

UNIVERSITY OF KWAZULU-NATAL

**Investigating predictors for the successful implementation of open innovation: A case of
small and medium enterprises in KwaZulu-Natal, South Africa**

By

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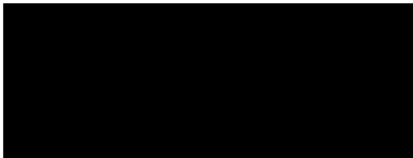
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DEDICATIONS

This research work is dedicated to my mother and late aunt Mrs Rev Daisy Hohoza Dube. They laid a strong foundation in me. I continue to live by your humble encouraging words.

ABSTRACT

Small and medium enterprises (SMEs) play a major role in South Africa's economic growth. These entities are faced with managerial issues that pose dangers to their survival. Open innovation (OI) emerged as a critical business strategy used predominately by large businesses to improve performance. It is defined as a distributed innovation process based on purposively managed knowledge flows across organisational boundaries, using pecuniary and non-pecuniary mechanisms compatible with the organisation's business model. Studies shows that the OI concept is not widely used by SMEs in South Africa. Specifically, the study aimed at understanding whether internal knowledge, external knowledge, and strategic networks influence the successful implementation of OI in SMEs in KwaZulu-Natal, South Africa. A case study approach was used to study SMEs in Pietermaritzburg. Convergent parallel mixed methods approach was adopted where qualitative and quantitative methods were used to collect data. Purposive and convenience sampling were utilised as non-probability approaches to select participants from a sample of 260 SMEs owners, managers/supervisors, and employees.

The findings indicated that there is correlation between internal knowledge, external knowledge, and strategic networks in influencing the successful implementation of OI in SMEs. The findings also identified dominant factors that affect full adaptation of OI by SMEs. The factors include lack of leadership, adaptation capacity, patent and motivation issues, lack of finance, and lack of collaboration. Given the findings of this study, SMEs are encouraged to embrace OI principles where collaborative and strategic partnerships are formed with other businesses to complement internal innovation processes for sustainable growth. Further research should be done to identify strategic and sustainable partnership models for the application of OI in SMEs. Government and policy makers are encouraged to craft and enact policies that incentivise and encourage SMEs partnerships through OI initiatives. Given the inter-relationships between internal knowledge, external knowledge, and strategic networks in predicting successful application of OI in SMEs, the study encourages SMEs owners to adopt OI to deal with failure rate and improve their innovation processes. Embracing OI will assist SMEs deal with sustainability issues as innovative processes and new partnerships are forged to boost operations.

TABLE OF CONTENTS

DECLARATION	i
ACKNOWLEDGEMENTS	ii
ABSTRACT.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ACRONYMS	xiii
CHAPTER ONE	1
INTRODUCTION AND BACKGROUND TO THE STUDY	1
1.1 Introduction.....	1
1.2 Background and context of study	1
1.3 Research problem.....	3
1.4 Research objectives.....	3
1.5 Research questions.....	3
1.6 The rationale of the study	4
1.7 Overview of research methodology	5
1.8 Limitations of the research study	6
1.9 Structure of the dissertation	6
1.10 Summary of chapter one	8
CHAPTER TWO	10
LITERATURE REVIEW: THE CONCEPT OF SMALL AND MEDIUM ENTERPRISES	10
2.1 Introduction.....	10
2.2 The concept of Small and Medium Enterprises (SMEs)	10
2.2.1 International definition of SMEs.....	12
2.2.2 The South African definition and classification of SMEs.....	14
2.3 The Significance of SMEs in South Africa.....	17
2.4 SMEs and Innovation in global context.....	18
2.5 Open innovation in SMEs context	19
2.5.1 Interactions with suppliers	21
2.5.2 Interactions with direct and indirect customers.....	21
2.5.3 Interactions with universities or colleges	22
2.5.4 Interfaces with industry experts	22
2.6 Open innovation in small and medium enterprises (SMEs) in South Africa.....	22

2.7 Implementation of open innovation in SMEs	24
2.8 Open innovation challenges to Small and medium enterprises	25
2.8.1 Selecting the partners	26
2.8.2 Management and financial constraints	27
2.8.3 Level of absorptive and desorptive capacity issues	29
2.8.4 Organisational cultural issues.....	30
2.8.5 Collaboration strategic constraints	31
2.8.6 Intellectual property (IP) issues.....	32
2.9 Summary of the chapter two	33
CHAPTER THREE	34
LITERATURE REVIEW: THE CONCEPTUALISATION OF OPEN INNOVATION	34
3.1 Introduction.....	34
3.2 The Concept of innovation.....	34
3.3 The concept of closed innovation	37
3.4 The conceptualisation of open innovation	39
3.5 The archetypes of open innovation	44
3.5.1 Outbound (Inside-out) open innovation	45
3.5.2 Inbound (Outside-in) open innovation	46
3.5.3 Coupled open innovation	47
3.6 The implementation of the open innovation paradigm	49
3.6.1 The framework for implementing open innovation	50
3.7 The significance of open innovation.....	54
3.7.1 Use of various triple-helix role players	54
3.7.2 Focused research and development.....	55
3.7.3 Increased commercialisation rate	56
3.10 Measurements of open innovation	56
3.11 Gaps in the existing open innovation literature	58
3.12 Summary of chapter three	59
CHAPTER FOUR.....	61
RESEARCH METHODOLOGY.....	61
4.1 Introduction.....	61
4.2 Research processes.....	61
4.3 Research philosophy	65
4.4 Four main types of research paradigms	67

4.4.1 Postpositivism philosophy	68
4.4.2 Realism philosophy	69
4.4.3 Constructivism philosophy.....	69
4.4.4 Transformative philosophy	70
4.9 Sampling	71
4.9.1 The Target population	71
4.9.2 The Sample size	72
4.4.5 Pragmatism philosophy	72
4.5 A comparison of research philosophies	74
4.6 The research paradigm for this study	76
4.7 Research objectives.....	78
4.8 Research design	79
4.8.1 Mixed methods approach	80
4.8.1.1 Mixed methods design for this study.....	81
4.9.3 Sampling techniques	82
4.9.3.1 Purposive/judgemental sampling.....	82
4.9.3.2 Convenience sampling.....	82
4.9.3.3 Stratified sampling.....	82
4.9.3.4 Cluster sampling	83
4.9.3.5 Systematic sampling	83
4.9.4 Sampling techniques for this study	83
4.10 Data collection methods.....	84
4.10.1 Primary data	84
4.10.2 In-depth interviews.....	85
4.10.2.1 The structure of the in-depth interview guide used	86
4.10.3 The questionnaire	87
4.10.3.1 The design of the questionnaire.....	87
4.11 Data analysis	88
4.11.1 Qualitative data analysis procedure.....	89
4.11.2 Descriptive statistics.....	90
4.11.3 Inferential analysis	91
4.11.3.1 Principle component Analysis (PCA).....	92
4.11.3.2 The Kruskal-Wallis test.....	92
4.11.3.3 Pearson Correlations test	93

4.12 Data quality control.....	94
4.12.1 Reliability	95
4.12.2 Validity.....	96
4.12.2.1 Internal validity.....	96
4.12.2.2 Construct validity	96
4.12.2.3 Ecological validity.....	97
4.12.2.4 External validity	97
4.13 Pilot testing	97
4.14 Ethical requirements	97
CHAPTER FIVE	100
PRESENTATION AND INTERPRETATION OF EMPIRICAL FINDINGS.....	100
5.1 Introduction.....	100
5.2 Response rate	101
5.3 Section A: Demographic.....	102
5.3.1 Gender representation	103
5.3.2 Participants' age	103
5.3.3 Participants' race.....	103
5.3.4 Highest education/ qualification.....	104
5.4 Business details.....	105
5.4.1 The size of companies from which the participants were drawn	105
5.4.2 Form of business	106
5.4.3 Industry type.....	106
5.4.4 The number of years the participants had been working in the organisation.....	107
5.5 Reliability results	108
5.6 Validity test results	108
5.7 Analysis of the research questions.....	111
5.7.1 Construct formation with factor analysis	111
5.7.2 Pearson correlations results.....	112
5.7.3 Kruskal Wallis H test	113
5.7.4 Tests for independence.....	115
5.9 Quantitative Results on current knowledge of open innovation in SMEs.....	117
5.10 Section B: Findings from qualitative and quantitative data pertaining to the research objectives	118
5.10.1 Research objective one:.....	118

5.10.1.1 Qualitative results: The influence of internal knowledge implementation of OI	119
5.10.1.2 Quantitative results – The influence of internal knowledge on the implementation of OI	120
5.10.2 Research objective two:	121
5.10.2.1 Insights from qualitative data- external knowledge on the implementation of OI.	121
5.10.2.2 Findings from the quantitative findings regarding external knowledge on the implementation of OI	123
5.10.3 Research objective three:	124
5.10.3.1 Insights from qualitative data with regard to the influence of strategic networks on the implementation of OI	124
5.10.3.2 Quantitative results- Influence of strategic networks on implementation of OI	126
5.10.4 Research objective four:	128
5.10.4.1 Qualitative insights:	128
5.10.4.2 Findings from quantitative data:	129
5.10 Conclusion of chapter five	131
CHAPTER SIX	133
DISCUSSION OF RESEARCH FINDINGS	133
6.1 Introduction	133
6.2 Participants' knowledge of open innovation	133
6.3 Discussions in relation to the research objectives	135
6.3.1 Research objective One:	135
6.3.2 Research objective two:	138
6.3.3 Research objective three:	141
6.3.4 Research objective four:	143
6.4 Conclusion of chapter six	144
CHAPTER SEVEN	146
CONCLUSIONS AND RECOMMENDATIONS	146
7.1 Introduction	146
7.2 Summary of key findings	146
7.3 Recommendations	148
7.3.1 Recommendations for future research	148
7.3.2 Practical managerial recommendations	149

7.4 Contribution to the body of knowledge	149
7.5 Limitations of the study	150
7.6 Areas for future research.....	151
7.7 Conclusion of chapter seven	152
REFERENCE LIST	153
APPENDIX A. IN-DEPTH INTERVIEW GUIDE.....	180
APPENDIX B. RESEARCH QUESTIONNAIRE	183
APPENDIX C. CONSENT FORMS	188
APPENDIX D. ETHICAL CLEARANCE CERTIFICATE	191

LIST OF TABLES

Table 2.1. UNIDO's qualitative indicators in defining SMEs	12
Table 2.2 European SMEs classification	13
Table 2.3 South Africa classification of Small and Medium enterprises	15
Table 3.1 The progression of the definition of open innovation.....	40
Table 3.2 Trends in the interpretation of OI across different sectors	44
Table 3.3 The dimensions of coupled open innovation processes	48
Table 3.4 Open innovation modes	54
Table 4.1 Research paradigms	68
Table 4.2 A comparison of research philosophies	75
Table 5.1 Key to code names of participants	100
Table 5.2 Response rate	101
Table 5.3 Summary of the demographic profile of the study sample (participants).....	102
Table 5.4 Summary of business details.....	105
Table 5.5 Reliability results	108
Table 5.6 AVE and CR test results	110
Table 5.7 Discriminant validity test results	111
Table 5.8 Construct correlation results	113
Table 5.9 Mean ranks.....	114
Table 5.10 Kruskal-Wallis test results	114
Table 5.11 Current knowledge and experience of open innovation	115
Table 5.12 Current knowledge and experience on open innovation.....	117
Table 5.13 The influence of internal knowledge on implementation of OI.....	119
Table 5.14 The influence of internal knowledge	120
Table 5.15 The influence of external knowledge on implementation of OI.....	121
Table 5.16 The influence of external collaboration factors	123
Table 5.17 The influence of strategic networks on implementation of OI	125
Table 5.18 The influence of strategic networks on the implementation of OI	127
Table 5.19 Other innovation frameworks used by SMEs	128
Table 5.20 Other innovation frameworks used by SMEs	130

LIST OF FIGURES

Figure 1.1. Structure of the study.....	7
Figure 3.1 Constructs of innovation.....	36
Figure 3.2 Closed innovation model.....	38
Figure 3.3 Open innovation model	41
Figure 3.4 Three archetypes of open innovation processes	45
Figure 3.5 A four-phase process model for leveraging external sources of innovation	51
Figure 4.1 The research ‘onion’	63
Figure 4.2 Developing the research process	67
Figure 4.3 Research paradigm for this study	78
Figure 4.4 The Triangulation mixed methods design	81
Figure 4.5 Steps used in the sampling process	71
Figure 4.6 Data collection instruments used.....	85

LIST OF ACRONYMS

AVE	Average Variance Extracted
CBS	China Bureau of Statistics
EIBA	Export-Import Bank of India
EU	European Union
FMCG	Fast-Moving Consumer Goods
GDP	Gross Domestic Product
GEM	GEM Global Entrepreneurship Monitor
HSSREC	Humanities and Social Science Ethics Committee
IMF	International Monetary Fund
IP	Intellectual Property
KMO	Kaiser-Myer-Olkin
KPI	Key performance Indicators
M&A	Mergers and Acquisitions
OECD	Organisation for Economic Co-operation and Development
OI	Open Innovation
PCA	Principle component Analysis
IPOO	Inputs, Process, Output and Output
R&D	Research and Development
SME	Small and Medium Enterprises
SPSS	Statistical Package for Social Science
TMO	Technological Management and Organizational
UK	United Kingdom
UNIDO	United Nations Industrial Development Organization
US	United States of America
VAT	Value Added Tax
WBG	World Bank Group

CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction

The overarching aim of this study is to investigate the predictors of successfully implementation of Open innovation (OI) in SMEs in KwaZulu-Natal, South Africa. This chapter gives the background of the study of OI in small and medium enterprises (SMEs) as experienced by SMEs owners, manager/supervisors, and employees in the South African setting. It highlights the research problem and the rationale for the study based by the gap that exist in literature. The chapter also provides the research objectives and questions used as the bases of the results. It also presents an overview of the research design and methodology used. It concludes by presenting the limitations and structure of the study.

1.2 Background and context of study

Management issues have become a thorn problem in business today. A statistical analysis conducted to investigate the success rate of SMEs showed that as opposed to the developed countries, significant percentage of SMEs are shutting down annually in the developing countries (Bushe, 2019; Bowmaker-Falconer and Mike Herrington, 2019; Kanayo, Olamide, Ogujiuba and Stiegler, 2021). Fundamentally, Momba (2016), Moonsamy (2016) and Krause and Schutte (2015) indicated that South African entrepreneurs are reluctant to embrace innovative initiatives but they mainly focus on the daily operations of their businesses. Momba (2016), Moonsamy (2016) and Krause and Schutte (2015) further noted that OI is mainly associated with large businesses in this country. This observation explains the research gap that exist between OI in SMEs (Krause and Schutte, 2015). Studies also show limited research that focus on OI in SMEs in South Africa (Momba, 2016; Krause and Schutte, 2015). Large firms have experienced growth through successfully implementing OI strategies that enhances innovation processes of organisations (Momba, 2016; Moonsamy, 2016). Evidence of such successes is shown through the firms' ability to cut costs, improve production levels and unearth innovative skills among employees, which ultimately lead to new product discoveries and improved service offerings.

They are widely renowned as engines that drive the global economy and the integration of global social unity. EDSE report (2021) through its SME Competitiveness Outlook 2021 it

indicated that, SMEs that make a contribution of 50% to employment and 53% to Gross Domestic Product (GDP). Further research showed that SMEs contribute about half of the South Africa's GDP. SMEs have continued to be firm in their effort to improve the economic growth, to create employment, to improve the well-being of people and to stabilise societal and political landscape of the South African economy. According to Ramasobana and Fatoki (2014) as well as Herrington, Kew and Mwanga, (2016) in the Global Entrepreneurship Monitor report of 2016, global studies show that many SMEs face huge challenges to survive in the ever-evolving business environment. In South African, SMEs are not spared by these challenges (Herrington et al., 2016). Many interventions aimed at assisting SMEs to manage and grow businesses have been availed by both public and private sectors in KwaZulu-Natal, South Africa (Ramasobana and Fatoki, 2014). These interventions include access to finance, training and skills development as well as access to market and adequate infrastructure (Ramasobana and Fatoki, 2014). However, studies have also indicated that these efforts are yielding less results (Leboea, 2017).

Further research revealed that the inability to identify appropriate strategies to develop and grow businesses remain a major management issue among SMEs in KwaZulu-Natal, South Africa (Krause and Schutte, 2015). In this regard, the success of SMEs depends on their ability to embrace innovation strategies to enhance their business models (Santoro, Vrontis, Thrassou and Dezi, 2018; Horth and Vehar, 2015; Brooks, 2017). Chesbrough (2006) identified OI as a critical model used by large businesses to transform innovation processes and create a competitive advantage in the ever-changing business environment. The model advocates for the sharing of internal and external knowledge to improve innovation processes of organisations, including the formation of strategic networks aimed at improving business innovation processes.

Based on this background information, it is equally important that research on OI in SMEs be carried out. Momba (2016) and Krapez, Skerlavaj and Groznik (2012) studies point out that OI assist organisations by enhancing innovation processes, mitigating business closures and improving growth. Focusing on OI in SMEs could lead to a newer dimension of innovations and subsequent economic growth of the country (Momba, 2016; Krause and Schutte, 2015). In this study, the researcher sought to investigate the predictors for the successful implementation of OI in SMEs in KwaZulu-Natal. This study is guided by OI theory where three OI constructs (out-bound, in-bound, and coupled) were used achieve its objectives. The

theory is widely known and accepted as a critical model used globally by SMEs to enhance innovation processes in organisations (Chesborough, 2006; Krause and Schutte, 2015).

1.3 Research problem

Many SMEs are battling to survive in the ever changing business environment today. Their inability to embrace innovative initiatives have seen many of them struggling to survive while a number are closing down every year in South Africa. It was noted that SMEs are implementing unrealistic, unsystematic and erratic business strategies that lead to slow growth. If not rectified, the number of SMEs closing down or facing liquidation will continue to increase in the country (Moonsamy, 2016; Krause and Schutte, 2015). The phenomenon of SMEs facing difficult operating challenges and shutting down is widely documented in recent studies (Calof et al., 2018; Krause and Schutte, 2015). This calls for SMEs to find sustainable innovative ways that mitigate the faced glitches. “Open innovation emerged as one of the critical strategy to address innovation and sustainability issues confronted by SMEs. In particular, the main objective of this study is to investigate the predictors that lead to the successful implementation OI in SMEs in KwaZulu-Natal, South Africa”.

1.4 Research objectives

The specific objectives of the study are:

1. To understand the influence of internal knowledge (Inside-Out) on the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.
2. To determine the influence of external knowledge (Outside-In) on the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal South Africa.
3. To ascertain strategic network (Coupled integration) factors that influence the successful implementation of in Small and Medium Enterprises in KwaZulu-Natal, South Africa.
4. To explore other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.

1.5 Research questions

The research questions of the study are:

1. How do internal knowledge (Inside-Out) influence the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa?
2. How do external knowledge (Outside-In) influence the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, KwaZulu-Natal?
3. What are the strategic networks (Coupled integration) factors that influence the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa?
4. What are the other innovations used by Small and Medium Enterprises in KwaZulu-Natal, South Africa?

1.6 The rationale of the study

The researcher sought to investigate the predictors of the successful implementation of OI by SMEs in KwaZulu-Natal. This study was prompted by the increased number of SMEs that are closing down every year due to operational challenges. Furthermore, this research was conducted to further understand how SMEs can deal with the growth related challenges and also how the OI concept can help them mitigate those challenges.

This study was considered significant based on the fact that it was intended for understanding how SMEs can integrate external knowledge into their own innovation processes. Furthermore, the study was regarded important because it helps to understand strategic factors that impact on innovation processes in the SMEs sector. In general, without this study we would continue to see SMEs in KwaZulu-Natal implementing unrealistic, unsystematic and erratic innovation strategies that lead to slow growth and closure of these entities. Additionally, the significance of this study is also centred on the need to examine and understand employees involvement in innovation processes of their organisations. It is an important study as it helps to understand factors that predict the successful implementation of OI in SMEs. The study's worth is that it will inform policy makers on the need to craft and execute policies aimed at fostering innovation in SMEs in South Africa.

In addition, this study contributes towards reducing the research gap on current discourses in studies that investigate predictors of the successful application of OI by SMEs in KwaZulu-Natal, South Africa. It demonstrated the use of the mixed methods research approach to understand the interplay, the relationship between identified predictors and their influence in the application of OI by SMEs.

1.7 Overview of research methodology

The concept of OI has been dominated by studies that used both qualitative and quantitative methods. Similarly, prior studies mainly focused on large businesses and much has not been carried out in SMEs in South Africa (Ahn et al., 2017; Brunswicker and Vanhaverbeke, 2015; Roessl and Hyslop, 2016; Moonsamy, 2016; Krause and Schutte, 2015). Recently, calls have been made to investigate OI in SMEs as the concept is relatively new to the sector in South Africa (Hossain and Islam, 2016; Krause and Schutte, 2015; Moonsamy, 2016). Based on this background, the mixed methods approach was deemed most fitting to capture detailed insights on how OI is perceived by SMEs in Pietermaritzburg.

Qualitative data was collected through in-depth interviews. The choice to collect qualitative data was chosen to get in-depth informations on implementaion of OI in SMEs from SME owner, manager, or supervisors. Thirteen (n=13) SMEs owners/ managers or supervisors were interviewed to get in depth understanding and insights on OI phenomenon within the SMEs sectors. Quantitative approach was used to get a relationship between the variabes (internal knowledge, external knowledge, and strategic networks) in influencing the successful implementation of OI in SMEs in KwaZulu-Natal, South Africa. (Two hundred and eighteen employees (n=218) employees participated in the questionnaires survey. The researcher used two non-probability sampling techniques to identify research participants. Purposive sampling technique was used to identify interview participants while convenience sampling method was used to find employees that took part in questionnaire survey. Thematic technique was used to analyse in-depth interview data. The “Statistical Package for Social Science (SPSS)” was utilised to capture and analyse data. Findings for descriptive analysis were presented using histograms, pie charts, tables and bar charts. Inferential statistics such as principal component analysis, ANNOVA, Pearson’s correlations and T-tests were conducted to explore associations between variables.

Reliability of questionnaire was ascertained by the use of Cronbach’s Coefficient Alpha statistical analysis. The statistical reliability analysis was performed to ascertain the ability of the research constructs contained in the questionnaire (Likert scaled questions) to give consistency results when it is used multiple times. Average variance extracted (AVE) and factor analysis were also performed on the questionnaire to determine it collect appropriate data for the study.

Trustworthiness for the qualitative data was accomplished through various measures. A five-step technique was used to determine the credibility, transferability and confirmability of interview data. The steps followed during in-depth interview processes included engagement, persistent observation, peer debriefing; negative case analysis; referential adequacy; and member checking. This approach was followed by lengthy engagements established by the researcher with participants, peer debriefing discussions on the interview process that was followed after the data collection phase through to the compilation of the findings and the conclusion of the study. The researcher gave the participants a summary of all information recorded during in-depth interviews to increase credibility of the interview data.

1.8 Limitations of the research study

The study had two main limitations. Firstly, the study was restricted to SMEs listed on the National Government databank in KwaZulu-Natal. The study did not include the narratives of other SMEs that were not yet listed on the databank at the time the research was conducted. Secondly, two non-probability sampling techniques, namely: convenience and purposive sampling methods were used to select research participants. Therefore, the findings do not provide the views of the whole population, and therefore, the outcome of the study can not be generalised across the entire population or across whole country. Despite the identified confinements, the results can be used as a base for future studies on OI in SMEs in the country.

1.9 Structure of the dissertation

As presented in Figure 1.1, the dissertation has seven interlinked chapters.

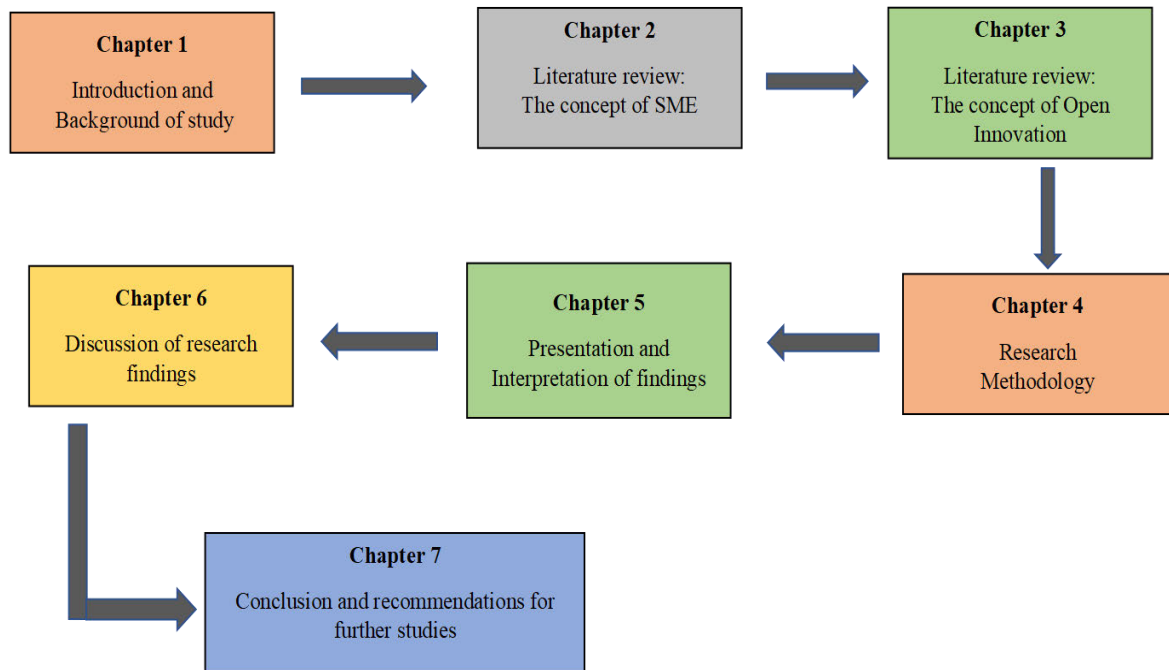


Figure 1.1. Structure of the study

Source: Author's own compilation.

Chapter 1: Introduction and background of the study

This chapter provides a detailed overview, background, and research problem of the study. Also the research objectives and questions, rationale of the study, and a brief synopsis of the research methods used to collect data are outlined in this chapter. Finally, it also provides the limitations and structure of the dissertation.

Chapter 2: Literature review on the concept of Small and medium enterprises

Chapter 2 contains a comprehensive literature review on the concept of small and medium enterprises. Available and relevant literature was surveyed as the foundation for the topic of this study. In this chapter, literature on the global and local definition of SMEs and the significance of SMEs in South Africa was reviewed. Insights regarding OI challenges associated with SMEs are presented in this chapter. Finally, it presents literature analysis on OI in SMEs in South Africa.

Chapter three: Literature review: The concept of open innovation

This chapter contains a detailed literature review on the concept of OI. It provides the origins of the concept and three archetypes (In-bound, Out-bound and Coupled) of OI which form the pillars of the concept. It presents findings of reviewed literature on the implementation of the

concept by organisations across the world. Finally, it provides insights from literature regarding the significance, measurements and the existing gap in OI literature.

Chapter four: Research methodology

Chapter four provides a well-rounded description of the research methods used for the study. It provides a literature review on the research philosophy and discussions on the research paradigms used for this study. It illustrates a detailed research design used to collect and analyse data. It also provides the measures taken to ensure reliability, validity of the research instruments and the results. Finally, it outlines the measures used to address ethical issues associated with this study.

Chapter five: Presentation of findings

In chapter five findings are presented. It provides themes identified from data collected through interviews, as well as descriptive and inferential statistical results obtained from the survey questionnaire.

Chapter 6: Discussion of research findings

In chapter 6 research findings presented in Chapter 5 are discussed according to the research objectives. The discussion was guided by the inclusion of literature findings on theoretical analysis of OI in SMEs as presented in the literature review chapters.

Chapter 7: Conclusion and recommendations for further research

This chapter provides the conclusions and recommendations based on the findings and discussions of the findings. In this chapter the researcher also points out the research limitations and gives suggestions for further studies.

1.10 Summary of chapter one

The summary chapter serves as an introductory and synopsis chapter. In this chapter an overview of the research problem is outlined. The background of study is presented as a systematic summary identifying the existing gap in the present literature that justified the need to attend to the research problem. The rationale of the study indicating the existing gap in OI studies in SMEs in KwaZulu-Natal, South Africa is provided. This chapter also presents the research objectives and questions used as the foundation for the research findings. An overview of the research methodology used for the study and chapter the limitations and structure of the

thesis are also provided in this chapter. The proceeding chapter provides the literature review on SMEs.

CHAPTER TWO

LITERATURE REVIEW: THE CONCEPT OF SMALL AND MEDIUM ENTERPRISES

2.1 Introduction

The previous chapter provided an introduction of the study. Given the aim of this study, this chapter explores SMEs in relation to the parameters and objectives of the study. This was done with the aim to understand the conceptualisation of SMEs and how OI fits in as a business concept. The chapter begins with a discussion of the concept of SMEs in both the global and the South African contexts to clearly understand the OI gap in SMEs. The researcher further discusses how the concept of SMEs is defined in literature and accepted in nations across the world. Also, the researcher pin-points the lack of an agreed definition of SMEs both in business and in academic arenas.

The researcher then reviewed literature on OI paradigm in SMEs in the South African context and discovered that the OI paradigm is not widely associated with SMEs, and also that it is mainly practiced by large firms across the country. The review was followed by all-inclusive discussion of OI challenges associated with the SME sectors. Finally, the chapter provides the summary and conclusion of the chapter.

2.2 The concept of Small and Medium Enterprises (SMEs)

The concept of SMEs is acknowledged differently across the global spectrum. Its unique characteristics are highlighted as the main influencers of the discourse that has emerged both in the academic and industrial circles across the globe. Global studies revealed that there is no agreed definition on SMEs (Akinyemi and Adejumo, 2017; European Union Commission, 2017; OECD, 2017a; Soar, 2017). This argument is centered on getting clarity on the characteristics, ownership management, and size of entities that are regarded as SMEs in different countries (Dar at al., 2017; Rieckmann, Wan, and Meng, 2017).

Since there is no global identified definition for SMEs, the criteria used to identify firms belonging to this sector differs from country to country (Durst and Bruns, 2019; Charalambous and Polemidiotis, 2017; European Union Commission, 2017). Some researchers identify SMEs as entities that are privately owned, managed and financially supported (Charalambous and

Polemidiotis, 2017; Durst and Bruns, 2019; Soar et al., 2015). However, SMEs are globally identified as engines that drive economic growth in many countries across the world (Akinyemi and Adejumo, 2017; World Bank Group, 2018; World Trade Report, 2016). Some countries use both quantitative and qualitative features to define and identify businesses that belong to this sector (Durst and Bruns 2019; Rieckmann et al., 2017). Quantitative features include aspects of a firm that can be measured like capital investments by members, value of assets and profit generated by the firm (Charalambous and Polemidiotis, 2017; European Commission, 2017a; OECD, 2017a). Qualitative features of SMEs include all aspects of the firm that cannot be measured like firm formation, ownership and operational activities (Charalambous and Polemidiotis, 2017; Durst and Bruns 2019). While definition and classifications of SMEs differ across nations, adopting a universal definition is difficult because the nature of SMEs depends on the economic development of each country. Therefore, SMEs definition changes with fluctuations in the economic growth of a particular country.

Economic challenges experienced by a country such as inflation structural variables and business cycles influence the description and classification of organisations as SMEs in that particular country (Indian Ministry of Micro, Small and Medium Enterprises (IMMSME), 2014). For example, economic variables such as inflation, business trends and structural challenges experienced in 2005 necessitated the review of SME definition. However, the acronym “SMEs” is globally used, and it is used for micro, small and medium businesses (Fatoki, 2018; Durst and Bruns, 2019; Inyang, 2013). The United Nations Industrial Development Organization (UNIDO) identifies various qualitative attributes to identify SMEs among its member countries. These attributes are depicted in Table 2.1. The table also draw differentiation characteristics between large entities and SMEs.

Table 2.1. UNIDO's qualitative indicators in defining SMEs

Indicator	SMEs	Large Businesses
Management	* Proprietor entrepreneurship * Functions are linked to the nature of personalities of the proprietors	* Manager entrepreneurship * Division of labor is according to the subject matter
Human resources	* Lack graduates from universities * Should have knowledge about the whole business	* Employ many university graduates * Vast specialisation
Communication	* Communication is personalised	* Communication is highly formalised
Relationship with customers	* It is unstable because of lack of long-term contacts	* It is stable because it is based on long-term relationship and communication
Production process	* Labor is used intensively	* There is intensive use of capital
Research and development	* Limited research, as the company works according the market. An intuitive approach is used	* Research is usually part of the company's strategy. Therefore, it is institutionalized
Finance	* Family funded * Self-financing	* Have access to many sources of finance from the capital market

Sources: Faloye and Akinkoye (2013, p. 180); Bomani (2015, p. 24); Sparrow (2011, p. 671).

2.2.1 International definition of SMEs

The United States of America (US), the United Kingdom (UK) and China, use the number of workers, annual turnover and total assets to classify companies as SMEs (Charalambous and Polemiotis, 2017; China Bureau of Statistics (CBS), 2017; OECD, 2017a). Furthermore, the Chinese definition also gives unique challenges to comprehend the definition because it depends on a particular industry and labor concentration in most businesses in the country (China Bureau of Statistics (CBS), 2017; Jin, 2018). China Bureau of Statistics (CBS), (2017) also states that the Chinese definition also incorporate production and management measures to determine whether a business is a small or medium enterprise. The US uniquely defines and classifies SMEs as per sector of the economy. For example, SMEs in the manufacturing sector and those that engage in export must have a yearly turnover of between US\$7 million to US\$25 million (OECD, 2017a). Additionally, the definition further expounds that the upper limit is the same across all sectors. However, yearly turnover is not used to classify SMEs in the manufacturing sector that are not involved in export (OECD, 2017a).

Importantly, renowned organisations such as the World Bank, the European Union (EU), the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD) use the number of employees, annual turnover and assets to identify entities as SMEs. For example, OECD identify SMEs as privately-owned entities with 10 to 250 permanent employees and annual income not exceeding 10 million dollars. Conversely, most recognised institutions adopt and use the SME definition prescribed by the law of each country where they are working. For example, India, Malaysia and Zimbabwe use assets of the firm in classifying SMEs (Export-Import Bank of India (EIBA), 2012; SME Act, 2011, the World Bank Group (WBG), 2012). However, European countries also use similar definition as those of US, UK and China but countries in this region incorporate micro entities into small businesses and medium enterprises and abbreviate them as ‘SMEs’ (European Union Commission, 2015). For example, European businesses are recognised as SMEs when they hire “less than 50 employees and have yearly revenue of 10 million euros or yearly balance sheet not exceeding 10 million. An entity is regarded as a medium enterprise when it hires less than 250 people and has an annual revenue not exceeding 50 million euros or a balance sheet of less than 43 million euros” (European Union Commission, 2015). The European Union’s classification of SMEs is shown in Table 2.2.

Table 2.2 European SMEs classification

Company category	Employees	Turnover	or	Balance sheet total
Medium-sized	Less than 250	Less than /= € 50 m		Less than = € 43 m
Small	Less than 50	Less than/= € 10 m		Less than/= € 10 m
Micro	Less than 10	Less than/= € 2 m		Less than/= € 2 m

Source: European Union, (2015, p. 11).

As indicated in Table 2.2, the European Union recognised a business as micro when it employs less than 10 people and has an annual income of less than two million pounds. Also, a business is referred to as a small entity when it employs 50 workers and has an asset value of less than 10 million pounds (European Union, 2015). Subsequently, the European Union recognises a business entity as a medium-sized one when it hires less than 250 employees and has asset value of less than 43 million pounds (European Union, 2015).

Importantly, South Africa’s SMEs definition is grounded on both the industry sector, the total number of workers, yearly business income and VAT listing. The definition and classification of SMEs in South Africa is discussed and highlighted in the section that follows.

2.2.2 The South African definition and classification of SMEs

The definition and classification of SMEs in South Africa is spelt out in the National Small Business Act of 1996 Section 102. In South Africa, the acronym “SMEs” is used to refer to small and medium businesses, and the term SME is generally used to mean “micro, very small, small and medium enterprises” (Fatoki, 2018). The Act further defines SMEs as an entity owned by an individual or many people and employ not more than 200 workers. The Act categorises companies as “micro, very small, and medium sized using specified guiding principles in different sectors of the South African economy.

Significantly, the National Small Business Act of 1996 describes ‘small and medium enterprises’ as follows:

“A separate and distinct business entity, including co-operative enterprises and non-governmental organizations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or sub sector of the economy mentioned in column I of the Schedule” (Department of Trade and Industry, 1996, p. 2).

The Act categorize SMEs as micro, very small, small or medium businesses as depicted in Table 2.3.

Table 2.3 South Africa classification of Small and Medium enterprises

Sector/ subsectors in accordance with the Standard Industrial Classification	Size or class	Total full-time equivalent of paid employees Less than	Total annual turnover Less than (R million)	Total Gross Asset Value (fixed Property excluded) Less than (R million)
Agriculture	Medium	120	R4.00m	R4.00m
	Small	50	R2.00m	R2.00m
	Very small	10	R0.40m	R0.40m
	Micro	5	R 0.15m	R 0.15m
Mining and Quarrying	Medium	200	R30.00m	R18.00m
	Small	50	R7.50m	R4.50m
	Very small	20	R3.00m	R1.80m
	Micro	5	R 0.15m	R 0.10m
Manufacturing	Medium	200	R40.00m	R15.00m
	Small	50	R10.00m	R3.75m
	Very small	20	R4.00m	R1.50m
	Micro	5	R 0.15m	R0.10m
Electricity, Gas and Water	Medium	200	R40.00m	R15.00m
	Small	50	R10.00m	R3.75m
	Very small	20	R4.00m	R1.50m
	Micro	5	R 0.15m	R 0.10m
Construction	Medium	200	R20.00m	R4.00m
	Small	50	R5.00m	R1.00m
	Very small	20	R2.00m	R0.40m
	Micro	5	R 0.15m	R 0.10m
Retail and Motor Trade and Repair Services	Medium	120	R30.00m	R5.00m
	Small	50	R15.00m	R2.50m
	Very small	10	R3.00m	R0.50m
	Micro	5	R 0.15m	R 0.10m
Wholesale Trade	Medium	120	R50.00m	R8.00m
	Small	50	R25.00m	R4.00m
	Very small	10	R5.00m	R0.50m
	Micro	5	R 0.15m	R 0.10m
Commercial Agents and Allied Services	Medium	120	R30.00m	R8.00m
	Small	50	R15.00m	R4.00m
	Very small	10	R3.00m	R0.50m
	Micro	5	R 0.15m	R 0.10m
Catering	Medium	120	R10.00 m	R 2.00 m
	Small	50	R 5.00 m	R 1.00 m
	Very small	10	R 1.00 m	R 0.20 m
	Micro	5	R 0.15 m	R 0.10 m
Transport	Medium	120	R20.00 m	R 2.00 m
	Small	50	R10.00 m	R 1.00 m
	Very small	10	R 2.00 m	R 0.20 m
	Micro	5	R 0.15 m	R 0.10 m
Storage	Medium	120	R20.00 m	R 5.00 m
	Small	50	R10.00 m	R 2.50 m
	Very small	10	R 2.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m

Communications	Medium	120	R20.00 m	R 5.00 m
	Small	50	R10.00 m	R 2.50 m
	Very small	10	R 2.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m
Finance	Medium	120	R20.00 m	R 4.00 m
	Small	50	R10.00 m	R 2.00 m
	Very small	10	R 2.00 m	R 0.40 m
	Micro	5	R 0.15 m	R 0.10 m
Business Services	Medium	120	R20.00 m	R 4.00 m
	Small	50	R10.00 m	R 2.00 m
	Very small	10	R 2.00 m	R 0.40 m
	Micro	5	R 0.15 m	R 0.10 m
Community	Medium	120	R10.00 m	R 5.00 m
	Small	50	R 5.00 m	R 2.50 m
	Very small	10	R 1.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m
Social and Personal Services	Medium	120	R10.00 m	R 5.00 m
	Small	50	R 5.00 m	R 2.50 m
	Very small	10	R 1.00 m	R 0.50 m
	Micro	5	R 0.15 m	R 0.10 m

Source: Department of Trade and Industry (1996)

As amended in 2004, the National Small Business Act of 1996 clearly indicates that South Africa use both quantitative and qualitative features to define SMEs in the country (Fatoki, 2018; Krause and Schutte, 2015). The Act further classify the businesses into different sectors of respective industries where these companies are found. Quantitative aspects of a business such as the number of full-time workers, the net asset value, and yearly revenue are used to identify the size of business for each sector of the industry. For example, the Act stipulates that a small enterprise should hire not more than 50 workers and has a gross value that ranges between 2-10 million rands irrespective of the sector. A medium enterprise is regarded as a business that employs more than 10 people and has year turnover of between 1-2 million rands but has net asset figure of not more than 50 million rands. The Act also considers the labour intensity characteristics found in different sectors. For example, medium enterprises are expected to hire at most 120 permanent workers across all sectors exceptin the manufacturing, electricity, gas and water, mining and quarrying, and construction sectors where companies are expected to hire at least 200 full time workers (Department of Trade and Industry, 1996).

