A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – The case of South Africa

by

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DECLARATION

I, Samuel Molelekwa Thema, declare that “A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – The case of South Africa” is my work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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DEDICATION

I wish to dedicate this study to the following:

- All the health workers around the globe whose job tasks entail exposing their health to safeguard public health during COVID-19.
- My dearest mother (Letta Malebo Thema) and sister (Gladys Jennifer Sekano) passed on during COVID-19.
- My late father, Amos Maletja Thema.

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- Last but not least, to my only brother Cuthbert Seganya Thema for his support.

ABSTRACT

The primary purpose of this study was to develop a suitable framework for the application of Quality Infrastructure (QI) services by Small and Medium-Sized Enterprises (SMEs) in South Africa. The QI is a vital system that binds different helices within its value chain, including users of its services, such as firms and consumers. The framework contributes to the need to encourage SMEs to use QI services to optimise their business performance. The literature review suggested six significant factors as determinants to encourage SMEs to use QI services. The choice of research design was a sequential multi-method approach (qualitative followed by quantitative). Phase one involved qualitatively exploring the six factors from QI experts' perspectives through semi-structured interviews, followed by focus groups with QI practitioners and SME representatives. A thematic analysis approach was applied during the data analysis. The validity and reliability of the data were tested via different strategies of trustworthiness, including debriefing. The results from phase one were used to design the questionnaire in phase two. The questionnaire was distributed to SMEs' representatives and their associations. Data analysis in phase two was able to leverage the potential confirmation of the confirmatory factor analysis (CFA) after using the exploratory factor analysis (EFA). A conceptual measurement model was presented during EFA consisting of 28 variables represented by six primary constructs. Thus, the research design culminated in the final framework to achieve the study's main purpose. The six important factors that emerged from the study and were included in the final framework include (1) education; (2) requirement; (3) awareness; (4) impact resulting from the QI; (5) collaboration; and (6) affordability. The framework provides a much-needed building block towards an effective QI that the key QI institutions and other interested parties in South Africa can use.

Keywords: Accreditation, conformity assessment, confirmatory factor analysis, dynamic capability, exploratory factor analysis, metrology, Quality Infrastructure, resource-based view, Small and Medium-Sized Enterprises, SME performance, standards.

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LIST OF ACRONYMS AND ABBREVIATIONS

AfCTA	African Continental Free Trade Area
BIPM	International Bureau of Weights and Measures
BSI	British Standard Institute
CAB	Conformity Assessment Body
CASCO	Committee on conformity assessment
CFA	Confirmatory Factor Analysis
CIPC	Companies and Intellectual Property Commission
DC	Dynamic Capability
DTIC	Department of Trade, Industry and Competition
EFA	Exploratory Factor Analysis
EU	European Union
GDP	Gross Domestic Product
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
ILAC	International Laboratory Accreditation Cooperation
InetQI	International Network on Quality Infrastructure
ISO	International Organisation for Standardization
MRA	Mutual Recognition Arrangement
NMISA	National Metrology Institute of South Africa
NQI	National Quality Infrastructure
NRCS	National Regulator for Compulsory Specification
NSBA	National Small Business Act
OECD	Organisation for Economic Corporation Development
PTB	Physikalisch-Technische Bundesanstalt
QI	Quality Infrastructure
RBV	Resource-Based View
SABS	South African Bureau of Standards
SANAS	South African National Accreditation System
SEDA	Small Enterprise Development Agency
SME	Small and Medium-Sized Enterprises
UNIDO	United Nations Industrial Development Organization

