct loaded onto one construct and thus the construct is unidimensional. This means that the SME Performance construct was valid.

4.4 Reliability of Scale

Reliability of scale of each of the five constructs was conducted using Cronbach's Alpha. The results are shown below.

Table 8: Reliability Test

Construct	Number of items	Cronbach's Alpha	Reliability Level
Entrepreneurial Capacity	5	0.888	Good
SME Performance	4	0.881	Good
Technological Capacity	5	0.862	Good
Absorptive Capacity	4	0.834	Good

Reliability results revealed that there was good reliability level for each of the constructs Entrepreneurial Capacity (5 items, α = 0.888), SME Performance (4 items, α =0.881), Technological Capacity (5 items, α =0.862), and Adaptive Capacity (4 items, α =0.834), since the Cronbach's Alpha values were above 0.8.

Since each of the five factors were reliable, a summated scale was computed for each construct by calculating the average of items within the respective constructs. The descriptive statistics for the constructs and the correlations among the constructs is shown below.

Table 9: Descriptive Statistics and Pearson's Correlation

	Descriptive Statistics		Correlations			
	Mean	Std. Deviation	1.	2.	3.	4.
1.Absorptive Capacity	5.98	0.98	1			
2.Entrepreneurial Capacity	3.87	1.59	.170*	1		
3.Technological Capacity	4.46	1.595	.369**	.585**	1	
4.SME Performance	5.54	1.17	.397**	.300**	.305**	1

Strongly disagree = 1 and Strongly agree = 7

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Absorptive Capacity (mean = 5.98) was the highest rated followed by SME Performance (mean = 5.54) while Entrepreneurial Capacity (mean = 3.87) was lowest rated construct. The results show that there is a significant correlation between SME Performance and each of Absorptive Capacity ($r = 0.397$, p-value < 0.01), Entrepreneurial Capacity ($r = 0.300$, p-value < 0.01), and Technological Capacity ($r= 0.305$, p-value < 0.01).

4.5 Hypothesis Testing

Multiple regression analysis was conducted with SME Performance as the dependent variable and Entrepreneurial Capacity, and Technological Capacity as the independent variables. The results are shown below.

Table 10: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.372[a]	.139	.121	1.09476	1.868
a. Predictors: (Constant), Entrepreneurial Capacity, Technological Capacity					
b. Dependent Variable: SME Performance					

The model summary shows that Entrepreneurial Capacity, and Technological Capacity explain 13.9% of variation in SME Performance (r-square = 0.139).

The ANOVA table, which was used to assess whether at least one of the independent variables was significant in predicting SME performance is shown below.

Table 11: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.953	3	9.318	7.774	.000[b]
	Residual	173.784	145	1.199		
	Total	201.737	148			
a. Dependent Variable: SME Performance						
b. Predictors: (Constant) Entrepreneurial Capacity, Technological Capacity						

A p-value of 0.000 < 0.05 in the ANOVA table is an indication that at least one of Entrepreneurial Capacity and Technological Capacity is significant in predicting SME performance.

Table 12: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.209	.319		13.174	.000		
	Entrepreneurial Capacity	.205	.078	.280	2.621	.010	.522	1.917
	Technological Capacity	.271	.096	.322	2.823	.005	.455	2.195
a. Dependent Variable: SME Performance								

4.6 Model Diagnostics

4.6.1 Validity of the model

The null hypothesis is that all the coefficients of the independent variables are equal to zero (that is, $H_0: \beta_1 = \beta_2 = \beta_3 = 0$).

The alternative hypothesis is that at least one of the coefficients is not equal to zero: (That is,H_1: $At\ least\ one\ B_i \neq 0, for\ i = 1, 2$)

The regression model is invalid if the null hypothesis is true. The results from the ANOVA table show that the p-value of the F-test was 0.000 < 0.05. Thus, the null hypothesis is rejected at 5% significance level. It is concluded that the model is valid. This implies that at least one of the B_is is not equal to zero.

4.6.2 Testing the Coefficients

For each of the independent variables, test for (i = 1, 2).