Given the uniqueness of the classification of SMEs in South Africa, it is equally important to explore the significant role they play in the country's economy.

2.3 The Significance of SMEs in South Africa

Small and medium enterprises are globally renowned as the engines that drive economic growth in many countries (Akinyemi and Adejumo, 2017; GEM global report, 2018; World Bank Group, 2018; World Trade report, 2016). The European Commission annual report on European SMEs 2016/2017 noted that SMEs have contributed to current innovation in the region and continue to shape economic direction of many countries in the region (European Commission, 2017). The same sentiment is echoed by the OECD report which state that 99% of businesses in its member countries are SMEs entities which contribute 70% of new job creation and innovation in its member countries (OECD, 2018). Similarly, the OECD report also state that 99% of businesses in its member countries are SMEs entities which contribute about 70% of new job creation and innovation (OECD, 2018). Most of SMEs in OECD member countries employ more than 250 people which is a significant contribution to employment generation in their respective member countries. The Asian region has seen the growth of SMEs in recent years. The growth is underpinned by the acknowledgement of the economic contribution SMEs has to the GDP of respective countries in the region (OECD, 2018; GEM global report, 2018; World Bank Group, 2018; World Trade report, 2016). In Africa, SMEs are equally recognized as the driving force for economic growth, job creation and poverty reduction in many countries (Augustine and Asiedu, 2017; Bieńkowska, 2018; Herrington, Kew, and Mwanga, 2016; Schenk, 2017). This assertion is widely echoed by many researchers and captains of industries who alluded that SMEs growth is on the rise in most African countries (Augustine and Asiedu, 2017; Bieńkowska, 2018; Feingold, 2018).

In South Africa, SMEs are recognised as the backbone of economic growth. where they contribute to about half of the gross domestic product (GDP) of this country each year (Fatoki, 2018; Schenk, 2017; World Bank Group, 2018). According to Herrington et al. (2017) and Parsons (2018), SMEs contributed more than 60% to job creation and about 40% of South Africa's GDP in 2017. The same report by Herrington et al. (2016) in Global Entrepreneurship Monitor further noted a significant entrepreneurial growth in the South Africa. Additionally, Herrington et al. (2017) further emphasised that there is a “very tight correlation between the level of entrepreneurship in South Africa and its rate of economic growth”. SMEs thrive on the entrepreneurial zeal and hunger exhibited by owners who take calculated risks to grow their ventures (Bieńkowska, 2018; Herrington et al., 2016). However, the growth rate of SMEs in South Africa remains low as compared to global entrepreneurial standards (Augustine and Asiedu, 2017; Feingold, 2018; Herrington et al., 2016).

Importantly, SMEs are entities which play critical role in new job creation and poverty reduction in the country (Augustine and Asiedu, 2017; Bieńkowska, 2018; Herrington et al., 2016). SMEs do not only assist in economic development endeavours of the country but they assist in integrating communities around the country. Akinyemi and Adejumo (2017) and Herrington et al. (2016) supported the argument that SMEs are located in communities where they assist in forging relationships with surrounding communities. The location of SMEs in communities does not only have complementary benefits that aid economic growth but they also assist in reducing poverty in communities (Augustine and Asiedu, 2017; Krause and Shutte, 2015).

Despite the economic and community development roles SMEs play in South Africa, they continue to experience huge operational glitches which affect their performance and success (Augustine and Asiedu, 2017; Herrington et al., 2016; Krause and Shutte, 2015). In the following section, some of the OI related challenges faced by SMEs in South Africa are explored.

2.4 SMEs and Innovation in global context

Globally, innovation is viewed as a central concept in improving competitiveness of businesses, promote employment, and creation. Literature places SMEs as significant contributors to economic and social development of nations across the world (Herte et al., 2021). At the other hand innovation is viewed as the engine that drives these entities across the world. Herte et al., (2021) argued that innovation in SMEs can succeed when these entities are supported. This assertion was in support of Audretsch and Lehman (2005) who suggested that there is positive effect on growth when SMEs' R&D investments are supported. Thornhill (2006) highlighted that the level of innovation correlates with performance measured by growth. For example, the level of innovation in the EU member countries has been on the rise during the recent years (European Commission, 2019). The rise is associated with the kind of support SMEs in the region get from their respective countries. Through supporting competitiveness and SME innovations in the EU, these entities have managed to surpass targeted growth threshold and effectively spearhead innovations, and skills development in the region. EU policies for SMEs have seen these entities focus on working together to improve their product and services offerings. This approach is consistent with OECD report which suggest that company executives must not focus on creation of new businesses but invest in

innovation that encourages regeneration (Ahmad and Seymour, 2008). According to the European Innovation Scoreboard - EIS Database (2020a) and Hollanders, Es-Sadki, and Merkelbach, (2019) SMEs in the EU region have manage to improve introduction of new products. However, the same scorecard also revealed that in-house innovations have declined during the same period due to SMEs inability to cope with global operating challenges. The scoredcard also showed that there was a decline in SMEs collaborating with other firms to enhance innovations (Herte et al., 2021).

2.5 Open innovation in SMEs context

Open innovation approaches in SMEs is fragmented and differs with those of large organisations (Bresciani and Ferraris, 2014; Colombo et al., 2014). The fragmentation of OI in SMEs resonates with the nature of the concept which has been widely associated with large businesses since its inception. Open innovation in SMEs is constantly over-showed and overlooked by compounded challenges faced by entrepreneurs found in these entities. This proclamation echoes the views of many researchers such as Roessl and Hyslop (2016) and Santoro et al. (2018), who pointed out that OI is hampered by the shortage of management skills and knowledge in SMEs. However, cross inter-organisational collaborations have shown and proven to assist in addressing OI related challenges faced by SMEs (Santoro et al., 2018). The implementation of OI in SMEs is underpinned by the notion of ‘smallness’ which continue to limit them to commit resources to other avenues which tend to grow their businesses (Ahn et al., 2017; Colombo et al., 2014; Moonsamy, 2016; Santoro et al., 2018). Other studies acknowledge that OI in SMEs still faces huge challenges which are centered on limited capacity to measure benefits accrued to them through such engagements (Ahn et al., 2017; Podmetina et al., 2014). Researchers (Ahn et al., 2017; Roessl and Hyslop, 2016) revealed that SMEs can use OI to complement their limited resources and supplement innovation processes by incorporating external knowledge and ideas through OI engagements.

Open innovation in SMEs takes different forms (Brunswicker and Vanhaverbeke, 2015). Given limited resources associated with SMEs, these entities prefer to engage in OI approaches with less financial costs to their organizations (Brunswicker and Vanhaverbeke, 2015; Santoro et al., 2018). These approaches include networking and informal information gathering over expensive and multifaceted transaction-based ones, such as purchasing and licensing intellectual property (IP) (Brunswicker and Vanhaverbeke, 2015). Studies by Brunswicker and Vanhaverbeke (2015) and Santoro et al. (2018) suggest that through networking and informal

engagements SMEs have managed to maintain their position in OI platforms by engaging in more inbound activities as compared to outbound undertakings.

Although OI encourages SMEs to use external knowledge and outside partners to speed up innovation, these entities continue to encounter performance issues. Cheng and Shiu (2015) argued that there is no direct relationship between OI and innovation performance. Many companies fail to adopt OI and harness OI values due to inability to select the rightful partners (Dahlander and Piezunka, 2014; Hossain and Anees-ur- Rehman, 2016). This argument was supported by Bogers et al. (2017), Greco, Locatelli, and Lisi (2017) and Kim, Kim, and Foss, (2016) who identified controversies associated with OI such as the extent of openness, absorptive capacity, and implications for innovation performance. Too much of openness leads to bad innovation performance as the company will lose focus and control over main capability (Kim et al., 2016). Companies need to strike a balance between external adaptation and internal integration for OI achievements (Naqshbandi, 2018). Existing scholars argued that OI lessens innovation out (Bengtsson, et al, 2015; Garriga, Von Krogh, and Spaeth, 2013; Greco et al, 2017). Nevertheless, researchers identify various benefits associated with OI such as learning chances, market expansion, and use of latest technologies from partners (West and Bogers, 2014).

Open innovation modes in SMEs also involves taking consideration of the inflow of knowledge and changes involved through the acceptance and execution processes of OI as a business concept (Ahn et al., 2017). Ahn et al. (2017) and Usman, eta al. (2018) also suggested that OI in SMEs does not only focus on the inflow of external knowledge into the innovation process but also on how SMEs deal with changes that further affect the market. OI system has opportunities for SMEs as it enables them to make improvements with minimum problems. These opportunities assist SMEs' ability to utilise external sources and get assistance to develop own systems from outside support that also improves internal employee skills. Changes brought into SMEs through OI can be distinguished as horizontal or vertical innovation. Ahn et al. (2017) and Boldrini, Caverot and Ezequel (2017) eluded that OI can cause a "horizontal shift" when it is directed towards the already established market and that a vertical shift may occur when changes are directed towards improving quality attributes of existing products. Horizontal partnerships also include changes that are realized when SMEs collaborate with partners outside its value chain. These alternations are mainly realized when SMEs use cutting-edge external technologies from multiple partners to complement its own

innovation processes (Akinwale 2018). SMEs can collaborate with partners from within its industry or outside its industry peripheries to enhance its innovation performance. With regards to SMEs, horizontal partnerships with rival organisations brings a win-win situation to an organization as resources and expertise are effectively utilised for the benefit of both companies. Vertical partnerships to SMEs enhance product quality and innovation methods. For example, customers' views gathered to improve product and service quality are critical components of vertical partnership because they assist in enhancing the innovation process and produce high quality products and services for customers. However, sourcing external knowledge includes considering the characteristic of sources such as interactions with suppliers, customers, universities and colleges, industry experts, and network allies.

2.5.1 Interactions with suppliers

Sourcing for knowledge to stimulate and improve R&D within the organization is an uphill task for SMEs. However, SMEs look upstream of the value chain by interacting with suppliers. According to Brunswicker and Vanhaverbeke (2015), SMEs interact with suppliers in developing new products. SMEs usually consult suppliers to assist in technology aspects of the new product development. SMEs seek technology partnership with suppliers to leverage their internal capacity by taking advantage of suppliers' competencies to quickly introduce products into the market. Open innovation collaborations between SMEs and suppliers is generally impacted by culture, time frame and industry in the area where organisations are found.

2.5.2 Interactions with direct and indirect customers

Open innovation collaborations for SMEs also include sourcing critical information from direct and indirect customers. Customers' contribution to SMEs' R&D through OI streams include providing tacit information which could be difficult to get from internal innovation processes. Interaction with customers is normally achieved by collecting customer feedback which provide critical insights about a product's performance and service quality. Customer feedbacks may offer new discoveries and business breakthrough to the organisation (Brunswicker and Vanhaverbeke, 2015).

2.5.3 Interactions with universities or colleges

Universities and research institutions are essential partners for successful OI program for SMEs. These institutions provide the source of creative and pre-industrial know how to SMEs. This affirmation is consistent with Akinwale's (2018) as well as Brunswicker and Vanhaverbeke's (2015) argument that due to the shortage of financial resources, SMEs collaborate with universities and research institutions because they are easy to engage and are renowned as institutions that value innovation.

2.5.4 Interfaces with industry experts

SMEs are renowned for using intermediaries to access certain technologies critical to their operations. Collaboration with industry experts is used to provide essential information necessary to close the technology gap and speed up commercialisation in SMEs. Like other intermediaries, industrial experts play a significant role in identifying ambiguities which can derail effective integration and allowing smooth osmosis of external ideas and knowledge into the R&D processes of the organization (Moonsamy, 2016). Interfacing with external industrial experts gives confidence to employees to engage them and become more innovative (Momba, 2016). Open innovation collaborations with industry experts allow skills transfer and boost employee competencies in an organization. Industry experts bring confidence to SMEs and assist them to introduce products quicker into the market. However, Parida, Oghazi, and Ericson (2014) note that integrating external knowledge of experts require dealing with difficulties in aligning it to the culture of the organization.

2.6 Open innovation in small and medium enterprises (SMEs) in South Africa

Since its inception, OI has been globally associated with large businesses in South Africa (Akinyemi and Adejumo, 2017; Soar et al., 2015). Lately, there is recognised inroads on OI studies in SMEs in South Africa (Krause and Schutte, 2015). Studies on OI in SMEs are based on the realisation that they can innovate and reduce operating costs by incorporating external knowledge and technology into in-house R&D processes. These proclamations are consistent with the arguments made by Ahn et al. (2016), Brunswicker and Vanhaverbeke (2015) as well as Roessl and Hyslop (2016) who suggest that SMEs' success can be augmented by strategically opening up of their borders to allow free movement of external ideas and knowledge into the organisation's R&D processes.

In South Africa, OI in SMEs is acknowledged as the engine that drives strategic integration and access to external ideas and technology not found in SMEs peripheries (Krause and Schutte, 2015; Moonsamy, 2016). This argument is based on the notion that traditional management challenges can only be addressed by incorporating ideas and knowledge with partners such as suppliers, customers, competitors and research institutions (universities and colleges) to innovate (Momba, 2016). Moonsamy (2016) asserts that inbound OI in SMEs succeed when strategic efforts are accepted to complement the business model. However, Saebi and Foss (2015) highlighted that SMEs business models are not attuned to OI ordinances. SMEs have to restructure their business models to adapt OI. This view is in agreement with Hienerth et al. (2011) who argued that participating in dual-creation needs a move away from traditional business models and adopt friendly models. This approach calls for restructuring of vital inhouse processes such R&D or sales and marketing to allow smooth integration and adaptation of inbound knowledge. Restructuring the business model allows firms to align identified OI strategies to the normal operations of the organisation. For example, when adopting a collaborative OI strategy firms select partners on the basis of mutual agreements. This approach calls for close communication and mutual cooperation to transfer and share implicit information between partners. A study by Momba (2016) on OI in manufacturing firms in South Africa, identified that SMEs have limited knowledge on how to share ideas, knowledge, and technology with other entities in the country.

Inbound OI in SMEs is perceived differently as compared to how it is perceived in large businesses. In large businesses, it is widely recognised as a business strategy where R&D decisions are well crafted to avoid risks that may compromise the competitive position of the organisation. However, inbound OI in SMEs is equally defined and influence the size of these entities. For instance, the size of an SME effects the way it structures itself, build capacity, and identify partners with resources to compliment the internal R&D capacity of the organisation (Hossain and Kauranen, 2016). Different implementation processes pursued by SMEs also significantly determine the performance scale adopted to measure the benefits of OI (Hossain and Kauranen, 2016). This assertion is consistent with the notion that SMEs use less formalised approaches to implement and measure R&D activities in the organisation. However, Bocken, Farracho, Bosworth, and Kemp (2014) argue that establishing organisational systems and inventive platforms linked to outside organisation is critical for SMEs. Inbound OI in SMEs is defined by their ability to establish absorptive capacity which is a “firms’ ability to sense, value, assimilate, and apply new knowledge” (Hossain and Kauranen, 2016, p. 63). Building

absorptive capacity is fundamental in searching innovation from outside sources. Similarly, absorptive capacity is enhanced when SME work with intermediaries.

2.7 Implementation of open innovation in SMEs

Open innovation has been widely acknowledged as a vital business strategy used to enhance the performance and sustainability of the organisations across the world. The implementation of OI by SMEs is mainly done to increase the chances of creating maximum value either by product or technology. Incremental and transformational are some of the ways that are used to apply OI paradigm (Yoon et al., 2016; Moonsamy, 2016). The choice and application of these transformational approaches in SMEs sectors has been accepted with mixed feelings where opening up innovation processes for OI collaborations with outside firms is the major problem (Akinyemi and Adejumo, 2017; Krause and Schutte, 2015; Momba, 2016; Soar et al., 2015). Previous studies suggest that large firms are more open to OI but SMEs appear to have a superior concentration of OI than big companies (Spithoven et al. 2013). SMEs are renowned for exhibiting unique innovation modes to those of large firms. Their uniqueness is centred on their qualities and attributes such as flexibility, less formalised, and quicker to make decisions (Brunswick and Vanhaverbeke, 2015). Sudarmaji (2016) asserts that the global market competition and constant demand for improved products or services have become a motivation for SMEs.

Studies reveal that there are different factors that SMEs need to consider when implementing OI (Yoon et al., 2016; Hossain and Kauranen, 2016; Santoro et al., 2018). When SMEs engage in OI collaborations with other organisations, it is crucial that they consider investigating the correlation between internal necessities and external possible effects to the organisation (Yoon et al., 2016). Internal necessities are regarded as main OI obstacles to SMEs while external potentials are identified as efficiency of the external support systems used in OI collaborations (Lee and Yoon, 2016; Roessl and Hyslop, 2016; Santoro et al., 2018). Lee and Yoon (2016) suggested that trust is the major internal factor that determines sustainability of OI relationships. External factors comprise of industrial attributes and governmental support situated outside firms. Previous studies suggest that policies for a win-win partnership strategies between large firms and SMEs focus on government's role in shared growth (Yoon et al., 2016; Kyun et al., 2006). Yoon et al. (2016) suggest that lack of technical information is one of the central barrier for OI collaborations in SMEs sectors. Earlier studies also suggest knowledge interactions as an important approach to the successful application of OI.

Chesbrough (2006), Huizingh, (2011) and Mortara and Minshall (2011) pointed out that this method advocates for equal treatment of parties for successful OI engagements. The established collaborative relationships can be sustained when partners clarify future expectations and understand mutual interests than merely relying on exhaustive contract clauses. Mortara and Minshall (2011) identified inbound activities, and both inbound and outbound activities as two key distinctive knowledge flows in OI processes. Lee and Yoon (2016) argued that the concept of knowledge interaction as the extent of the mutual collaboration is viewed as ‘asymmetric and ambidextrous’ knowledge interaction. In this case Lee and Yoon (2016) viewed asymmetric interaction as one way knowledge flow with no exchange of ideas where one firm plays a principal role in the R&D processes. Lee and Yoon (2016) identified that ambidextrous interaction means more interactive collaborations of technological ideas that could lead to successful OI investments. Moonsamy (2016) suggests that the application of OI in SMEs should consider the influence of the business model as it defines how value is created and income is produced through products or services. These assertions are consistent with other previous studies (Chsbrough, 2006; West and Bogers, 2014) which point out that business models are central to the successful application of OI.

However, there are a number of factors that determine the successful and failure to invest OI among SMEs. Yoon et al., (2016) identified these factors as ‘firm level factors’ that shape the character of the firm and subsequent determine the level of OI by the organisation. The firm level factors include business models (BMs), profile, and attitudes toward OI. The compatibility of SME business models is one of the important engine that propels OI investments in SMEs. The size of the organisation determine the intensity and level of its OI investments. Previous studies point out that smaller firms are associated with more uncertainties in technology, fewer resources, and less investment in R&D (Brunswick and Vanhaverbeke, 2015; Krause and Schutte, 2015; Santoro et al., 2018; Yoon et al., 2016).

2.8 Open innovation challenges to Small and medium enterprises

SMEs are continuously recognised as the catalyst for economic growth in many countries in the world (Akinwale, 2018; Akinyemi and Adejumo, 2017; Fatoki, 2018). This notion is acknowledged by many governments across the world who are pursuing ways of jump-starting SMEs into internal network engagements which encourage collaborations and increase growth of innovation in the SMEs (Muller et al., 2017). However, SMEs’ pursuit of sustainable growth has seen them failing to emerge from early development phases and achieve growth. Globally,

SMEs in emerging economies face OI related challenges as compared to their counterparts in developed countries worldwide (Dukic et al., 2015; Hossain, 2015).

Researchers point out that SMEs' pursuit to engage in OI is mainly influenced by generic internal and external factors such company size, industry type, insufficient resources, technology strengths and market type (Kaur, Naqshbandi and Jayasingam, 2014). Fundamentally, Krause and Schutte (2015), Momba (2016) and Moonsamy (2016) indicated that South African entrepreneurs are reluctant to embrace innovative initiatives but mainly focus on the daily operations of the business. However, there are specific OI challenges associated with the OI paradigm (Brunswicker and Vanhaverbeke, 2015; Krause and Schutte, 2015; Santoro et al., 2018). Some of the OI specific impediments include financial, economic factors, the level of absorptive capacity, organisational culture, intellectual property issues, collaboration strategic issues, the lack of resources (financial and human capital), inadequate R&D competency, the lack of management skills and the lack of information. Von Dyck (2015) recognised that the most difficult predicament businesses face when seeking to engage in OI is exposing intellectual property of the organisation. Previous studies (Igartua, Garrigós, and Hervas-Oliver 2010; Teirlinck and Spithoven 2013; Verbano, Crema, and Venturini 2015) point out that incorporating open innovation dimensions (inbound, outbound and coupled process) is a costly process especially to SMEs as compared to closed innovation model. Significantly, different studies conclude that OI related challenges in SMEs are compound by inability to maintain a balance between OI activities and daily business operations (Enkel et al., 2009; Savitskaya, Salmi, and Torkkeli 2010; Knudsen and Mortensen 2011; Verbano et al., 2015).

The following section explore some of the OI related challenges associated with SMEs. These challenges include selection of partners, managerial and financial impediments, absorptive and desorptive capacity issues, organisational cultural problems, collaborative constraints, intellectual property issues, and the lack of information and time.

2.8.1 Selecting the partners

Open innovation is associated with many risks that SMEs need to avoid at all cost. Thus collaboration in OI involves avoiding such risks and get maximum rewards for all stakeholders. Given the failure rate in application for OI projects, partners selection is a very important task for ensuring successful collaborations. Due to the failure rate, selecting the the right partners

is imperative in the preliminary stages of partnership development (Bierly and Gallagher, 2007). Selecting the right partners for OI project is difficult task as it requires total commitment of every employee from top management down to lower level employees. Popov (2018) point out that some big firms identify OI partners as the extension of their own innovation process. These firms consider selecting partners as an important tasks towards establishing strategic alliance. Thus, they consider it as vital task.

Given the significance of selecting the right partners for OI programmes, some organisations have adopted selection model. Selection models used differ from firm to firm. Compatible management style, unique competencies, and strategic fit is the first selection principle (Wu et al., 2009). Marketing knowledge is considered as the second selection principle that companies use to select partners when they aim to expand market share, improved export opportunities and knowledge (Wu et al., 2009; Yoon and Song, 2014). Intangible assets such trademarks, patents, , reputation, and alliance experience is the third principle used to select partners (Wu et al., 2009; Yoon and Song, 2014). The company's complementary capabilities such as wider potential company's market coverage, partners' owned managerial capabilities, quality of the distribution system, and diverse customer (Yoon and Song, 2014; Wu et al., 2009). Yoon and Song (2014) pointed out the degree of fitness, which includes elements such as willingness to share knowledge, organizational culture, and flexibility of strategic partners as the fourth selection principle used to select partners.

2.8.2 Management and financial constraints

Despite the low-level of absorptive capacity challenges faced by SMEs when seeking to engage in OI, the lack of management skills and inadequate financial resources are considered as huge obstructers (Lv, Zeng and Lan, 2018; Santoro et al., 2018). Researchers reveal that management issues derail OI endeavours in SMEs (Ama and Okurut, 2018; Santoro et al., 2016). The determination to pursue a growth strategy depends on the owners of the business. Open innovation practices in SMEs fails to take off as owners are preoccupied by the daily activities of the business and pay less attention to other growth strategies (Usman et al., 2018). SMEs are usually run and managed by the owners who make all managerial decisions for the company. This sentiment is consistent with Hossain (2015) who point out that in many SMEs in the world, OI decisions are made by owners. SMEs are recognised as entities which employ many people but lack skilled manpower to assign them to collaboration activities with external partners.

Partnerships for OI require consistent decisions, and the latter is deemed to be major challenge to SMEs owners. This notion is consistent with Bigliardi and Galati (2016) and Pellegrino (2017) who point out that OI practises in SMEs are jeopardised by the lack of managerial skills and skewed information towards growth strategies. Open innovation practice requires managerial intelligence to recognise areas of internal R&D processes that may require improvement from external partners. Identifying external partners for R&D is a major problem for SMEs (Bigliardi and Galati, 2016; Moonsamy, 2016). Van de Vrande et al. 2009 cited in Pellegrino (2017) and Bigliardi and Galati (2016) highlighted that identifying external sources for OI in SMEs is a major managerial challenge to both SMEs and large corporations. Identifying partners in OI engagements entails taking bold managerial skills to effectively recognise and choose the right external partners (Pellegrino, 2017; Sağ, Sezen and Güzel, 2016). Managerial challenges to OI strategies are exhibited in the assigning workers to take part in OI projects with external organisations. The challenge for SMEs owners is identifying and assigning special individual workers to go and work in organisations' projects identified for OI partnerships without compromising in-house R&D processes (Pellegrino, 2017).

Furthermore, the managerial OI related problems are caused by financial constraints in SMEs. According to Hossain (2015), public policies in many countries are not supportive of IO in SMEs. Lack of policy frameworks that outline R&D external sourcing services guidelines for SMEs make it difficult for these entities to identify partners for OI engagements (Hemert et al., 2013). Kim et al. (2014) and Hemert et al. (2013) suggest that public policy must encourage the establishment of networks for effective collaboration and partnerships for OI programs. Furthermore, Kim et al. (2014) argued that for OI policy to be successful in SMEs, team size, out-bound openness, and perceived uncertainties should be clearly defined. McAdam et al. (2014) maintained that public policy must encourage integration of SMEs into networks for easy access for administrative support from government. When networks are established, implementing public funds policy for OI programs will be easy to SMEs. This assertion is in support of Suh and Kim (2012) and Vega et al. (2012) who argue that public funding as a public policy is a vital catalyst for acceleration of OI in SMEs.

Studies on dynamic capabilities for OI engagements suggest that due to vital attributes such as strong seizing abilities, strong sensing competences, and configuration aptitudes, SMEs are able to develop OI approaches (Grimaldi et al., 2013). Hossain (2015) highlight that SMEs are

inclined to vertical and horizontal collaborations with customers, suppliers, and other agencies for innovation than horizontal collaborations with academic institutions, research institutions, and government agencies.

Globally, financial constraints play a critical role in the failure of OI in SMEs. Bigliardi and Galati (2016) as well as Usman et al. (2018) elucidate that inadequate financial support derails OI practices in SMEs. According to Parida et al., (2014), selecting a partner for OI engagements require financial resources. Certifying IP require huge financial investments. Researchers established that the formalisation of agreements and the adoption of a structured methodology pose enormous financial risks for SMEs (Bigliardi and Galati, 2016). Financial and policy frameworks to incorporate both internal and external knowledge and technology are cited as deterrents to the success of OI in SMEs (Bigliardi and Galati, 2016). Studies reveal that financial challenges and the “liability of smallness” associated with SMEs made it difficult for large businesses to consider collaborating with financially indented SMEs (Ama and Okurut, 2017; Bigliardi and Galati, 2016; Jeong, Noh, Song, and Lee, 2017). Financial constraints associated with SMEs makes it difficult to get credit lines and financial assistance from financial institutions such as banks, government agencies for R&D and technology upgrade through OI collaborations (Dukic et al., 2015; Hossain, 2015). Many financial institutions view supporting SMEs OI partnerships as too risky and are reluctant to assist these enterprises (Ama and Okurut, 2018; Hossain, 2015).

2.8.3 Level of absorptive and desorptive capacity issues

The level of absorptive capacity has emerged as a critical factor in OI in SMEs. Absorptive capacity is recognised as the company’s ability to identify and incorporate outside knowledge that is necessary to complement in-house research and development (R&D) processes (Calof, Meissner and Razheva, 2018; Parida, Oghazi and Ericson, 2014). It is associated with both outside-in and inside-out OI practices (Nitzsche, Writz, and Gottel, 2016). Hossain (2015) acknowledged that the absorptive capacity of the firm is influenced by its desorptive capacity. De Zubielqui et al. (2016), Pilav-Velic and Marjanovic (2016), and Kim et al. (2016) have stressed out the positive relationship that exist between absorptive capacity and innovation performance. The relationship also facilitates relations between management of partners involved in outside-in, and inside-out OI engagements. According to Lichtenthaler (2009) cited in Hossain (2015) desorptive capacity refers the company’s ability to effectively manipulate outside ideas for its benefit. Firms with high absorptive capacities are those that source

knowledge from external sources such as suppliers, customers, and public institutions. These firms are known to have frequently introduced new sweeping innovations than their peers (Pilav-Velic and Marjanovic, 2016). SMEs are considered to have a low level absorptive capacity (Calof et al., 2018; Hossain, 2015). Brunswicker and Ehrenmann (2016) and Calof et al. (2018) posit that the low level of absorptive capacity in SMEs is caused by the failure of the management staff to recognise and understand the importance of OI. Open innovation requires these entities to restructure their absorptive and desorptive capacity strategy. The lack of managerial skills is widely documented as a key impediment to SMEs interactions with industry key players and it results in derailment of OI strategies (Sağ, Sezen and Güzel, 2016). Despite the lack of these skills, SMEs are widely acknowledged as inventors of new technology. Consequently, SMEs are unable to introduce new inventions to the market and commercialise them because of the lack manufacturing capacity and the lack of forming external partnerships (Ferto, Molnar, and Toth 2016; Zhang and Chen, 2015). SMEs put inadequate consideration on knowledge absorption mechanisms to capture and retain external ideas and knowledge for R&D activities. Absorption capacity is also affected by other heterogeneous factors such as financial constraints, human resources, as well as access to information and technology issues (Calof et al., 2018; Zhang and Chen, 2015).

2.8.4 Organisational cultural issues

Organisational culture refers to values, norms and attitude that are recognized and shared between employees in the organisation (Akinyemi and Adejumo, 2017; Fatoki, 2018; Akinwale, 2018; GEM global report, 2018; World Bank Group, 2018). Culture that is adopted by the organisation determines the level of commitment to invest and open the organisation's R&D process to external partnerships (Ama and Okurut, 2017; Biglardi and Galati, 2016). For example, a risk averse culture poses substantial problems to the adaptation of OI. SMEs realise that OI has huge uncertainties and perceived them as a huge challenge to growth aspirations. Firms that put less value on new growth strategies such as OI are mostly likely to be stuck on "not invented here" predicament for a long time (Aloini, Lazzarotti, Manzini, and Pellegrini, 2017; Bondarenko, 2015; Havas, 2016). Having a compatible culture is cited as important way on integrating innovations from outside sources. The attitude of the organisation to acquire external ideas and technology is the major contributor to low level of growth of the organisation (Bondarenko, 2015; Havas, 2016). Adopting OI require the renewed mindshift not only in R&D processes but also in the mentality of workers. Since OI involve the use of external knowledge and technology, it requires complete change in worker's way of thinking. Low

levels of attitude derail investment and participation of SMEs in OI initiatives. The attitude of SMEs to participate in OI activities is also influenced by the fear to open up borders to outside rivalry organisations that may compromise their position in the market (Parida et al., 2014). The fear of losing a strategic market position is also expatiated by the fright to partner with suppliers who may end up as future competitors. Culture determine the firm's permeability level of its boundaries for OI engagements (Ahn et al., 2017). Negative attitude leads to SMEs delaying in making external partnerships, and in turn this affects the sharing of important technology that can be very critical to the discovery of new products and and to the improvement of service offerings of the organisation. The inability to acknowledge the importance of external ideas and knowledge further derails the commercialisation of new products (Yoon, Shin and Lee, 2016).

2.8.5 Collaboration strategic constraints

Selecting the right partnership is the key foundation for OI, which comes with huge predicaments of developing a win-win strategy. Identifying strategic R&D partnerships requires huge efforts and mental capacity to select right partners for SMEs (Ama and Okurut, 2018; Parida et al., 2014). The challenges involved in selecting suitable partners include dealing with the dilemma of choosing between a big organisation, a small specialist company or distinctive experts for OI collaborations. The OI partnership selection process also includes a huge consideration on insights of each partner and developing mutual relationships which will benefit both parties. OI agreements may result in opportunistic behavior where one partner in the agreement may gain ideas and knowledge and choose not to share its own information or expertise (Bigliardi and Galati, 2016).

Collaboration for OI takes two forms, namely: vertical and horizontal forms. According to Santoro et al. (2016), vertical partnerships include collaborating with firms in different spheres in productions while horizontal integration is the consolidative effort of many organisations producing similar products and services. Vertical partnerships are equally important for incremental innovations and vertical partnerships are associated with sweeping innovations (Ama and Okurut, 2017; Santoro et al., 2016). Studies indicate that SMEs favor vertical partnerships (market actors) as opposed to horizontal partnerships (research establishments, universities, or government) for product improvements.

2.8.6 Intellectual property (IP) issues

Patents assist firms to register inventions to the outside world (Hossain, 2015; Lahr and Mina, 2016). Registering discoveries becomes the intellectual property which needs to be protected. However, small and medium enterprises face intellectual property related issues when they incorporate OI paradigm as a business approach to improve R&D activities (Ahn et al., 2017; Hossain, 2015; von Dyck, 2015). Open innovation is an embodiment of a shared vision centred on sharing intellectual property. Co-patent is referred to as ground breaking discovery and creation that conjointly owned by two or many people (Belderbos et al., 2014; Santoro et al., 2018). Conjointly patents send significant information to investors about the company's strengths on R&D while also clearing doubt about the organisation (Lahr and Mina, 2016; Santoro et al., 2018). However, it is considered difficult for SMEs to share and reveal IP to external organisations for the risks of losing it to external competitors (von Dyck, 2015). Additionally, co-ownership of patent creates duopoly where parties are at risk of competing against each other. Lahr and Mina (2016) and Santoro et al. (2018) reveal that both parties have the permission to dispose patent. Disposing patent is difficult to SMEs since they suffer from the "liability of smallness" where large patent co-owners maliciously dispose patent to third parties (Moonsamy, 2016).

Researchers (Ardito et al., 2016; Lv et al., 2018) point out that the "liability of smallness" gave SMEs limited opportunity to succeed on registering co-ownership of patent with large partners. Managing patents is considered as an expensive and difficult exercise for SMEs (Ahn et al., 2017). Unlike in large corporations, patents in SMEs are not professionally managed. Managing patents is acknowledged as an expensive administrative task. Patent costs prohibit SMEs to effectively engage in outbound innovation. Large firms tend to leverage economies of superiority and choose to retain control of co-patents (Lv et al., 2018). The "liability of smallness" issues is also exhibited in patent sharing with research institutions and universities which are not aligned to commercial motives. Universities and scientific research institutions focus on public and social value, and cutting-edge technology respectively, therefore concluding co-patent agreements with SMEs becomes very difficult (Ardito et al., 2016; Jeong et al., 2017; Lv et al., 2018). SMEs are resources and technically deprived. This, together with the potential for having limited power on R&D programs when collaborating with large organisations imply that benefiting from patent is very difficult for SMEs (Lv et al., 2018). Open innovation requires that SMEs share details of concluded projects and future intellectual property details to allow partners the opportunity to successfully take part in future inclusive

programs. Hossan (2015) highlighted that SMEs must be extra cautious in protecting their IP. They need to strike a balance between revealing own IP in OI partnerships.

2.9 Summary of the chapter two

In this chapter, literature for the study has been reviewed, with focus on the concept of SMEs. A detailed discussion on the definition of SME has been clearly presented to position the concept to this study. The discussion is centered on exploring the definition of SMEs across the world. However, literature indicated that there is no international accepted universal definition for SMEs across the world. Countries use different qualitative and quantitative aspects to identify and classify entities as SMEs. The researcher further discussed the significance of SMEs in South Africa, highlighting their economic, and social contribution to the country. This is followed by an outline of the global and local OI related challenges associated with SMEs. The OI impediments such as managerial and financial constraints, absorptive and desorptive issues, organisational cultural issue, collaboration strategic constraints, and IP issues have been discussed. Furthermore, a review on OI in SME in South Africa has also been presented in this chapter, the intention being to clearly define the gap identified for this study and to effectively align it with the objectives of the study. The next chapter presents a further review of literature on the concept of OI.

CHAPTER THREE

LITERATURE REVIEW: THE CONCEPTUALISATION OF OPEN INNOVATION

3.1 Introduction

In chapter three the researcher proceeds with a discussion of the OI architypes such as inbound (Outside-In), outbound (Inside-Out), and coupled innovation, explicitly exploring the framework for the successful implementation of the OI paradigm. The significance of OI were explored to determine how the concept can be aligned with SMEs. OI in SMEs is further discussed to understand how it is perceived in the SME sectors in the world. Finally, an outline of how OI is measured in organisations is provided to justify why the current study was necessary. The summary and conclusion of the chapter are then provided.

3.2 The Concept of innovation

Innovation emerged as a critical concept and significant topic of discussion in academic and business corridors as it is associated with defining the future of organisations. The concept was first coined by Joseph Schumpeter (1962) cited in Sledzik (2013, p. 90) who acknowledged innovation as the launch of a new or significantly improved product or service, the introduction of a new method of production or sales, opening a new market, the identification of new sources of raw material supply or the creation of a new industry structure. As the concept gathers recognition, scholars brought about different views in support of Schumpeter's views on innovation (Brooks, 2017; Horth and Vehar, 2015; Popov, 2018). For example, innovation is widely recognised as a process of generating novel ideas critically important for creating something new (Brooks, 2017; Horth and Vehar, 2015; Krause and Schutte, 2015; Popov, 2018). Lee et al. (2010) and Teece (2010) stressed that innovation resonates with the persuasion of efforts that lead to the introduction of something new to the organisation. Additionally, Brooks (2017) and Popov (2018) point out that innovation is a process that brings new ideas to reality. The new ideas may include establishing something that improves or replaces a business process to upturn efficiency and productivity (Brooks, 2017; Horth and Vehar, 2015). Irrespective of the form innovation takes place in the organisation, it is recognised as an ingenious progression where ideas emanate from within the organisation such as from the workers, internal research and development or executives. It may also emanate from external sources such as customers, suppliers, media reports, market research bureaus, universities or other sources of new technologies. Innovation is widely recognised by the

unique forms and intensity it presents itself to customers and rivalry businesses in the market. Paradkar, Knight, and Hansen (2015) asserts that novelty varies from mere discoveries of systematic methods and know-hows to simple improvements on presenting products and services to consumers.