CHAPTER 1: CONTEXTUALISING THE RESEARCH

1.1 INTRODUCTION

This chapter provides an orientation to the study. The study is about developing a suitable framework that can be used for the application of Quality Infrastructure services by SMEs in South Africa to optimise their business performance. The QI in South Africa is comprised of key institutions, namely, (1) the National Metrology Institute of South Africa (NMISA), (2) the South African National Accreditation System (SANAS), (3) the South African Bureau of Standards, and (4) the National Regulator for Compulsory Specification (NRCS). These institutions, together with conformity assessment bodies such as testing laboratories, inspection bodies, certification bodies, have the potential to optimise SMEs' business performance. This chapter is divided into fourteen sections. Following the introduction, Section 1.2 covers the background of the study and the topic being explored. Section 1.3 covers the research problem. Section 1.4 covers the research questions, followed by the research sub-questions in section 1.5. Section 1.6 covers the objectives of the study, followed by the research propositions in section 1.7. Section 1.8 covers the relationship between the objectives and the research activities. Section 1.9 discusses the scope. Section 1.10 briefly discusses the methodology, followed by validity and reliability in section 1.11. Section 1.12 covers the research ethics, while section 1.13 covers the benefit and contribution of the study. The last section 1.14 covers a brief description of the layout of the thesis.

1.2 BACKGROUND

SMEs play a critical role in most economies across the world, especially for developing countries. These types of businesses are drivers of the economy and are prolific in terms of job creation (Parvin, Asimiran & Ayub, 2021; Gherghina, Botezatu, Hosszu & Simionescu, 2020; Al Kiyumi & Matriano, 2021; Fungwe & Kabubi, 2020). According to the Organization for Economic Cooperation and Development (OECD, 2017), SMEs are the predominant form of enterprise, accounting for approximately 99% of all firms in the OEDC area. The report further indicates that the SME sector accounts for about 70% of jobs on average, generating between 50% and 60% of value added on average. In emerging

economies, SMEs contribute up to 45% of total employment and 33% of Gross Domestic Product (GDP).

The above statistics clearly suggest a need to pay attention to enhancing the performance of SMEs, in particular, in light of their contribution to the national GDP and job creation within the OECD area for emerging countries. Given the importance of SMEs in the economy, especially for emerging economies, governments across the globe are continually looking for novel ways to strengthen the SME sector to ensure their competitiveness and survival. Despite strong interventions by various governments, the SME sector continues to be confronted by a number of challenges, including risks associated with their survival (Nyoni & Bonga, 2018).

The QI system has been identified as one of the viable tools that can contribute towards SME performance to enhance their competitiveness. For example, companies can use standards to demonstrate investments in their performance. The impact of these investments is dependent on the trust in the accreditation system and certification (Blind, Mangelsdorf & Pohlisch, 2018).

One example of the impact of the QI system is from a study based on companies operating in the information technology service in Brazil (dos Reis & de Almeida, 2021). The study concludes that innovative companies within this sector were able to attribute a high to medium degree of importance to variables such as certification and testing institutions, which were strongly linked to the functions of the QI.

Whilst the QI is identified as a viable tool that can contribute towards SME performance, a number of reports in literature focus on the origin and the development of the QI (Moljevic, 2016). There is no study that focuses on how the QI key institutions can effectively service SMEs in developing countries.

1.3 RESEARCH PROBLEM

Previous studies have shown that Small and Medium-Sized Enterprises (SMEs) are drivers of the economy and prolific in terms of job creation (Parvin et al., 2021; Gherghina et al., 2020; Al Kiyumi & Matriano, 2021; Fungwe & Kabubi, 2020). However, these types of businesses are faced with a number of quality related

challenges, including certification and implementation of standards, inability to access international markets because of poor product quality that falls below the required market standards, absence of highly effective technology, accurate measurement, and lack of sufficient funds to meet the expected criteria (Chumphong, Srimai & Potipiroon, 2020; Sfakianaki & Kakouris, 2020; Magodi, Daniyan & Mpofu, 2022).

The QI system has been hailed as a viable tool that has the potential to solve quality related problems (Sun, Xiao, Niu, Cao & Yao, 2022:1). A number of studies have been done, and several frameworks related to the QI have been proposed (Sun et al., 2022).

However, existing theories in literature have been insufficient in corroborating the relevant concepts, and the relationship between the QI and SMEs' performance, in particular for emerging economies. Theories related to the QI have failed to be applied for SMEs in research because most of these theories focused mainly on the development and the application of the QI and did not include the impact of the QI towards SMEs.