$H_0: B_i = 0$

$H_1: B_i \neq 0$

Table 13: Test of significance of coefficients

Variable	Coefficient	P-value
Entrepreneurial Capacity	$B1$	.010
Technological Capacity	$B2$	.005

The results show that there is sufficient evidence to show that Entrepreneurial Capacity (B = 0.205, β = 0.280, p-value = 0.010) and Technological Capacity (B = 0.271, β = 0.322, p-value = 0.005) were linearly related to SME performance since the p-values were less than 0.05.

4.6.3 Testing for violation of error term conditions

The histogram and the normal P-P plot charts below were drawn to assess whether the error terms were normally distributed as required for regression analysis.

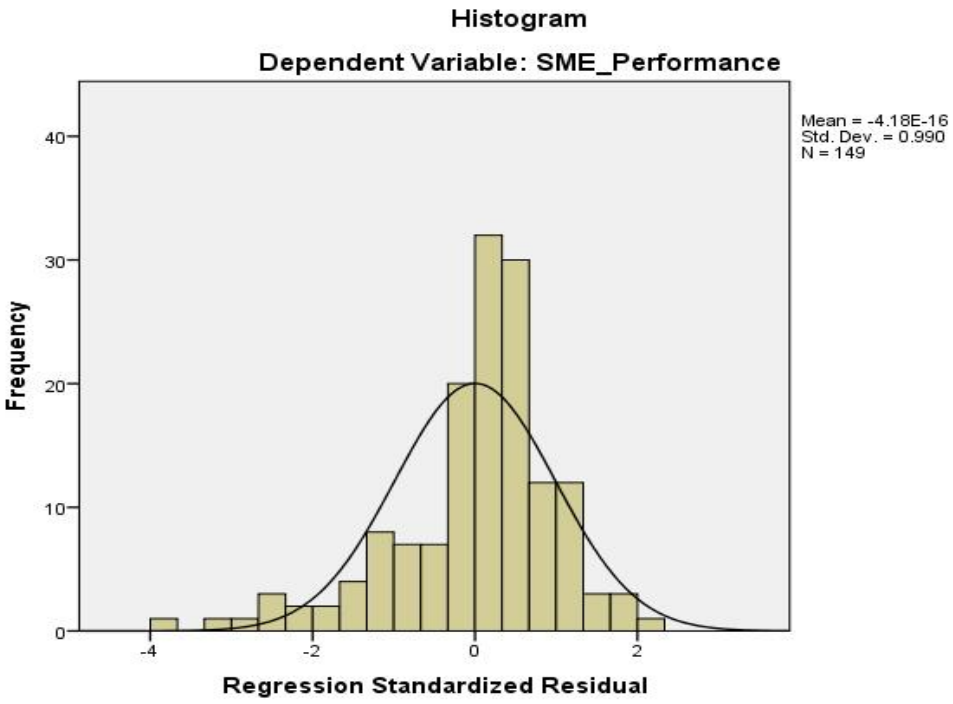

Figure 9: Histogram of SME Performance

As required, the histogram is bell shaped, which suggests that the residuals were indeed normally distributed as required for regression analysis.