However, Rogers (1995) cited in Piperopoulos (2016) argued that innovation is a notion or a practice recognized as novel to the person or proxy evaluating it. Piperopoulos (2016) suggests that innovation happens from two distinctive actions. The first type of innovation happens when a novel idea is developed while the second approach to innovation is realized when improvement is made to an existing product or procedure. This assertion is consistent with Ošenieksa and Babauskaa (2014) and Paradkar et al. (2015) who posit that innovation means coming up with something new or something that significantly improves a process in an organisation. However, literally, innovation means merely creating something (Paradkar et al., 2015). This notion is in support of Kanagal (2015) who argues that the novelty of new ideas should entail creating something new that solves problems experienced by customers and provides value to market needs. Innovation should be described by its ability to establish new markets and defining new competition in the market (Kanagal, 2015). Furthermore, innovation could mean altering the business model to adopt to market variations and deliver improved products and services to customers (Chesbrough and Bogers, 2014; Paradkar et al., 2015).

Innovation can be adopted as a business strategy where it will be developed as a culture and used to spearhead innovative thinking in an organisation (Chesbrough and Bogers, 2014). Likewise, Selman (2002, p. 2) argued that innovation is “intentionally bringing into existence something new that can be sustained and repeated and which has some value or utility”. Gault (2018) pointed out that innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices workplace organisation or external relations Gault (2018) also pointed out that the key characteristic of novelty acquired through new ideas and knowledge is seen from the new products or services offerings to customers. Selman (2002) further exemplified his definition drawing a comparative analysis between art and innovation. The conclusion was that art shows creativity but it does not require utility as it reflects the artist’s assertiveness or familiarity with nature. Innovation must allow for something or some prospects or achievement or value away from the novelty (Selman, 2002). Manuylenko et al. (2015, p. 1030), associate

innovation as the act of developing a complex process of innovation creation, distribution and use, focussing on efficiency growth and the development of innovative activities.

Innovation has been widely recognised as a business concept that is going through many phases. Its developments are embedded and associated with the two forms commonly associated with it. These unique forms include transformational and incremental innovation. Parida et al. (2014) and Paradkar et al. (2015) suggest that transformational innovation include coming up with new products or service offerings to the market while incremental innovation involves improving existing products or using existing organisational processes to produce new products and services. Teece et al. (2010) and Lee et al. (2010) argued that innovation progression of ideas is reaffirmed by business model of an organisation. However, Chesbrough and Bogers (2014) suggest that progression of ideas can be sourced from the existing guarded R&D initiatives in the organisation (closed innovation) and from external partners through sharing of knowledge (open innovation). Innovation consists of various concepts which saw the birth of OI. Some of the concepts of innovation are depicted in Figure 3.1.

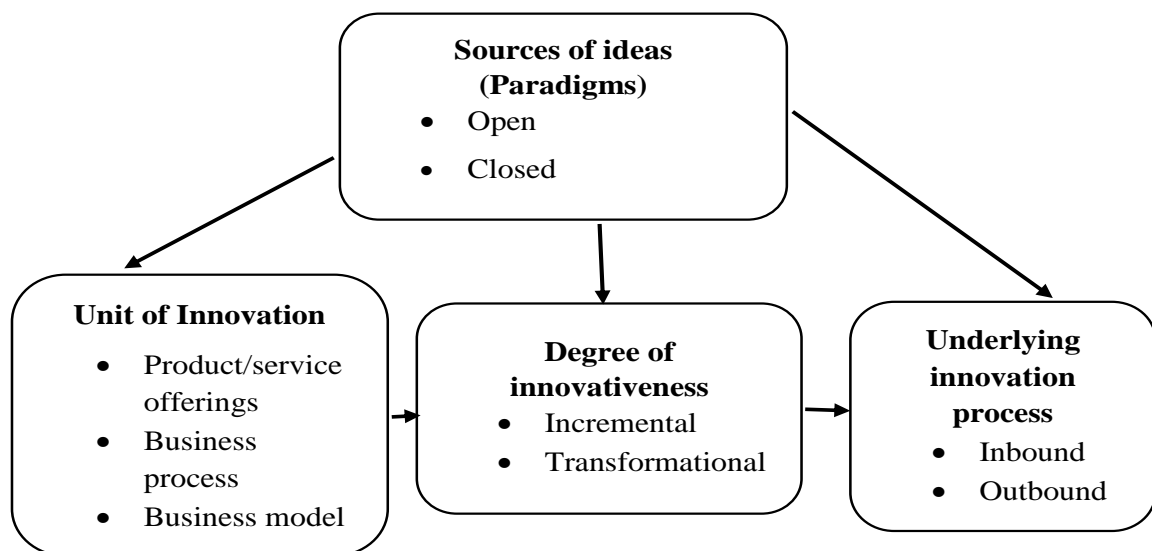


Figure 3.1 Constructs of innovation

Source: Adopted from Moonsamy (2017)

As shown in Figure 3.1, a number of constructs are embedded in the broader structure of the innovation paradigm. The paradigm consists of four hypotheses such as how/where innovation ideas are sourced, what is being innovated (unit of innovation), degree of innovation and the underlying innovation process (Moonsamy, 2017).

3.3 The concept of closed innovation

Closed innovation is the process where an organisation produces ideas and knowledge internally without the assistance of an external partner, from the generation the idea to manufacturing, commercialisation and distribution of goods and services to customers (Chesbrough, 2017). Closed innovation is regarded as a self-reliant way of generating new ideas within the organisation. Through, closed innovation, an organisation relies on its own internal R&D processes and investments greatly in employing highly qualified personnel. The close innovation model depends on strict rules such as intellectual property laws to protect its product replication by rivals (Corvello, De Mauro, Grimaldi, Scarmozzino, 2015). In the closed innovation paradigm, all inventions are developed and protected by a single organisation. The closed innovation model hinges on the philosophy that “successful innovation requires control” (Chesbrough, 2003b, p. 36). Importantly, Lassen and Laugen (2017, p. 1131) suggested that through closed innovation “firms can develop a competitive advantage by building in-house research and development competencies, which effectively enable the development and commercialisation of new products, processes, or services”. Organisations pursuing this model have the perception that only their ideas and efforts will successfully generate, develop, market and distribute products and services to customers. However, Lassen and Laugen (2017) argued that closed innovation depends on inside capabilities which are deemed to be insufficient for an organisation to get and maintain a modest edge in the dynamic business environment. Maintaining consistent, new innovation products to market through closed innovation is difficult to achieve in the fast changing technological business environment (Lassen and Laugen, 2017). Figure 3.2 illustrates the Closed innovation model.

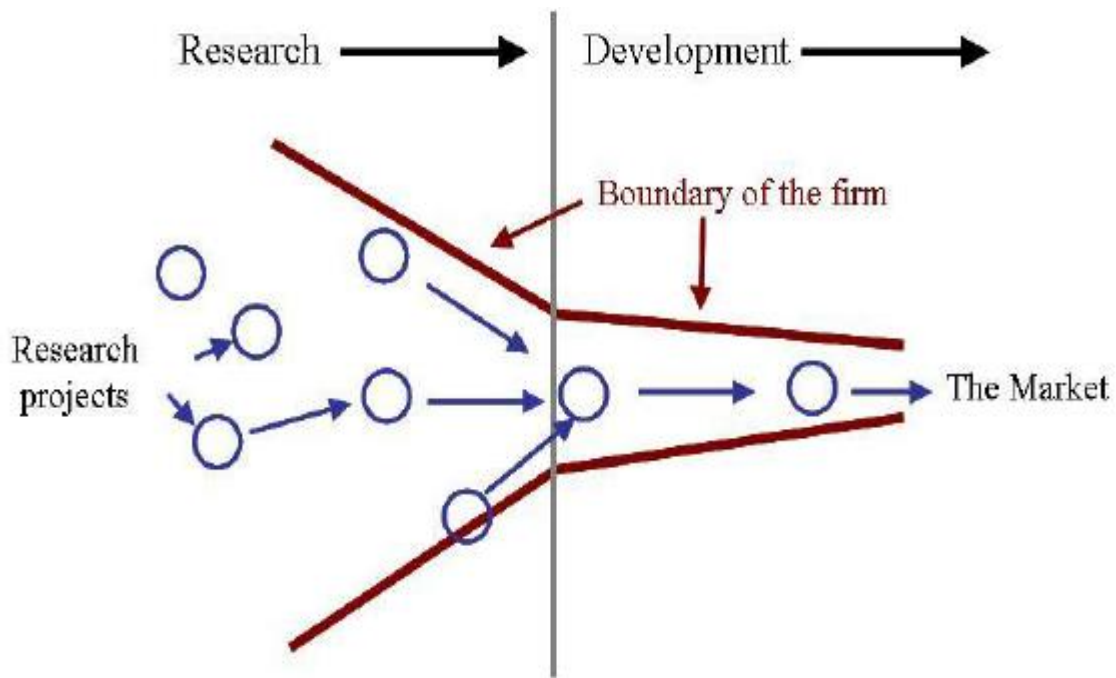


Figure 3.2 Closed innovation model

Source: Chesbrough (2003b)

As depicted in Figure 3.2 the borders of an organisation are solid and no infiltration of external ideas and knowledge is allowed into the research projects and development activities of the organisation. The organisation merely sources ideas and knowledge internally from the idea generation stage through to the commercialisation phase of the innovation process without incorporating external inputs from other organisations. Close innovation model merely indicate that firms rely on their own financial and human resources investments to spearhead in-house R&D processes. Consequently, as years go by the market pressure seem to inform and determine customers' appeal to products and services. This phenomenon saw the birth of the OI paradigm as the new philosophy to product development in an organisation.

Chesbrough (2003b) postulates that the transition from closed innovation to OI required policy and structural adjustments to the new paradigm. It requires enormous change in the workers mentality, shifting from the "invented here" syndrome to incorporate "proudly found elsewhere" philosophy that exhibit opening up organisational borders (Chesbrough, 2003b, p. 38).

3.4 The conceptualisation of open innovation

Open Innovation emerged in the 21st century as a critical business concept. The concept was established on the realisation that organisations can keep up with market pressure by embracing external ideas and knowledge to enhance innovation processes within them (Chesbrough, 2003a, and 2003b cited in de Beer and Armstrong, 2015). Chesbrough (2003b) cited in de Beer and Armstrong (2015), OI model recognised that the borders of organisations and their close environments are permeable, which allows the movement of novelties to pass through easily between firms. OI also emerged with global firms such as IBM and P&G's realization that they can develop in-house technology capabilities by incorporating ideas and knowledge from outside companies. In OI model, organizations can commercialize its internal ideas and innovations from other organisations and explore ways of bringing internal ideas to the market by using external knowledge and technology sourced from other organisations (Chesbrough, 2003a).

As from the ground-breaking work of Chesborough (2003a) cited in Krause and Schutte (2015), the concept is being widely accepted as a novel dynamic approach to contemporary entrepreneurship in business today. Over the years the new OI paradigm has been globally accepted in both academic and business corridors as the engine that drives growth for organisations (Hossain, Islam, Sayeed and Kauranen, 2016; Krause and Schutte (2015); Moonsamy, 2016; West. et al., 2014). As illustrated in Table 3.1, since its inception, the paradigm has received some refinements. The amendments were done to respond and incorporate emerging insights as the concept continue to be accepted and embraced across all industries and in research institutions as well as in academic corridors (Chesbrough and Di Minin, 2014).

Table 3.1 The progression of the definition of open innovation

Period	Definition
Original definition	“Open innovation means that valuable ideas can come from inside or outside the company and can go to the market from inside or outside the company as well. This approach places external ideas and external paths to the market on the same level of importance as those reserved for internal ideas and paths” (Chesbrough, 2003a, p. 43).
Refined version 1	“Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively” (Chesbrough, 2006, p. 01).
Refined version 2 (Current definition)	“Open innovation is the distribution innovation process which is based on purposively managed knowledge flows across organisational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organisation’s business model. These flows of knowledge may involve knowledge flows to the focal organisation (leveraging external knowledge sources through internal processes), knowledge outflows from a focal organisation (leveraging internal knowledge through external commercialisation processes) or both (coupling external external knowledge sources and commercialisation activities)” (Chesbrough and Bogers, 2014, p. 12).

Chesbrough (2003b, p. 15) firstly defined OI as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively”. The new innovation paradigm ushers in a shift from the closed innovation model where R&D were done internally to a more inclusive and collaborative approach (open innovation) that includes the incorporation of ideas and knowledge from external partners to augment innovative processes of an organisation (Moonsamy, 2016). Chesbrough (2003a) cited in Moonsamy (2016, p. 15), refer to reasons for the shift as “erosion factors” of the old paradigm. Some of the factors include the movement of employees, the occurrence of additional proficient universities, the advanced development in information technology (IT) and the rising distribution of knowledge across modern organisations (Ahn et al., 2017; Gassmann, Enkel, and Chesbrough, 2010). However, the current definition of OI has been recently improved and widely acknowledged as “a distributed innovation process based

on purposively managed knowledge flows across organisational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model" (Chesbrough, 2006a cited in Chesbrough and Bogers, 2014, p. 3).

The current OI definition means that the organisation can innovate by purposively identifying and incorporating streams of ideas and knowledge from external sources (Chesbrough and Bogers, 2014). The definition indicates the existence of a connecting mutual thread (inflow of ideas and knowledge) that connect the company with others. These streams of ideas and knowledge include utilising both internal and external sources to augment internal innovation processes. According to Chesbrough and Bogers (2014), the new definition draws its central distinction on the recognition of inflows and outflows of ideas and knowledge from the peripheries of the organisation which are considered pertinent to the business model of the organisation. These external ideas and knowledge can be used together with internal resources in speeding up in-house R&D processes for the organisation. Open innovation model is depicted on Figure 3.3.

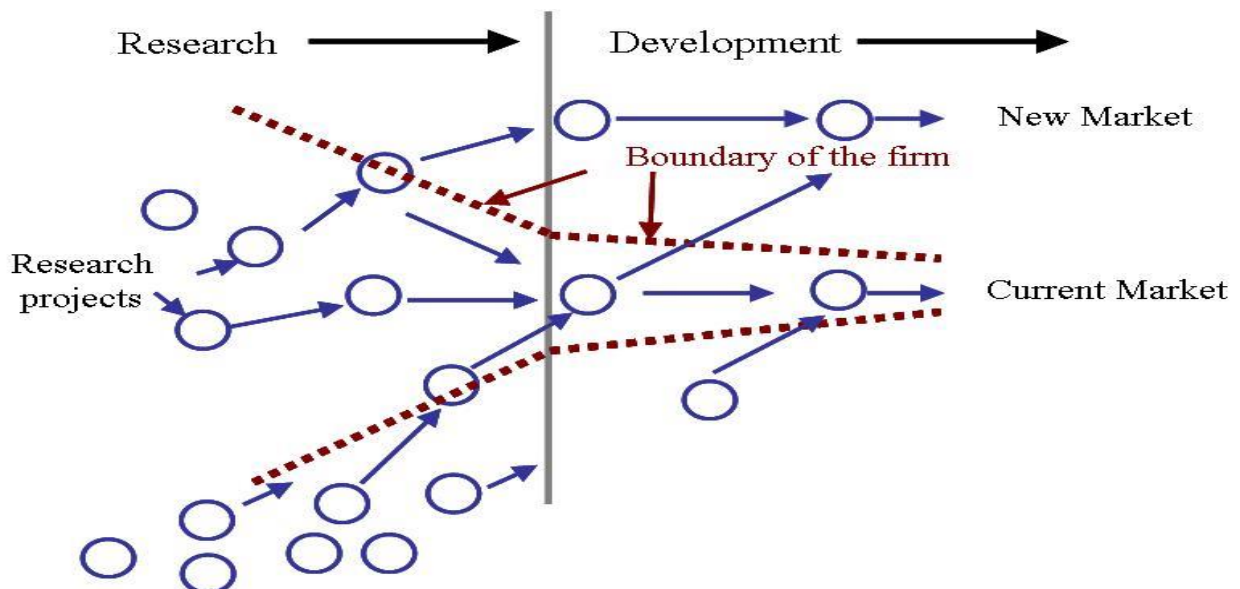


Figure 3.3 Open innovation model

Source: Chesbrough (2003a)

Figure 3.3 indicates that borders of the organization are porous. Ideas and knowledge move freely across the boundaries from inside and outside the organization into internal research and development processes of the organization (Chesbrough, 2003a). The ideas and knowledge are incorporated from the idea generation stage through to the commercialization of the product.

The permeability nature of the boundaries of the organization supports the acquiring of ideas and knowledge from anywhere to speed up innovation in the organization. Ideas can be generated by developing working relationships with suppliers, customers/consumers, research institutions and other interested stakeholders (Corvello et al., 2015).

Open innovation has reaffirmed the porous nature of the boundaries of internal R&D and calls for more permeability to external inflows of ideas and knowledge into the innovation processes of the organisation (Cassiman and Valentini, 2016; Uduma, Ibeh and Ogbuji, 2015; Krause and Schutte, 2015). Similarly, the same researchers suggest that recent modifications of the definition recognised that acquiring external knowledge does not happen in a haphazard manner but takes planned steps that include financial considerations and efforts guided by the business model of the organisation.

A number of researchers recognised that since its inception, OI has been gaining global recognition as a fundamental tool used to respond to dynamics in the business environment (Alexy, Morean and Salter, 2016; Freel and Robson, 2017; Rangamiztousi and Ismail, 2015). Additionally, Tucci, Chesbrough, Piller and West (2016) recognised OI as unexpected spill-overs which are realised from R&D processes of the organisation. Similarly, an organisation can create internal channels where inflows of ideas and knowledge is harnessed to benefit internal innovation processes while external processes are established to share information obtained with other organisations. However, Tidd (2014) and Krause and Schutte (2015) pointed out that in as much as OI is widely accepted as an important business concept, it still lacks specific implementation frameworks in many organisations across the world. The researchers (Krause and Schutte, 2015; Tidd, 2014), argued that firms consider OI as a general strategy which does not pin point how outside knowledge is obtained and it enables organisations to allow organisations to share internal information. However, other researchers acknowledge OI as collaborations among firms not with other bodies such as research institutions such as universities or colleges in sourcing knowledge to improve products and technology of the respective firms (Greco, Grimaldi, and Cricelli, 2016; Tidd 2014).

However, OI is construed differently across industrial sectors. For example, the fast evolving electronic and telecommunication sector identify IO as a strategic armament that assists in dealing with the rapid development pace which is reducing product life cycles in the sector. Therefore OI is used to deal with competition and the fast moving markets, and also for

lessening production costs. Subsequently, the energy sector is mainly concerned about sustainable issues (supply deterioration and environmental issues) in the global markets. Firms in the energy sector understand OI as a tool that assist in identifying new technologies to increase supplies and deal with sustainable issues. Technology life cycle and confidentiality concerns are key unique characteristics which define OI in the aerospace and defence sector. However, firms in this sector adopt OI to respond to the alarming development of technologies and escalating R&D costs. Fast FMCG firms need to constantly present themselves in the market and always look for ideas to produce new products. To FMCG firms, OI is a paradigm used to innovate and create a competitive advantage in the market. Given the nature of their technology, software and media organisations are regarded as open and identify OI as formal initiatives that allows customers to be innovative. Restropectively, Salge, Bohne, Farchi and Piening (2012) point out that the success of OI is humpered by the inability to deal with challenges related with openness described by the paradigm. Huizingh (2011) suggest that the lack of formal inter-firm heterogeneity in understanding factors that assist firms to reap great rewards from OI engagements is blamed for the failure of OI.

Table 3.2 Trends in the interpretation of OI across different sectors

Sector	Industry characteristics	What form does OI take?
Electronics and telecoms	Strong need to adapt to the growing demand from consumers and to keep the organisation up to date with the rapid pace of technology development. Collaboration to create industry standards is regarded important. Reducing costs is a priority.	OI is being used as a means of gaining access to new technologies in order to anticipate competition, to keep up with the fast moving markets and to reduce costs. Standards and regulations are both an opportunity to work openly and a ‘constraint’ on innovation.
Energy/oil	Business is changing because of sustainability issues (declining oil supplies, global warming).	OI is an opportunity to identify new technologies to improve the oil supply and to help the industry evolve and increase its sustainability.
Aerospace and defence	Traditional engineering businesses. Have a long technology lifespan and long lead times for their adoption. Strong confidentiality issues especially for defence. Strong influence of policy makers and government on innovation strategies.	OI is a new concept, especially for defence companies who are wary of information leaks. However, OI approaches are being adopted in response to the increasing complex technologies and the rising R&D and innovation costs.
FMCG	There is the need to reduce time to market and find new ideas for generating new products. Strong marketing influences the innovation strategy.	OI is an opportunity to innovate and increase competitive advantage. Most FMCG companies are currently developing their OI strategies (more formalised OI).
Software and media	Software companies have almost been opened up their innovation processes due to the nature of their technology.	Open source software, and internet web 2.0 have revolutionised the innovation processes so that users (customers) can themselves contribute to innovation.

Source: Author’s own compilation

3.5 The archetypes of open innovation

Bogers, Chesbrough and Moedas (2018), acknowledged that outside-in, inside-out and coupled innovation are critical types of OI. These three types are also known as inbound, outbound and

coupled OI, respectively. Outside-in OI is when the organisation avails its OI processes to absorb ideas and knowledge from external sources. The archetypes of OI are depicted on Figure 3.4 and discussed in the subsequent sections.

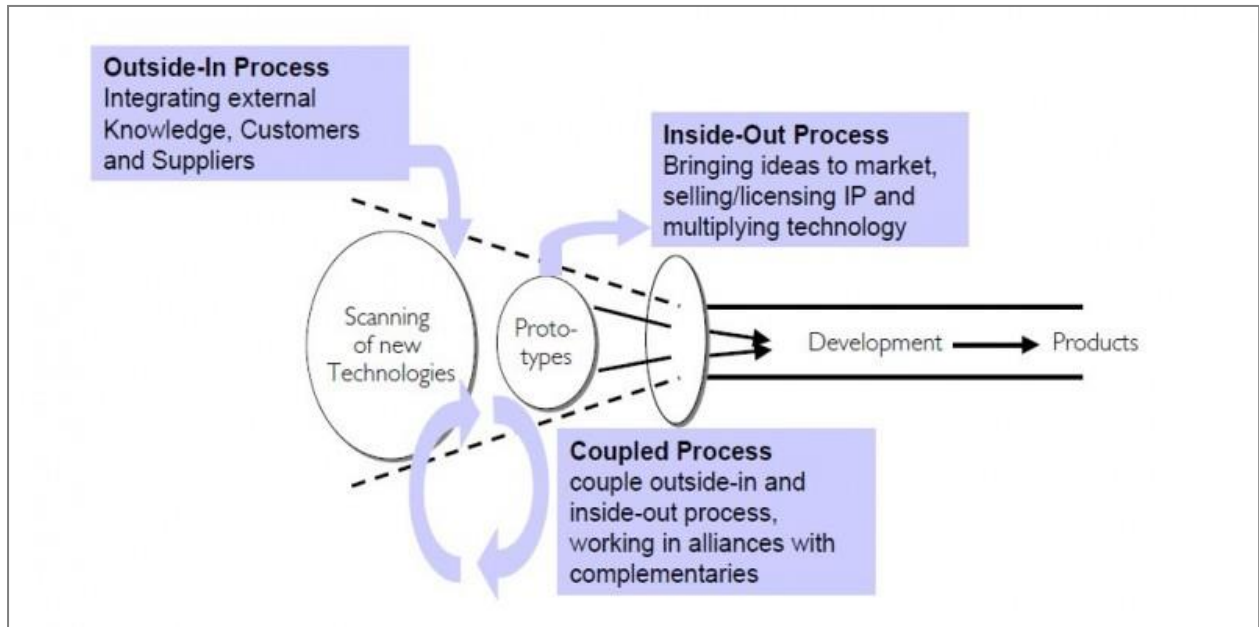


Figure 3.4 Three archetypes of open innovation processes

Source: Bogers, Chesbrough and Moedas (2018)

3.5.1 Outbound (Inside-out) open innovation

Outbound (inside-out) OI entails unveiling unused and underutilised innovations to other organisations (Bogers et al., 2018; Piller and West, 2014). According to Gassmann and Enkel (2004) cited in Canik, Bohemia and Telalbasic (2017, p. 3) outbound OI means “earning profits by bringing ideas to market, selling IP and multiplying technology by transferring ideas to the outside environment”. It happens when an organisation seeks to get commercial benefits by availing internal innovations to other entities with business models that suits such inventions (Spithoven, Vanhaverbeke, and Roijakkers, 2013). For example, an organisation can license out new technology invented internally to other firms with business models compatible with it. Cassiman and Valentini (2016) maintained that outbound OI is used by firms to offload extra innovation that could not be kept. Outbound OI is anchored on the need to profit from technologies and capabilities that are deemed excess to the company. Such excesses will be out-licenced or sold to produce extra income to the company. Importantly, firms use outbound OI to decongest internal innovation processes and profit excess inventions through out-licencing to other organisations. Organisations use outbound OI to venture into other industry

sectors by selling patents, joint venture, out-licencing IP, and spin-offs (Lichtenthaler, 2009; Zuppo, Rosa, Bermejo and Zambalde, 2016). The outbound process does not only provides economic benefits from selling new technologies and other discoveries but it also offers huge non-financial benefits such as setting new industry standards, accessing outside knowledge, and creating an opportunity to operate on broader outward licensing arrangements with other organisations (Cassiman and Valentini, 2016; Lichtenthaler, 2015; Zuppo et al., 2016). Literature indicated that outbound OI result from the formulation of ventures (spin-off entities) where the organisation takes advantage of the established proficiencies and resources such as human capital, technology, and other supporting services (Cassiman and Valentini, 2016; Akinwale, 2018; Brunswicker and Van de Vrande, 2014; van de Vrande et al., 2009). For example, the establishment of Lucent Technologies by Bell Labs in 1996 was formed as a spin off entity (Chesbrough, 2003a).

Consequently, outbound OI exposes great risks to organisations. Firms seeking to ofload their inventions through outward licensing are likely to expose and weaken its market position by transferring its pertinent technology (Lichtenthaler, 2015). According to Teece (2000) cited in Kutvonen (2011; p. 462) innovation is construed as an “idiosyncratic good” that poses transferability challenges to many organisation. Identifying shelved ideas and knowledge assets is a difficult task for many organisations (Kutvonen, 2011). For example, firms in the technology sector are unable to identify the potential benefits of shelved ideas other than those currently used in existing business models.

3.5.2 Inbound (Outside-in) open innovation

Inbound OI is considered as a strategy taken by companies to introduce processes and products novelties (Lakemond, Bengtsson, Laursen and Tell, 2016; West and Bogers, 2014). Inbound process include the movement of streams of ideas and knowledge across the borders of the organisation into its innovation processes of the organisation (Chesbrough and Bogers, 2014; Hossain, 2015; Paik and Chang, 2015). The outside-in’s quest is centered on the premises of leveraging the internal capacity and capabilities with ideas and knowledge from outside the organisation’s boundaries. Additionally, inbound innovation involves unveiling the firm’s innovation processes to benefit from outside contributions and inputs (Hossain et al., 2016; Piller and West, 2014). This assertion is consistent with Greco et al. (2016) and Laursen and Salter’s (2014) claim that the combination of external streams of proficiency and internal knowledge reduces dependence on capabilities of employees in accelerating innovation-

related decisions in the organisation. Studies reveal that inbound OI calls for the highest degree in permeability structure and innovation processes boundaries to allow a clear osmosis of external knowledge and technologies into the internal processes of the organisation (Tucci et al., 2016; Randhawa, Wilden and Hohberger, 2016).

Inbound OI complements in-house R&D processes by drawing on expert knowledge and technological resources from external organisations (Michelino, Caputo, Cammarano and Lamberti, 2014). Additionally, streams of knowledge flowing into the innovation process of an organisation do not only reduce reliance on home grown R&D but they also eliminate R&D risks and costs which could have otherwise been incurred by the organisation. Furthermore, Bogers et al. (2018) point out that instead of depending on in-house R&D processes, out-bound OI propagates an organisation's search for external firms with business models that will assist in the commercialising of its products. This assertion is consistent with the argument made by Spithoven et al. (2013) who argued that outbound OI is based on the premises that organisations' functions are influenced by others in the business environment. Additionally, this notion agrees with Chesbrough's (2012) assertion that the collaborative nature of outside-in OI stands out above other innovation frameworks because it allows organisations to produce novel products internally from ideas deemed idle and not utilised in-house through licensing out intellectual property (IP) rights and spinoffs. Furthermore, West and Bogers (2014, p. 816) recognize three key stages in the course of outbound OI, namely: "obtaining knowledge (both the search for and acquisition of knowledge), integrating knowledge, and commercializing knowledge".

3.5.3 Coupled open innovation

Coupled OI also known as co-innovation involves creating strategic partnerships with complementary partners in a more structured way such as forming joint ventures, collaborations, and alliances (Bogers et al., 2018; Piller and West, 2014). Researchers acknowledge coupled innovation as a concurrent process that combine both outside-in and inside-in innovation dimensions carried out through a strategic arrangement such as strategic alliances (Bogers et al., 2018; Conboy and Morgan, 2011; Gassmann, Enkel and Chesbrough 2010). Gassmann and Enkel (2004, p. 6) support the same definition when they refer to coupled innovation as "coupling the outside-in and inside-out processes by working in alliances with complementary partners in which the give and take principle is crucial for success". Coupled OI involves partnerships between two or more firms to purposively manage common streams

of inside and outside ideas and knowledge across the borders through combined intercessions and economic actions (Bogers et al., 2018; Piller and West, 2014). The type of partnership involves deeper discussions which result in long term agreements. The arrangements are underpinned by the need to share ideas and knowledge that lead to shared output and new innovation to the market. Similarly, the majority of firms engaging in OI intend to stock external knowledge or intellectual property (IP) as assets for their respective innovation process for future monetary gains (Piller and West, 2014). Specifically, coupled OI collaboration include the development of association with explicit allies like conglomerates of rivals in the market, suppliers and research institutions (Bogers et al., 2018, Lakemond et al., 2016).

Piller and West (2014) argued that coupled OI is centered on four dimensions such as: external actor, coupling topology, the impetus for collaboration, and the locus of innovation. These dimensions are reflected in Table 3.3.

Table 3.3 The dimensions of coupled open innovation processes

Dimensions	Alternatives
External Actor Firms	Firms: customer, supplier (complement or, rival). Other organisations: university, research lab, government, other non-profit organisations. Individual: customer, consumer, inventor, civilian.
Coupling Topology Dyadic	Dyadic: single partner. Network: multiple partners. Community: a new inter-organisational activity.
Impetus for Collaboration	Top-down: initiated by upper management Bottom-up: developed through employee or customer collaborations.
Locus of Innovation	Bidirectional: innovation created within organisation. Interactive: innovation jointly created outside the company.

Source: Piller and West (2014)

According to Piller and West (2014), external players in the coupled OI sphere include suppliers, research institutions, clients, government and non-governmental organisations. The participation of these partners varies according to the phase of innovation process that include

the R&D phase and commercialization phase. Importantly, some players can affect the outcome of the incentive, synchronization and administration of the process (Canik, Bohemia and Telalbasic, 2017). Coupled OI can take the coupling topology dyadic dimension which involve partnering with a single firm, multiple partners (networks) or community partnerships. Coupled OI can be defined by the impetus for collaboration. This association can be described as both a top-bottom and bottom-up approach instigated by top executives and workers or customer cooperation, respectively in an organisation. Coupled OI can be identified by the locus of innovation characteristics embedded in the partner organisation (Piller and West, 2014). Piller and West (2014) posit that coupled OI happens between two parties (bi-directional), where invention happens in the firm or between various firms and where innovation happens outside companies.

3.6 The implementation of the open innovation paradigm

The implementation of OI differs from company to company. Studies indicate that the size, structure, culture and strategic preferences determine the implementation of OI in an organization (Momba, 2016; Sloane, 2011). Similarly, studies discreetly undertake that OI approaches are impartially alike, but firms adopt a different company architecture which is often poses a problem in terms of aligning to the OI strategy pursued by the organization (Hienerth, Keinz, and Lettl, 2011; Salge et al., 2012). Caputo, Lamberti, Cammarano and Michelino, (2016) indicated that the implementation of OI requires acknowledging the right and access to the organisational structure, not merely on relying on property rights which protect assets of the organisation. Michelino, Caputo, Cammarano and Lamberti (2014) illustrated that OI avails organisations to a wide networks and connections that can be utilized to speed up innovation in the organisation. The successful implementation of OI requires an organizational culture which acknowledge and accept strong external communications. Additionally, the execution of the OI strategy is determined by the company's ability to transform the business model to accommodate the new innovation paradigm (Saebi and Foss, 2015). The failure to integrate OI approaches with the framework of a business model results in performance discrepancies. In general, OI approaches only succeed when they are effectively aligned to the business model of the organization (Chesbrough and Bogers, 2014; Foss and Saebi, 2017).

Studies show that there are various approaches that are used to implement OI (Rosell, 2014). Firms use emerging information and communication technology (ICT) administrative and

institutional tools to facilitate collaboration with external players in the OI partnerships (Lazzarotti, Manzini, and Pellegrini., 2015; Aloini et al., 2017). Significantly, Aloini et al. (2017) elaborated that it is the correct identification of organisation's "technological, management and organizational (TMO) tools" that define the behavior and approaches adopted by the organization towards innovation processes. The execution of OI involve understanding the direction and movement of knowledge streams within the two important (in-bound and out-bound) activities.

However, Rosell (2014) suggests that implementing OI requires consideration of certain degrees of trust between firms. Trust and attitude contribute to the type of ideas and knowledge to be shared in OI engagements. Competence –based trust and rational trust are essential elements of successful OI collaborations. Competence-based trust is centred on trust based on technical capabilities, know-how and skill of the organisation while rational trust relies on the goodwill and moral duty of the organisation involved in OI partnership (Rossell, 2014). Mortara et al. (2011) espoused that OI approaches necessitated the compounded changes in technology, market and organisational structure. The notion was further modified by Ahn et al. (2017) who suggested that the new grouping of OI approaches are based on the central changes involved due to the human characteristics of the owners of the organisation. According to Ahn et al. (2017), R&D collaborations and licensing-in as the first technology-oriented activities of OI include accelerating technology assets of the organisations. Technology orientation mode is also centered on developing technological skills that address long-term objectives intended to be achieved through OI participations. Open innovation can also be executed through market oriented OI approaches. Some of the approaches include finding market expectations by involving clients in the innovation processes. An organisation would license-out as a way of commercializing under-utilized in-house knowledge in the new market. The implementation of OI further include considering organisation-oriented OI activities that causes drastic alterations to the structure of the organisation. These problems include mergers and acquisitions and spin-offs activities. These OI modes alter the structure of an organisation by either enlarging or reducing its borders (Ahn et al., 2017).

3.6.1 The framework for implementing open innovation

West and Bogers (2014) identified crucial OI steps that are used to implement OI. The three steps include obtaining, integrating and commercialisation. According to West and Bogers (2014) these steps are drawn from the contemporary OI model created by Chesbrough (2003b)

and other models of historical model of cohesive innovations. West and Bogers (2014) stated that a fourth step could also be added to the three steps to incorporate insights and/or feedback from customers/consumers.

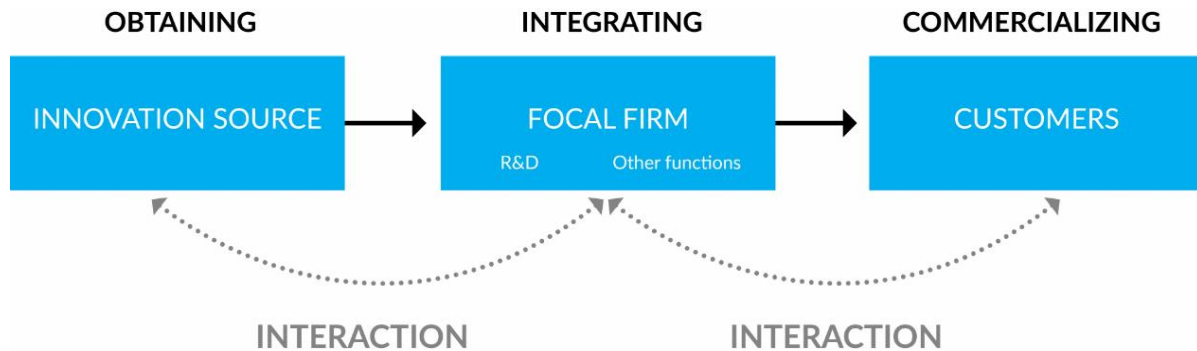


Figure 3.5 A four-phase process model for leveraging external sources of innovation

Source: West and Bogers (2014)

Implementing OI takes several steps. As discussed in the subsequent sections, some of the steps include identifying external sources, integrating ideas and knowledge to R&D processes, commercialization and alignment of feedback.

Step 1. Obtaining innovation from external sources

Sourcing ideas and knowledge requires coordinated effort and resources to identify the correct source. According to Syoen (2017), the organisation must firstly identify external sources of novelty and take the innovations into the organisation's innovation processes. Sources for extraction of ideas and knowledge include customers, suppliers and competitors (West and Bogers, 2014). The company can collaborate with a number of external firms or look at experts with explicit knowledge useful for the organisation's innovation needs and expectations (Syoen, 2017). However, identifying and selecting important information is the main obstacle to many firms' quest to obtain outside sources. This view supports West and Bogers's (2014) argument that the challenge resonates with the need to align external sources expertise and technology within the business model of the organisation. The sourcing of external ideas and knowledge is determined by the organisational principles that guide and defines the type of sources, whether from suppliers, individuals, or universities. Reviewing sources to obtain external ideas and knowledge is not limited to the characteristics of the source but the in-house factors such as R&D competencies and the corresponding resources in the organisations (Lee, 2010; Teirlinck, Dumont, and Spithoven, 2013). According to West and Bogers (2014, p. 815),

external sourcing hangs on two fundamental drivers: “improved efficiency through scale economies and access to innovations (or innovation-producing capabilities) not held by the focal firm”. Obtaining outside sources for OI can be executed by identifying and reviewing innovation being pursued by external firms. While outside sources can be obtained by cooperation with various participants, organisations can inactively find sources by merely utilizing the capability of technology such as the Internet (West and Bogers, 2014).