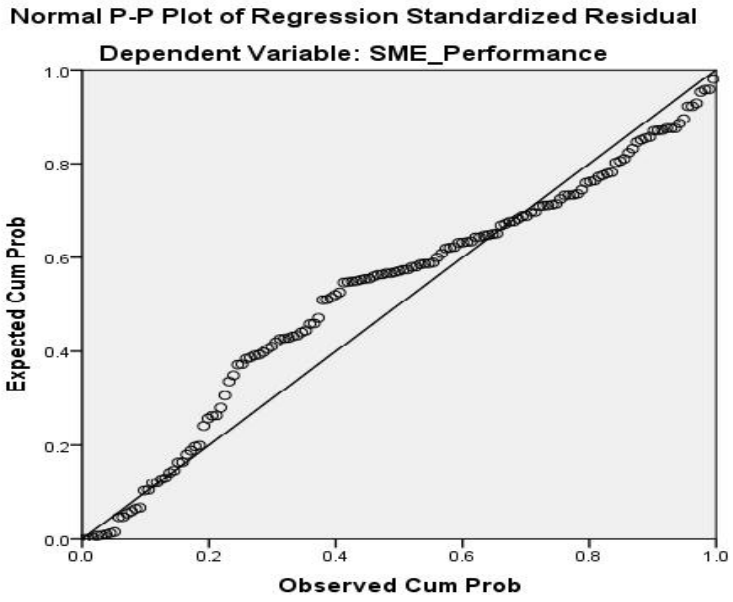

Figure 102: Normal P-Plot of SME Performance

The Normal P-P plot of standardised residuals also shows values very close to the diagonal line, this suggests that the residuals are normally distributed. Thus, the assumption for error terms being normally distributed is met.

4.6.4 Testing for Heteroscedasticity

The error terms were plotted against the fitted values to assess whether there is any pattern in the error terms. The requirement is that the error terms should not show any pattern as they should be constant, a condition called homoscedasticity.

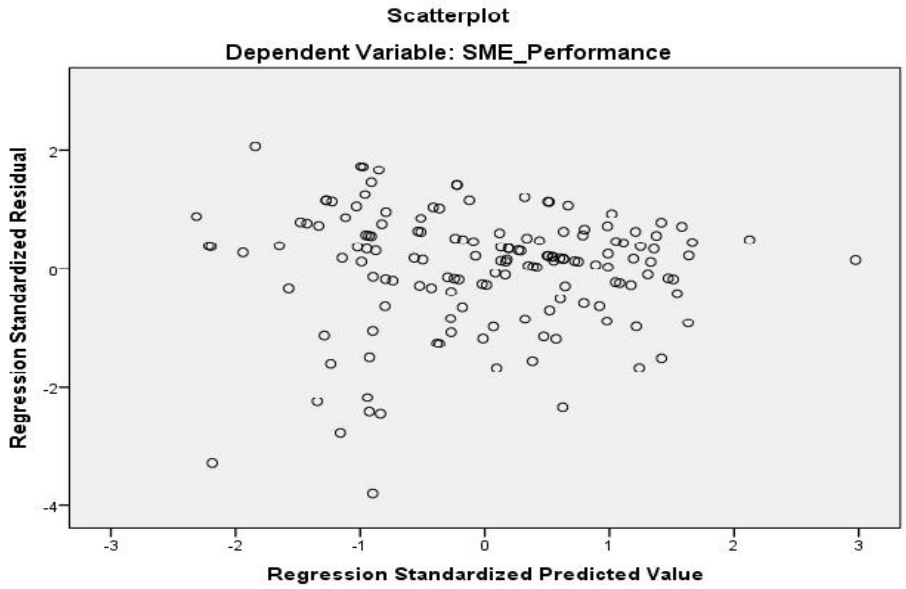

Figure 113: Scatter plot of SME Performance

The error terms were scattered all over, which shows that there was no pattern. This indicates that there was no heteroscedasticity. Hence the assumption of homoscedastic was met.

4.6.5 Test for independence of error terms

The Durbin-Watson, a statistic that provides a test for significant residual auto-correlation, was computed. The Durbin-Watson value was 1.868 as shown in the Model Summary table. This value was within the acceptable range of between 1.4 and 2.6. This means that the error terms were independent as required.

4.6.6 Test for Multicollinearity

The table below shows the Collinearity Statistics.

Table 14: Collinearity Statistics

Independent variable	Tolerance	VIF
Entrepreneurial Capacity	.522	1.917
Technological Capacity	.455	2.195

4.7 Results Pertaining to hypothesis 1: Entrepreneurial Capacity has a positive impact on SME performance.

Ho: There is no relationship between Entrepreneurial Capacity and SME performance.

H1: Entrepreneurial Capacity has a positive impact on SME performance.

The results in the coefficients table show that there is a positive and significant relationship between Entrepreneurial Capacity (B = 0.205, β = 0.280, p-value = 0.010) and SME performance. The relationship is positive since the coefficient for Entrepreneurial Capacity was greater than zero (0.205). The relationship is also significant since the p-value was less than 0.05.

This means that the null hypothesis is rejected in favour of the alternative hypothesis and it is concluded that Entrepreneurial Capacity has a positive impact on SME performance.

4.8 Results Pertaining to hypothesis 2: Technological Capacity has a positive impact on SME performance.

H2: Technological Capacity has a positive impact on SME performance.

H0: There is no relationship between Technological Capacity and SME performance.

The results in the coefficients table show that there is a positive and significant relationship between Technological Capacity (B = 0.271, β = 0.322, p-value = 0.005) and SME performance. The relationship is positive since the coefficient for Technological Capacity was greater than zero (0.271). The relationship is also significant since the p-value was less than 0.05.

This means that the null hypothesis is rejected in favour of the alternative hypothesis and it is concluded that Entrepreneurial Capacity has a positive impact on SME performance.

4.9 Results pertaining to hypothesis 3: Absorptive Capacity Mediates the relationship between Technological Capacity and SME performance.

H3: Absorptive Capacity mediates the relationship between Technological Capacity and SME performance.

H0: Absorptive Capacity does not mediate the relationship between Technological Capacity and SME performance.

There are four conditions that should be met for there to be mediation (Baron & Kenny, 1986). The first condition for testing for mediation is that the independent variable should be significantly related to the dependent variable. The second condition is that the independent variable significantly relates to the mediator. The third condition is that the moderating variable is significantly related to the dependent variable controlling for the independent variable. The final condition is that the addition of the moderator variable to a model with the independent variable will significantly reduce the contribution of the independent variable to the prediction of the dependent variable.

The first condition of the independent variable being significantly related to the dependent variable is not met. Therefore, Absorptive Capacity does not mediate the relationship between Technological Capacity and SME Performance. Therefore, H3 is not supported.

Table 15: Summary of hypotheses

Hypothesis		**Outcome**
H1	Entrepreneurial Capacity has a positive impact on SME performance.	Supported
H2	Technological Capacity has a positive impact on SME performance.	Supported
H3	Absorptive Capacity mediates the relationship between Technological Capacity and SME performance.	Not Supported

4.10 Conclusion of Presentation Results

The research is not based on previous models and hence the testing of the new instrument and factors for validity and reliability were pivotal to the successful execution of this research. The Cronbach Alpha scores were between 0.84 and 0.94 which is much greater than the minimum required score of 0.6. This is an exceptional indication of reliability. With reference to validity, Kaiser-Meyer-Olkin (KMO) measures of between a minimum of 0.539 and maximum of 0.770 were observed. This is a strong indication that the instrument was valid and reliable.

The results with respect to the four hypothesises were outlined. Multicollinearity, Test of significance of coefficients, ANOVA, Descriptive Statistics and Pearson's Correlation amongst independent variables and dependent variables, were tested and presented. The focus is on the correlation between Absorptive Capacity, Entrepreneurial Capacity, Technological Capacity, and SME Performance. For the purpose of this research, a significance level of 5% level is adopted. As highlighted earlier in this chapter, the results show that there is a significant correlation between SME Performance and each of Absorptive Capacity ($r = 0.397$, p-value < 0.01), Entrepreneurial Capacity ($r = 0.300$, p-value < 0.01) and Technological Capacity ($r= 0.305$, p-value < 0.01

The following research hypothesises were revealed with respect to the businesses sampled.

H1 Entrepreneurial Capacity has a positive impact on SME performance.

The conclusion based on the sample was that Entrepreneurial Capacity has a positive impact on the performance of the performance of the SMEs in the technology sector. The alternative hypothesis is confirmed and is therefore accepted.

H2 Technological Capacity has a positive impact on SME performance.

The conclusion based on the sample was that Technological Capacity has a positive impact on the performance of the performance of the SMEs in the technology sector. The alternative hypothesis is confirmed and is therefore accepted.