Step 2. Integrating development innovations

Open innovation require identifying and searching for ideas, knowledge and technology from external sources. Benefiting from external sources require the capacity to integrate such ideas, expert knowledge and technology in the innovation processes of the organization. At integrating development stage, analysis of new ideas are made where new projects are identified and new corporations are cemented to address market demands. Such partnerships may result in licensing, contracting, product and service development partnerships and technology transfer programs. However, the organisation can only benefit from this exercise when it has capacity and enthusiasm to successfully integrate the results with its R&D processes. This assertion is consistent with West and Bogers’ (2014) and Syoen (2017)’s argument that the successful implementation of OI calls for the establishment of a compatible innovation culture that assist the company to profit from ideas, knowledge and technology acquired from outside sources. West and Bogers (2014) espoused that integrated innovations demand leveraging the peripheral sources. According to West and Bogers (2014), the chances that the organisations may leverage on outside partners is known as “absorptive capacity” of the firm. It is central for firms to build enough capacity so that they will be able to absorb all the gains obtained from external engagements (de Oliveira et al., 2017; Nitzsche, Writz and Gottel, 2016). Importantly, firms with strong in-house R&D are reluctant to embrace outside technologies.

Step 3. Commercialising

The OI process concludes with the commercializing stage. Chesbrough and Bogers (2014) and West and Bogers (2014) posit that outside input must add value to innovation process of an organization. Accordingly, the commercialization stage of OI process is expected to add value to the organisation (de Oliveira, 2017). However, the products must be aligned to the business model of the organisation (Chesbrough and Bogers, 2014; Syoen, 2017; West and Bogers, 2014).

Step 4. Feedback

The fourth phase of the OI process include reverse flows and bi-directional collaborations that go beyond prior stages. These collaborations act as “interactions mechanisms” which happen at every stage of the process. The feedback includes response loops and reciprocal communications with external stakeholders and collaborations with outside innovation groups and communities (Syoen, 2017; West and Bogers, 2014). Integrating external knowledge into the OI processes include incorporating feedback loops from external stakeholders (Hughes and Wareham, 2010; Mortara et al., 2011).

According to the four-phase framework to leveraging outside sources of innovation by West and Bogers (2014), it is noted that sourcing outside partners for innovation include determining the innovation essentials for the organization. Once the innovation has been identified, the organisation needs to ascertain how to bring it into the market. West and Bogers (2014) point out that bringing external innovation include another process that comprise of “searching, enabling and filtering, and acquiring”. Sourcing outside sources for innovation include identifying firms with complementary knowledge (asset), R&D capabilities and technology that will aid the innovation process of the organisation. Identifying external sources entails collaborating with stakeholders or looking for experts with knowledge on the type of innovation being pursued by the organisation (Ili, Albers, and Miller, 2010; West and Bogers, 2014). Searching for outside sources for innovation also include passively considering obtaining innovation being “pushed” by outside parties. Some of the outside sources include suppliers, competitor, universities, and customers (Paradkar et al., 2015; Piperopoulos, 2016).

Table 3.4 Open innovation modes

OI mode by direction of knowledge flow	Definition	OI mode by dominant core changes involved
In-bound		
In-sourcing	Introducing external knowledge to reduce time-to-market and find new ideas by purchasing or paying royalties.	Technology oriented
R&D collaborations	Conducting R&D with external partners.	Market oriented
Customer engagement	Accessing new ideas by involving customers in the R&D or design process.	
Out-bound		
Licensing-out	Licensing or selling unused technologies to maximise profit.	Market oriented
Spin-off	Spin-off internal organisations to commercialise disruptive technologies.	Organisation oriented
Coupled		
M&A/Strategic alliance	Buying potential companies or building strategic alliances with them to absorb their knowledge.	Organisation oriented

Source: Chesbrough and Bogers (2014)

3.7 The significance of open innovation

Open innovation has emerged as a critical business concept used to transform innovation processes in organizations. Since its inception OI was accepted as the answer to calls by businesses to speed up innovation processes, accelerate quality, and eliminate costs (Eidam, Brockhaus, and Kehrel 2014). Similarly, researchers Lichtenthaler (2015); West and Bogers (2014) and West et al. (2014) acknowledge that OI allows industry convergence. This argument is consistent with Ahn et al. (2017) and Roessl and Hyslop's (2016) claim that organisations now need external knowledge embedded in other industries to complement and narrow existing knowledge gap. The benefits of OI to SMEs are discussed in the following section:

3.7.1 Use of various triple-helix role players

Open innovation allows the formation of complementary collaborations, and open organisations' borders allows streams of purposive ideas and knowledge critical in speeding the innovation process (Brunswick and Vanhaverbeke, 2015; Chesbrough and Bogers, 2014).

OI allows sourcing of ideas, knowledge, and technology from multiple sources such as customers, suppliers, government, retailers, trade partners, academia. According to Manceau et al. (2012), OI provides a solution of addressing projects issues through the utilisation of triple-helix approach where they are completed timeously through more sustainable innovation. Firms can commercialise products faster than before when they engage in OI approaches. Triple-helix approach has the chance of speeding up OI processes that result in new breakthroughs being realised.

Chesbrough (2003b) cited in Lichtenthaler (2015) suggest that the commercialisation of knowledge is abundant in the present external borders of an organization. Historically, knowledge was only kept internally where they were hardly used. Through OI such ideas and knowledge can now be commercialised for the benefit of the organization by internal engineers with the assistance of venture capital or spill-over to other organizations that will profit from it. Similarly, organisations can commercialize through external routes such as selling intellectual property (IP). Significantly, outbound OI is associated with boosting the performance of an organization. However, Lichtenthaler (2015), Vanhaverbeke et al. (2014), West and Bogers (2014) and West et al. (2014) emphasised that outbound OI approaches can only yield better results when conducted under conducive conditions.

3.7.2 Focused research and development

Organisations that invest in OI have the opportunity to solve R&D problems faster as specific solutions, and targets are clearly defined and jointly solved. Through OI established partnerships are, firms are able to identify OI problems and work together to quickly solve them. OI does not focus on merely sharing ideas, knowledge, or technology but help improve innovation processes. Capacity gained through OI engagements between partners increase success rate of identified projects (Mohalajeng, 2015). Innovation capacity of individual firms also increases as IO encourages the utilisation of internal and external ideas, knowledge, and technology from all partners. Increased R&D outputs correlate with the increased innovation success rate (Mohalajeng, 2015; Marais and Schutte, 2010).

Since OI collaborations increases the absorptive rate of ideas, knowledge, and technology has the benefit of allowing partners the ability to quickly access new markets (Anon, 2009). The penetration rate into new markets is aided by the new products produced in OI partnerships.

Partners investing in OI also take advantage of the existing links between partners to penetrate new industries. Taking advantage of the relationships between partners, members taking advantage and position themselves as new competitors in new markets (Mohalajeng, 2015).

3.7.3 Increased commercialisation rate

SMEs are recognised as good at inventions but lack appropriate resources for commercialization (Lee et al., 2010). However studies revealed that OI increases commercialisation rate in SMEs (Hemert et al., 2013; Lee et al., 2010). Kang et al. (2013) suggest that investment in external R&D, and innovative capabilities have high positive influence of commercialisation rate in SME innovations. Brunswicker et al. (2015) stated that OI practices in SMEs enhance innovation performance in two critical dimensions such a success rate of launching innovation, and appropriation of financial value from new innovations (products and services) Collaborations with partners is identified as an important driver for commercialisation of SMEs discoveries. It is through cooperations with large firms that commercialisation rate among SMEs is significantly high. Such collaborations assist SMEs deal with challenges that they could not have managed to handle alone. Brunswicker et al. (2015) highlighted that “application-oriented sourcing” vital enhances success of commercialisation of separate innovation projects. It is also referred as a “full-scope sourcing strategy” (Brunswicker et al., 2015).

3.10 Measurements of open innovation

Measuring OI attributes differs across industries (Carroll et al., 2017; Erkens et al., 2013;). Prior study by Chesbrough (2006) acknowledge that most firms use inputs, process, output and output (IPOO) metrics and qualitative factors such as operating problems, ownership and control to measure the degree of openness (Carroll et al., 2017; Erkens et al., 2014). Erkens et al. (2014) point out that organisations must firstly determine the key performance indicators (KPIs) so that the best measurement is chosen to assess the OI process. Some of the performance indicators include product market performance agility, new product releases and innovation sales as well as profit growth (West and Bogers, 2014). Erkens et al. (2014) suggest the most prominent approaches of OI that cover both the beginning and proceeding phases that are guided by different principles. These phases include the following principles:

Phase 1:

Phase one of the metric is guided by principle one which has three key activities that need to be carried out.

Principle 1: Use unique metrics for each OI method

This principle include the method with important characteristics, attributes, and resources intended to be used in OI approaches (Erkens et al., 2014).

- (i) **Lead user approach-** ascertain innovation users at the forefront and who tend to benefit from gaining solutions to their problems. They are more forth coming to deliberate and confronting their innovation desires and ideas in the workplaces.
- (ii) **An ideation contest-** the organization looking for information on innovation post out its difficulties to stakeholders (suppliers or customers) to assist with ideas to solve the problem. The organization will give price to the participant that come up with the best solution.
- (iii) **Boadcast search-** include competition aimed at identifying technical solutions not just ideas. This approach includes searching for engineers, scientist or professionals to assist resolve main R&D issues that the organization failed to solve in-house means. The winning solution will be rewarded with financial price.

Phase 2:

Phase two of the metric is guided by principle one which has three key activities that need to be carried out.

Principle 2: Type of measures – input, process, output and outcome (IPOO)

Erkens et al. (2014) demonstrated that the second guideline pinpoints the types of variables that need to be traced by the whole performance system. The elements of Principle 2 include:

- (i) **Input KPIs** measure the inputs of the project such as financial or human resources.
- (ii) **Process KPIs** are utilized to ascertain the transformation of inputs into final products and to increase the effectiveness of the innovation process in terms of budget changes, time variance and error ratio.
- (iii) **Output KPIs** ascertain the outcome the proceeding activities in the process such as the number of patents, the amount of publications and the amount of ideas.

Phase 3:

Phase three of the metric is guided by principle one which has three key activities that need to be carried out.

Principle 3: How to use your open innovation metrics efficiently

Erkens et al. (2014) suggest that just relying on performance measurement system does not give assurance of positive results. The authors propose the following third, three level principle (instrumental, conceptual and symbolic) metrics that can be used:

- (i) Instrumental include utilisation of information or metrics used directly making decisions such as when the OI program is annulled. For example, when projected sales are lower than expected.
- (ii) Conceptual one- entails using information or metric that does not result in positive outcome, but it just gives a general view and acceptance, for instance when the manager realises that the lead time of OI program is lower than expected.
- (iii) Symbolic- Metrics can be used when the decisions are made already and using it will confirm and validate them.

3.11 Gaps in the existing open innovation literature

From the reviewed literature, various conclusions drawn from studies on OI since its inception in 2003 to date were identified. It was found that the OI definitions were being constantly revised, limited OI research studies in developing countries, and no clear OI application framework for both large and emerging businesses.

Firstly, the reviewed literature identified showed that since its inception, OI definitions were constantly being revised in an effort to clearly position the concept into the ever-evolving business environment. Scholars argued that before the OI definition was revised; it was not clear with regard to how to source and also on the type of knowledge that can be acquired through OI strategies. Although the current OI definition is accepted, researchers reasoned that the model remain sensitive to context and eventuality. OI's sensitivity to the business environment and market possibility has resulted in difficulties in shifting from closed innovation to OI in many firms across the world. Studies revealed that OI's sensitivity to the external setting resulted in firms in different sectors to use unique strategies to address innovation needs of their organisations. Literature has also shown that OI is accepted as a framework for sustainable growth. However, the majority of studies argued that there is no OI

framework, which makes it a monumental task for firms willing to implement and speed up innovation process through the OI route.

The reviewed literature has also shown various research philosophies which were used to explore OI studies since its inception in 2003. OI was coined based on the positivism paradigm where it was concluded on sources of gathering and sharing knowledge and ideas to speed up internal innovation processes of the organisation. Since then, many OI empirical studies investigating and exploring the implementation of OI in firms used similar research philosophies. Although the positivism paradigm was used to gather data through qualitative and quantitative methods for OI research, studies which employed mixed methods are scarce. Therefore, an in-depth understanding on OI may be elicited through a mixed methods approach. This methodology will produce deeper and richer insights on OI.

Furthermore, literature has shown that OI has been widely investigated in developed countries than in developing countries. For example, there are significant OI studies conducted in countries such as US, Europe, UK, China, Japan, South Korea, New Zealand and Australia. While literature revealed that OI has been given attention in developed economies, it has been gaining recognition in developing regions such as Asia, Africa, and Latin America and the Caribbean as well. This research study proposed that more significant findings may be obtained which may augment our appreciation on OI. It will also add more insights from a South African perspective thereby adding an African contextual understanding to the OI domain.

3.12 Summary of chapter three

Chapter three outlined the second part of the reviewed literature on OI paradigm. The researcher took a middle –grounded method to present literature review for this study. This is a contemporary approach being used by several contemporary researchers who argue and approve the inclusion of literature review chapters at the beginning and immediately after the introduction chapter of a thesis. The chapter begins by exploring important concepts which are deemed necessary to give a background view on the topic of the study. These concepts include innovation and closed innovation. These concepts were viewed with understanding that they both gave birth to the OI paradigm which is a central concept for this study. The contextual view of OI philosophy and its archetypes were explored with the intention of positioning them in the topic of this study. This is followed by a discussion on the implementation framework for the OI paradigm. The significance of OI has been highlighted to understand the importance

of OI in business settings. Literature has been reviewed in the SMEs context to get more insights on OI in SMEs entities in the world. Measurements of OI have been explored to get an overview on how OI is measured. Additionally, the existing gaps in OI literature have been explored. The reviewed literature will help in the discussion of research findings in the discussion chapter. The next chapter presents the research methodology used in this study.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter describes the research methodology directing this study which investigate the predictors for successful implementation of OI in SMEs in KwaZulu-Natal, South Africa. The research methodology was provided to outline the theoretical perspective of the study and how they were utilised to decide the research methods and approaches employed in answering the research questions of this study. This technique was done consistent with scholars (Burrell and Morgan, 2017; Creswell and Poth, 2017; Saunders et al., 2019) who highlight that research methodology entails identifying research approaches that are followed to collect data necessary for achieving the objectives of a study. This chapter unpacks the research steps adopted to guide the researcher in collecting and analysing empirical and secondary data for this study. The chapter is comprised of seven parts. The first part provides a discussion of the research processes of the study. The researcher outlines how the research onion approach was used as a model to guide the research steps undertaken for this study. The use of a research onion model is accordance to Saunders, Lewis, and Thornhill's (2019)'s view that the research process as an "onion" consisting of layers which resemble the steps deemed necessary to conduct a research study. The second part gives a review and a comparative understanding of research philosophies used in conducting research studies. It further highlights the research approach that was used to guide this study. The third part details the research design used to achieve the objectives of this study. The fourth and fifth parts presents how data was collected and analysed, respectively. The sixth section outlined validity and reliability measures that were followed to ascertain that the research instruments capture the appropriate valid and reliable data. The last part provides a discussion of the ethical considerations employed for the study, followed by the conclusion of the chapter.

4.2 Research processes

Research process is recognised as clear and logical steps considered critical in conducting a research study (Bell, Bryman and Harley, 2018; Cooper and Schindler, 2008; Sekaran and Bougie, 2016). Researchers acknowledged that research process as a systematic approach used to identify, assess and analyse data to answer research questions (Bell et al., 2018; Sekaran and Bougie, 2016). A research onion was selected as a model to assist in defining the research

process that was followed to collect data for this study. This approach was chosen consistent with Saunders et al. (2019) who suggested and exquisitely viewed research processes as an ‘onion’ whose layers represent research procedures to be followed in conducting a research study. According to Melnikovas (2018, p. 29), research onion can be effectively used to answer critical question such as “*what should I start with?*” Muranganwa (2016), Raithatha (2017) and Ramdhani, Mnyamana and Karodia (2017) suggested that research onion assist in developing a comprehensive research methodology for both social science and business research studies. The research onion is used to lay the foundation on how the research should be carried out. It defines the beliefs and logical assumptions which assist in comprehending research questions and the selection of research techniques for a particular study (Raithatha, 2017; Saunders et al., 2019).

According to Saunders et al. (2019), research onion is read from the outer layer into the inner layers. The outer layer represents the research philosophy which kick starts the research process. Raithatha (2017) and Saunders et al. (2019) suggested that only after the researcher has identified the research philosophy for the study is when one moves to the second layer. The second layer include the research approaches that the researcher can clearly define for a given study. The research approach is informed by the research philosophy identified by the researcher for the chosen research. Only after the research approach is clearly identified, the research model refers the researcher to the third layer which clearly defines the research strategies. It comprises of various research methods that the researcher can choose from to collect data for the study. Importantly, the research strategy(s) is/are influenced by the research approach identified from the previous layer of the model. The research strategy leads to the forth layer which establishes the methodological choices of the research. These choices include mono methods, multi-methods, and mixed methods techniques that can be used to collect empirical data. The fourth layer leads to the fifth layer which defines the duration of the study. The time horizon layer calls for the researcher to clearly define the time period before steps are taken to collect and analyse data. Finally, the research onion model concludes with the sixth layer which constitutes techniques and procedures to be used to collect and analyse data. The research onion is depicted in Figure 4.1.

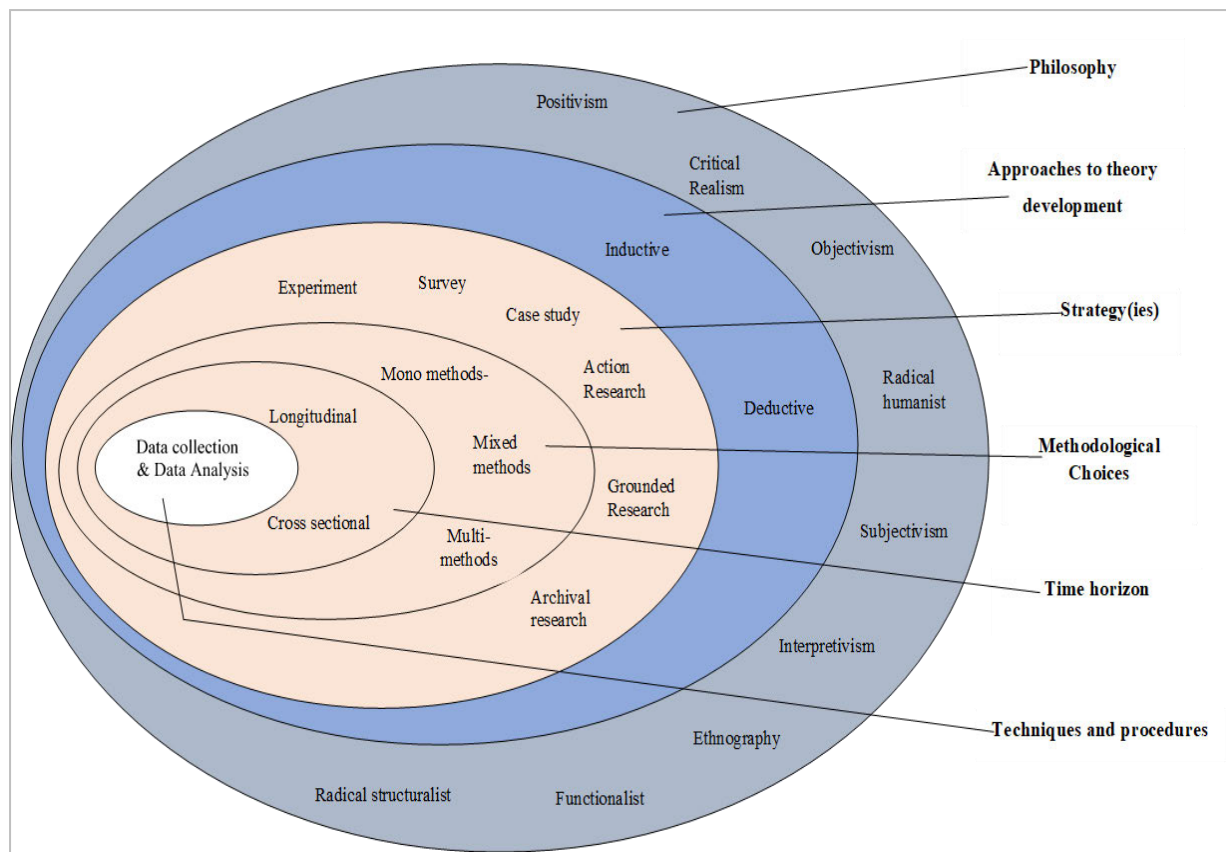


Figure 4.1 The research ‘onion’

Source: Saunders et al. (2019, p. 130)

The six layers comprised in the research onion model are further discussed in the sections that follow:

1. Research philosophy – forms the foundation of the research by describing the ontology (nature of reality), epistemology (nature, source of knowledge or facts) and axiology (values, beliefs and ethics) of the study. Research philosophy establishes systems of beliefs and assumptions of acquiring and developing knowledge through research (Creswell, 2014; Saunders et al., 2019). The way the researcher views the world with certain assumptions inform the type of research philosophy for a specific study. Researchers are consciously mindful of the assumptions and include them in every stage of research (Burrell and Morgan 2017; Raithatha, 2017). The assumptions are ontology, epistemology and axiology in nature which are either consciously made or not to influence the research processes. The assumptions influence how the researcher understand the research questions.

2. Research approaches – as informed by research philosophy identified in the first layer of the model, these approaches include deductive and inductive approaches. Deductive method

advocate that the research begins with an existing theory then research questions or hypothesis should be established and data should then be collected to approve or reject the hypothesis (Saunders et al., 2019). The inductive approach starts with identifying a phenomenon followed by conducting research to understand it. A theory is then developed based on the results obtained from analysing the identified phenomenon (Saunders et al., 2019).

3. Research methods – is informed by the type of research approaches found in the third layer of the research onion. The model recognises three distinctive research methods which includes qualitative, quantitative, and mixed methods (Creswell, 2014; Skinner, Hester and Malos, 2013; Saunders et al., 2019).

4. Strategies – these are strategies used to collect data. The layer consists of various strategies that the researcher can use to collect data to answer the research questions. These strategies include conducting experiments, case studies, surveys, action research, grounded research, and archival research (Saunders et al., 2019). Some researchers usually associate some strategies with certain research philosophies, but this approach takes cognisance of the permeability between the borders. For example, ethnography is related to interpretivism while surveys and experiments are linked to positivism and pragmatist scholars. However, Saunders et al. (2019) suggest that the researcher could use one or a number of strategies within the research design.

5. Time horizons – The layer describes the duration of the study. The research could be either cross sectional or longitudinal. Cross sectional research entails gathering data at a pre-determine time while longitudinal research involves gathering data frequently over an extended period so as to link data (Saunders et al., 2019). For example, case studies or surveys are used strategies in a cross-sectional study where data is collected to respond to a research question over a stipulated period of time. Contrary to this, in a longitudinal study that require the collection of data for a prolonged period utilises experiments, grounded theory, action research and archival strategies to answer research questions (Saunders et al., 2019).

6. Techniques and procedures – This layer is considered as the final layer of the research onion framework. It consists of data collection and analysis for the study. The layer defines the type of choices regarding the content to be decided on the research instruments. It also includes decision on the research sample and type of questions (structured or semi-structured) required to capture relevant data. Decisions and research instruments to be used for a study are informed by the research philosophy, strategies, choices and time horizons for the study (Saunders et al., 2019).

The choice of research philosophy is underpinned by defining the critical assumptions important to successfully conduct a research. According to Saunders et al. (2019) ontological, epistemological and methodology questions need to be clearly defined so that a suitable paradigm is identified for the study. Guba and Lincoln (1994), cited in Ha (2011) indicated that philosophical assumptions can be clearly defined by compressively responding to the ontological question ('what is the nature of the reality?'), epistemological question ('what is the nature of the relationship between the researcher and the researched?') and methodological questions ('how is data collected from the subjects?'). Ha (2011) refer to these questions as 'paradigm-defining pointers. They are also used to differentiate the difference between research philosophies (Bomani. 2015; Ha. 2011).

4.3 Research philosophy

Literature acknowledges that there are various definitions for research philosophy. There are divergence interpretations about what constitutes a research philosophy. According to Saunders et al. (2019, p. 130), research philosophy pertains "to a system of beliefs and assumptions about the development of knowledge". Research philosophy is widely recognised as paradigms (Creswell and Poth, 2017; Raithatha, 2017). Paradigms are commonly referred to researchers' beliefs towards creating knowledge. Research paradigms are known as common assumptions, ideologies, standards and expectations that researchers have about conducting a research study to interrogate a given phenomenon (Creswell and Poth, 2017). These assumptions inform the researcher about the research strategy needed to conduct a study. Weaver and Olson (2006, p. 460) describe philosophy as "patterns of beliefs and practices that regulate inquiry within a discipline by providing lenses, frames and processes through which investigation is accomplished". According to Mackenzie and Knipe (2006) and Kivunja and Kuyini (2016), research philosophy is a kind of reasoning that guides academic scholars in understanding the research questions and the selection of appropriate research methodology for the study. It shows the road map on where the researcher is coming from in trying to get meaning from data.

Research paradigms include various stages chosen by the researcher to position research approaches into research objectives in the study (Creswell and Poth, 2017; Eisner, 2017; Padgett, 2016). Padgett (2016) as well as Creswell and Poth (2017) point out that paradigms depend on the relationship that exist between it and philosophical view point, attitudes, values, and interpretations of the researcher on how the world functions. Research philosophies and

paradigms have numerous dynamics which determine principles and ideals of the researcher which influence a conclusive result in the study (Kivunja and Kuyini, 2016). Kivunja and Kuyini (2016) and Padgett (2016) further suggested that paradigms have influence on the researcher's principles and values in having credible research outcomes. Hamlin (2015) suggested that despite the impact of research paradigms, the type of the research questions determine the research methods for a study. Significantly, research paradigms pinpoint the research methodology that is chosen to conduct a particular research study (Creswell and Poth, 2017; Bomani, 2015). This assertion is in support of Trautrim, Grant, Cunliffe and Wong's (2013) argument that given the relationship that exist between research paradigm and research methodology, researchers should first determine the research paradigm before they choose the research methods for the research study.

The divergent perspectives illustrate the inconstancies on the recognition and interpretation of paradigms by scholars. However, in spite of the consistency among scholars, paradigms shape both qualitative and quantitative research designs. Literature point out that there are four major research paradigms (Mertens, 2014; Creswell and Poth, 2017). These research dimensions include constructivism, post-positivism, also viewed as interpretivism, pragmatism and transformative (Mertens, 2014; Blanton and Kegley, 2016). However, research methodology literature indicates that pragmatism and transformative are the new kids in research corridors and are now widely used in research studies (Creswell and Poth, 2017; Blanton and Kegley, 2016; Nye Jr. and Welch, 2016).

Research philosophies exhibit different characteristics which causes them to have very unique attributes from each other. However, studies acknowledged that the differences are underpinned by different research assumptions associated with each philosophy (Burrell and Morgan 2016; Saunders et al., 2019). The assumptions are commonly referred to as epistemologies, ontology, and axiology (Creswell, 2014; Hamlin, 2015; Mertens, 2014; Sekaran and Bougie, 2016). Epistemology is referred to as the assumptions made towards the pursuit for trying to understand the natural reality of the world settings (Bell et al., 2018). It defines what is considered as accepted knowledge, its validity and how it is communicated to other people (Burrell and Morgan 2016; Saunders et al., 2019). Epistemology further defines the researchers' energies on trying to understand the reality and the truth about the world (Bell et al., 2018). Ontology in research refers to assumptions commonly associated with efforts in trying to understand the truth and reality about the world (Bell et al., 2018; Saunders et al.,

2019). According to Saunders et al. (2019, p. 134), axiology denotes “the role of values and ethics”. The values and beliefs of the researchers determine the type of the research topic chosen by the researcher. The way one incorporates the individualistic values into the research process defines the authenticity of the study (Saunders et al., 2019). Axiological theorists uphold that there must be balance between the values of the researcher and those of the research participants. Consistently, research philosophy reflects the researchers’ values as well as the data collection strategy adopted in the study (Saunders et al., 2019).

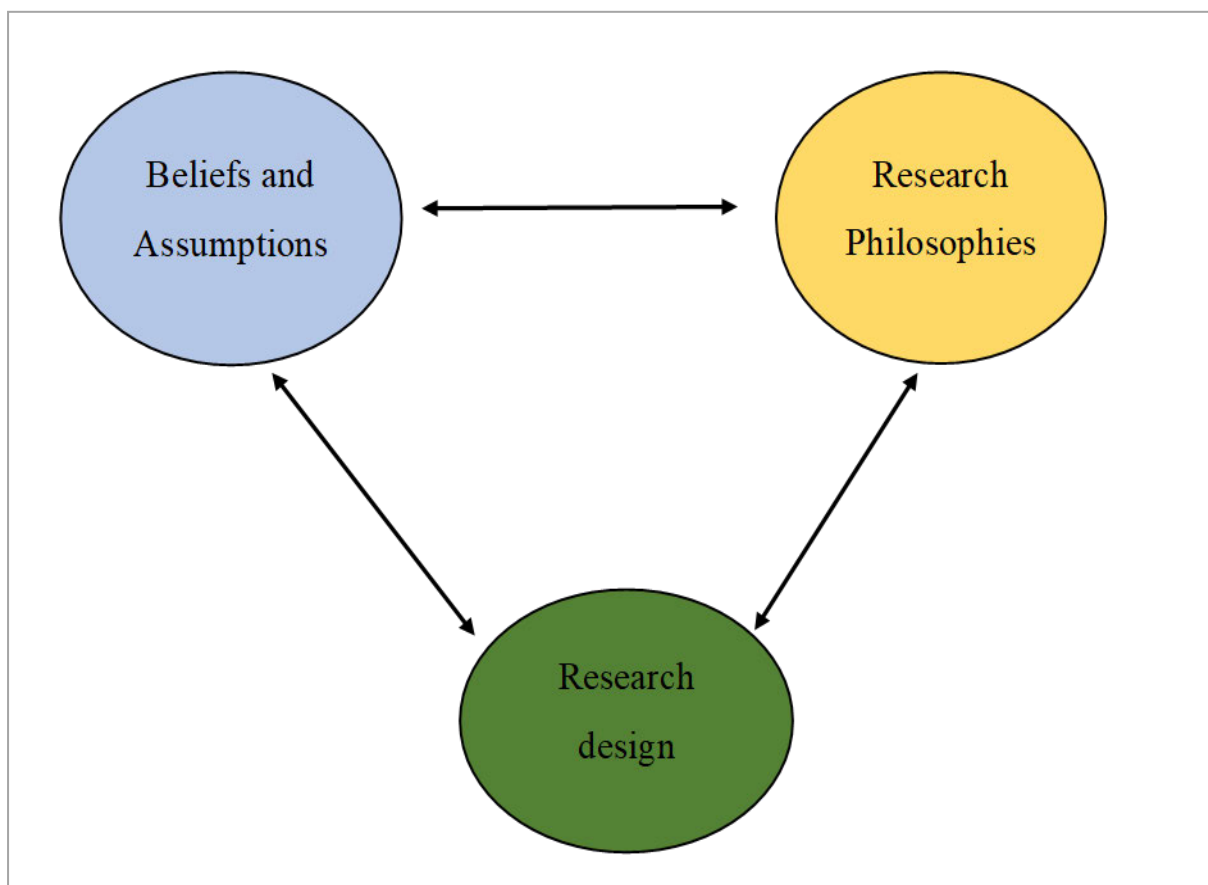


Figure 4.2 Developing the research process

Source: Saunders et al. (2019)

4.4 Four main types of research paradigms

There are four main types of research paradigms or worldviews discussed in the research methodology literature and these are: postpositivism, constructivism, transformative and pragmatism (Creswell, 2014; Mertens, 2014). The four research paradigms are summarised in Table 4.1.

Table 4.1 Research paradigms

Post-positivism	Constructivism
<ul style="list-style-type: none"> • Determination • Reductionism • Empirical observation and measurement • Theory Verification 	<ul style="list-style-type: none"> • Understanding • Multiple participant meanings • Social and historical construction • Theory generation
Transformative	Pragmatism
<ul style="list-style-type: none"> • Political • Power and justice orientation • Collaborative • Change-orientation 	<ul style="list-style-type: none"> • Consequences of actions • Problem centred • Pluralistic • Real-world practice orientation

Source: Creswell (2014)

4.4.1 Postpositivism philosophy

Postpositivism focuses on describing a situation that can be openly observed and accurately measured (Creswell, 2014; Sekaran and Bougie, 2016). Sekaran and Bougie (2016) emphasised that positivism is an accepted scientific approach which uses deductive reasoning by making use of hypotheses developed from theoretical frameworks. However, positivism assumptions are centred on traditional forms of research that are more associated with quantitative research where extensive quantitative analysis is carried out to develop a conclusive logic towards the development of explanatory theory. Saunders et al. (2019, p. 106) recognises positivism critics who reason that social sciences “are far too complex to lend itself to theorising by definite laws in the same way as physical sciences”. However, the postpositivism paradigm emphasises that knowledge is usable when it is based on observations from outside the truth and where laws are established (Creswell and Poth, 2017; Sekaran and Bougie, 2016; Raithatha, 2017). Positivism philosophy recognise the researcher as an objective analyst of external world where results are obtained independently of the subject of the study. Importantly, positivism paradigm thrives on determination approach where ideas are summarised into different sets to observe, test and measure the existing truth to verify the already established theory. Retrospectively, the paradigm underlines the deterministic approach where ideas and knowledge are broken into small distinctive sets for effective testing, observation and measuring the truth that exist and finally validating the existing theoretical framework (Creswell, 2014). Positivism prohibit researchers from using their own beliefs in defining the value of the research being conducted. It relies on the use of various structured methods to collect data for a study.

4.4.2 Realism philosophy

Realism philosophy in research is defined as the “view that entities exist independently of being perceived, or independently of our theories about them” (Phillips, 1987, p. 205). Realism philosophy is underpinned by the notion that there is a real world that exist independently outside of our views and creation. It supports the notion that what our senses reveal to us as reality is the truth and objects exist independently of human mind. As also argued by Saunders et al. (2019, p. 104), “the essence of realism is that what the senses show us as reality is the truth: that objects have an existence independent of the human mind.” As branch of epistemology, realism is considered as similar to positivism in that it assumes that scientific methods can be used towards advancement of knowledge. Realism philosophy is underpinned by it two distinctive types. These include direct and critical realism. Direct realism denotes the notion that “what you see is what you get; what we experience through senses portrays the world accurately” while critical realism argues that “what we experience are sensations, the images of things in the real world, not the things directly” (Saunders et al., 2019, p. 138). Critical realism exposes how people’s senses betray them. This argument is centred on two distinguishing steps which include the existing of things and the sensations they convey, and mental processing that happens once the sensation get into people’s minds. This claim is consistent with Baskar’s (1989) argument, cited in Saunders et al. (2019) that we will only be able to understand what is going on in the social world if we understand the social structures that have given rise to the phenomena that we are trying to understand.

4.4.3 Constructivism philosophy

Constructivism paradigm is also regarded as interpretivism and it is centred on the notion that learning is a constructive process (Creswell, 2014). It is also recognised as a phenomenological way of understanding people and the meaning they attach to rules, norms, and values that control their contacts. It states that people construct knowledge of the world by experiencing and understanding through reflection of their experiences (Adom, Yeboah and Ankrah, 2016). The paradigm is centred on interpretivism theorists who denote that the world is naturally constructed hence there no need to search for the truth. Importantly, the paradigm recognises the use of laws by people as an effort to understand meaning in the world they live and work by interrogating people’s thoughts (Sekaran and Bougie, 2016; Creswell, 2014). This paradigm illustrates that theories do not precede a research study but it follows it so that it is grounded on data collected by study. This argument is in agreement with Bunniss and Kelly (2010) and Creswell’s (2014) claim that interpretivism draws its meaning from experiences of people.

Interpretivism theorists suggest that the paradigm use qualitative methods to gain knowledge about realities of the world. Significantly, the paradigm highlights that knowledge, morals and values of the researcher may impact the research methods and the outcomes. Therefore, interpretivists stress that qualitative methods are commended since the outcomes are considered as mediation and subjective interpretation of the researcher (Boksberger and Melsen, 2011; Saunders et al., 2019, Wahyuni (2012). However, the constructivism worldview draws parallel lines with the positivism paradigm on the subject matter of both natural and social sciences (Jervis, 2017). Subsequently, constructivism relies on the scholars' ability to avoid bias in the pursuit to understand the laws that determine humanity's effort regarding how they make sense of the world they live and work in (Sekaran and Bougie, 2016).

4.4.4 Transformative philosophy

The transformative paradigm emerged partially because of disagreements that exist between people who are constantly confronted with discriminating and oppressive tendencies such as feminism, racial orientation, disability issues and sexual orientation on previously used historical research methods such as constructivism and positivism (Biddle and Schafft, 2015; Mertens, 2014). The cornerstone of transformative philosophical assumption is that knowledge is impartial and it reflects the power and relation in the society. The assumption advocates that knowledge gained through research is meant to enhance the society (Creswell and Poth, 2017). The paradigm focuses on studies that empower disadvantage people and advance social justice. Transformative philosophical principles are underpinned by the assumption that research study must be integrated with politics and political transformation which impact on socially disadvantaged people in the society. Recognising the power differences and ethical implications that exist in society is a cornerstone to understanding the research inquiry pursued through transformative philosophical methodologies. Mertens (2014) argued that scholars perusing the transformative view must not base their methodological choices solely on pragmatics as the approach is limited on axiological issues. However, the transformative paradigm advocates for the consideration of both contextual and historical factors in deciding the methods to use when conducting research. Transformative worldview theorists support the use of mixed methods and theoretical frameworks in research (Martínez-Alemán, Pusser, Bensimon, 2015; Mertens, 2014). This approach is relevant as transformative philosophy depends on the divergence of views and data sources rather than on triangulation methods. The use of mixed methods is central for scholars pursuing studies through a transformative worldview as it limits focusing on individuals in the study.

4.9 Sampling

Sampling is renowned as integral element of the research design as it does not determine the quality of data collected but it determines the authenticity of study results. Bryman and Bell (2007) and Malhotra (2010) pointed out that a sample defines the chorological steps undertaken in the sampling process of the study. These steps include clearly defining target population, determining the sample frame, selecting the sampling technique(s), determining the sample size, and executing the sampling process. Malhotra (2010) posits that sampling steps are interlinked and are implemented sequentially in a research study. The study adopted the sampling process shown in Figure 4.5.