H3 Absorptive Capacity mediates the relationship between Technological Capacity and SME performance.

The conclusion based on the sample was that Absorptive Capacity has no moderating effect on the relationship between Technological Capacity and the performance of SMEs in the technology sector. The null hypothesis is confirmed and therefore the alternative hypothesis is rejected.

5 CHAPTER 5. DISCUSSION OF RESULTS

5.1 Introduction

This chapter provides an in-depth discussion with respect to the aims of this study to assess technological firms doing business with state owned enterprises (SOEs) in South Africa. The main constructs being assessed against the sampled SMEs' performance are Absorptive Capacity, Entrepreneurial Capacity, Technological Capacity, and SME Performance. These are being assessed through the lens of doing business with SOEs, especially through the supplier development programmes. These factors of technology-based SMEs are analysed within the government supported programmes and policies implemented through SOEs. This is reflected in the conceptual framework in Chapter 2 of this report.

The discussion of the results is structured in the following way:

- Descriptive statistics
- Determinants (underlying factors)
- Research hypothesis
- Summary of the results

5.2 Technology-based SMEs doing business with State Owned Enterprises

5.2.1 Province

The concentration of technology-based SMEs doing business in Gauteng province confirmed the researcher's expectation and is in line with the province's economic reputation as the single largest contributor to **South Africa's GDP** with a **contribution** of 33.8%. This feat has been achieved despite the province having only 1.4% of **South Africa's** land area. The results of this research

indicate that 54% of the SMEs that participated in this study do business with SOEs in Gauteng (54%), followed by Mpumalanga (16%) and Limpopo (12%).

The researcher anticipated that the Western Cape would be second to Gauteng but contrary to that expectation and perception, the research indicated that only 5% of the technology-based SMEs do business with SOEs in Western the Cape Province, well behind Mpumalanga and Limpopo provinces respectively. This could be because the head offices of most SOEs tend to be located in Gauteng.

5.2.2 Age groups of SME owners/shareholders

A proportion of 45% of the businesses had shareholders in the 36 – 45 years age group, 24% in the 26 – 35 years age group and 15% in the 46 – 55 years age group.

This trend is consistent with the findings in the GEM report (2018) which found that the highest prevalence of entrepreneurial activity is among those aged 25–34 years and 35–44 years across all three development phases of the entrepreneurship journey.

5.2.3 Type of business

Technology-based Entrepreneurs who participated in the survey indicated that 21% of them were in engineering, followed by 20% in the provision of technical services, while manufacturing had 7%. This shows the level of manufacturing of technology-based SMEs doing business with SOEs is very low at the moment in South Africa.

5.2.4 Gender of Respondents

The results of the survey indicate that males have a higher affinity and propensity to engage in technological entrepreneurship than their female counterparts. Most of the businesses had only male shareholders only (70%) compared to 15% that

had only female shareholders only. 10% of the participating SMEs had both male and female as shareholders of the business.

5.2.5 Respondent ethnic group

Four in every five (80%) businesses had a Black owner while 17% had a White owner and 5% had an Indian owner. The proportion of black businesses almost mirrors the 2011 census figures which puts the Black population at 76,4%.

5.2.6 Highest attained education level

Most of the business owners had a college diploma (37% of the respondents), 20% had a university degree and also 20% had a postgraduate qualification. Consistent with the literature reviewed, this also confirms that there is a strong relationship between the level of education and the levels of entrepreneurship.

5.2.7 Turnover

The results of the survey indicate that the majority of the SMEs that participated in the survey had a turnover of R10 million or less per annum. This is much lower than the upper limit of SMEs turnover as defined by National Small Business Amendment Act 2004 which defined them as businesses with five or fewer employees and a turnover of less than R64 million. This probably puts most of these amongst the large majority of SMEs that are concentrated on the very lowest end, where survivalist firms are found (Berry, 2002).

5.2.8 Absorptive Capacity

The study concerns itself with the moderating effect of Absorptive Capacity on the relationship between Technological Capacity and SME performance. Contrary to the original assumption made by the researcher that there was a moderating effect of Absorptive Capacity on the relationship between Technological Capacity and SME performance, the results indicate the complete

opposite. Basic conditions for mediation were not met. The first condition of the independent variable being significantly related to the dependent variable is not met. The four conditions are as outlined in Chapter 4 of this study.

Other researchers who had similar findings in relation to Absorptive capacity echo this. Despite the key role that it plays in determining firms' capability to access and make use of external knowledge, there is little evidence provided about this important determinant of knowledge acquisition in the context of SMEs (Muscio, 2007).

5.2.9 Technological Capacity

The sample results show that Entrepreneurial Capacity has a positive impact on SME performance. The results show that the coefficients have a positive and significant relationship Entrepreneurial Capacity (B = 0.205, β = 0.280, p-value = 0.010). Existing literature postulates that Technological Capacity, by contributing both to exploratory and exploitative learning promotes ambidexterity. This helps the firms to identify, evaluate and select external information and technologies for adoption (Tzokas, Kim, Akbar, & Al-Dajani, 2015). The results of this study concur with other researchers who established that there is a positive relationship between technological capacity and SME performance (Tzokas et al, 2015).

5.2.10 Entrepreneurial Capacity

Entrepreneurial Capacity has a positive impact on SME performance. This is consistent with existing literature (Claryssea, Tartari, & Salter, 2011).

The results in the coefficients table show that there is a positive and significant relationship Entrepreneurial Capacity (B = 0.205, β = 0.280, p-value = 0.010) and SME performance. The relationship is positive since the coefficient for Entrepreneurial Capacity was greater than zero (0.205). The relationship is also significant since the p-value was less than 0.05.

5.2.11 SME Performance

The results of the study show that there is a positive relationship between two of the constructs (Entrepreneurial Capacity and Technological Capacity) and the performance of the SMEs. This is consistent with literature reviewed (Tzokas,et al, 2015).

The research though, could not establish any mediation effect of the SMEs Absorptive Capacity on the relationship Technological Capacity and SME performance.

5.3 Discussion of Hypothesis 1 to 3

The study examines the relationship between independent variables, Entrepreneurial Capacity and Technological Capacity and the dependent variable SME performance. In addition to that, the mediating role or effect of Absorptive Capacity and the relationship between Technological Capacity and SME performance is also tested. The study examines these relationships in the framework of collaborative relationships between technology-based SMEs and state-owned enterprises (SOEs).

The impact of these relations on the performance of SMEs is analysed in conjunction with extant literature.

H1: Entrepreneurial Capacity has a positive impact on SME performance.

The empirical results of this study indicate that entrepreneurial capacity has a positive impact on the performance of SMEs. This is consistent with existing literature, which identifies Entrepreneurial Capacity, which is also known as the opportunity recognition capacity, as the single most important variable that determines the success or failure of entrepreneurial ventures (Claryssea, et al., 2011). The perceived support and stability offered by collaborating with the huge SOEs tend to encourage the SME owners to recognise opportunities outside their relationship with SOEs and grow their businesses further.

The results of this study reinforce what is generally expressed in existing literature.

H2: Technological Capacity has a positive impact on the SME performance

Technological Capacity or capability has been associated with the performance of technological firms, in this case, technology-based SMEs. Existing literature has established that entrepreneurial ventures with strong technological capabilities tends to perform better especially in collaborative relationships (Tzokas, et al., 2015).

The literature reviewed in this regard is in line with the results of this study. The study by this researcher indicated that indeed, Technological Capacity is positively related to the SME performance. The more the Technology Capacity an SME has, the better are its chances of being successful.

H3: Absorptive Capacity mediates the relationship between Technological Capacity and SME performance.

Other studies have confirmed the moderating role of Absorptive Capacity on Performance (Tzokas, et al., 2015). This is contrary to the results of this study on SMEs doing business or collaborating with SOEs in the technological sector. For mediation to exist there are four conditions that have to be met. In this study, the first condition of the independent variable being significantly related to the dependent variable was not satisfied. This indicates that in this study, Absorptive Capacity did not have any mediating effect on the relationship between Technological Capacity and SME performance.