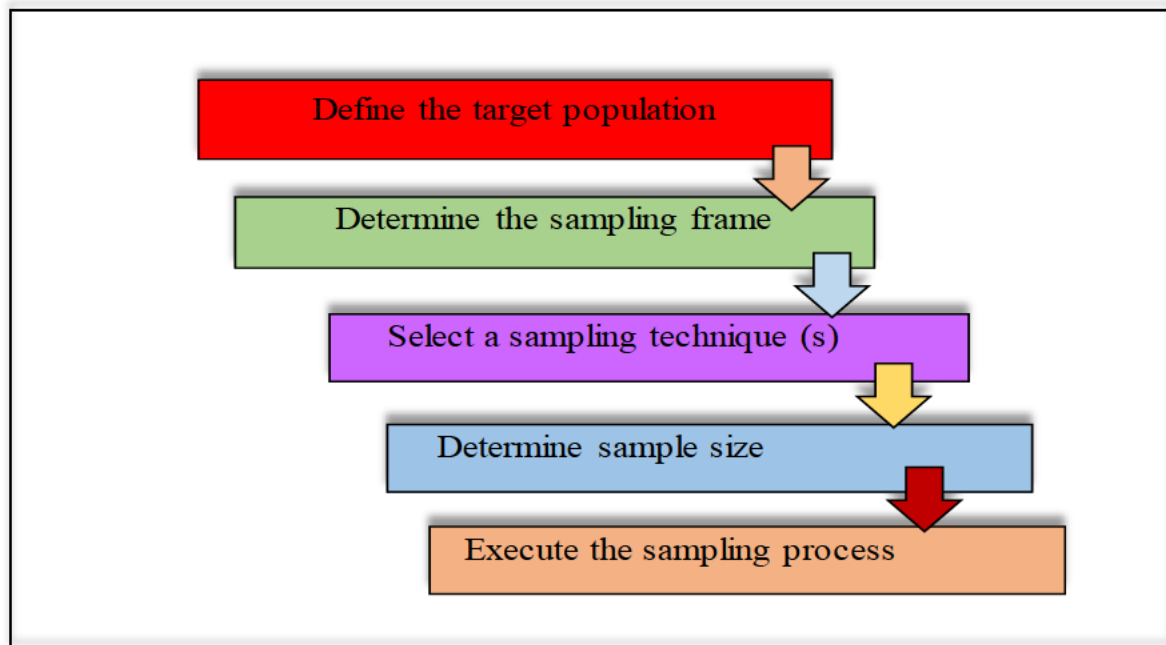


Figure 4.3 Steps used in the sampling process

Source: Malhotra (2010)

4.9.1 The Target population

Target population is widely recognised as elements, events, or a collection of people with interesting qualities and characteristics the researcher desires to explore through a study (Malholta, 2010; Sekaran and Bougie, 2016). This study was focused on SMEs in KwaZulu-Natal province, South Africa. At the time of this study, the SME database of the national government of the Department of Economic Development, Tourism and Environmental Affairs revealed that there were 1242 SMEs in the city of Pietermaritzburg (Department of Economic Development, Tourism and Environmental Affairs, 2018). The choice of using the government

SME databank was based on the need to formalise the sampling process and officially identify research participants for the study. The target population for the study was 1242 registered SMEs. The researcher used the Department of Economic and Tourism's database to draw a sampling frame because the database is locally available and it is constantly updated.

4.9.2 The Sample size

A sample size is recognised as the number or units that is drawn from the population to represent the population of the study (Malhotra, 2010; Welman et al., 2011). In this study, the researcher used Krejcie and Morgan's (1970) table to decide or rather to approximate a realistic sample size for the study. Krejcie and Morgan (1970)'s formula used is illustrated below:

$$s = \frac{X^2(1-P)}{d^2(N-1) + X^2P(1-P)}$$

s = required sample size

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

Given the populace size ($N=1242$) and using confidence level of 95% and a 5% margin of error, the required sample size for the study was 265 participants. The sample size was further divided to accommodate the research methods (mixed methods) used in the study. Therefore, the 15 entrepreneurs/managers or supervisors were selected to take part in in-depth interviews while 245 employees participated in the questionnaires survey.

4.4.5 Pragmatism philosophy

Pragmatism was coined from the Greek word "pragma" which means "actions". The pragmatism paradigm focuses on the use of actions to objectively address explicitly the identified phenomenon by the researcher (Sekaran and Bougie, 2016). Sekaran and Bougie (2016) as well as Creswell (2014) underlined that pragmatism study is grounded on realistic actions taken towards resolving the problem being studied. Creswell (2014) and Mertens (2014) point out that unlike other research philosophies, pragmatism focuses on research questions and advocates the researcher to focus on the identified research problem and to look at ways to address the problem. It hugely relies on reconciling subjectivism, objectivism, values, facts, knowledge and the contextualisation of experiences in research. The paradigm is underpinned by the actions taken by the researcher to answer the research questions of the study. However, pragmatism philosophical worldview focuses on the need to understand the

relation between theoretical framework and empirical evidence (Sekaran and Bougie, 2016). It advocates for the use of concepts, hypotheses, ideas and research results in a more detailed format for a conclusive research outcome. Furthermore, pragmatism theorists advocate for the use of mixed methods where various data collection methods and analysis are used to get credible, and reliable results in a single study (Creswell, 2014).

Various research philosophies offer the researcher various assumptions to conduct a study. Objectivism and subjectivism are considered as central assumptions that define how researchers conduct studies. According to Saunders et al. (2019), objectivism combines assumptions regarding the natural settings where realities are exclusive to human interpretations. However, realism philosophy is commonly associated with objectivism assumptions where social settings are regarded as physical units. Objectivism argue that the assumptions on physical, social and physical phenomenon occur independently without human knowledge and commonly last longer. Objectivists' researchers attempt by all means to exclude both values as they are of the view that they will contribute biasness in the study (Saunders et al., 2019). They also disregard personal values and beliefs throughout the enquiry processes. In epistemology, objectivism viewpoint hinges on the assumptions that seek to determine the truth in a social setting. The truth is established through measuring facts and observing the social settings. Saunders et al. (2019) argue that management enquiry can take an objectivism viewpoint as the latter is considered as an impartial entity. Therefore, the objectivism assumptions would be centred on the notion that management has a formal structure with laws that govern it. Importantly, objectivists' enquiry interrogates the deviations from the established norms and the emerging developments in the organisation. Assumptions could be recognised as subjectivism.

Subjectivism includes assumptions which recognise that people's perceptions are real. Subjectivists posit that no reality exist without perceptions. Saunders et al. (2019) assert that subjectivism embraces nominalism which illustrate that order and structure of social phenomenon studies are conceived by scholars through the utilisation of language, theoretical groupings, views and consequential actions. Burrell and Morgan (2016) underlined that nominalists recognise no reality in social establishments because people experience and view reality contrarily. Therefore, scholars posit that it is significant to discuss about multiple realities at the expense of a single reality.

Given the above important interpretations and understanding on research paradigms, this study adopted pragmatism to answer the research questions for the study. The choice is squarely made based on the fundamental assumptions prescribed by this paradigm in assisting researchers across the world. The assumptions are mainly centred on acquiring knowledge by objectively focusing on actions that aid in collecting relevant data that adequately respond to the research questions and effectively assist in realising the predictors for the successful implementation of OI in SMEs sectors in KwaZulu-Natal, South Africa.

The pragmatism paradigm was used to get the in-depth understanding on the predictors of successful implementation of OI in SMEs. The paradigm was adopted by the researcher to get answers for the research questions.

4.5 A comparison of research philosophies

According to Guba and Lincoln (1994, cited in Ha, 2011) a comparison of research philosophies is accomplished by understanding ontological, epistemological, and methodological questions. These aspects question the nature of reality, relationships, the researcher and the researched, and how data is collected from the research subjects, respectively (Hall, 2011). Bomani (2015) suggest that answers to these questions clearly establishes their unique differences. A comparisons of the research philosophies are depicted on Table 4.2.

Table 4.2 A comparison of research philosophies

Paradigm defining questions	Positivism	Postpositivism	Interpretivism	Pragmatism
Ontology: The researcher's view of the nature of reality or being.	<ul style="list-style-type: none"> – Knowledge is external and objective. – It is independent of social actors. – It is governed by natural laws – Reality can be observed as well as predicted. 	<ul style="list-style-type: none"> – Objective reality exists but there is no absolute truth. – Interpretation of reality is through social conditioning. – It is independent of human perceptions and beliefs. 	<ul style="list-style-type: none"> Reality is subjective. – Reality changes. – Many perspectives exist for one event or situation. – Situations or events are unique and cannot be generalised. – Reality is constructed through social interaction. 	<ul style="list-style-type: none"> – Reality is external and multiple. – A perspective is chosen that best addresses the research question.
Epistemology: The researcher's view regarding what constitutes acceptable knowledge.	<ul style="list-style-type: none"> – Researchers and subjects under study are independent and do not influence each other – Findings are replicated and subject to approval or falsification. 	<ul style="list-style-type: none"> – Researchers are neutral to avoid biases and follow procedures rigorously. 	<ul style="list-style-type: none"> – Researchers and subjects are involved in interactions. – Researchers and participants influence each other in the research process. 	<ul style="list-style-type: none"> – Researchers and subjects can be independent of each other or otherwise, depending on the nature of research – A kind of relationship is chosen that best assists in coming up with data that addresses the research question.
Axiology: The researcher's view of the role of values in research.	Research is undertaken in a value-free way, the researcher is independent of the data and maintains	Research is value laden; the researcher is biased by world views, cultural experiences and upbringing. These will impact on the	Research is value bound, the researcher is part of what is being researched, cannot be separated and so will be subjective.	Values play a large role in interpreting results, the researcher adopts both objective and subjective points of view.

	an objective stance.	research.		
Methodology	<ul style="list-style-type: none"> – Experimentation – Observation – Manipulation 	<ul style="list-style-type: none"> – Modified - Experimentation – Observation – Manipulation 	<ul style="list-style-type: none"> – Interaction between the researcher and research participants. – Different constructions are interpreted. 	<ul style="list-style-type: none"> -Experimentation, observation and manipulation. – Interaction between the researcher and research participants. – Methods which best address the research questions are used.
Research design	Quantitative research approaches are used.	Quantitative approaches are dominant with some qualitative approaches.	Qualitative research approaches are used.	Quantitative and qualitative research approaches are used.

Adapted from Bryman, as cited in Grix (2004, p. 64); Hughes & Sharrock, as cited in Grix (2004.p. 64); Mack (2010, p. 7); Wahyuni (2012:70) and Bomani (2015; p. 196)

4.6 The research paradigm for this study

This study adopted the pragmatism philosophical principles. The choice was explicitly made in consideration of Saunders et al. (2019)'s acknowledgement that the paradigm is compatible with mixed methods which is critical in collecting in-depth data to address research questions in a study. A combination of both qualitative and quantitative techniques was used to obtain and understand data, where the weakness of one is compensated by the strengths of the other. This approach was critical as it assured that in-depth data collected respond to issues being pursued by the study. An inductive approach was adopted where careful OI observation and analysis were carried out in the SME sectors in KwaZulu-Natal province. The observation exposed the researcher to varied challenges faced by SMEs in the country. The challenges were generalised to SMEs across sectors in the province. The observations were underpinned by the need to understand how OI was implemented in SMEs sectors. An inductive approach was carried out where the researcher collected data related to OI in SME sectors in the province. This approach was used with the realisation that the gathered data would assist in understanding the predictors for successful application of OI in SMEs in KwaZulu-Natal. An inductive approach was followed up by choosing strategies to follow for this study.

Above all, the case study approach was adopted as strategy for exploring OI concept in SMEs in the city of Pietermaritzburg. The case study design was used for this study consistent with Hyatt, Scanlon, and Nakamura, (2014) and Yin (2014)'s assertions that a case study includes conducting a detailed study of a complex phenomenon using varied data sources. Yin (2014) illustrates that a case study may focus on a single case or several cases. For this study, the case study approach focused exclusively on several SMEs sectors in KwaZulu-Natal province. To get detailed views on the issue being investigated, multiple sources were used to collect data for the study. In-depth interviews were conducted on SME owners or managers or supervisors. This was complemented by survey carried out using a questionnaire on SMEs employees of the same sampled SMEs. The choice to collect data through mixed methods was consistent with the views of several scholars who reasoned that this approach helps in getting detailed data and effectively achieve the objectives of a study (Creswell, 2014; Hamlin, 2015).

A cross-sectional approach was chosen to define the time horizon for the data collection processes. Finally, the model led to the layer which illustrate the procedures and techniques used to collect and analyse data. Various qualitative and quantitative procedures and techniques were used to collected and analyse data for this study. These approaches and techniques are discussed in Section 4.9. Figure 4.3 shows the research onion model used for this study. The terms used may not be entirely similar. For intance, the case study is referred to as the research design in this study.

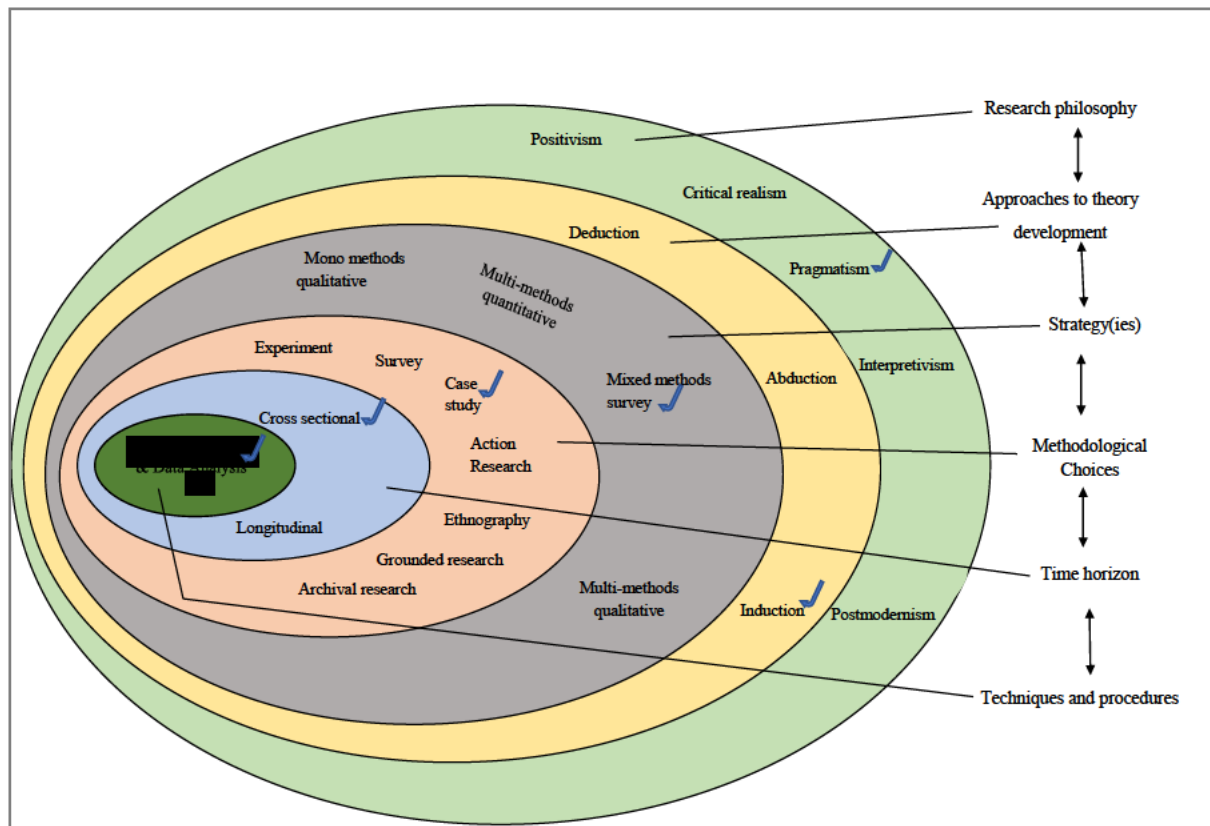


Figure 4.4 Research paradigm for this study

Source: Adopted from Saunders et al. (2019)

4.7 Research objectives

The main objective of this study was to understand the predictors of the successful implementation of OI in SME sectors in KwaZulu-Natal, South Africa.

The specific objectives of the study were as follows:

1. To understand the influence of internal knowledge (Inside-Out) on the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.
2. To determine the influence of external knowledge (Outside-In) on the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal South Africa.
3. To ascertain strategic network (Coupled integration) factors that influence the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.
4. To understand other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.

4.8 Research design

A study design entails a road map or plan which describes and pinpoints the sequences followed by the researcher to achieve the objectives of the study (Denzin and Lincoln, 2011; Welman Kruger, and Mitchell., 2011). The research design clearly defines the alley ways to be taken towards arriving to an intended destination of the study. The study adopted a case study research design. The choice was made consistently with scholars (Creswell, 2014; Lewis, 2015; Saunders et al., 2019) who postulate that exploratory case study is informed by need to pursue and investigate an area where there is limited information about it. Consequently, the design was implemented with the zeal to entirely establish hypotheses about predictors of the successful implementation of OI in SMEs in KwaZulu-Natal. A case study research design was chosen in support of Saunders et al. (2019, p. 139), who outlined that exploratory studies “are a valuable means of finding out what is happening, seeking new insights, asking questions and assessing a phenomenon in a new light”. The triangulation approach was used to critically respond to defined research questions. The triangulation approach entails using varied numbers of data collection methods in a single research (Creswell and Clark, 2011; Lewis, 2015; Saunders et al., 2019; Yeasmin and Rahman, 2012). Scholars (Lewis, 2015; Saunders et al., 2019; Welman et al., 2011) view qualitative, quantitative and mixed methods as key research designs that guide research projects.

The study adopted a mixed methods design. According to Creswell (2014), Hamlin (2015) and Saunders et al. (2019), mixed methods is used to get in-depth information and assist aligning research objectives and questions into the research study (Lewis, 2015). Combining qualitative and quantitative research techniques assist researcher to get balanced data for a study. Mixed methods research design permits the researcher to study a multifaceted phenomenon. This approach is vital as it affords the researcher the opportunity to get critical insights from participants who are involved in the situation under investigation. Mixed methods approach was also adopted for this study because it assists the researcher to investigate the predictors of the successful implementation of OI in SMEs. The choice of mixed methods approach is consistent with the main aim and questions of the study. The suitability of this method is informed by the type of in- depth data that was needed to investigate the predictors of successful application of OI in SMEs sectors.

4.8.1 Mixed methods approach

Mixed methods approach in research involves the utilisation of mixed forms of data in a single study. It draws its roots from research techniques such as qualitative and quantitative research approaches. According to Creswell, Clark, Gutmann and Hanson (2003), mixed methods approach include the use of one qualitative and quantitative data collection technique to gather a richer and more elaborate data to be used in one study. The use of mixed methods confirms triangulation because it supports the use of multiple data sources in one research (Creswell, 2014; Mertens and Hesse-Biber, 2012; Sekaran and Bougie, 2016). A mixed methods approach was used to complement triangulation as it makes use of varied data sources to a single study. According to Creswell and Clark (2011), triangulation design is used to gather complementary data from multiple sources that is distinctively different in a single study that is integrated for analysis and interpretation. The significant element of triangulation design is centred on the ability to collect varied data from both qualitative and quantitative methods which effectively enhance the validity and reliability of research results of a study (Almalki, 2016). Tashakkori and Teddlie (2003, p. 674) called triangulation a “veritable magical word in mixed methods research” and “near-talismanic method” that merge data sets from both quantitative and qualitative methods. De Lisle (2011) point out that merging different data sets improves the generalisation, transferability and authenticity of research results. The convergence characteristic of mixed methods affords the researcher the opportunity to merge both qualitative and quantitative data sets to get reliable results (Almalki, 2016). The use of mixed methods also affords researcher the ability to compensate the weakness of one method with the strengths of the other (Creswell and Clark, 2011).

Contemporarily, the mixed methods technique accommodates researchers from varied philosophical orientations whose varied perspectives can be answered by it. Furthermore, the mixed methods approach has the ability to bring diversity into the study where diverse conceptual dimensions are narrowed down in a single study. It instantaneously addresses divergence of exploratory and conformity questions which cannot be addressed in a single study. Also, the mixed methods technique gives researchers the prospects of getting results from diverse assortment of data critical in getting to the bottom of the phenomenon under investigation. The ability to combine data collected through mixed methods techniques assists the researcher to identify similarities and differences that provide greater insights to a complicated phenomenon under study (Teddlie and Tashakkori, 2011).

However, mixed methods researchers acknowledge that the approach is not immune to challenges as it is associated with varied impediments that affect conclusive research results (Almalki, 2016; Hamlin, 2015; Saunders et al., 2019). In general, the mixed methods approach calls for researchers to be vested with skills and acumen to effectively analyse and integrate both qualitative and quantitative data sets (Almalki, 2016). Hamlin (2015) and Cameron (2008) underscored that integrating two data sets is a monumental problem to mixed methods researchers. The concept of using both qualitative and quantitative methods in a single study calls for researchers to clearly spell out their choice of incorporating two data sets in a single study (Creswell, 2014; Sekaran and Bougie, 2016).

4.8.1.1 Mixed methods design for this study

The study adopted mixed methods technique called the convergent mixed methods design. According to Creswell (2014), a convergent approach gives the researcher the opportunity to merge quantitative and qualitative methods to have a complete appreciative of the problem being investigated. In this study, the researcher collected qualitative and quantitative data at the same time or roughly simultaneously and the findings were merged together to understand the issues pursued in this study (Creswell and Clark, 2007; Hamlin, 2015). Interviews and questionnaire surveys were conducted simultaneously by the researcher and findings were integrated together to answer the research question. The convergent mixed methods procedure is depicted in Figure 4.4.

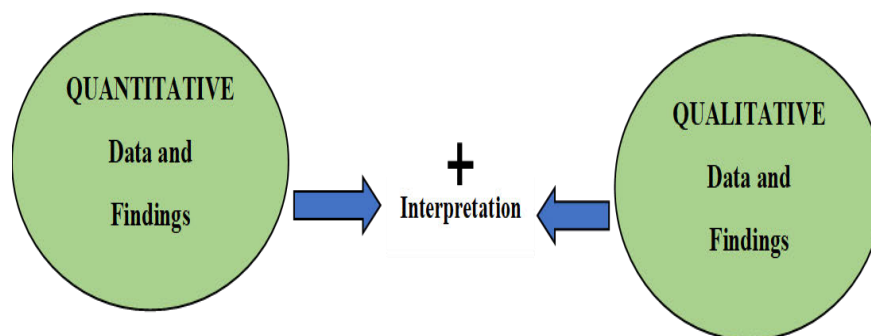


Figure 4.5 The Triangulation mixed methods design

Sources: Creswell and Clark (2007)

4.9.3 Sampling techniques

Creswell and Poth (2017) point out that there are several sampling methods which are probability and non-probability sampling approaches. The proceeding section outlines some of these techniques.

4.9.3.1 Purposive/judgemental sampling

Purposive sampling is recognised as approach where researchers use their personal judgement to choose participants for the study (Brooks, Manias, and Nicholson, 2017; Saunders et al., 2019; Scalzo et al., 2017). Purposive sampling permits researchers to rely on their experience, ingenuity and earlier research experience to select elements of the study population (Malhotra, 2010; Welman et al., 2007). Saunders et al., (2019) agree with these scholars when they pointed out that purposive sampling technique is also known as judgemental sampling. This approach is recognised as an important tool in addressing research problems in a exploratory study (Brooks, Manias, and Nicholson, 2017; Saunders et al., 2019). Furthermore, Saunders et al., (2019) identified that purposive sampling method is also suited for case study research. Brooks, Manias, and Nicholson (2017), Malhotra (2010) and Mayer and Alexander (2017) indicated that sampling technique is regarded as cost-effective, fast and suitable way of determining sample size for the study.

4.9.3.2 Convenience sampling

Convenience sampling is a non-probability sampling technique (Ali, et al., 2017; Saunders et al., 2019). It includes selecting research participants who are easily accessible. This approach is also referred to as hapahazard way of identifying participants Saunders et al., 2009; Welman et al., 2007). Previous studies indicated that convenience sampling is cost effective and less time consuming method of identifying participants (Saunders et al., 2019; Welman et al., 2007). This approach affords researchers to collect rich information for the study. However, convenience sampling has different short comings such as prone to researchers' biasness and influence (Saunders et al., 2019; Welman et al., 2007).

4.9.3.3 Stratified sampling

Stratified sampling methods afford the researcher the opportunity to stratify the population into distinctive groups (Vermeulen, 2017; Zhao et al., 2019). It is mainly used by researchers when they want to observe relationships that exist between subgroups. This approach is also considered as random sampling strategy of creating subgroups within the research population.

4.9.3.4 Cluster sampling

Cluster sampling is a sampling strategy that affords the researcher the opportunity to divide the population into clusters (separate groups) (Cutting, Karger, Pedersen, and Tukey, 2017). Once the cluster is chosen, a simple random sample is chosen from the population (Foss, 2017; Scott and Siltanen, 2017).

4.9.3.5 Systematic sampling

Systematic sampling method is a probability sampling strategy where a bigger sample from a larger group of the population is selected comprehensively starting from a fixed period interval (Senaratna, Perret, et al., 2017). The sampling interval entails dividing the population size by the desired sample size (Foss, 2017; Fortin, Stewart, Poitras, Almirall, and Maddocks, 2012).

4.9.3.6 Snowball sampling

Snowball sampling is a sampling strategy where participants assist the researcher to identify other potential participants (Wig et al., 2014). This approach is used mostly when participants are difficult to find. In theory, snowball sampling is viewed in the context of a ball in that once rolling it gathers ‘snow’ on the way and become larger and larger (Lent et al., 2009; Sheu et al., 2009).

4.9.4 Sampling techniques for this study

Two distinctive non-probability sampling approaches were adopted for this study to select research participants. These non-probability sampling methods were used because the chances of participants being selected to take part in research is normally not known (Creswell and Poth, 2017; Zikmund, Babin, Carr and Griffin., 2010). The researcher used both purposive and convenience sampling techniques to select participants from the research population. Purposive sampling strategy was mainly used to identify SME owners, managers, or supervisors to take part in the in-depth interview section of the study. Participants from this group were chosen as they are regarded as people with in-depth knowledge necessary to explore OI in SMEs. The indicated sampling technique was chosen because it advocates for the use of the researcher’s judgement to select participants who best suit the objectives of the study (Malhotra, 2010; Saunders et al., 2019). Furthermore, Bryman (2008), cited in Eyles (2009, p. 31) posit that “the goal of purposive sampling is to sample participants in a strategic way, to obtain a sample appropriate for the research question and to ensure that there is a variety in the resulting sample

so that participants differ from each other in terms of key characteristics.” This sampling strategy was used to narrow down the study population. Purposive sampling also allows the researcher to use his or her experience and ingenuity to select research participants (Brooks, Manias, and Nicholson, 2017; Bryman, 2015; Taylor, Bogdan, and DeVault, 2015). Additionally, the researcher used convenience sampling to compliment the purposive sampling technique to identify and recruit participants at the identified SMEs. The choice was made based on the need to recruit research participants who were available at the sample site when the researcher arrived. Purposive sampling strategy was used because it is a cost-effective way of collecting empirical data (Malhotra, 2010; Saunders et al., 2019; Taylor et al., 2015).

Convenience sampling approach involves a consciously selection of participants by the researcher (Saunders et al., 2019; Welman, Kruger, and Mitchell, 2007). This sampling strategy was used to recruit employees to take part in questionnaire survey of the study. Convenience sampling technique was selected because it gave the researcher the opportunity to consciously select participants available at the time when the researcher visited the sample site (Malhotra, 2010; Saunders et al., 2019). This sampling strategy was chosen for this study because it is less expensive and it is a quicker way of identifying research participants (Zikmund et al. 2010; Malhotra, 2010 and Saunders et al. 2019). The indicated sampling strategy is widely recognised as a low-cost method of gathering quantitative data (Case, Burwick, Volpp and Patel, 2015; Malhotra, 2010; Saunders et al., 2019). Convenience sampling technique was selected because the results of the study were not going to be generalised to a big population.. However, convenience sampling is associated with some limitations such as bias and reliance on the researcher’s experience and values. Additionally, the sampling strategy advocates for the recruitment of people only present when the researcher arrives at the sample site. This approach is deemed as limited since it excludes absent people from participating in the study.

4.10 Data collection methods

The researcher utilised both primary and secondary data to answer the research questions identified to achieve the main objective of the study. The data collection methods used are discussed below.

4.10.1 Primary data

Primary data denotes the original data collected by the researcher to be used in a study (Welman et al., 2011). For this study, a questionnaire survey and in-depth interviews were used to gather

data for the study. The empirical evidence was collected from 245 questionnaire surveys and 15 in-depth interviews. The data collection instruments used are depicted in Figure 4.6.

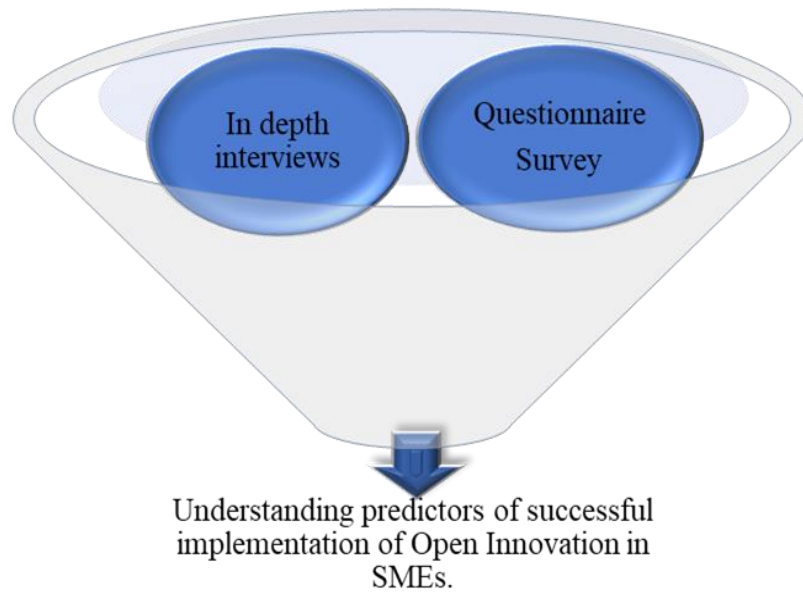


Figure 4.6 Data collection instruments used

Source: Author's own drawing

4.10.2 In-depth interviews

In-depth interviews are considered as important tools from collecting detailed data for research studies. Blanche et al. (2006, p. 297) recognised interviews as “a natural form of interacting with people”. This notion was supported Hamilton and Finley (2020) and Malhotra (2010) who pointed out that an interview is an essential way of collecting empirical data where insights are uncovered through face to face interaction with participations. Usually, interviews are conducted through structured, semi-structured or unstructured models. In this study the researcher utilised a semi-structured interviewed model. The model was used because it is flexible and it has the capacity to control proceedings and to shape the flow of responses from participants. Moreover, the semi-structured interview model was used because it allows participants to freely express themselves, thereby providing rich data for the study (Smith, 2015). Face to face conversations are widely recognised as human interactions where deeper and quality insights are sourced from participants on the topic being investigated (Saunders et al., 2019).

In-depth interviews assist researchers to read non-verbal signs such as facial expressions, body language and the change of positions and several forms of behaviours that give critical

information to the study (Macmillan and Schumacher, 2010). The interactions assist in exploring and discovering fundamental motivations, attitudes, beliefs, and feelings of the participations on the topic under review (Saunders et al., 2019). Conducting in-depth interviews is recognised as an essential platform for getting information on a very complex topic.

In-depth interviews were conducted between the researcher and entrepreneurs/ managers or supervisors of selected SMEs in the city of Pietermaritzburg in KwaZulu-Natal, South Africa. The in-depth interviews took an interactive dimension where participants were exposed to a free atmosphere to give detailed perspectives on the OI paradigm in SMEs. The in-depth interviews were scheduled and conducted at the premises of the sampled SMEs. An in-depth interview guide was used to guide the interviews (Appendix A). The guide was designed according to the objectives and research questions of the study. The proceedings were voice recorded as the researcher also took down notes to compliment the voice recorded interviews. The length of the in-depth interviews was approximately thirty minutes per participant.

4.10.2.1 The structure of the in-depth interview guide used

The interview guide was designed according to the theoretical framework used to direct the study. The questions were crafted in line with research objectives and research questions for this study. The interview guide consisted of six sections which include the background information and business profile of the SMEs, the knowledge and experience of OI amongst entrepreneurs in SMEs, internal knowledge (Inside-Out) factors that influence the successful initiation of OI in SMEs, external knowledge (Outside-In) factors that influence the successful implementation of OI in SMEs, and the strategic networks (Coupled integration) factors that influence the successful implementation of OI in SMEs. The indicated sections are further explained in the sections that follow:

Section A: The section outlines background information of SMEs owners/managers or supervisors. The questions include the need to get an overview on the age groupings, gender, and the participants' level of education. Finally, in this section the researcher explored the motivation for establishing or working for the SMEs entity.

Section B: This section gives the profile of SMEs sampled for the study. The questions were designed to explore and understand operational periods, the SMEs sector, and the type of ownership of SMEs sampled for the study.

Section C: Section C was designed to explore and understand the current knowledge on OI by SMEs. The questions were designed to direct the researcher to get more insights of SMEs' perceptions on OI. It also includes the need to get information on SMEs' investments into OI and benefits accrued personally by employees.

Section D: The main purpose of this section was to understand the internal knowledge (Inside-Out) factors that influence the successful initiation of OI in SMEs. It consists of four questions which were used to explore how SME are incorporating external knowledge to improve new product discoveries and services. The questions were designed to understand external knowledge from external universities and research institutions to improve innovation processes and product development. The section also looked at reasons why SMEs are not incorporating external knowledge into innovation and product development processes.

4.10.3 The questionnaire

Sekaran and Bougie (2016) as well as Quinlan (2011) recognise a questionnaire as a formal instrument that consist of questions used to collect information from research participants. It is widely acknowledged as an easy instrument to collect data in a research study (Saunders et al., 2019). Questionnaires are designed based on the variables identified to answer research questions. For this study, four variables were identified and questions were designed from them. The research questionnaire was designed by the researcher and personally handed out to participants. This approach was used consistent with Denscombe (2014) and Saunders et al. (2019), who argued that hand delivery of research instruments offers higher responses from participants.

4.10.3.1 The design of the questionnaire

A single questionnaire was used to collect data from SME employees. It was designed to answer the research question of the study. Three critical elements of designing a question were considered. These include (i) wording of questions; (ii) planning on variable categorisation scaling and coding, and (iii) the overall presentation of the questionnaire. The questionnaire

incorporated OI insights identified from reviewed literature. The questionnaire comprised of three sections.

Section A: This section contained questions aimed at collecting personal information of participants. The questions asked were related to position, gender, age, race and qualifications. These attributes were considered important as they determine employees' decisions to participate in OI programs in the organisation.

Section B: Section B include business profile questions. The questions aimed at understanding the number of workers in the organisation, the type of business, and industry sector. This section was deemed critical for obtaining important insights on the organisational capacity to engage into OI programs.

Section C: This section comprised of questions on OI. The questions were derived from five variables (current knowledge and experience on OI; Inside-Out; Outside-In, and Coupled integration) to gather valuable insights on OI in SMEs. The questions were presented on a Likert scale where participants were asked to select their best answer to each question. The use of a Likert scale was done in recognition of Dahlberg and McCaig (2010) who outlined that it is one of the important tools used to determine participant's responses. The scale consisted of 5 points that ranged from "Strongly Disagree, Somehow Agree, Neither Agree or Disagree, Somewhat Agree to Strongly Agree". Every level was categorically assigned a number ranging from 1 to 5 respectively. The categories were in ascending order, where the highest score indicated the most positive reaction while the lowest showed the least positive reaction (Malhotra, 2009).

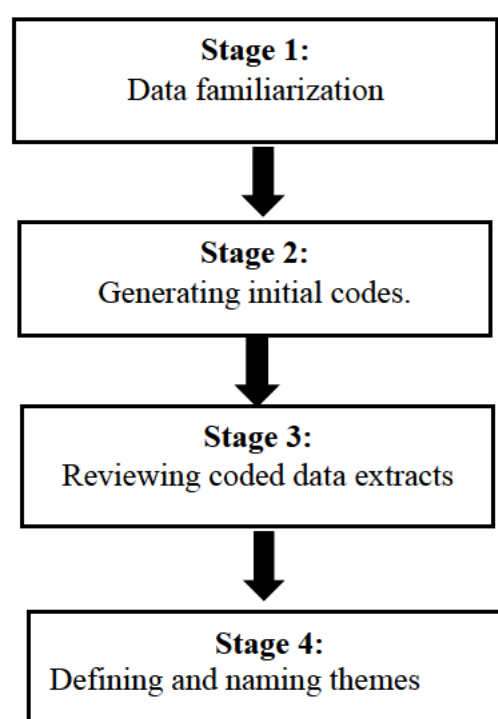
4.11 Data analysis

Data analysis entails investigating primary data with the intention of getting a better understanding of the problem being investigated (Silver and Lewins, 2014). Qualitative data analysis is referred to as a non-mathematical procedure used to analyse people's words, behaviour and beliefs (Silver and Lewins, 2014). Quantitative data collected from the questionnaire survey was descriptive in nature so statistical tools were used to describe and interpret it (Dahlberg and McCaig, 2010). In-depth interview data was recorded and transcribed for easy interpretation. Thematic analysis technique was used to analyse qualitative data, whereby the in-depth interview data was transcribed and then summarised to identify themes

as per the research objectives. According to Quinlan (2011) and Onwuegbuzie and Combs (2011), thematic analysis involves a thorough reading of the collected data, identifying key areas of focus, and categorising information to make a conclusive analysis. The thematic analysis procedure followed in this study is further discussed in section 4.11.1.

4.11.1 Qualitative data analysis procedure

The researcher used Braun and Clarke's (2006) qualitative data analysis model. The model consists of six phases which include familiarisation, the generation of initial codes, the identification of themes, reviewing the coded data extracts, defining and naming of themes from data, and producing a report. The framework was used to extract meaning from the interviews data that captured OI implementation strides by SMEs in Pietermaritzburg. The following steps were followed to analyse data:



Adapted from Harding (2018. p. 56–66)

Stage 1: Data familiarization: All interview proceedings were recorded by the researcher. This was followed by an exhaustive reading of the recordings which also captured the non-verbal communication signs such as the change of voices, emotions, gestures, and facial expression. This was done to determine that information is not distorted or exaggerated.

Stage 2: Generating initial codes. The recorded data was open coded. The researcher created codes and used them to identify themes.

Stage 3: Identifying themes. Themes were identified and organised from coded data. The emerged themes were then coded again and the frequency of their occurrence was determined.

Stage 4: Reviewing coded data extracts. The emerged themes were reviewed to identify patterns. This was done to get more meaning from the themes and establish linkage between them.

Stage 5: Defining and naming themes. The identified patterns were established and named in relation to the successful implementation of OI by SMEs.

Stage 6: Producing a report. The emerged patterns were analysed and a short, coherent, comprehensive, non-repetitive, and thought-provoking account of data was produced. The report was presented in a discussion format of participants perceptions regarding the implementaion of OI in SME sectors in KwaZulu-Natal.

Questionnaires were checked for errors before data analysis was done. The Statistical Package for Social Science (SPSS) computer software was used to capture quantitative data on diagrams, graphs and pie charts. Descriptive and inferential statistics were used to analyse responses for each research objectives. The results were presented in tables and figures for easy reference. This presentation assisted the researcher to further analyse and interpret the SPSS results.

4.11.2 Descriptive statistics

Descriptive statistics were used to present and describe data. The researcher used frequencies to profile the responses of participants and to present the findings. Since all constructs had different classifications, bar charts, pie charts, bar graphs and histograms were used to present results. Descriptive statistic was utilised to define and undestand the appearance of data such as the range of score, mean, standard deviation, skewness (Saunders et al., 2019; Salkind, 2012). Frequency distributions were used to show the number of participants for each variable. Frequencies tables and figures were utilised to illustrate demographic data and the details of SMEs used for this study. The researcher also used the median and mean as statistical tools to understand tendencies and the location of responses. Standard deviation and range were utilised

as statistical tools to measure the variability of responses and to obtain insightful information, since the study utilised interval-ratios. Descriptive statistics is mainly used to describe data while inferential statistics is utilised to approximate the figure of the test score for the population (Macmillan and Schumacher, 2010, Khalid et al., 2012).