The findings of the study are contrary to the expectations of the researcher. The researcher anticipated that the ability to assimilate and emulate the competences of the larger established enterprises (SOEs) would result in the smaller partner (SMEs) being able to leverage these strengths and thereby improve their performance. The results of this study turned out to be contrary to existing

literature on SMES collaborating with SOEs in the technological space. This could be a result of the quality of the SMEs absorptive capacity (Muscio, 2007).

Other researchers argue that this could be due to the safeguarding of dynamic capabilities of each of the parties involved. Each party would be protecting itself from losing its competitive advantage to the collaborator or partner (Sawers, Pretorius, & Oerlemans, 2008).

5.4 Conclusion of results discussion

The study examines the relationship between independent variables Entrepreneurial Capacity and Technological Capacity on the dependent variable SME performance. The study also assesses the mediating effect of Absorptive Capacity on the relationship between Technological Capacity and SME performance. There was a positive and significant relationship between the independent variables Entrepreneurial Capacity (B=0,205 p-value 0,005) and Technological Capacity (B = 0,271 p-value = 0,005) with the dependent variable SME performance. The study found that Absorptive Capacity does not have a mediating effect on the relationship between Technological Capacity and SME performance.

Table 16: Summary of Discussion

Main Construct	Hypothesis		Outcome	Literature
Entrepreneurial Capacity	H1	Entrepreneurial Capacity has a positive impact on SME performance.	Supported	(Claryssea, Tartari, & Salter, 2011) (Shamsuddin, Ismail, Sarkawi, Jaafar, & Rahim, 2017)
Technological Capacity	H2	Technological Capacity has a positive impact on SME performance.	Supported	(Tzokas, Kim, Akbar, & Al-Dajani, 2015) (Doh & Kim, 2014)
Absorptive Capacity	H3	Absorptive Capacity Mediates the relationship between Technological Capacity and SME performance.	Not Supported	(Tzokas, Kim, Akbar, & Al-Dajani, 2015)

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the conclusions of this study. A summary of the literature is presented together with the summary of the findings and discussions in the preceding two chapters, namely, Chapter 4 and Chapter 5. Finally, yet importantly, is the section that addresses the recommendations, limitations and implications of this study for public policy makers, small business owners, technology transfer practitioners and funding institutions, both public and private, and lobby groups for small business enterprises. Finally, this chapter discusses areas and suggestions for future research.

6.2 Conclusion of the study

In light of the research problem of this study and the literature reviewed, the following questions arose and the study makes an attempt to answer them.

1) What is the impact of Entrepreneurial Capacity on performance of technology-based SMEs as a result of their collaboration with SOEs through government support programmes?
2) What is the impact of Technological Capacity on the performance of technology-based SMEs as result of their collaboration with SOEs through government support programmes?
3) What is the mediating effect of SME absorptive Capacity on the relationship between Government Support (Supplier Development Programs) and SME technological Capacity?

The effectiveness of the SMEs support programmes put in place by the government to stimulate growth, sustainability and improved performance of SMEs has been met with differing results from place to place across the globe. Existing literature in the South African landscape has focused mainly on incubation. Very little exists in trying to assess the impact of the collaboration with

SOEs on the performance of the SMEs. There has been literature on technology incubators and incubated SMEs which are more start-ups and not established businesses. There has been sparse literature on established technology-based SMEs.

The results of the research confirmed the researcher's assumed position on the relationship between Entrepreneurial Capacity and SME performance. There is a relationship between these two constructs and the results confirm that the Entrepreneurial Capacity has a positive impact on SME performance. The conclusion based on the sample was that Entrepreneurial Capacity has a positive impact on the performance of the performance of the technology-based SMEs. The research result confirmed the alternative hypothesis and therefore is accepted.

Consistent with the researcher's assumed position that there is a relationship between Technological Capacity and technological SME performance, the research results showed that the relationship does exist, and it is a positive one. The conclusion based on the sample was that Technological Capacity has a positive impact on the performance of the performance of the technology-based SMEs. The research results confirmed the alternative hypothesis and therefore, make it accepted.