4.11.3 Inferential analysis

Inferential statistics is a deductive analysis of data drawn from a population of the study. It is mainly concerned with accuracy and consistency of the results of data (Myers et al., 2010). Data is inspected to check relationships, differences in order to answer the research questions of the study. Inferential statistics is also used to predict similarities between sample and the population (Egboro, 2015; Macmillan and Schumacher, 2010). Inferential statistical results also help researchers to decide how data relates to the hypotheses and the extent findings could be generalised to the research population. Inferential statistics assist researchers to make approximation of the population parameter and to test the hypotheses about the population under study (Khalid et al., 2012). Parametric and non-parametric tests are the two types of inferential statistics. Parametric tests are mainly used by researchers in situation where interval or ratio data, and a sample is randomly chosen. It is also used where observations are independent, and the sample is extracted from a normally distributed population (Salkind, 2010; Wilson, 2014). For parametric tests to be used, data must satisfy these requirements so that the researcher is able to give an accurate estimation and inferences (Bomani, 2015; Eisenbeisz, 2011). According to Campbell (2006) and Eisenbeisz (2011) parametric tests include the analysis of variance (ANOVA), z-test, Pearson's correlation coefficient, t-test, and linear regressions (Campbell, 2006; Eisenbeisz, 2011).

Non-parametric tests are used in circumstances where data is nominal (categorical) or ordinal (ranked), observations are independent, and data is collected from a randomly selected sample (Eisenbeisz, 2011). Non-parametric tests are also identified as 'distribution-free' tests (Eisenbeisz, 2011). Non-parametric tests are applied in conditions where data is nominal (categorical) or ordinal (ranked), observations are independent, and data is collected from a randomly selected sample (Eisenbeisz, 2011; Sekaran and Bougie, 2016). In this study, the questionnaire produced both nominal and ordinal data. Therefore, non-parametric tests were employed because the Likert-scale questions used in the questionnaire generated non-parametric data. In this study, the Kruskal-Wallis test, Pearson Correlation Coefficient, and Principle Component Analysis (PCA) were used for inferential analysis on research responses.

Associative analysis was conducted through cross-tabulations to establish associations between variables.

4.11.3.1 Principle component Analysis (PCA)

Principal components analysis (PCA) is a factor analysis technique used to determine complete variance in data (Malhotra, 2010). It is often used to establish the relationship between questions used to explore constructs in research study. Groth, Hartmann, Klie and Selbig (2013) refer to it as a multifaceted statistical approach utilised mainly to reduce variables and dimensions while keeping data variation in datasets. PCA is widely used to identify and extract essential data presented in tables, to transform information as new variables, and to explore similarities on observations and variables (Groth et al., 2013).

In this study, PCA was used to assess questions used in the questionnaire. The approach was done to determine the relationship between questions and constructs presented in the Likert scale format in the questionnaire used in this study. The Principal Component Analysis coefficient was compiled on all study variables. However, variables with a higher range (above 5) were adjusted to a normal range. PCA results were used to understand the relationship between variables (internal, external knowledge, and coupled innovation) used in this study (Jaadi, 2019). The results gave the summary and trend on the influence the identified variables has on the results regarding the predictors of successful implementation of OI in SMEs.

4.11.3.2 The Kruskal-Wallis test

Kruskal-Wallis test is a non-parametric test that uses ranks where there are more than two independent or unrelated samples or groups to be compared and evaluated (Campbell, 2006; Eisenbeisz, 2011; Lovelace and Brickman, 2013; Maurya et al., 2013). The Kruskal-Wallis test is used where data is not from a normal distribution, the samples are independent, the data values is ordinal, and the variances of the samples is different (Hecke, 2012; Yin, 2012). In this regard 'independence' is regarded as the score of one variable that has no influence over the counting of another attribute. According to Saunders et al. (2019), the Kruskal-Wallis test is an ordinal measurement test which is used to compare groups of data. It is also known as a one-way ANOVA that uses ranks to check if there is a statistically important variances between groups of independent variables, ordinal or continuous independent variable. It is mostly used when data is not from a normal distribution, data values are ordinal or when variances of the samples are different and are independent (Hecke, 2012; Yin, 2012). The independence of

samples refers to instances when the score of one variable has no influence on the other. Using the Kruskal-Wallis test helps the researcher to understand whether the statistical differences in medians were obtained by statistical chance or they are significant or have a bearing on the participant's perceptions.

The calculation of Kruskal-Wallis tests begins with ranking data from the lowest to the highest, the scores are averaragely ranked. The groups are then calculated using the Kruskal-Wallis test (H) formula:

$$H = \left[\frac{12}{n(n+1)} \sum_{j=1}^c \frac{T_j^2}{n_j} \right] - 3(n+1)$$

Where:

n = the sum of all participants (participants from all groups)

Tc = rank total for each sample

nc = the number of participants in each sample

Kruskal-Wallis tests were used to ascertain the existing statistical weighty variance in SME entities groupings per sector regarding the predictors for successful implementation of OI. The groupings considered for this test include sectors such as service, retail, manufacturing, as well as the construction and engineering sectors. The researcher wanted to establish if sectors associated with SMEs have a significant influence on the predictors of OI.

4.11.3.3 Pearson Correlations test

Spearman's (rho) rank correlation coefficient, is a non-parametric test, that was formulated by Charles Spearman to determine the strength of an association between two variables (Hauke and Kossowski 2011; Papathanasiou and Siati, 2014). Bomani (2015) illustrates that the index of association among two variables is indicated by the correlation coefficient. Correlation coefficient test is used where data is not normally distributed and is ordinal in nature, or when one of the variables is ordinal (Papathanasiou and Siati, 2014). The Pearson correlation coefficient or the r-index is widely preferred as the suitable matric for showing effect size when inteprating relationship between variables. The correlation coefficient considers variances and co-variances of two variables and measures magnitude and direction of linear association among them. The Spearman's rho varies from -1.00 to +1.00, demonstrating the extent of the

connection among the two variables (Papathanasiou and Siati, 2014). However, the results could reflect positive, negative, and no relationship between variables (Khalid et al., 2012). Positive correlation indicate existence of direct connection between variables where the increase or decrease of a single variable will result in similar increase or decrease of another variable (Wegner, 2012). Similarly, a negative linear correlation denotes an increase or decrease in value of single variable will lead to decrease or increase of another variable (Wegner, 2012). This indicate a converse association among variables.

$$R_s = \frac{1 - 6 \sum D^2}{n(n^2 - 1)}$$

Where:

- $\sum D^2$ = the sum of all the values in the last column of the solution matrix.
- n = number of research participants in the data set.

Results:

$r = +1$ indicates a perfect positive linear correlation

$r = 0$ indicates no linear correlation

$r = -1$ indicates a perfect negative linear correlation

Correlation tests were done to determine the relationship between the identified variables in predicting the successful application of OI. The tested variables include internal, external knowledge, and strategic networks.

4.12 Data quality control

The researcher made consistent efforts and followed acceptable steps to address issues that are usually experienced in research studies. This was done in support of the argument made by Bryman and Bell, (2007), Cypress (2017) and Saunders et al. (2019) that research results can only be valid and relied on when bold steps are followed to avoid the researcher's bias and choice of conflicting research methods for a study. Therefore, several measures were followed to assess and ascertain the reliability and validity of research results. Several steps were charted as discussed in the following sub-sections.

4.12.1 Reliability

Reliability is about the ability of the measuring instruments to give dependable and consistent outcome when they are used several times (Saunders et al., 2019); Zikmund, 2012). The questionnaire needs to be reliable for the study to pass any reusable or reliable conclusion. To ensure reliability of quantitative data, a statistical reliability analysis was carried out on the research constructs contained in the questionnaire on the Likert scaled questions. Cronbach's Coefficient Alpha statistical analysis was performed to ascertain the ability of the questionnaire to give consistency results when it is used multiple times. The Cronbach's alpha test was also done in order to ascertain internal consistency which assess the interrelations of items in a construct or group. The accepted Cronbach's alpha score is above 0.7 and considered as a good reliability. Factorability for sample adequacy of research variables were established by utilising Bartlett's test of sphericity and Kaiser-Myer-Olkin (KMO) tests. To further ascertain reliability of the questionnaire, a pilot study was conducted on five (5) SMEs.

A five-step technique was undertaken to determine credibility, transferability and confirmability of qualitative research. According to Lincoln and Guba 1985 cited in Noble and Smith (2015, p. 34) the five steps that can be used to assess credibility of qualitative research are "engagement, persistent observation, and triangulation; peer debriefing; negative case analysis; referential adequacy; and member checking". Additionally, the researcher established lengthy engagements with participants, aimed at building relationships. The researcher established relationships that enabled participants to open up and voluntarily provide the required information for the study. Through lengthy engagements, the researcher had the opportunity to observe elements that could improve the quality of data for the study. Importantly, the researcher engaged in peer debriefing discussions with research participants on the process that was followed after the data collection phase through to the compilation of the findings and the conclusion of the study. The researcher gave the participants a summary of all information recorded during in-depth interviews. This is in accordance to the claim made by Lincoln and Guba 1985 cited in Noble and Smith (2015) who stated that giving a summary feedback of information to research participants increases credibility of the research data. The recorded interviews were played back to participants. This approach assisted in boosting their self-confidence levels, and consequently, they provided more information for the study. Finally, the confirmability of qualitative data was improved by the triangulation approach where various research methods were used to compare data collection instruments used for this study.

4.12.2 Validity

Validity in a research study is concerned with the extent to which research methods will investigate what is supposed to be accomplished (Arshad, Hameed, and Ulkashif, 2014; Saunders et al., 2019; Zikmund et al., 2010). Average variance extracted (AVE) was used to measure convergent validity. AVE determines the level of variance captured by a construct versus the level due to measurement error. Values above 0.7 are considered very good while the level of 0.5 is acceptable. AVE is the mean variance extracted from items loading on the construct. Factor analysis was conducted to ascertain that the measuring instruments measure the intended purpose in answering the objectives of the study. The researcher addressed the specific types of validity such as “internal validity, external validity, measurement validity, ecological validity and content validity”.

4.12.2.1 Internal validity

Internal validity pertains to subjects of causality and is mainly associated with issues relating to whether deductions that include a causal relationship between variables is acceptable (Bryman and Bell, 2007). For example, if y causes z then the study needs to ascertain that y is responsible for the variation z and nothing else is generating the identified relationship.

4.12.2.2 Construct validity

Construct validity is also described as measurement validity (Welman et al., 2011). It is used to determine whether the research instrument is able to measure intended constructs (Bryman and Bell, 2007). This type of validity literally focuses on questions related to determining if the identified measure for a certain concept actually represents it or not. When the measure for a particular concept is unreliable and inappropriate to measure it, then it is unacceptable as a measure of the concept. The researcher used mixed methods strategy as a way of improving validity of the study in agreement of Saunders et al. (2019) and Tashakkori and Teddlie (2010) who state that the mixed methods approach enhances the validity of the study. Additionally, a pilot study was conducted with five SMEs to assess construct validity of the research instruments. Internal validity pertains to the ability of research instruments to access what it is supposed to find (Zikmund et al., 2010; Bryman and Bell, 2007). The research instruments were given to experts in the field under study to assess their internal validity and content validity.

4.12.2.3 Ecological validity

Ecological validity relates to whether or not social science is applicable to individual's daily natural social situations. For example, do research instruments capture daily life situations, attitudes, values, and knowledge (Bryman and Bell, 2007). For this study, the researcher was a resident and worked in SMEs in Pietermaritzburg, is well vested, and understood how the research is linked and relates to daily operations of SMEs.

4.12.2.4 External validity

External validity refers to the ability to generalise results beyond the breath and context of the study (Bryman and Bell, 2007). Since the study adopted a non-probability method, the findings cannot be generalised across the entire sectors under study.

4.13 Pilot testing

Denscombe (2014) and Saunders et al. (2019) posit that pilot test research instruments on small sample to ascertain the feedback from participants before they are used on the main study. It is mainly done to detect and eliminate all problems in research tools to be used to collect data. Saunders et al. (2019) suggest that when pilot test results are positive it means that the research instruments will be able to provide a similar outcome when used in the main study.

A two phased pilot study was conducted. The initial stage involved in-depth interview carried out between the researcher and three SMEs owners in Pietermaritzburg. The second phased include a questionnaire survey with SME workers in Pietermaritzburg. The two phased pilot tests were carried out to assess dependability and consistency of research instruments to be used in the main study. The SMEs owner did not find any problem with the interview guide used and the results indicated that the instrument was able to collect the intended data. The Findings obtained from the pilot questionnaire survey indicated that two questions were not clear to participants. Adjustments were made, the feedback from participants was incorporated. Additionally, the adjustments were also used to further explore various insights which were overlooked when the research instruments were initially designed.

4.14 Ethical requirements

Paying attention to ethical conduct is an essential element of a research study (Bhattacharjee,

2012; Welman et al., 2011). Ethics in research refers to principles and standards of conduct that are observed when collecting, analysing, presenting and publishing data collected from the subject of the study (Bhattacharjee, 2012). Adhering to ethical prescripts in research helps the researcher to carry out the study in a noble way with honesty and respect to human rights. Ethical standards in a research study include agreeing with prospective research participants, as well as maintaining privacy and confidentiality (Bhattacharjee, 2012; Silverman, 2010). Paying attention to ethical conduct reduces research bias encountered in research processes. To deal with the ethical dilemma, the researcher has to remain as objective as possible throughout all the phases of the study. In this study, the researcher complied with ethical requirements stipulated in the policy of the University of KwaZulu-Natal. The university's ethical policy prescripts underline respect to the rights of research participants and also the researchers' responsibilities. An ethical clearance was obtained from the Humanities and Social Science Ethics Committee (HSSREC) of the University before any contact with the prospective research participants was made. The authorisation reference number HSSREC/00000630/2019 was issued for the study (see Appendix D). The study includes SMEs in Pietermaritzburg; therefore, a consent letter was obtained from the office of the national Economic Development, Tourism and Environmental Affairs in Pietermaritzburg. The informed consent letter was acquired to use the Department's SME database to formalise the identification of SMEs for the study. Furthermore, gatekeepers from SMEs were identified and they were asked to take part in this study.

Informed consent forms were issued to participants and those willing to participate were asked to sign them as an agreement to take part in the study. Participants were given information sheets that explain the goals and matters to be addressed in the research. Those with questions were given the opportunity to ask before the interview and questionnaires survey exercise started. During data collection, potential participants were told that their involvement in the study is purely voluntary and also that they can pull out whenever they wish to do so. Importantly, they were informed of all the procedures to be followed in the study in order to maintain confidentiality and to protect their identity. The researcher further assured probable participants that at the subsequent stages of the study no names were recorded during the interview proceedings and questionnaire survey. The researcher asked for permission from in-depth interviews participants to record the interview proceedings. An audio recorder was used to capture interview proceedings. Those not willing to have their voices recorded were allowed to participate in the study and instead of recording their voices, the researcher took notes of the

interviews. The consent forms and ethical clearance certificates are attached in Appendix C and D of the study respectively.

4.15 Summary of chapter four

In chapter four, the researcher has outlined the research methodology adopted for this study. The research philosophy, research design, study population, sample size, sampling methods, data collection, and analysis strategies have been discussed. Data quality control measures have also been discussed, highlighting how validity and reliability issues were addressed in the study. Furthermore, the pilot testing exercise conducted on the research instruments has been presented, and an explanation of how ethical issues were dealt with in this study was provided. The next chapter presents the empirical findings of the study.

CHAPTER FIVE

PRESENTATION AND INTERPRETATION OF EMPIRICAL FINDINGS

5.1 Introduction

The previous chapter gave a detailed explanation of the research methodology and research design used for this study. Chapter five presents the research findings from data collected through in-depth interviews and questionnaire survey. The presentation was aimed at understanding the relationship between the identified constructs (internal knowledge, external knowledge, strategic networks and other innovation frameworks) in relation to the successful implementation of OI in SMEs. This chapter is divided into two sections, namely: Section A (demographic, business details, reliability and validity of findings and Section B (findings from qualitative and quantitative data).

The chapter begins by presenting the response rate followed by the reliability and validity tests results obtained from Cronbach's Alpha statistical analysis on the questionnaire used to collect data. This is followed by Section B which presents findings from the qualitative and quantitative data.

To adhere to research ethics requirements, the participants' names were not revealed in the discussion of the qualitative results. Codes were established and used to represent the identity of participants. The codes are depicted on Table 5.1.

Table 5.1 Key to code names of participants

Targeted participants	Code (<i>Pseudo name</i>)
1 st SME owner	P1
1 st Manager	P2
2 nd SME owner	P3
3 rd SME owner	P4
4 th SME owner	P5
5 th SME owner	P6
2 nd Manager	P7
6 th SME Owner	P8
7 th SME Owner	P9
3 rd Manager	P10
8 th SME owner	P11
9 th SME owner	P12
1 st Supervisor	P13

Note: P, as used in Table 5.1, means Participant. Hence, P1 means Participant 1.

5.2 Response rate

The study's response rate is depicted on Table 5.2.

Table 5.2 Response rate

Research Activity	Participants	Number of Participants (n)	Responses (n)	Response Rate (%)
In-depth interviews	SME owners, Managers/supervisors	15	13	87
Questionnaire survey	Employees	245	218	89
Total		260	231	89

Source: Author's own compilation

The sample size for the project was 260 participants. As the study used a mixed methods design, the sample size was then divided. Fifteen in-depth interviews were scheduled between the researcher and the identified SMEs. The researcher managed to successfully hold thirteen (n=13) interviews while two SMEs managers cancelled the appointment due to a busy business schedules in their organisations. The thirteen interviews were deemed sufficient given that data saturation started to emerge from interviews. The participants who were studied using in-depth interviews consisted of nine SME owners, three managers and one supervisor. In-depth interview response rate was 87%. The impressive response rate was alluded to the research topic being interesting, and also to the great excitement shown by some of the participants with regard to engaging on the topic.

Two hundred and sixty (N=260) questionnaires were handed out to the identified SMEs in the city by the researcher with the help of the research assistants. Two hundred and eighteen (n=218) questionnaires were collected from the participants. The response rate of the questionnaire survey was 89%. The remarkable response rate was attributed to the researcher's choice to hire a research assistant. The high return rate was also credited to the fact that the questionnaire was hand delivered. In addition, the impressive response rate was ascribed to the easiness of the questions used and participants were allowed by their bosses to participate during working hours. They were also given adequate time to respond to the questionnaire.

5.3 Section A: Demographic

The findings of the demographic representation of research participants were combined from the findings of both in-depth interviews and questionnaire surveys. The demographic results indicate the race, age, gender, highest education qualification, forms of business, and position in the organisation. Table 5.3 presents the summary of the demographic results of 231 participants.

Table 5.3 Summary of the demographic profile of the study sample (participants)

Demography variable	Category	Frequency	Percentage
Race	African	75	32.5
	White	42	18.2
	Indian	71	30.7
	Coloured	43	18.6
Age group	Below 20	5	2.2
	20-29	33	14.3
	30-39	121	52.4
	40-49	56	24.2
	50-59	14	6.1
	Above 60	2	0.87
Gender	Male	107	46
	Female	124	54
Highest qualification	No formal education	5	2.2
	Primary school certificate	1	0.4
	High school certificate (Matric)	43	18.6
	Diploma	104	45
	Bachelor's degree	75	32.5
	Postgraduate degree	3	1.3
Position in the company	Owner	14	2.8
	Manager	11	6.1
	Supervisor	9	3.9
	Employee	197	85.3

5.3.1 Gender representation

Findings showed that the study had a good gender representation. The participants were predominantly female who constituted 54% of the study sample. Male representation consisted of 46%.

5.3.2 Participants' age

The participants' age distribution had a bell shape. As shown in Figure 5.1, the modal age group was the one with participants aged 30-39 years, making up over half (52.4%) of the sample (121 participants) followed by the 40-49 group making up 24.2% (54 participants). The 20-29 age group was made up of 14.3% of the participants (33 people). The extreme age groups made up less of the distribution with the 50-59 age group making up 4.6% (10 participants), those below 20 years of age, making up 2.2% (5 participants) and lastly those above 60 years of age, making up 0.9% of the participants (2 participants).

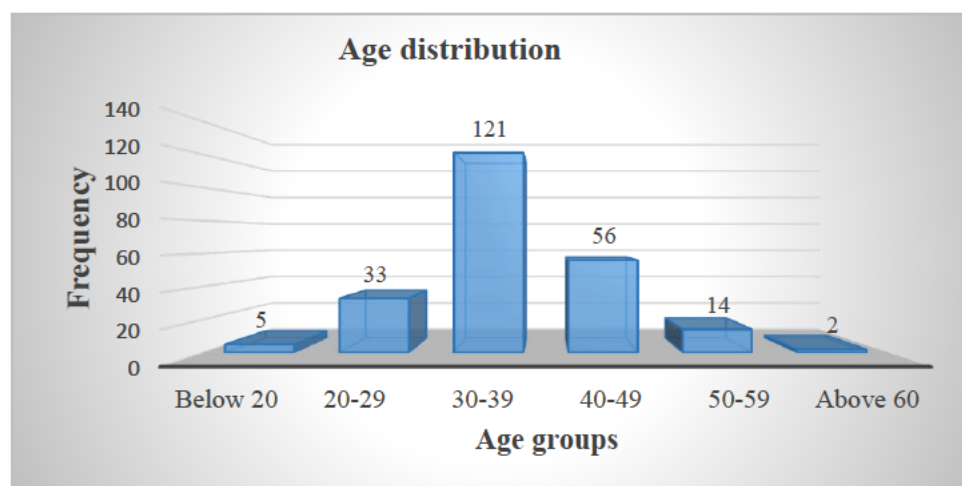


Figure 5.1 Age distribution

5.3.3 Participants' race

The sample was dominated by African and Indian participants who made up 32% and 31% respectively. Likewise, whites and coloureds had similar proportions of 18% and 19%, respectively (Figure 5.2).

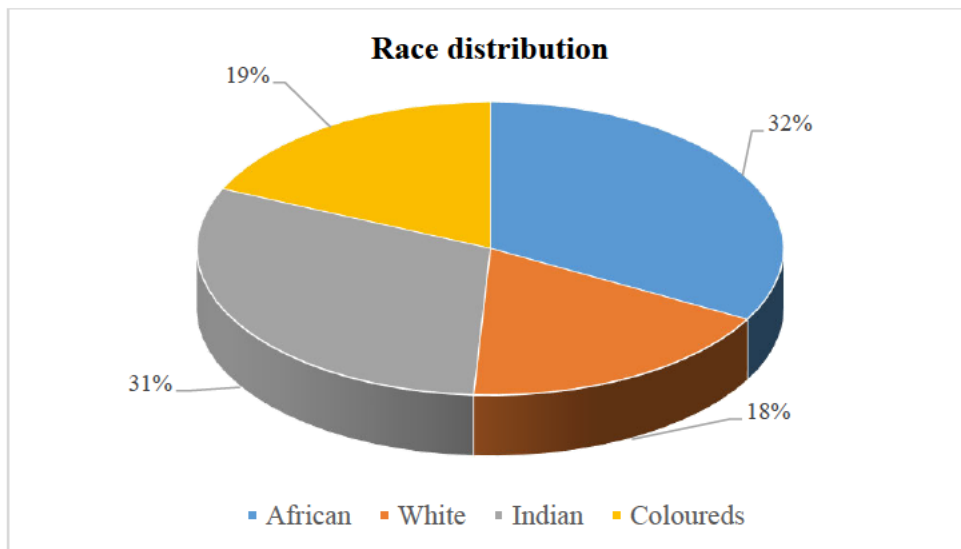


Figure 5.2 Race distribution

5.3.4 Highest education/ qualification

Figure 5.3 shows the highest education distribution results of the participants. The education level of the participants was almost bell shaped with the majority in the middle and less on the extremes. 45% of the participants had a diploma, 32.5% had bachelor's degree, and 18.8% had a high school certificate. 1.3% participants had a postgraduate degree, while 2.2% had no formal education and 0.4% had primary school certificates.

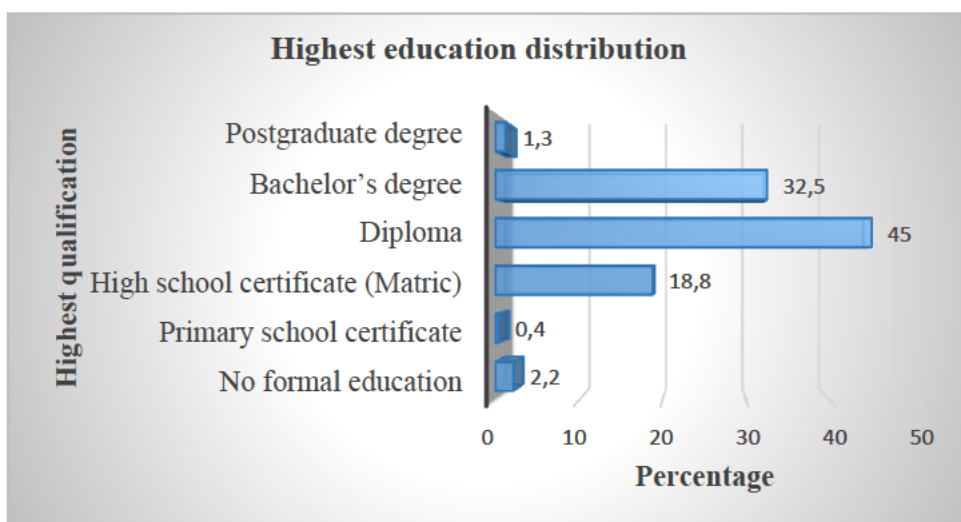


Figure 5.3 Education distribution

5.4 Business details

Business details include findings regarding the number of workers in the organisations, the form of business, the type of industry, and number of years participants had been working in their respective entities. The summary of the findings are depicted on Table 5.4.

Table 5.4 Summary of business details

Business details	Category	Frequency (n)	Percentage (%)
Number of workers in the company.	(1-10)	44	19
	(11-20)	64	28
	(21-30)	28	12
	(31-40)	59	26
	41 and above	36	15
Form of business	Sole proprietor	26	11
	Private Company (Pty) Ltd	174	75
	Personal Liability Company	4	2
	Public Company (Ltd)	27	12
Industry type	Service sector	61	26.4
	Retail sector	61	26.4
	Manufacturing	60	26
	Construction & engineering	49	21.2
Number of Years participants worked in the organisation	Under 5 years	64	27.7
	6-10 years	102	44.2
	10-15 years	45	19.5
	16 years and over	20	8.6

5.4.1 The size of companies from which the participants were drawn

The majority (28%) of the participants were drawn from SMEs consisting of 11-20 employees. 19% of the participants were from a company with 1-10 employees. Similarly, those with 31-40 employees made up just over a quarter of the SMEs, making up 26% of the sample. 15% of the participants were drawn from entities with over 41 employees (Table 5.4).

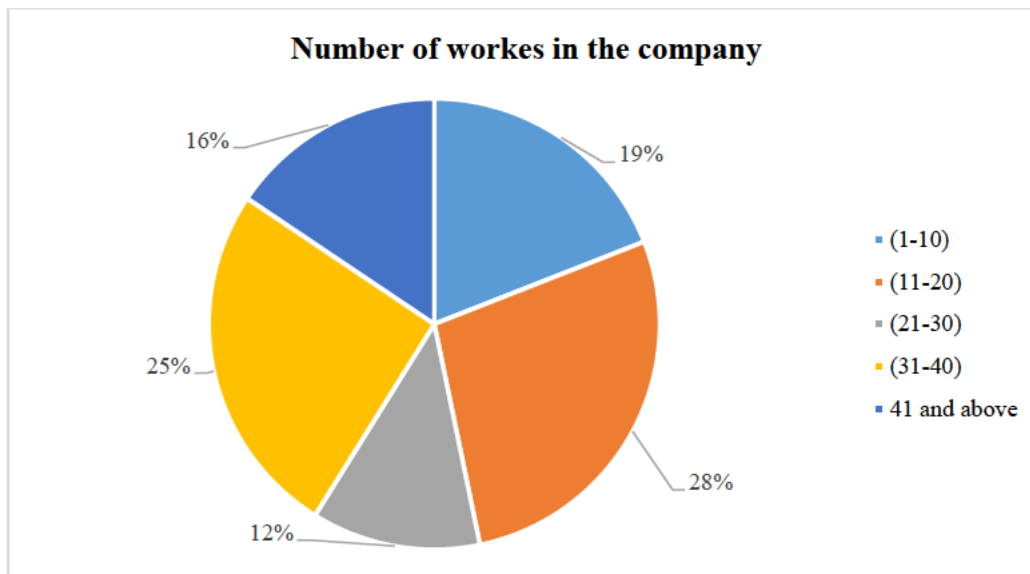


Figure 5.4 Distribution of workers in the company

5.4.2 Form of business

The form of business distribution results indicated that just over three quarters (75.2%) of participants were drawn from Private companies. Public and sole proprietor made up an almost equal percentage with 12% and 11% respectively. Only 2% of SMEs were drawn from personal liability entities (Figure 5.5).

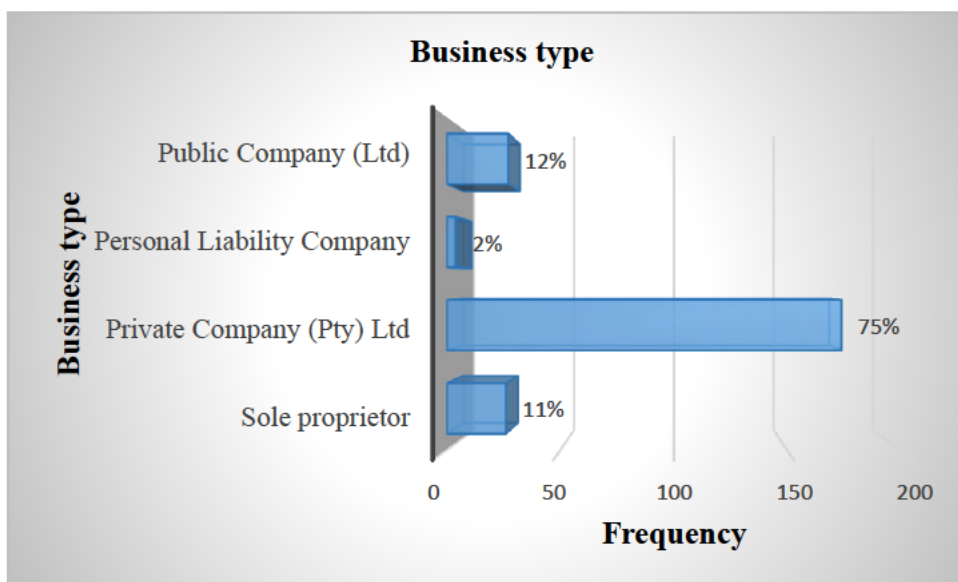


Figure 5.5 Distribution of business types

5.4.3 Industry type

The distribution by industry was fairly spread. The service sector made up 27.5%,

followed by the retail sector which had 26.1%. The manufacturing sector had 25.7% and lastly the construction and engineering sector, which constituted 20.6% of the participants (Table 5.6).

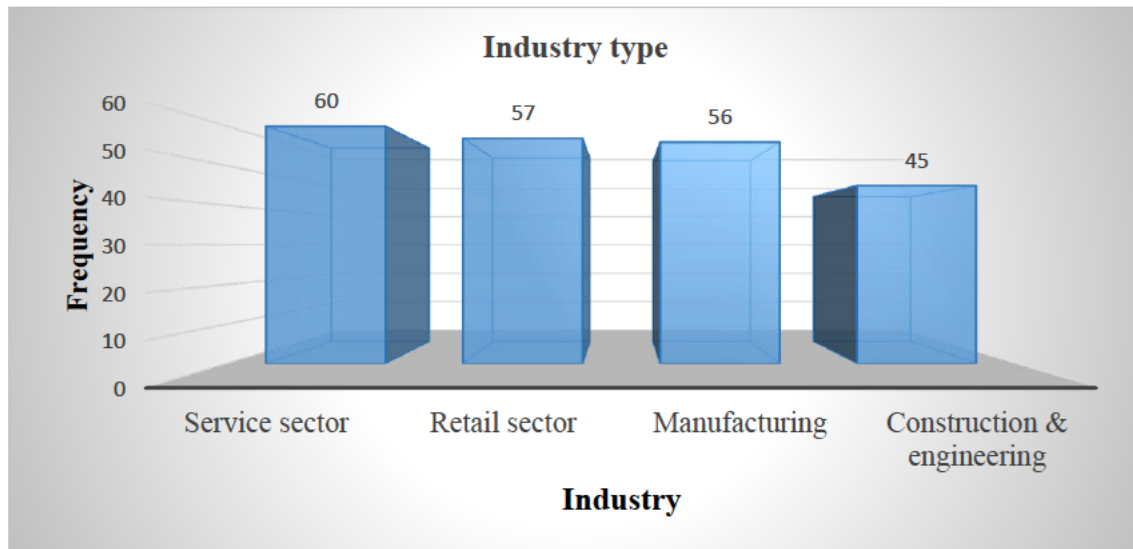


Figure 5.6 Industry distribution

5.4.4 The number of years the participants had been working in the organisation

The length of period during which participants had been working in the studied organisations is shown of Figure 5.7. 44.2% of the participants had worked with the organisation for 6-10 years. While, just over a quarter, 27.7% had worked for under 5 years. 19.5% had worked for 10-15 years and lastly 8.7% had worked for the relevant organisation for 16 years and over.

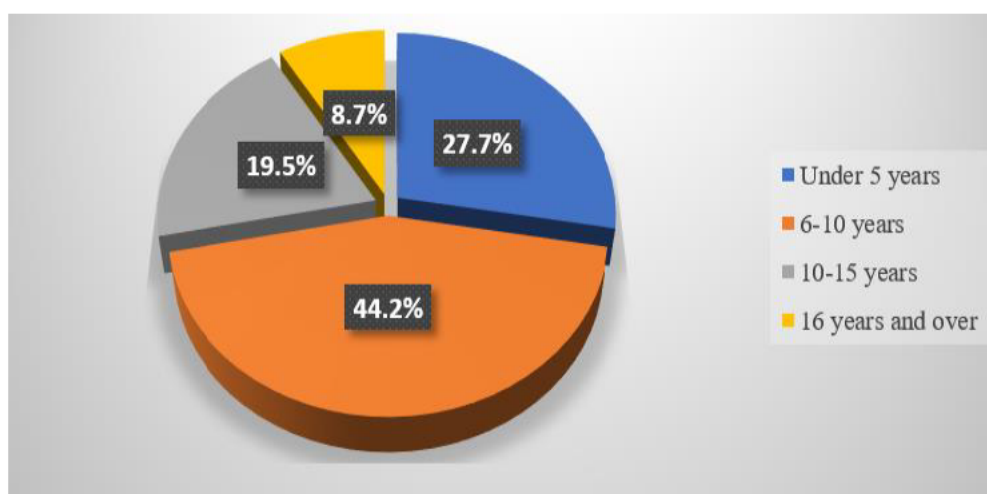


Figure 5.7 Number of years of working at the relevant companies

5.5 Reliability results

To run the reliability test, the researcher firstly checked the inter item correlations for multi-collinearity whereby items have very high correlations of above 0.8. The inter item correlations did not suffer from multi-collinearity which allowed the researcher to proceed to check for questionnaire reliability. The whole questionnaire had a Cronbach Alpha of 0.92%. This shows very high internal consistency from the questionnaire items. The scale when item is deleted did not indicate any increase of Cronbach Alpha, therefore, all items were kept in the questionnaire.

After checking the overall reliability, the researcher needed to check for the individual sections to check if the created constructs indeed captured the same thing. The results shown in Table 5.5 show that all sections had high reliability/internal consistency. This means the researcher could thus use study results to generalise the findings onto the population from which the sample was derived.

Table 5.5 Reliability results

Item	Cronbach's Alpha
Overall questionnaire	0.917
Current knowledge and experience on OI	0.839
The influence of internal knowledge	0.810
The influence of external collaborations factors	0.797
Strategic network	0.819
Other innovation frameworks/models	0.655

5.6 Validity test results

Validity is the extent to which the scores from a measure represent the variable they are intended to represent. Face validity also known as content validity is the extent to which a measurement method appears “on its face” to measure the construct of interest (Salkind, 2012; Saunders et al., 2019; Zikmund et al., 2010; Welman et al., 2007). It is a subjective measure and hence the least important. Looking at the questionnaire items, the researcher identified that the questions do address the issue of OI. This was confirmed by a general random sample of 10 people who looked at the questions to see whether they appeared to measure what was intended to be measured, and all of them had the view that indeed the questions appeared to do so.

Criterion validity is the extent to which people's scores on a measure are correlated with other variables (known as criteria) that one would expect them to be correlated with (Miller and Salkind, 2012; Novikov and Novikov, 2019). For this study, inter item correlations showed the expected correlations between items. Convergent validity is when construct items must have high convergence and show how the scale is closely linked to other variables, implying that the variables should share a huge proportion of variance (Helmes, Holden, and Ziegler, 2015; Krabbe, 2016). This is easily measured by the factor loadings of the constructs. It can be seen from Table 5.5 that the factor loadings were all above 0.5 which indicates convergent validity. To further measure validity, the researcher used the Average variance extracted (AVE) which is the mean variance extracted from items loading on the construct. The AVE values obtained were all greater than 0.5 for the first 4 constructs which shows that there was convergent validity (Table 5.6). The last construct (other innovation/models) has 0.43 AVE which shows weak convergence, but it is still acceptable also taking into account the high factor loadings. The square root of the AVE was greater than the correlations of any two constructs hence indicating discriminant validity.

Composite reliability is also a measure of convergent validity. The researcher required a value above 0.7 to pass the construct as having convergent validity. Based on the values shown which are all above 0.7 it was concluded that sufficient convergent validity was achieved. Lastly, the researcher consider the discriminant validity which is the extent to which a construct is truly distinct from other constructs. That is to say, the extent to which scores on a measure are not correlated with measures of variables that are conceptually distinct. This is tested by comparing the AVE'S with the squared inter construct correlation values. The results are shown on Table 5.7 and it can be seen that the AVE values in bold are all greater than the squared correlations in their column and rows. This indicated that there is discriminant validity.

Table 5.6 AVE and CR test results

Construct	Items	Lambda	AVE	Composite reliability
A. Current knowledge and experience on OI	1	0.546	0.535	0.8872
	2	0.568		
	3	0.801		
	4	0.802		
	5	0.825		
	6	0.812		
	7	0.706		
B. The influence of internal knowledge	1	0.686	0.643	0.8775
	2	0.838		
	3	0.872		
	4	0.800		
C. The influence of external knowledge factors	1	0.573	0.501	0.8562
	2	0.673		
	3	0.741		
	4	0.813		
	5	0.756		
	6	0.666		
D.Strategic networks	1	0.617	0.541	0.8723
	2	0.734		
	3	0.842		
	4	0.856		
	5	0.803		
	6	0.487		
E. Other innovation frameworks/models	1	0.546	0.434	0.7913
	2	0.660		
	3	0.616		
	4	0.733		
	5	0.720		

Table 5.7 Discriminant validity test results

	Current Knowledge	Internal Motivators	External Factors	Strategic Network	Other innovation frameworks
Current Knowledge	0.731				
Internal knowledge	0.376	0.802			
External knowledge	0.345	0.343	0.708		
Strategic Networks	0.375	0.355	0.343	0.735	
Other innovation frameworks/models	0.092	0.092	0.065	0.060	0.659

5.7 Analysis of the research questions

This section outlines statistical tools used to analyse the research questionnaire used to collect data for this study. The purpose was to address the significance, and interconnectness between constructs and variables in the questionnaire. The statistical analysis instruments used include Kaiser-Meyer-Olkin Measure (KMO), logistic regression, construct correlations, Kruskal-Wallis H test, and Chi-square test for independence. The results are presented in the subsequent sections below.

5.7.1 Construct formation with factor analysis

The questionnaire was subdivided into sections that allow the researcher to have different items that measures particular constructs. Given that each section had only seven items or less, the researcher did not create further breakdown of constructs but created one factor for each section using Principal components.

For the section “Current knowledge and experience on OI” there were 7 items. The Kaiser-Meyer-Olkin Measure (KMO) of sampling adequacy obtained was 0.791(79.1%). This means there was sampling adequacy in data. The Bartlett's Test of Sphericity had a p-value of 0.00 hence the researcher reject the null hypothesis of identity matrix and conclude that factor analysis may be useful with the data.

For “the influence of internal knowledge”, 4 items were identified. The KMO obtained was 0.733 (73.3%). This means there was sampling adequacy in data. The Bartlett's Test of

Sphericity had a p-value of 0.00 hence we reject the null hypothesis of identity matrix and conclude that factor analysis may be useful with data.

“The influence of external knowledge” section had 4 items. The KMO obtained was 0.693 (69.3%). This means there was sampling adequacy in the data. The Bartlett's Test of Sphericity had a p-value of 0.00 hence the null hypothesis of identity matrix was rejected and it was conclude that factor analysis may be useful with the data.

The “strategic networks” section had 6 items. The KMO obtained was 0.765 (76.5%). This means there was sampling adequacy in data. The Bartlett's Test of Sphericity had a p-value of 0.00 hence the null hypothesis of identity matrix was reject and the researcher conclude that factor analysis may be useful with data.

Other innovation frameworks/models had 5 items. The KMO obtained was 0.608 (60.8%). This is lower than 70% but is still acceptable for sampling adequacy in data. The Bartlett's Test of Sphericity had a p-value of 0.00 hence the null hypothesis of identity matrix was reject and it was conclude that factor analysis may be useful with data.

5.7.2 Pearson correlations results

Table 5.8 shows the inter construct correlations. There was a significant strong positive correlation ($p = 0.613$) between “current knowledge” and “internal knowledge”. “External knowledge” and “current knowledge” had a moderate significant positive correlation ($p = 0.587$). “Strategic network” and “internal knowledge” had a significant strong positive correlation ($p = 0.612$) with “current knowledge”. “Use of other innovation models” had a weak positive correlation of 0.303 with “current knowledge”. All other constructs had also significant weak positive correlations with integrated factors with correlation values of $p = 0.304$, $p = 0.255$ and $p = 0.245$ for “Internal knowledge”, “external knowledge” and “strategic networks”, respectively. The correlations between “strategic networks”, “internal knowledge” and “external knowledge” were similary moderate and positive at $p = 0.596$ and $p = 0.586$, respectively. “External knnowledge” and ”internal knowledge” had a significant, positive moderate correlation of $p = 0.587$.

Table 5.8 Construct correlation results

		Current Knowledge	Internal Knowledge	External Knowledge	Strategic Network	Other innovation frameworks/models
Current Knowledge	Pearson Correlation	1				
	Sig. (2-tailed)	0.000				
Internal knowledge	Pearson Correlation	0.613**	1			
	Sig. (2-tailed)	0.000				
External knowledge	Pearson Correlation	0.587**	0.586**	1		
	Sig. (2-tailed)	0.000	0.000			
Strategic Network	Pearson Correlation	0.612**	0.596**	0.586**	1	
	Sig. (2-tailed)	0.000	0.000	0.000		
Other innovation frameworks/models	Pearson Correlation	0.303**	0.304**	0.255**	0.245**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	

5.7.3 Kruskal Wallis H test

The results of the Kruskal-Wallis H test showed that there was a statistically significant difference in the current knowledge scores for the different OI responses, Kruskal- Wallis H value = 71.911, $p = 0.000$, with a mean rank of “No” of 71.63 and 144.05 for “Yes” (Table 5.9).

There was a statistically significant difference in the Internal knowledge scores for the different OI responses, Kruskal- Wallis H value = 30.667, $p = 0.000$, with a mean rank of number of 84.83 and 132 for “Yes” (Table 5.10).

There was a statistically significant difference in the External knowledge scores for the different OI responses, Kruskal- Wallis H value = 18.177, $p = 0.000$, with a mean rank of number of 89.90 and 126.26 for “Yes”.

There was a statistically significant difference in the Strategic networking scores for the different OI responses, Kruskal- Wallis H value = 34.3 $p = 0.000$, with a mean rank of number of 83.32 and 133.39 for “Yes”.

There was a statistically significant difference in the Strategic networking scores for the different OI responses, Kruskal- Wallis H value = 7.04, significant at $\alpha = 0.000$, with the mean rank values of 97.69 and 120.28 for “Yes”.

Table 5.9 Mean ranks

Ranks			
	Open Innovation	N	Mean Rank
Current knowledge	No	104	71.63
	Yes	114	144.05
Internal knowledge	No	104	84.83
	Yes	114	132.00
External knowledge	No	103	89.90
	Yes	114	126.26
Strategic networks	No	104	83.32
	Yes	114	133.39
Other innovation frameworks models	No	104	97.69
	Yes	114	120.28

Table 5.10 Kruskal-Wallis test results

Test Statistics					
	Current knowledge	Internal knowledge	External knowledge	Strategic networks	Other innovation frameworks models
Kruskal-Wallis H	71.911	30.667	18.177	34.300	7.040
df	1	1	1	1	1
Asymp. Sig.	0.000	0.000	0.000	0.000	0.008
a. Kruskal Wallis Test					
b. Grouping Variable: Open innovation					

5.7.4 Tests for independence

Chi-square tests were used to test if some of the responses were dependent on demographical factors. The exact fisher test was preferred due to the cell counts of some categories being less than 5 which violated the Pearson chi-square assumption.

For other variables there was no significant association with OI.

5.8 Qualitative results on current knowledge of open innovation in SMEs

The participants were asked about their current knowledge and experience on OI. Their perceptions pertain to the knowledge they had at the time of this study, how the concepts were perceived by SMEs in KwaZulu-Natal, and its importance to their respective organisations. The empirical results showed that participants had varied sentiments regarding OI as a business concept. Their views are depicted on Table 5.11.

Table 5.11 Current knowledge and experience of open innovation

Themes	Sub themes	Themes Frequency (n)
Very important concept	Practised by many companies	11
Improves growth	Product/service quality improve, growth increases, profits and standards improve	10
Increases company production rate	Improved products/services, reduces competition, build relationship, increased customer base,	8
Improve employee skills	Employees motivated, share ideas/expertises, high self-esteem, self motivated, increase individual performance	12

Various themes and sub-themes emerged reflecting participants' knowledge and experience on OI. Four main themes were identified, and they were supported by various sub-themes. The themes were also identified from a number of sub-themes that confirm participants' knowledge and experience on OI. The results showed that 91% of the participants indicated that OI is not practised by many organisations. This was pointed out by several participants. For example: Participants P1, P10 and P13 pointed out the following:

P1: *"Yaah!, I think most businesses are not practicing it. They don't share ideas unless with their friends- competition is tough in the business".*

P10: *"Not really. I think SMEs are not sharing things. It's like they do it on their own unless they are not showing it up".*

P13: *“Not sure if it’s being practised. Some businesses like us shy away from approaching other businesses for ideas on the challenges we are facing”.*

Findings also showed that the majority (83%) of participants associated OI with improved growth on the company that practice it. This assertion was revealed by participants P4 and P8 who highlighted the following:

P4: *“It is important because it helps business to improve themselves. It helps deal with competition. For example, Ethiopian shop owners put money together and order stock in large quantities. They negotiate for big discounts. They price their products the same., so they don’t compete among themselves in the process”.*

P8: *“Very important because it helps understand and grow the business. The product or services increase”.*

Moreover, findings indicated that participants associate OI with market growth. This was indicated by 67% of the participants who pointed out that OI helps to grow the market. For example: Participants P1 and P13 had the following sentiments:

P1: *“Very important, it makes business improve its products, service quality increase - customer base increase as well”.*

P13: *“It’s all for profit sake, and also to increase our market share, standards and competitiveness”.*

Most of the participants indicated that OI improves the skills of employees. This was revealed by all (100%) of the participants who said that employees share ideas and expertise, and motivate them. At personal level, participants also indicated that their self-esteem is raised when they participate in OI programmes. The following extracts support the assertions made.

P8: *“Yes we do. Workers are motivated to work hard, their spirit is raised, their skills are improved, and their performance increase too”.*

P4: *“To workers, it helps improve their skills, performance and production levels, employees are motivated too”.*

P1: *“Oh yes... very important . My business skills increase. My self-esteem is raised”.*

5.9 Quantitative Results on current knowledge of open innovation in SMEs

Table 5.12 Current knowledge and experience on open innovation

Current knowledge and experience on Open Innovation		Frequency Distribution					
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total Agree
1. My company understands Open innovation.	Count	0	3	101	58	56	52.3
	%	0	1.4	46.3	26.6	25.7	
2. My company incorporates views of employees towards improving products and service offerings of the company.	Count	1	21	147	49	0	22.5
	%	0.5	9.6	67.4	22.5	0	
3. My company works with suppliers to improve innovation processes.	Count	0	0	19	134	65	91.3
	%	0	0	8.7	61.5	29.8	
4. We incorporate external knowledge from universities and other research institutions to improve products and services.	Count	0	0	18	126	74	91.7
	%	0	0	8.3	57.8	33.9	
5. My company empowers workers to be creative and innovative.	Count	0	0	19	132	67	91.3
	%	0	0	8.7	60.6	30.7	
6. My company develops partnerships with other organisations.	Count	0	0	22	111	85	89.9
	%	0	0	10.1	50.9	39.0	
7. My organisation invests in Open Innovation because it receives benefits from it.	Count	0	0	17	114	87	92.2
	%	0	0	7.8	52.3	39.9	
		Cronbach's Alpha			0.839		

As depicted in Table 5.12 just over 52.3% of the participants agreed with the view that their company understands OI. 46.3% were neutral in their response and 1.4% did not agree. When asked whether their companies incorporate views of employees towards improving products and service offerings of the company,” 22.5% of the participants agreed, while 10.1% did not agree. The majority (67.4%) gave a neutral response. 91.3% of the participants agreed that their company works with suppliers to improve innovation processes. The other 8.7% were of a neutral view. 91.7% of the participants agreed that their company incorporates external

knowledge from universities and other research institutions to improve products and services while 8.3% gave a neutral response.

The findings further revealed that the majority (91.3%) of the participants agreed that they had knowledge on OI while 8.7% did not agree about its existence. 89.9% of the participants agreed that their company develops partnerships with other organisations while 10.1% disagreed. Lastly, 92.2% agreed that their organisation invests in OI because it receives benefits from it, while 7.8% were of a neutral view.

5.10 Section B: Findings from qualitative and quantitative data pertaining to the research objectives

This section presents the qualitative and quantitative results of participants' response to questions associated with the research objectives of this study. The results are presented according to the order of given research objectives. The presentation of the qualitative results was derived from in-depth interviews where thematic analysis was done to capture insights from research participants. Various themes emerged for each objective. Quantitative results were obtained from the use of various statistical tools used to analyse the collected data. Factor analysis was carried out on quantitative data obtained from the questionnaire survey. The constructs were grouped and their frequencies observed. The modelling of the relationships was then done on each research objective.

5.10.1 Research objective one:

To understand the influence of internal knowledge (Inside-Out) on the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.

The main thrust of objective one was to understand the influence of internal knowledge on the successful implementation of OI in SMEs in KwaZulu-Natal. Section G of the interview guide and Section D of the questionnaire was used to understand the perceptions of participants with regards to the effect of internal knowledge on the implementation of OI in the organisation. The instruments were used to get more insights on how organisations use internal knowledge as a business strategy to improve internal innovation processes.

5.10.1.1 Qualitative results: The influence of internal knowledge implementation of OI

Various themes and sub-themes emerged from research participants (Table 5.13).

Table 5.13 The influence of internal knowledge on implementation of OI

Themes	Sub themes	Themes' Frequency (n)
Sharing ideas	Working teams, skills development, improved knowledge levels, Creativity improves.	9
Strategic partnerships	Joint venture, Project teams, Contracts agreements	12
Business growth	Market growth, Improved service quality, New products discoveries, Financial growth, Improved customer base.	8
Increased profit margins	Sales increases, financial growth,	11

Four main themes emerged from the participants. The themes were supported by various sub-themes indicated in Table 5.13. These themes include sharing ideas, strategic partnerships, business growth, and increased profit margins. The results indicated that participants had different perceptions regarding the use of internal knowledge in implementing OI. The emerged sub-themes reflect on the importance and benefits derived from the use of internal knowledge in managing organisation's innovation processes. The sub-themes include working teams, skills development, creativity improvements, joint ventures, project teams, market growth, new product discoveries, financial growth, sales increases, and financial growth. The themes and sub-themes were confirmed by the following interview excerpts:

P5: "Yes, we gain a lot. Our company's innovation process is improved. New products are produced quickly, thereby meeting customers expectations."

P13: "Yes a lot. Skills development of workers improved, products and services, and market growth too. Creativity is improved too."

P8: "It improves my business skills and motivate me to work hard to improve my business."

P12: “Yes. Internal knowledge is very important for our innovation processes. It improves our processes. It helps us to generate a lot of ideas and knowledge from workers.”

SI3: “Yes, I want product quality. Service quality improves, market share, profit increase-employees become experts in their areas of work.”

5.10.1.2 Quantitative results – The influence of internal knowledge on the implementation of OI.

Factor analysis was carried out on variables used to understand the influence of internal knowledge on the implementation of OI. The constructs were grouped and their frequencies obtained as depicted on Table 5.14.

Table 5.14 The influence of internal knowledge

The influence of internal knowledge		Frequency Distribution					
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total Agree
My organisation avails its innovation processes to external strategic partners.	Count	0	0	36	103	79	83.5
	%	0	0	16.5	47.2	36.2	
My company allows employees to work together with external strategic teams in new product and development programs.	Count	0	0	20	85	113	90.8
	%	0	0	9.2	39.0	51.8	
My company generates more ideas to improve its products and services offerings.	Count	0	0	24	96	98	89
	%	0	0	11.0	44.0	45.0	
My organisation avails its research and development platforms to strategic networks.	Count	0	0	35	100	83	83.9
	%	0	0	16.1	45.9	38.1	
		Cronbach's Alpha 0.810					

83.5% of the participants agreed that their organisation avails its innovation processes to strategic partners. When asked if their company allows employees to work together with external strategic teams in new product and development programs, 90.8% agreed, 9.2% were neutral and none disagreed.

89% of the participants agreed with the view that their companies generate more ideas to improve their products and service offerings, while 11% were neutral and none disagreed. In terms of availing research and development platforms to strategic networks, 83.9% of the participants agreed that their companies do that and none of them disagreed, whereas the rest of the participants had a neutral opinion.

5.10.2 Research objective two:

To determine the influence of external knowledge (Outside-In) on the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal South Africa.

The main focus of objective two was to understand the influence of external knowledge on the successful implementation of OI in SMEs in KwaZulu-Natal. Sections C item 3 and Section E of the questionnaire and the interview guide were designed to capture and understand the perceptions of participants with regards to the organisation's use of external knowledge in implementing OI in the organisations. They were also used to get more insights on how organisations acquire external ideas and knowledge to improve in-house innovation processes.

5.10.2.1 Insights from qualitative data- external knowledge on the implementation of OI.

Various themes and sub-themes emerged from research participants as shown on Table 5.15.

Table 5.15 The influence of external knowledge on implementation of OI

Themes	Sub-themes	Themes Frequency (n)
Improved in-house innovation process	New product partnerships, working teams	10
Strategic partnerships	Joint ventures, project teams, working groups	11
New products release	Product discoveries, new patents	8
Increase customer base	Shared market with external partners, shared products/services	5
New growth	Sharing expertises, employee skill developed new products to market.	6
Working teams	New groups formed, project teams established.	4
Expertise shared	Share knowledge on innovation process process, and innovative skills improved, share product ideas	

Seven themes and several sub-themes emerged from the participants. The results indicated that participants had different perceptions regarding the use of external knowledge. The emerged sub-themes showed that participants recognised several benefits derived from the use of external knowledge to the organisation. The sub-themes include new product partnerships, project teams shared products and services, sharing expertise, new working groups formed, and sharing knowledge about procedures. The sub-themes were confirmed by the following interview responses:

P1: *“Yes we do include their ideas, we explain how we do it , they also visit our company to learn more on how we do it”.*

P9: *“Yes it does a lot. We have new products discovered that are exciting to introduce to our customers. Service quality is also increased, financial benefits are realised too. Profits increase as well”.*

P11: *“Yes, it does. Our processes are improved, services quality improved too”.*

P12: *“Yes of course. We get a lot from working together with our suppliers”.*

P4: *“Yes.. they welcome teams from other companies who come and assist us. Formed teams also go out and work with other teams in our partnerships”.*

The results also showed that many participants associate external knowledge with their own innovation processes by acknowledging that it leads to new products release. This view was revealed by sub-themes that emerged. The sub-themes include join ventures, project teams, and working groups. These sub-themes supported the “strategic partnership” identified to describe participants’ views. It was also confirmed by the following interview responses:

P1: *“Yes , we participate in projects. The alliances are formed through formal agreements. We also form alliances through contract agreements”.*

P2: *“Yes we form teams that works with those from outside, Helps us to form partnerships too”*

P11: *“We form contractual agreements on new projects. We form working teams/ groups”.*

5.10.2.2 Findings from the quantitative findings regarding external knowledge on the implemetation of OI.

Factor analysis was carried out on variables used to understand the influence of external knowledge on the implementation of OI. The constructs were grouped and their frequencies observed. The modelling of the relationships then followed on each research objective. The results are presented in Table 5.16:

Table 5.16 The influence of external collaboration factors

The influence of external knowledge (Outside-In) factors		Frequency Distribution					
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total Agree
My company incorporate external knowledge to improve new product discoveries and service offerings of the organisation.	Count	0	0	11	118	88	85.9
	%	0	0	5.1	54.4	40.6	
My company works with universities and other research institutions to improve innovation processes and product development.	Count	0	3	33	102	80	83.4
	%	0	1.4	15.1	46.8	36.7	
My company partners with external companies and research institutions to register patents of new products.	Count	0	0	24	117	77	89
	%	0	0	11.0	53.7	35.3	
My company engages suppliers, customers and research institutions to cut cost on research and development.	Count	0	0	18	108	92	87.7
	%	0	0	8.3	49.5	42.2	
My company incorporate external knowledge into the innovation process to speed up the introduction of products into the market.	Count	0	0	20	107	91	90.8
	%	0	0	9.2	49.1	41.7	
My company uses external knowledge to have a competitive advantage in the market.	Count	0	0	19	96	103	81.3
	%	0	0	8.7	44.0	47.2	
	Cronbach's Alpha 0.797						

For all questions relating to the influence of external collaborations factors, none of the participants responded negatively to them. 85.9% participants were in agreement with the view that their company incorporates external knowledge to improve new product discoveries and services. The indicated percentage is almost the same as the percentage of participants (83.4%) who were in agreement with the view that their companies work with universities and other research institutions to improve the innovation processes and product development.

When it came to partnering with external companies and research institutions to register patents of new products, 89% of the participants were in agreement. Almost an equal proportion of participants (87.7%) responded positively to the idea that their companies engage suppliers, customers and research institutions to cut costs on research and development and also with 90.8% who agreed with the view that companies incorporate external knowledge into innovation process to speed up introduction of products into the market. 81.3% agreed that their companies use external knowledge to have a competitive advantage in the market.

5.10.3 Research objective three:

To ascertain strategic network (Coupled integration) factors that influence the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.

Objective three was designed to capture and determine the influence of strategic networks (coupled integration) factors that influence the successful implementation of OI in SMEs in KwaZulu-Natal. Section F of the interview guide was used to explore and understand the perceptions of participants regarding the use of strategic networks on propelling OI strategic endeavours of the organisation. Section C of the questionnaire was used to get perceptions of participants on the influence of strategic networks on implementing OI in the organisation. It was also used to get more insights on how the organisations engage in strategic network with other organisations to improve inhouse innovation processes.

5.10.3.1 Insights from qualitative data with regard to the influence of strategic networks on the implementation of OI.

As indicated in Table 5.17, various themes and sub-themes concerning the influence of strategic networks on the implementation of OI emerged from the research participants.

Table 5.17 The influence of strategic networks on implementation of OI

Themes	Sub themes	Themes Frequency (n)
Project agreements	Formal contracts, and relationships, participate in alliances.	10
Partnerships with suppliers	Improved relationship with supplies and customers.	11
Strategic teams formed	Working groups, team with partners.	7
Successful relationships	Enhanced working relations, formal relationship established.	4
Shared projects	Working together in projects, important projects identified.	5

Five major themes were recorded and they were supported by several sub-themes from the participants. Furthermore, findings revealed that the majority (92%) of the participants agreed with the view that their organisations form partnerships with suppliers to enhance internal innovation processes. Participants also highlighted that the strategic networks formed to enhance innovation processes has essential spin-offs such as cementing established relationships. Participants also acknowledged the type of agreements that are forged through strategic networks. Project agreements and formal contracts are signed to foster agreements between parties. These assertions are confirmed by the following responses from the participants:

P12: *“I have established ventures with other small practitioners in terms of which I would refer matters that are specialised eg maintenance, labour and conveyance cases”.*

P2: *“We form partnerships with other companies. We have contractual agreements to share ideas and knowledge on the projects we do”.*

P8: *“Yes we have alliance partnerships with our suppliers. Yes we engage in contractual agreements with our partners”.*

P11: *“Yes, we do it with our suppliers, we form them (strategic networks) through agreements, some are contracts agreements on projects or jobs”.*

P13: *“Yes, with our suppliers of course. We also share ideas with important customers to improve our services/products”.*

P2: *Yes, we form networks with our partners. They are formed through formal agreements and projects agreements”.*

Findings also showed that strategic teams are formed to take part in innovation project processes concluded through strategic networks. The working groups are mainly formed with suppliers involved in strategic network programs. Participants also pointed out that strategic projects are eventually formed through established networks. Strategic relationships are also forged through strategic network engagements. The following interview responses were captured from the participants:

P5: *“Through partnerships and contract agreements. Relationships are formed in the process. Thereby strengthen our ties”.*

P10: *“Yes, they do (strategic networks). They help a lot. For example, they improve our relationships with our partners”.*

5.10.3.2 Quantitative results- Influence of strategic networks on implementation of OI

Factor analysis was carried out on variables used to understand the influence of strategic networks on the implementation of OI. The constructs were grouped and their frequencies observed. The modelling of the relationships then followed on each research objective. The findings are presented on Table 5.18.

Table 5.18 The influence of strategic networks on the implemetation of OI.

Strategic networks		Frequency Distribution					
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total Agree
My company opens its innovation processes to other companies.	Count	0	1	22	102	93	89.4
	%	0	0.5	10.1	46.8	42.7	
My company shares ideas with key suppliers, customers and research institutions to improve its innovation processes.	Count	0	0	18	100	100	91.7
	%	0	0	8.3	45.9	45.9	
My organisation forms alliances with important partners to improve new product and service offerings of the organisation.	Count	0	1	23	101	93	88.9
	%	0	0.5	10.6	46.3	42.7	
My company participate in strategic networks to improve its own new product or service offerings.	Count	0	1	29	103	85	86.2
	%	0	0.5	13.3	47.2	39.0	
My company independently registers the new product developed in partnership with alliance partners.	Count	0	1	39	90	88	81.6
	%	0	0.5	17.9	41.3	40.4	
My company avails its new product development processes to its alliance partners.	Count	0	0	74	99	45	61.1
	%	0	0	33.9	45.4	20.6	
	Cronbach's Alpha 0.819						

89.4% of the participants agreed that their company opens its innovation processes to other companies whilst 10.1% were of neutral opinion and 0.5% disagreed.

In terms of sharing ideas with key suppliers, customers and research institutions to improve the innovation process, 91.7% agreed and the rest were of a neutral view. 88.9% agreed that their organisation participates in alliances with important partners to improve new products and service offerings of the organisation while, 10.6% were neutral and 0.5% disagreed.

In terms of strategic network participation to improve products and services, 96.2% agreed that their company participated, 13.3% were neutral and 0.5% disagreed. 61.1% agreed that their company avails its new product development processes to its alliance partners, while, 33.9% held a neutral opinion.

5.10.4 Research objective four:

To understand other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.

The main thrust of objective four was to understand other innovation frameworks used by SMEs in KwaZulu-Natal. Section G of the interview guide and Section C (item 5) of the questionnaire was used to understand the perceptions of participants with regard to the use of other innovation framework/models used by SMEs to improve innovation in their respective organisations in the province. The instruments were used to get more insights on how organisations use other innovation framework/models to improve in-house innovation processes.

5.10.4.1 Qualitative insights:

To understand other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.

Various themes were recorded regarding the use of other innovation frameworks/models in implementing open innovation. The themes are recorded in Table 5.19.

Table 5.19 Other innovation frameworks used by SMEs

Themes	Sub themes	Themes Frequency (n)
Non existence	No formal model used, Don't use framework, follow existing one, difficult to identify a model.	11
Formal business operations	Business practices, Own systems, existing models	10
Alignment problems	Difficult to align to overall strategy, lack of knowledge, shortage of skills, financial problems, lack of Buy-in by business partners.	2

Three themes emerged regarding the use any framework/model to enhance innovation in an organisation. Participants' responses revealed that the majority (85%) of them do not use any framework or model to enhance innovation in their respective organisations. They highlighted that they do not follow any innovation framework/model or follow any model to improve innovation. The results also indicated that 77% of the participants just follow normal business operations which include business practices, their own systems, and the existing models to enhance innovation. Two participants indicated that it is difficult to incorporate the model they are using into the overall strategy of the business. They cited the lack of knowledge, the shortage of skills, financial problems, and the lack of Buy-in by business partners as the main impediments to incorporation of the innovation framework/model to the overall strategy of the company. These findings were confirmed by the following interview responses:

P1: " No framework. Very difficult to identify one."

P10: "We don't normally follow any framework but just use our normal process that we improve time and again to meet customer needs."

P5: "No, we don't follow any model. We seem not to have time to look for other ways to do our business. We just follow the existing one."

P12: "It is very difficult to incorporate the framework to the overal business strategy of the company. There are so many challenges to it, like our business partners don't agree while some don't see any value of it."

P13: "You see, incorporating the framework to our business is hard. For example, we have so many partners that we need to liase with before we go ahead. Therefore, getting their Buy-in into the idea is very challeging. Very difficult to convince them. At times it takes ages. Therefore the idea idea just die."

5.10.4.2 Findings from quantitative data:

Other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.

Factor analysis was carried out on variables used to understand other innovation frameworks or models used by SMEs in KwaZulu-Natal. The constructs were grouped and their frequencies observed. The modelling of the relationships then followed on each research objective. The results are presented on Table 5.20.

Table 5.20 Other innovation frameworks used by SMEs

Other innovation frameworks used by SMEs		Frequency Distribution					
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Totally Agree
Open innovation can only succeed if it is incorporated into the overall strategy of the business.	Count	0	0	24	114	80	89.0
	%	0	0	11.0	52.3	36.7	
My organisation uses an innovation model to enhance innovation processes.	Count	0	3	43	133	39	78.9
	%	0	1.4	19.7	61.0	17.9	
My organisation experiences challenges with the current innovation model.	Count	0	1	55	105	57	74.3
	%	0	0.5	25.2	48.2	26.1	
The company is aware of other models that can be used to improve innovation processes for the organisation.	Count	1	5	184	22	6	12.9
	%	0.5	2.3	84.4	10.1	2.8	
My company can recommend these models to other organisations.	Count	1	2	202	7	6	6
	%	0.5	0.9	92.7	3.2	2.8	
	Cronbach's Alpha 0.655						

89% of the participants agreed that OI can only succeed if it is incorporated into the overall strategy of the business and the other 11% were of a neutral view.

Just over three quarters (78.9%) agreed that their organisation uses an innovation model to enhance innovation processes. Almost three quarters (74.3%) agreed that their organisation experiences challenges with the current innovation model while just over a quarter (25.2%) were neutral and 0.5% disagreed.

When asked if their companies are aware of other models that can be used to improve innovation processes for the organisation, 12.9% agreed, 84.4% were of a neutral opinion and

the rest of them disagreed. Only 6% agreed that their company can recommend these models to other organisations, whereas the majority (92.7%) were neutral and 1.4% disagreed.

5.10 Conclusion of chapter five

In chapter five, the results obtained from in-depth interviews and questionnaire surveys have been presented. The presentation was aimed at understanding the interplay between the identified constructs (internal knowledge, external knowledge, strategic networks, and innovation frameworks) in predicting the successful application of innovation in SMEs. The study had an overall response rate of 89% and a varied demographic profile of participants. The demographic profile include gender, age, race, and highest education qualification. The demographic results showed a balanced gender, age, and race representation of participants. The shape of education levels of the participants was almost bell shaped with the majority having diploma as their highest qualification. The business details results showed that participants were drawn from SMEs from different sectors. The majority of participants came from private companies in mainly service, retail and manufacturing sectors. Many of the participants had worked for more than five years.

The chapter also presented qualitative and quantitative results. Thematic analysis results and Statistical Package for Social Science (SPSS) software results were presented in accordance with the objectives of this study. Various themes emerged from the interview data which represents different perceptions participants had regarding the influence of the identified constructs on the implementation of OI in their respective organisations. The themes were backed by uncensored quotes recorded directly from the interview transcripts to validate participants' view points. Reliability and validity analysis results of the questionnaire were presented. The whole questionnaire had a Cronbach Alpha value of 0.92. Criteria, content, and convergent validity results were given. Average variance extracted (AVE) results were presented to ascertain the mean variance extracted from items loading on the constructs. All factor loadings were above 0.5, which indicates the presence of convergent validity and AVE. The Inferential statistics used to analyse quantitative data include Kaiser-Meyer-Olkin Measure (KMO), construct correlations, Kruskal-Wallis H test, and Chi-square test for independence. Factor analysis was conducted on variables in the questionnaire. It was subdivided into sections that allow the researcher to have different items that measures particular constructs.

Factor analysis results on the objectives of the study were presented. The results indicated that participants had different perceptions regarding the influence of the identified factors on the implementation of OI in their respective organisations. The results showed positive relationships between internal, external, and strategic networks as factors that influence the implementation of OI in SMEs under study. The results also showed that participants had mixed feelings between the uses of other innovation frameworks/models in their respective organisations. The majority (85%) indicating that they do not use any other framework or model to improve innovation processes in their organisations. The inability to use other frameworks or models was alluded to the identified challenges faced by SMEs. The identified impediments include the lack of knowledge and skills, financial incapacity and the lack of buy-in from business partners.

The next chapter discusses the results presented in this chapter. They are discussed as answers to the research questions of this study.

CHAPTER SIX

DISCUSSION OF RESEARCH FINDINGS

6.1 Introduction

The preceding chapter presented the empirical findings of this study. In this chapter the researcher discusses the findings of this research. The discussion is guided by four research objectives and questions outlined in Chapter 1. Chapter 6 is presented in the context of the link between the research findings and the reviewed literature on open innovation and how the identified factors are viewed in the pursuit of how they predict the successful implementation of the studied concept by SMEs.

Through the discussion of findings the researcher also seeks to establish whether the research objectives were achieved and answers to the research questions contributed in closing the identified research gap. The outline is also centred on answering the research questions and comparing them to the theoretical framework used to guide this study. The researcher begins chapter 6 by discussing the knowledge participants had regarding open innovation and how it is implemented and proceeds to discuss the findings in relation to the research objectives.

6.2 Participants' knowledge of open innovation

The focus in this section was to discuss the knowledge participants had regarding open innovation as a business concept. The two data sets results revealed varied perceptions participants had with regard to how the concept was perceived by SMEs in KwaZulu-Natal, and its significant effects to their respective organisations. The empirical findings also indicated that the majority (84.6%) of the participants had a well-vested knowledge of open innovation. Some (15.4%) had limited knowledge and exhibited ambivalence about it and also about how some of their business activities could be referred to as practising open innovation. These findings were also confirmed by quantitative results where factor analysis results indicated that the majority (52.3%) of the participants understood that their companies recognise open innovation as a business concept while 46.3% and 1.4% were neutral and did not agree respectively. The majority of the participants identified diverse problems associated with the implementation of open innovation, such as the lack of financial and human resources, and the shortage of managerial skills. These assertions are consistent with the reviewed literature (Ahn et al., 2016; Bresciani and Ferraris, 2014; Colombo et al., 2014; Krause and Schutte, 2015; Moonsamy, 2016; Roessl and Hyslop, 2016; Santoro et al., 2018) which state

that open innovation approaches in SMEs are fragmented and its application is hampered by limited resources and the shortage of skills. Participants said that investing in open innovation is a difficult task to SMEs as it includes opening up their operational boundaries to other businesses. The fragmentation of the concept to SMEs is also correspondingly associated with the confusion and the inability to link open innovation with the overall business strategy and operations of the business. This view was also confirmed by participants who expressed that open innovation is a difficult business approach which they felt compromises their operations as it exposes their business operations to other rival businesses. This assertion was supported by other participants who suggested that their organisations find it very difficult to implement open innovation because of contingent factors such as inadequate skills and limited resources. These assertions are consistent with the literature by (Ahn et al., 2017, Moonsamy, 2016, Roessler and Hyslop, 2016, and Santoro et al. 2018) which state that open innovation entails opening up the boundaries of the organisation to other entities which could pose great opportunities and various challenges.

The research findings also concurred with the literature by Saebi and Foss (2015) who indicated that SMEs are not attuned to the open innovation model. The same researcher highlighted that SMEs have less structured management and informal R&D structure that allow the opening of the business' boundaries for open innovation engagements more difficult. These affirmations support the notion that SMEs are not keen to open their innovation processes to external organisations (Ahn et al., 2017; Roessler and Hyslop, 2016). The research findings also indicated that participants' view on open innovation was centred on the benefits derived from it. This view was raised given the type of risks associated with the opening up of the operational boundaries to other businesses for open innovation initiatives. This assertion was in agreement with existing literature which suggest that the application of open innovation by SMEs is associated with the benefits derived from it (Krause and Schutte, 2015); Momba, 2016; Moonsamy, 2016). Like any other business entity, SMEs are of the understanding that investing in open innovation can only be done when the organisation benefit from it. As these open innovation investments involve sharing ideas and expertise with external organisations, this type of engagement is considered too risky to SMEs who are not willing to compromise their operations by opening up their operational boundaries without any guaranteed benefits to them. However, the research outcome also showed that the majority of participants agreed that their respective organisations develop partnerships and encourage employee creativity from open innovation engagements. This finding is supported by (Bigliardi and Galati, 2016; Hossain and

Kauranen, 2016) who expressed that success of open innovation in SMEs can be achieved when these entities form partnerships that support the sharing of resources, skills, ideas, and knowledge.

6.3 Discussions in relation to the research objectives

6.3.1 Research objective One:

To understand the influence of internal knowledge (Inside-Out) on successful implementation of Open Innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.

The main thrust of objective one was to understand the influence of internal knowledge (Inside-Out) on the successful implementation of open innovation in SMEs in KwaZulu-Natal, South Africa. Firstly the two data sets results obtained from both qualitative and quantitative methods revealed a link between participants viewpoints regarding the influence of internal knowledge on the successful application of open innovation. Similarly, there was a significant strong positive Pearson correlation result of ($p = 0.613$, significant at $\alpha < 0.05$) between current knowledge and internal knowledge. Similarly, Pearson correlation results indicated that strategic network and internal knowledge had a significant strong positive correlation ($p = 0.612$) with current knowledge. These results confirm the strong relationship between the two factors in influencing the application of open innovation by SMEs under study. This finding was similarly confirmed strongly by employees' acknowledgement that internal knowledge plays a significant role in the innovation process of the organisation. These assertions are validated by the reviewed literature (Cassiman and Valentini, 2016; Zuppo et al., 2016) which state that internal knowledge has a significant role on influencing the successful application of open innovation by SMEs. These studies illustrated that employees' ideas and views are accepted and used as imperative inputs into the innovation process of the organisation.

The use of internal knowledge was viewed as a central motivation factor by employees to fully commit and participate in open innovation engagements in the organisation. Participants also highlighted that the use of the internal knowledge acquired from employees act as a vital catalyst to the successful completion of the innovation process as they feel empowered to contribute to the growth of the organisation through open innovation participation. These sentiments are consistent with the persuasive argument made by Salge et al. (2012) who pointed out that firms adopt a different company architecture which is often difficult to align with OI

strategy identified by the organisation. These assertions were supported by Caputo et al. (2016) who posist that the need to reconfigure the organisational structure for open innovation investment is huge problem to SMEs. The findings correspondingly showed that participants had varied perceptions which reflected the use of internal knowledge as the engine that drives open innovation as it encourages employees to avail their skills as essential input to the innovation process of the organisation. Although these insights reflect the significant role played by internal knowledge for open innovation, they are not consistent with the literature by Chesbrough and Bogers (2014), and Foss and Saebi (2017), who indicated that performance inconsistencies always emerge due to the inability to effectively align it to the business model of the organisation.

However, participants also noted the unifying characteristic that internal knowledge has of bringing together ideas and knowledge in speeding the innovation process. Participants acknowledged that the term “*Open innovation*” is understood differently and is disjointed in SMEs as to how it is perceived and applied in large organisations. The fragmentation is confirmed by the reviewed literature, specifically the literature by Ahn et al. (2017), as well as Roessl and Hyslop (2016) which relate it to the paradoxical situation constantly confronted with these entities that has to deal with difficulties in opening their boundaries and effectively manage difficulties and the risk that comes with open innovation engagements. On the contrary, the overall findings indicated that the majority of the participants highlighted that their orngaisations have distinguishable strengths such as reactivity, and flexibility to open innovation initiatives.

The emerged themes and sub themes from in-depth interviews revealed that SME owners, managers and supervisors acknowledged the significant influence internal knowledge had in managing innovation processes in the organisation. This assertion was also reflected in the questionnaire survey results where participants indicated that internal knowledge had a huge influence on the application of open innovation. The two data sets results are consistent with the reviewed literature which acknowledged the huge positive influence internal knowledge had on the application of open innovation by SMEs (Ahn et al., 2017; Bogers et al., 2018; Krause and Schutte, 2015, Piller and West, 2014, West and Bogers, 2014). Similarly, these findings concurred with the argument made by Chesbrough (2003a), Cassiman and Valentini (2016) as well as Canik, Bohemia and Telalbasic (2017) who pointed out that internal knowledge plays a critical role in the accumulation of ideas that result in outbound innovation.