The researcher's assumed position on the mediating effect of Absorptive Capacity on the SMEs' Technological Capacity was repudiated by the research results. The alternative hypothesis was rejected in favour of the null hypothesis. The research results failed on the four conditions that should be met for there to be mediation. As alluded to in Chapter 5 of this research, the first condition for testing for mediation is that the independent variable should be significantly related to the dependent variable. The second condition is that the independent variable significantly relates to the mediator. The third condition is that the moderating variable needs to be significantly related to the dependent variable controlling for the independent variable. The final condition is that the addition of the moderator variable to a model with the independent variable will significantly

reduce the contribution of the independent variable to the prediction of the dependent variable.

6.3 Contributions of the study

The results of the data analysis from this research (empirical evidence) provide significant insights and thereby contribute to the extant literature and body of knowledge in some of the following ways:

a) The government finds it easy to implement its business policies through state-owned companies. In most African economies, the government has budgetary and fiscal spending that is larger than that of the private sector. The abundance of resources places the government at a vitally important position to support technology-based SMEs.
b) There has been very little research on the studies focusing on the technological firms doing or collaborating in business with state-owned companies except start-up firms housed at state-owned incubators.
c) Technology-based SMEs should not be assessed and approached in the same manner as other types of SMEs. They have potential to grow exponentially in a short space of time and have high impact on the economy and assist in the alleviation of socio-economic challenges of a country.
d) Policy makers should look deeper into identifying underlying causes to the marginal participation of females in the technological sector. Despite legislation that encourages inclusive participation; empirical evidence from the study shows dismal levels of female participation.

6.4 Implications and recommendations

a) Technology-based SMEs should be encouraged and supported to grow beyond the subsistence level. This sector has the potential to contribute in a significant way towards economic growth, poverty reduction through employment creation. About 75% of the SMEs that participated have an

annual turnover of R10 million or less. This makes them comparable to nascent entrepreneurs from developed nations.

b) Females should be encouraged to participate in the technological sector. This sector has the potential to turn into a billion Rand industry and contribute substantially to the country's gross domestic product while addressing socio-economic challenges like unemployment and underdevelopment.

c) The quality of the technology-based entrepreneurship needs to be improved. There is room for improving the level of technology that the SMEs can participate and grow in. There is room to grow the SMEs by assisting them to not rely on state-owned enterprises, but rather explore the growth strategies of getting their products and services to new markets and even going regional and global.

d) Ease of technology transfer. Big companies should make it easier for smaller companies that they collaborate or do business with to learn and acquire more technological knowledge that will empower them to be able to enter into new markets.

6.5 Suggestions for Future Research

a) The study focused on the established SMEs and their resultant performance from collaborating or doing business with state-owned companies. This gives one side of the story of this relationship. There is a need to also research on the impact of this relationship from the SOEs point of view. There are always three sides to a story, i.e. their side, our side, and the truth. There is a need to establish, through research, who is receiving the proverbial "short end of the stick" in these business collaborations.

b) The findings of the study indicate that a very outsized proportion of males involved in the technological sector compared to their female counterparts. There is a need to carry out more research more on the

reasons or causes of low female participation in the technological in sector in South Africa so that appropriate measures can be put in place in order to motivate and facilitate the removal of any barriers that may be found to exist to the female technological entrepreneur.

c) There is room for further empirical exploration to establish a common ground where future policies and programmes result in mutually beneficial relationships between technology-based SMEs and SOEs. The study can be applied to the big corporations in the private sector and their relationships with technology-based SMEs. Technology-based SMEs that intend to do business with state-owned enterprises need to have a deeper understanding of these organisations so that they offer relevant solutions that add value to their clients.

d) The study can also be extended to the relationship between technology-based SMEs and the private sector. The benefits accruing to both parties and challenges faced need to be researched and solutions offered on the best way forward in ensuring the sustainability of both parties.

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