The empirical findings also showed that most participants were of the view that their respective organisations avail their innovation processes to strategic partners while research and development platforms are also opened to strategic networks. These participants' views are consistent with the body of extant literature (Chesbrough, 2012; Spithoven et al., 2013; Zuppo et al., 2016) which point out that availing innovation processes to strategic partners assist in integrating internal knowledge, which lead to more outbound innovation activities. Participants further illustrated that internal knowledge led to the accumulation of innovations that are subsequently sold out to other organisations. These sentiments confirm the claim made by Cassiman and Valentini (2016) and Rosa et al. (2016) that internal knowledge support the accumulation of innovations, which are then used as a source of revenue to the organisation and licensed out to other organisations. Findings also indicated that participants identified challenges associated with out-licensed innovations. The identified problems include exposing capabilities to rivalry organisations, the creation of unfair competition, and the loss of market share. These sentiments are consistent with the claim made by Cassiman and Valentini (2016) as well as Lichtenthaler (2009) who argued that offloading inventions through outward licensing exposes and weakens its market position by transferring its pertinent technology to competitors.

Quantitative results were also confirmed by qualitative results, which reflected that internal knowledge has a huge influence on applying open innovation. For example, participants acknowledged the type of benefits derived from the utilisation of internal knowledge. Such benefits include the facilitation of strategic partnerships, where organisations use acquired internal knowledge through open innovation investments to attract other organisations to form joint ventures. Other identified benefits by participants include the sharing of expertise, and the speedy conclusion of new products and process discoveries for the organisation. These benefits are derived from the use of internal knowledge, and it coincides with preceding studies (Akinwale, 2018, Cassiman and Valentini, 2016; Chesbrough, 2003a; Zuppo et al., 2016) which pointed out that through the utilisation of internal knowledge, organisations can harness employee creativity capabilities as employees are allowed to participate in the innovation process and in the programs identified for open innovation. The benefits aspect associated with open innovation to business is supported by literature (Akinwale, 2018, Cassiman and Valentini, 2016; Zuppo et al., 2016) which stated that using internal knowledge, the output rate of products and discoveries of new product processes are realised quicker, which leads to more financial benefits and market growth for the organisation. Workers feel empowered and

motivated to take part in programs that are identified for open innovation. The findings indicated that participants felt that their involvement is a significant inspiration and clear acknowledgement that their contributions to the innovation processes are important to the development of the organisation.

6.3.2 Research objective two:

To determine the influence of external knowledge (Outside-In) on the successful implementation of Open Innovation in Small and Medium Enterprises in KwaZulu-Natal South Africa.

The research objective two was designed to determine the influence of external knowledge (Outside-In) on successful implementation of open Innovation in SMEs in KwaZulu-Natal South Africa. The results from two data sets indicated that participants had diverse views regarding the influence of external knowledge in facilitating the application of open innovation. The majority (85.9%) of participants pointed out that their organisations use external knowledge to facilitate new product discoveries and service enhancements, and to speed up the commercialisation of new products. This finding was confirmed by an empirical outcome where SMEs owners stressed that they used external knowledge from other organisations to complement inhouse innovation processes. This view is in agreement with extant literature (Chesbrough, 2003a; 2003b; de Beer and Armstrong, 2015; Saebi and Foss, 2015) which pointed out that open innovation needs a certain degree of permeability to the business and innovation process borders to warrant successful open innovation engagements. A significant percentage (81.3%) of participants agreed that their companies use external knowledge to have a competitive advantage in the market. These findings are consistent with Lichtenthaler (2015) and Momba (2016) who recognised the role played by external knowledge on reinforcing a competitive advantage through the quick development of new products and innovation processes in a constantly changing market. The new developments strengthen competitive advantage where organisations strengthen their positions through new products and upgraded innovation processes from open innovation participations.

The results from the two data set similarly revealed that participants acknowledged that external knowledge facilitates their companies to work with other organisations to enhance inhouse innovation processes. These results were consistent with the literature by Ahn et al. (2017), (Akinwale (2018), Brunswicker and Vanhaverbeke (2015), Boldrini et al. (2017) and

Moonsamy (2016) which state that firms can implement open innovation successfully when they work with other organisations or stakeholders such as research institutions (universities, research colleges), suppliers, and customers.

Factor analysis results showed that participants acknowledged the critical role played by external knowledge as an embodiment of open innovation which facilitate a shared vision underpinned by sharing intellectual property. These results were confirmed by empirical results which also accredited external knowlege to new product development partnerships, the formation of project teams, shared products and services, sharing expertise, the establishment of new working groups, and the sharing of knowledge regarding the innovation process. These findings are consistent with the body of literature (Greco et al., 2016; Hossain, 2015; Paik and Chang, 2015) which state that external knowledge facilitates the implementation and leverages internal capacity and capabilities with ideas and knowledge from external organisations. Participants viewed the central role played by external knowledge in speeding up the innovation process in the organisation. They regard it as a catalyst that spearhead engagements with other organisations. External knowledge was identified as an important constituent in aiding the successful application of open innovation as it allows integrating internal skills and expertise with those obtained from other organisations, thereby speeding up the innovation processes in the organisation. Participants also highlighted that through the use of external knowledge, the organisations are able to quickly complete its innovation processes that lead to the rapid introduction of new products into the market. These views are validated by current literature (Greco et al., 2016; Hossain et al., 2016; Tucci et al., 2016) which suggest that the use of external knowledge facilitates the rapid completion of new product development and improves innovation processes.

Significantly, the above views were also confirmed by in-depth interview results where SMEs owners suggested that external knowledge acts as a catalyst that speed up innovation processes by combining it with internal knowledge. However, participants also noted that the open innovation paradigm in SMEs is predisposed by the notion of ‘smallness’ which continue to limit these entities to commit resources to other avenues which tend to grow their businesses. The findings further exhibited varied views that support the insights obtained from the reviewed litrature, such as the literature by Ardito et al. (2016), Lv et al. (2018) and Santoro et al. (2018) where scholars assert that the use of external knowledge by SMEs exposes them to

various challenges. The identified challenges include intellectual property issues, and co-ownership of patents (duopoly) problems.

The findings further indicated that SMEs faces challenges when disposing patents. For example, SME owner in the music industry indicated that as a small business it is difficult to manage and dispose patents registered with large organisations. These sentiments are validated by (Belderbos et al., 2014; Lahr and Mina, 2016; Santoro et al., 2018) who suggested that SMEs have less influence in the management of co-patents or co-jointly patents. Participants also pointed out that it is considered difficult for SMEs to share and reveal IP to external organisations for the risks of losing it to external competitors. These findings revealed the notion of “*smallness syndrome*” suffered by SMEs when managing patents. These sentiments are evident in literature (Ardito et al., 2016; Jeong et al., 2017; Lv et al., 2018) where the “liability of smallness” is a major problem faced by SMEs. Participants illustrated that large patent co-owners spitefully dispose patents to third parties without their approval.

Despite the patent issues that are associated with the use of external knowledge in open innovation, findings indicated that participants identified the significant role external knowledge plays. For example, external knowledge was identified as the engine that drives collaborations, and also as the pillar for establishing strategic partnership between SMEs and large businesses for open innovation. This finding is confirmed by extant literature (Chesbrough and Bogers, 2014; Lichtenthaler, 2015; Vanhaverbeke et al., 2014; West and Bogers , 2014; West et al., 2014) which state that external knowledge allows industry convergence where ideas and knowledge are shared to improve new product discoveries and enhance innovation processes. Also, findings revealed the capability of external knowledge in opening organisational boundaries, allowing streams of ideas and knowledge into the innovation processes of the organisation. This point was also raised by participants who underline the positive role played by external knowledge in complementing internal knowledge in speeding up innovation processes for organisations. These assertions are agree with the existing literature (Ahn et al., 2016; Brunswicker and Vanhaverbeke, 2015; Chesbrough and Bogers, 2014; Roessl and Hyslop, 2016) which point to the complementary elements associated with external knowledge in facilitating inhouse innovations.

The findings also pointed to the imperative role played by external knowledge in transforming SMEs during and after open innovation engagements. Participants identified various

transformations that their businesses go through when they incorporate external knowledge through open innovation engagements. Some of the identified changes organisations experience when they use external knowledge for open innovation include taking horizontal and vertical partnerships. Participants viewed horizontal partnership as the one which occurs when their businesses partner with competing firms for win-win collaborations while vertical partnerships was viewed as the one which occurs when companies merge towards improving quality attributes of existing products. These partnerships include collaborations with partners from within its industry or outside its industry peripheries to enhance its innovation performance. These findings concur with existing literature (Ahn et al., 2017; Boldrini., 2017; Usman, et al., 2018) which state that the inflow of external knowledge into innovation processes may result in horizontal or vertical innovation where entities are directed towards the already established market, or are captivated towards improving quality attributes of existing products.

6.3.3 Research objective three:

To ascertain strategic network (Coupled integration) factors that influence the successful implementation of Open Innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.

The main focus of objective three was to ascertain the role played by strategic network factors (Coupled integration) to influence the successful implementation of open innovation in SMEs in KwaZulu-Natal, South Africa. Qualitative and quantitative results indicated that participants had similar perceptions regarding the influence of strategic networks in predicting the successful enactment of open innovation in their respective organisation. For example, factor analysis results on quantitative data revealed that the majority (89.4%) of participants acknowledged that their entities avail innovation processes to strategic partners. The following interview response confirms the this point:

P12: *“I have established ventures with other small legal practitioners to which I would refer matters that are specialised eg maintainance, labour and conveyance cases”*. An overwhelming percentage (91.7%) of in-depth interview participants further pointed out that strategic networks assist their organisations to quickly and successfully complete innovation processes. These findings validate insights obtained from reviewed literature (Bogers et al., 2018; Lakemond et al., 2016) where strategic networks were cited as critical components in the successful execution of open innovation processes. Participants also highlighted that through

strategic networks, their organisations are able to share ideas with suppliers, customers, and research institutions, thereby increasing the successful completion of innovation processes. These findings are supported by existing literature (Bogers et al., 2018; Gassmann et al. 2010; Lakemond et al., 2016; Piller and West, 2014) which highlight that coupled innovation opens up the inhouse innovation process to strategic or complementary partners formed through joint ventures, collaborations, and alliances. Participants also pointed out that strategic networks include combining resources through strategic engagements towards new product development and improved processes. This finding confirm extant literature (Bogers et al., 2018; Piller and West, 2014) which illustrate that combining outside-in and inside-out innovation dimensions is carried out in strategic arrangements such as strategic partnerships that involves working with external partners.

Participants also pointed out that strategic networks formed through open innovation are strengthened by contracts signed to tie parties together which aid the successful completion of innovation processes. The following interview response confirmed participants' views: P5: *"Through partnerships and contract agreements. Relationships are formed in the process. Thereby strengthen our ties"*. This viewpoint is propounded by reviewed literature (Bogers et al., 2018; Piller and West, 2014) which state that contractual agreements forged for identified projects has potential of building strong relationships between parties. Furthermore, the relationships formed are have the capacity to influence other business operations outside those earmarked for open innovation partnerships. The influence of relationships on the existing business operations was highlighted by participants when they sighted challenges that are associated with seperating projects for open innovation and effectively allocating resources (human capital, finance) to them. This view is agrees with the claim made by Ahn et al. (2017) and Roessl and Hyslop (2016) who stated that the limited capacity and the lack of managerial skills are major issues associated with strategic networks for open innovation engagements.

The above assertions were correspondingly confirmed by findings from the qualitative data where the majority (92%) of participants pointed out that strategic partnerships augment innovation processes and assist in the successful accomplishment of identified projects for open innovation. The point was confirmed by the following interview response: P10: *"Yes, they do (strategic networks). They help a lot. For example, they improve our relationships with our partners thereby help a lot in succesfully finishing projects on time"*.

The research findings similarly reflect that participants acknowledged the important role played by strategic networks in successfully completing identified projects meant to discover and introduce new products into the market. The above findings are confirmed by previous studies (Bogers et al., 2018; Lakemond et al., 2016; Piller and West, 2014) which indicate that strategic networks plays a significant role in effectively and efficiently managing innovation processes. On the contrary, the findings contradicts with some of the existing literature (Bogers et al., 2018, Lakemond et al., 2016; Piller and West, 2014) which state that strategic networks for open innovation programs have huge impediments which derail the conclusion of projects and exposes firms' operations to competitors. The same literature identified issues associated with IP as critical obstacle to the effective finalisation of projects.

Conversely, the findings revealed that strategic networks have a huge influence on the completion of projects done through the open innovation paradigm. Participants eluded that through the partnerships, their firms are able to successfully forge co-patents agreements which are critical for their respective businesses. This viewpoint corroborates with the reviewed literature (Chesbrough and Bogers, 2014; Lakemond et al., 2016) which illustrated that strategic networks result in the development of co-patents that could have been difficult to conclude when firms do it alone. This view was in line with Pearson correlations survey results ($p=0.596$ and $p=0.586$) which showed that strategic network has a strong relationship with internal and external knowledge, which illustrates that there is a positive correlation with the speeding up of innovation processes in the organisations. On the contrary, the findings also highlighted performance discrepancies that emanate from the failure to integrate ideas in the strategic network engagements. Participants illustrated that such discrepancies impact on the successful application and alignment of open innovation approaches to the business model of the company. These views are consistent with literature (Chesbrough and Bogers, 2014; Foss and Saebi, 2017) which suggest that the successful implementation of open innovation is determined by its effective alignment to the the business model of the organisation.

6.3.4 Research objective four:

To understand other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.

The main purpose of objective four was to understand other innovation frameworks used by SMEs in KwaZulu-Natal. The two data sets results reflected that participants had different

views regarding other innovation frameworks used to enhance innovation in their respective organisations. These assertions were confirmed by the average percentage (55%) of the participants who indicated that their organisations do not use innovation frameworks to improve products and service offerings. With regard to other innovation models that could be used, the survey results indicated that 12.9% of the participants pointed out that they are aware of the existing innovation models that could be used by SMEs. Additionally, the survey results also showed the majority (77%) of the participants indicated that their organisations just follow normal business operations which include the existing normal business practices, and their own systems to enhance innovation processes in the organisation. The inability to use any innovation model is consistent with the insights obtained from the reviewed literature, specifically the literature by Hossain and Islam (2016), Krause and Schutte (2015), Momba, (2016), Moonsamy (2016) as well as Saebi and Foss (2015), which emphasised the lack of enthusiasm among SMEs to embrace innovation models. These findings were also reflected in the findings from qualitative data, which points to various challenges that make SMEs fail to adopt innovation frameworks.

Similarly, some participants cited the lack of knowledge, the shortage of skills, and financial problems as some of the main impediments to the adoption and integration of innovation frameworks to the overall strategy of the company. For example, Participant P12 stressed that their business finds it very difficult to incorporate innovation models because of issues related to aligning them to the overall business strategy of the company. These sentiments were also raised by Participant P13 who highlighted that incorporating the innovation framework in the business is difficult because it is problematic to get support and approval from business partners. Nevertheless, the overall findings from two data sets (qualitative and quantitative results) indicated that the majority of the participants were not aware of other innovation frameworks that could be used to enhance innovation in their respective businesses. These findings lend backing to extant literature (Roessl and Hyslop, 2016; Santoro et al., 2018) that examine innovation challenges associated with SMEs. The shortage of management skills, the limited capacity, and the lack of knowledge were identified as some of the major problems.

6.4 Conclusion of chapter six

In chapter six the researcher discussed this study's research findings. Firstly, it discussed findings recorded pertaining to the knowledge participants had regarding open innovation in their respective organisations. Finally, the researcher discussed the research findings according

to the research objectives of this study. The overall research findings of this study ultimately suggest that participants had knowledge regarding open innovation. However, they showed various views regarding its application, thus lending credence to the existing literature in relation to innovation being a multifaceted business concept among SMEs in the country. The discussion also focused on the role played by internal knowledge, external knowledge, and strategic networks in predicting its successful application in SMEs in KwaZulu-Natal. Findings of this study revealed that internal, external, strategic networks are key predictors of the successful implementation of open innovation in SMEs. While the findings confirmed numerous earlier studies, in some cases they contradicted with previous studies, thus creating the foundation for future research to explore the identified inconsistencies. The next chapter provides the conclusion for this study and recommendations.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This chapter concludes the study which focused on the predictors of the successful implementation of OI in SMEs in KwaZulu-Natal, South Africa. The chapter provides a synthesised discussion linked to the empirical results presented in the previous chapter consistent with the objectives of this study. In this chapter the researcher began by providing a synopsis of the main findings of this study in relation to the research objectives outlined in Chapter one, and finally outlined the limitations of this study followed by proposing further studies in specific areas.

7.2 Summary of key findings

This research study was set to accomplish the following objectives:

Objective 1: To understand the influence of internal knowledge (Inside-Out) on the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.

Key findings: The two data sets (qualitative and quantitative) findings showed that SMEs owners and their employees had mixed views regarding OI as a business concept. SME owners acknowledged the term “*Open innovation*” and understood it as working with other businesses to improve their own ventures. They also echoed the view that the concept is fragmented in SMEs, and it is widely associated with large firms. The results further revealed that the application of OI among SMEs takes different routes as firms do not have a recognised method to it.

Findings also revealed the existence of an interrelation between SME owners and employees regarding the influence of internal knowledge on the successful implementation of OI. Employees as key stakeholders supported SMEs perspectives regarding knowledge sourced from workers being the key driver of the successful implementation of OI in the organisation. They elude that internal knowledge propels OI processes as employees are motivated to participate and showcase their skills (creativity) and expertise to the process. The study results

further indicated that internal knowledge is the engine that drives OI processes, and that it is the key predictor of the successful application of OI in SMEs.

Objective 2: To determine the influence of external knowledge (Outside-In) on successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal South Africa.

Key findings: External knowledge had a pervasive stimulus in facilitating the successful implementation of OI in SMEs. Most SMEs owners and employees who participated in the study had rich diverse views regarding the use of external knowledge in facilitating the innovation process through an OI paradigm. Participants alluded that external knowledge has a huge positive impact on spearheading in-house innovation processes and on speeding up the introduction of new products and technologies to the market. Most SMEs owners acknowledged the lack of resources, deficiency absorptive capacity, (human and financial), and inadequate managerial skills as major challenges faced in incorporating external knowledge into the innovation processes through OI. However, they also pointed out that success can be realised when SMEs share a common vision to OI investments that lead to unified product development partnerships, the formation of project teams, sharing intellectual property, and the co-ownership of patents.

Objective three: To ascertain strategic network (Coupled integration) factors that influence the successful implementation of open innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa.

Key findings: The strategic network (coupled integration) factor was perceived as a vital factor in influencing the successful implementation of OI in SMEs in KwaZulu-Natal. It was cited as the central factor given its element of resulting in strategic partnership with identified businesses. Similarly, participants shared the view that through strategic networks their organisations can merge internal capability imbedded within the organisation with expertise from external firms for the successful completion of innovation processes. Participants eluded the complementarity features entrenched in the coupled integration of combining both outside-in and inside-in innovation dimensions in stimulating innovation in their respective organisations.

Objective four: To understand other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.

Key findings: The responses regarding the use of other existing innovation frameworks indicated that SMEs owners had limited knowledge of them. The findings showed that employees were uninformed about whether their organisations had knowledge about the existence of other innovation models at their disposal to spearhead internal innovation or not. The lack of knowledge, and the absence of commitment by SME owners were cited as major impediments to seeking for models to improve innovation processes in the companies.

7.3 Recommendations

7.3.1 Recommendations for future research

Drawing from the conclusion of the study, the researcher recommends the following:

- Since SMEs are acknowledged as the drivers of the South African economy, government should craft policies and strategies that encourage innovation through sharing ideas and knowledge between these entities and large businesses. The policies should spell out guidelines and directions on patents and co-patent issues prevalent to OI investments by SMEs.
- Given the challenges predominant to SMEs, the use internal knowledge, external knowledge and strategic networks as identified the key predictors of OI application by these entities in KwaZulu-Natal province is recommended. These predictors will accelerate inhouse innovation as SMEs will benefit from expert ideas and knowledge from both external and strategic network partners. These predictors will facilitate innovations activities in the form of newfangled services, novel products, new processes or new technology to meet customer needs.
- As the South Africa economy is becoming more open, the government should enact policies that encourage and incentivise innovation in SMEs through OI partnerships with large corporations. Such policies should include training frameworks to facilitate effective OI alignment to different SMEs business models. This approach will assist in mitigating risks and failures associated with the adoption of OI.

7.3.2 Practical managerial recommendations

As evidenced from the research findings, it is imperative for SMEs in KwaZulu-Natal to embrace OI to enhance innovation. Throughout this study OI was recognised as an important business concept that is central in innovation and sustainability issues confronted by organisations. To ensure that SMEs get maximum benefits of OI, the study propose the following practical managerial recommendations:

- SME owners should take courageous steps to avail internal innovation processes to external organisations for strategic innovation.
- Selecting partners for OI is critical for SMEs. Therefore, it is advisable for SME owners to take precautional measures and sign contractual agreements with partners.
- SMEs should establish a model to select suitable partners for OI programs. A selection framework should spell out engagement processes for OI by all parties.
- SMEs owners should seek legal advice or appoint legal firms to handle contractual agreements with large firms. The legal firms will assist in taking matters associated with intellectual property rights and patent issues.
- Given the strong relationship between the predictors identified by this study, it is recommended that SMEs select one OI archetype at time. This approach will assist in familiarising with challenges associated with it before embracing the other ones.
- SMEs owners must adopt training models that could be used to mitigate against risks and challenges associated with OI alignment to their business models.

7.4 Contribution to the body of knowledge

Preliminary literature review revealed that there is a dent in global OI studies in SMEs, especially in South Africa. This study contributes towards reducing the research gap on current discourses in studies that investigate predictors of the successful application of OI by SMEs in KwaZulu-Natal, South Africa. Nevertheless, OI is critical to SMEs who play a significant role in the economic development of the country. Therefore, generally, this study contributes to the body of knowledge on this topic in various ways as follows:

Firstly, the influence of internal knowledge in predicting the successful application of OI in SMEs sectors not known in KwaZulu-Natal. Previous studies (Bresciani and Ferraris, 2014; Colombo et al., 2014; Roessl and Hyslop, 2016; Santoro et al., 2018) looked at OI related challenges faced by SMEs and the fragmentation of this paradigm in these sectors. Therefore,

this study adds value to how the identified predictors (internal knowledge, external knowledge, and strategic networks) aid the successful application of the OI paradigm in SMEs in KwaZulu-Natal province. This claim is consistent with existing literature (Ahn et al., 2017; Bogers et al., 2018; Krause and Schutte, 2015) which acknowledged the enormous positive influence internal knowledge had in the implementation of OI by SMEs.

This study demonstrates the use of the mixed methods research approach to understand predictors of the successful implementation of OI in SMEs, also the interplay and the relationship between the predictors and the application of OI. The former helped to further understand the interplay and the relationship between the identified predictors (internal knowledge, external knowledge, and strategic networks) and the application of OI paradigm by SMEs in the province. For example, Pearson correlation results showed a significant strong positive correlation of between the variables (internal knowledge, external knowledge, and strategic networks) in predicting the successful application of OI by SMEs in KwaZulu-Natal. This result was validated by findings from qualitative data which confirmed that the three key variables had great influence in predicting the successful implementation of OI by SMEs.

7.5 Limitations of the study

Despite accomplishing its objectives, this study had several specified limitations. These limitations include the following:

- The study was formulated as a case study where data was collected strictly from SMEs located in Pietermaritzburg area and listed on the National Government databank in KwaZulu-Natal province. As a result, the study excluded views of SMEs in other areas of the province. Therefore, the results of this study may not be generalised to all SMEs in the province.
- The study used non-probability sampling techniques called convenience and purposive methods to choose research participants. The empirical results do not show insights from the whole population. Thus they cannot be generalised across SMEs in KwaZulu-Natal.
- The sampling size for in-depth interviews raised some transparency and acceptable size issues commonly associated with qualitative studies, specifically with regard to the generalisation of findings. The researcher proceeded with the sampling procedure until

data saturation was realised. Hence, the sample size for qualitative part of this study was thirteen SMEs owners.

- Coding and transcribing of data was done by the researcher and the research assistant. This raises validation issues as the authentication of transcripts is accepted when the former is done by three or more experienced individuals in the relevant field.

7.6 Areas for future research

Studies on the implementation of OI in SMEs is critical for the development of these entities in South Africa. It is through adopting OI that SME in KwaZulu-Natal will be able to “survive and deal with competition. The liberated market and global investments in the country, SMEs has positive influence growing innovation. SMEs in KwaZulu-Natal are therefore encouraged to embrace OI for future growth aspirations. Future studies should concentrate on applying other qualitative methods such as focus groups deliberations among SME owners to get an in-depth understanding on the application of OI among SMEs in KwaZulu-Natal. The focus group deliberations will bring both SME entrepreneurs and those from large corporations to facilitate how SMEs could be enlightened and exposed to the experience of big businesses on the concept. These studies could be attempted per sector as operational challenges are unique in each sector. These studies per sector could unearth novel models that are most apt to address challenges being experienced by SMEs in those respective sectors.

Findings for this study were derived from SMEs from different sectors where each organisation had distinctive characteristics and experienced unique challenges. Therefore, different quantitative and qualitative dimensional approaches are needed to align the identified predictors for the effective application of the OI paradigm. These methods will add value in further identifying a structured approach of implementing OI in SMEs. Further studies should be carried out to establish the extent of the relationship between these predictors within a single sector for more in-depth analysis and accuracy.

Future studies should also take an in-depth case study approach, possibly longitudinal ones to gather further insights about the interplay and relationship between key variables identified in this study. This is consistent with existing configurational properties between these variables that could be further explored to give more light on the application of OI in SMEs in the province. Future studies should also focus on identifying sourcing strategies for external

knowledge for OI by SMEs. A framework developed from the sourcing strategies will enhance the successful application of OI by SMEs in the KwaZulu-Natal. Further studies should also identify a model to measure successful application of OI in SMEs. The model should include methods that could assist SMEs to implement OI effectively.

Further studies should also focus on investigating the existing government policies and strategies that could be used to encourage OI adaptation and execution by SMEs in South Africa. The policies and strategic frameworks will see the discovery of other innovation models mostly suited to address the application of OI by SMEs in the country. The failure to conduct these further studies will have negative consequences because SMEs in KwaZulu-Natal will continue to implement unrealistic, unsystematic, and erratic innovation strategies that lead to slow growth and closure of these entities.

7.7 Conclusion of chapter seven

In chapter seven the researcher has presented the conclusion and recommendations of this study. The chapter begins by providing an outline of the key findings followed by recommendations. The study's contributions to the body of knowledge on the predictors of the successful application of OI by SMEs in KwaZulu-Natal have been outlined, and the limitations associated with this study have been presented. The chapter concludes by pointing to areas for further research on the concept and its application by SMEs in KwaZulu-Natal, South Africa.

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APPENDIX A. IN-DEPTH INTERVIEW GUIDE

SECTION A: Background information

1. What is your age category?

1.Under 30 years	
2.30-49 Years	
3.50 years and over	

2. What is your gender?

3. What is your highest educational qualification?

4. What are the factors that motivated you to establish your business?

SECTION B: Business profile

5. How long have you been operating your business?

6. In which sector does your business fall under?

7. What type of business ownership is your company registered as?

8. SECTION C: Current knowledge and experience of Open Innovation amongst entrepreneurs in Small and Medium Enterprises in KwaZulu-Natal.

Open innovation is widely used as a way of purposely sharing internal knowledge with other organisations to improve innovation process for the organisation. It also include allowing other organisations use the company's ideas and knowledge to improve their own products and services. OI also include forming partnerships or alliances with suppliers, research insitutions (universities) aimed at improving product and services (Chesbrough, 2003).

1. What do you understand by Open Innovation as a business concept?
2. What are your perceptions towards Open Innovation among Small and Medium Enterprises in KwaZulu-Natal?
3. Could you please explain why it is necessary to engage Open Innovation activities to enhance innovation processes and product development in your company?
4. How does investing in Open Innovation programs benefit you on a personal level and your employees?

9. SECTION D: The internal knowledge (Inside-Out) factors influence on successful initiation of Open Innovation in Small and Medium Enterprises in KwaZulu-Natal

1. Does your organisation avails its innovation processes to external strategic partners? If YES, explain how you are doing it? If NOT explain why?
2. Does your company allow its employees to work together with external strategic teams in new product and development programs? If YES, can you elaborate how they work with external teams? In NOT, explain why?
3. Does your company gain anything through working with external teams? If SO what are some of the benefits. If NOT, explain why?
4. Open Innovation to generate more ideas to improve its products and services offerings.

10. SECTION E: External knowledge (Outside-In) factors that influence successful implementation of Open Innovation in Small and Medium Enterprises in KwaZulu-Natal.

1. How does your company incorporate external knowledge to improve new product discoveries and service offerings of the organization?
2. Does your company works with universities and other research institutions to improve innovation processes and product development? If YES, how is company engage them? If NOT, explain why?
3. Does your company partner with external companies and research institutions to register patents of new products? If SO can you explain the benefits derived from these engagements? If NOT, explain why?
4. Does including external knowledge in innovation process improve new products/services development for the company? If YES, explain in what ways? If NOT, explain why?

11. SECTION F: The Strategic Networks (Coupled integration) factors that influence successful implementation of Open Innovation in Small and Medium Enterprises in KwaZulu-Natal

1. Does your company form any strategic network with external factors? If YES, why is this important to your organization? If NOT, explain why?
2. Do you view forming strategic networks as a critical way of creating a competitive for your company? If Yes, how is it achieved? If Not explain why?

3. Does your company participate in alliances with important partners to improve? If YES, how are these alliances formed? If NOT, explain why?
4. Do you experience any challenges in these alliances? If SO, how are you addressing them? If NOT, explain why?

12. SECTION G: Influence of integrated collaboration factors on successful implementation of Open Innovation in Small and Medium Enterprises in KwaZulu-Natal, South Africa

1. Do you use any framework/model to enhance Open Innovation in your organisation? If YES please could you identify the framework/model that you are using? If NOT please explain why you are not using any?
2. How effective is the framework/model that you are using on spearheading Open innovation in your company? If Not explain why?
3. Could the model succeed if it is incorporated into the overall strategy of the business? If YES, how can be it be achieved? If NOT explain why?
4. Could you recommend the framework/model to other entrepreneurs or SMEs owners to improve their innovation processes? If Not explain why?

13. Other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.

1. Is your company aware of other models that can be used to improve innovation processes for the organisation? If Yes, what are these?
2. Does your organisation uses other different innovation model to enhance its innovation processes? If Yes, can you identify them?
3. Does your organisation experiences challenges with the current innovation model?
4. Does your company can recommend these models to other organisations?

THANK YOU!!

APPENDIX B. RESEARCH QUESTIONNAIRE

Thank you for agreeing to participate in this study. The questions in this questionnaire pertain to use of Open Innovation to speed innovation processes in Small and Medium Enterprise (SMEs) in KwaZulu-Natal, South Africa. The questionnaire should take less 10 minutes to complete. Please answer the questions to the best of your knowledge. Mark your answer by placing an **X** in the appropriate box and write in the space provided.

SECTION A: PERSONAL DETAILS

1. What is your position in the company? (Please tick applicable)

Position	Tick applicable
1. Owner	
2. Manager	
3. Supervisor	
4. Employee	

2. What is your age (Please tick applicable?)

1 Below 20	2 20-29	3 30-39	4 40-49	5 50-59	6 Above 60

3. What is your gender?

1. Male	
2. Female	

4. What is your race?

1. African	2. White	3. Indian	4. Coloured

5. What is your highest level of qualification? (Please tick applicable)

Level of education	Tick applicable
1. No formal education	
2. Primary school certificate	
3. High school certificate (Matric)	
4. Diploma	
5. Bachelor's degree	
6. Postgraduate degree	

SECTION B: BUSINESS DETAILS

6. How many workers are in your company?

1 (1-10)	2 (11-20)	3 (21-30)	4 (31-40)	5 Above 50

7. What form of business is your company?

1 Sole proprietor	2 Private Company (Pty) Ltd	3 Personal Liability Company	4 Public Company (Ltd)

8. Which industry best describes your company?

Type of industry	Tick applicable
1. Service sector	
2. Retail sector	
3. Manufacturing	
4. Construction & engineering	
5. Other (specify)	

9. How long have you been working in this organization? (Tick applicable)

1 Under 5 years	2 6-10 years	3 10-15 years	5 16 years and over

SECTION C: BUSINESS DETAILS

10. Using the scale indicate to what extent you agree or disagree to the following statements by marking your choice. **1-Strongly Disagree, 2- Somehow disagree, 3- Neutral, 4- Somewhat Agree, 5- Strongly Agree.** Please choose your answer to the statements by placing an **X** on the following scale.

C o d e	Research Variables	Strongly Disagree	Somehow Disagree	Neutral or Neither Agree	Somewhat Agree	Strongly Agree
		1	2	3	4	5
1	Current knowledge and experience on Open Innovationn					
1.1	My company understands Open innovation.	1	2	3	4	5
1.2	My company's Open Innovation include incorporating views of employees towards improving products and service offerings of the company.	1	2	3	4	5
1.3	In my company, Open Innovation include working with suppliers to improve innovation processes in the company.	1	2	3	4	5
1.4	My company incorporate external knowledge from universities and other research institutions to improve products and services offered by the organisation.	1	2	3	4	5
1.5	My company use Open Innovation to empower workers to be creative and innovative in the organization.	1	2	3	4	5
1.6	My company use Open innovation to develop partnership with other organisation.	1	2	3	4	5
1.7	My organisation invest in Open Innovation because its receive benefits from it.					
2	The influence of internal knowledge (Inside-Out) on successful implementation of Open Innovation					
2.1	My organisation avails its innovation processes to external strategic partners.	1	2	3	4	5

2.2	My company allows its employees to work together with external strategic teams in new product and development programs.	1	2	3	4	5
2.3	My company use Open Innovation to generate more ideas to improve its products and services offerings.	1	2	3	4	5
2.4	My organisation avails its research and development platforms to strategic networks.	1	2	3	4	5
3	The influence of external knowledge (Outside-In) on successful implementation of Open Innovation					
3.1	My company incorporate external knowledge to improve new product discoveries and service offerings of the organisation.	1	2	3	4	5
3.2	My company works with universities and other research institutions to improve innovation processes and product development.	1	2	3	4	5
3.3	My company partners with external companies and research institutions to register patents of new products.	1	2	3	4	5
3.4	My company engages suppliers, customers and research institutions to cut cost on research and development.	1	2	3	4	5
3.5	My company incorporate external knowledge into innovation process to speed up introduction of products into the market.	1	2	3	4	5
3.6	My company uses external knowledge to have a competitive advantage in the market.	1	2	3	4	5
4	Strategic network (Coupled integration) factors that influence successful implementation of Open Innovation					
4.1	My company opens its innovation processes to other companies.	1	2	3	4	5
4.2	My company share ideas with key suppliers, customers and research institutions to improve its innovation processes.	1	2	3	4	5
4.3	My organisation participate in alliances with important partners to improve new product and service offerings of the organisation.	1	2	3	4	5
4.4	My company participate in strategic networks to improve its own new product or service offerings.	1	2	3	4	5
4.5	My company independently registers the new product developed in partnership with alliance partners.	1	2	3	4	5

4.6	My company avails its new product development processes to its alliance partners.	1	2	3	4	5
5	Other innovation frameworks used by Small and Medium Enterprises in KwaZulu-Natal, South Africa.					
5.1	The company is aware of other models that can be used to improve innovation processes for the organisation.	1	2	3	4	5
5.2	My organisation uses different innovation model to enhance its innovation processes.	1	2	3	4	5
5.3	My organisation experiences challenges with the current innovation model.	1	2	3	4	5
5.4	My company can recommend these models to other organisations.	1	2	3	4	5

THANK YOU!!

APPENDIX C. CONSENT FORMS

UKZN HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE (HSSREC)

APPLICATION FOR ETHICS APPROVAL For research with human participants

Information Sheet and Consent to Participate in Research

Date:

Greetings,

My name is Victor Hlatywayo (208502749) from School of Management, IT and Governance at the University of KwaZulu-Natal. My contact details are: 0677005585/0844107522 and my email addresses are: vhlatywayo@yahoo.com ; vzhlax@gmail.com and 208502749@stu.ukzn.ac.za

You are being invited to consider participating in a study that involves research title: Investigating predictors for the successful implementation of Open Innovation: A case of Small and Medium Enterprises in KwaZulu-Natal, South Africa. The aim and purpose of this research is to understand the central prerequisites (or critical success factors) that predict the successful implementation of Open Innovation in Small and Medium Enterprises (SMEs) in KwaZulu-Natal, South Africa. The study is expected to include 15 SMEs owners/managers or supervisors to take part in in-depth interviews and 245 employees to participate in questionnaire survey for the study. All participants will be drawn from SMEs in Pietermaritzburg area. It will involve the following procedures: in-depth interviews and questionnaire survey where participants will be asked questions related to the study. The duration of your participation if you choose to participate and remain in the study is expected to be 30 minutes and 10 minutes for in-depth interviews and questionnaire survey respectively.

The following study will not have any direct benefit for participants, however it will be a benefit to the improvement and development of SMEs in KwaZulu-Natal province and in the country.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number_____).

In the event of any problems or concerns/questions you may contact the researcher at 0677005585/0844107522 or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus

Govan Mbeki Building

Private Bag X 54001

Durban 4000 KwaZulu-Natal, SOUTH AFRICA

Tel: 27 31 2604557- Fax: 27 31 2604609

Email: HSSREC@ukzn.ac.za

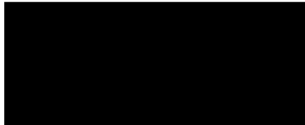
Your participation in the study is voluntary and by participating, you are granting the researcher permission to use your responses. You may refuse to participate or withdraw from the study at any time with no negative consequence. There will be no monetary gain from participating in the study. Your anonymity will be maintained by the researcher and the School of Management, I.T. & Governance and your responses will not be used for any purposes outside of this study.

All data, both electronic and hard copy, will be securely stored during the study and archived for 5 years. After this time, all data will be destroyed.

If you have any questions or concerns about participating in the study, please contact me or my research supervisor at the numbers listed above.

Sincerely

Victor Hlatywayo



CONSENT TO PARTICIPATE

I have been informed about the study entitled Investigating predictors for the successful implementation of Open Innovation: A case of Small and Medium Enterprises in KwaZulu-Natal, South Africa by Victor Hlatywayo.

I understand the purpose of the study which include the need to understand the central prerequisites (or critical success factors) that predict the successful implementation of Open Innovation in Small and Medium Enterprises (SMEs) in KwaZulu-Natal, South Africa. I clearly understand all the procedures of the study as explained by Victor Hlatywayo.

I have been given an opportunity to ask questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without claiming any benefits from the study.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at 0677005585/0844107522.

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Additional consent, where applicable

I hereby provide consent to:

Audio-record my interview / focus group discussion YES / NO

Signature of Participant

Date

Signature of Witness
(Where applicable)

Date

Signature of Translator
(Where applicable)

Date

APPENDIX D. ETHICAL CLEARANCE CERTIFICATE



01 November 2019

Mr Victor Hlatywayo (208502749)
School of Management, IT & Governance
Westville Campus

Dear Mr Hlatywayo,

Protocol reference number: HSSREC/00000630/2019

Project title: Investigating predictors for the successful implementation of Open Innovation: A case of Small and Medium Enterprises in KwaZulu-Natal, South Africa

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 08 October 2019 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid for one year from 01 November 2019.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

Yours sincerely,



Professor Urmilla Bob
University Dean of Research

/ms

Humanities & Social Sciences Research Ethics Committee
Dr Rosemary Sibanda (Chair)
UKZN Research Ethics Office Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Website: <http://research.ukzn.ac.za/Research/Ethics/>

Founding Campus:  Edgewood  Howard College  Medical School  Pietermaritzburg  Westville

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