According to the SME policy Index report (2019), monitoring and evaluation of the impact of the QI remain a challenge, and are largely insufficient for the SME sector. As a result, SMEs are not systematically informed about standards and existing programmes remain scattered, with very few economies having targeted programmes to support SME awareness and for SMEs to participate in standardizations (SME Policy Index, 2019:292).

For example, Sternad, Krenn and Schmid (2019) observed that even though there were attempts to improve the BE models to be suitable for SMEs, obstacles were encountered when introducing BE in SMEs. SMEs, on the other hand, were found to be reluctant to take more encompassing quality management systems into consideration, and limited financial resources and time were some of the reasons mentioned for SMEs not to embrace the BE models (Jaeger & Adair, 2016; Murphy & Leonard, 2016).

The report from Choi, Hyun and Kang (2014), on the other hand, lacks in-depth consideration of cases involving one or multiple countries, failing to take into

consideration an assessment in countries that have different population sizes, economies, import and export volumes and specific industries such as SMEs.

The study by Harme-Liedtke (2010) focused on the system dynamics and the leverage points to support innovation systems. In that sense, the identification of market failures was lacking to identify appropriate leverage points for system interventions. Furthermore, a better understanding of quality-driven innovation processes at the local and sectoral level, such as within the SMEs sector, was not adequately covered to contribute to the creation of a national innovation system in developing countries from the bottom up.

Therefore, this study seeks to close this research gap from previous studies and develop an appropriate framework that can encourage SMEs to use services provided by the QI in order to optimise their business performance. Failure to enact and develop such a framework may significantly influence policy makers to provide clear policy direction for the QI systems in developing countries in the context of SMEs. Furthermore, failure to develop such a framework may deny the opportunity to contribute to the theoretical body of knowledge in this field, as well as aiding in trade and sustainable development, for example, within the context of African Continental free Trade Area (AfCTA).

1.4 RESEARCH QUESTIONS

The main research question for this study was:

> What are the potential factors which can be incorporated into a framework that can encourage SMEs to use services provided by the QI in developing countries?

1.5 RESEARCH SUB-QUESTIONS

The sub-research questions for the current study were as follows:

1. What are the potential factors that can encourage the use of the services provided by the QI within the SME sector in South Africa, based on the inputs from QI experts as determined by robust qualitative research methods?

2. What is the relation between potential factors that can encourage the use of the services provided by the QI and SME performance?
3. To what extent do the potential factors and their associated variables conform to the pre-established theory as determined by quantitative research methods?
4. What is an appropriate framework that can be used for the application of the QI services by SMEs in South Africa to optimise SMEs business performance, and to make other significant contributions within the QI discipline?

1.6 RESEARCH OBJECTIVES

To answer the main research question of the study the following objectives had to be achieved:

Research Objective 1 - to determine potential factors that can encourage the use of the services provided by the QI within the SME sector in South Africa, based on the inputs from QI experts as determined by robust qualitative research methods.

Research Objective 2 - to determine the relation between potential factors that can encourage the use of the services provided by the QI and SME performance.

Research Objective 3 - to determine the extent to which potential factors and their associated variables conform to the pre-established theory as determined by quantitative research methods.

Research objective 4 - to develop an appropriate framework that can be used for the application of the QI services by SMEs in South Africa to optimise SMEs business performance, and to make a significant contribution within the QI discipline.

1.7 PROPOSITIONS

Proposition 1: SME awareness about the QI services is likely to enhance SMEs performance.

Proposition 2: Collaboration amongst the QI key institutions as well as between SMEs representatives and the QI is likely to enhance SME performance.

Proposition 3: Educating SMEs about the services provided by the QI is likely to increase SME performance.

Proposition 4: The ability for SMEs to afford services provided by the QI is likely to increase SME performance.

Proposition 5: The ability for SMEs to comply with specified requirement is likely to increase SME performance.

Proposition 6: The ability for SMEs to realise the impact from the QI services is likely to increase SME performance.

1.8 THE RELATIONSHIP BETWEEN THE RESEARCH OBJECTIVES AND RESEARCH ACTIVITIES

The following diagram provides the links between the research objectives and the research activities.

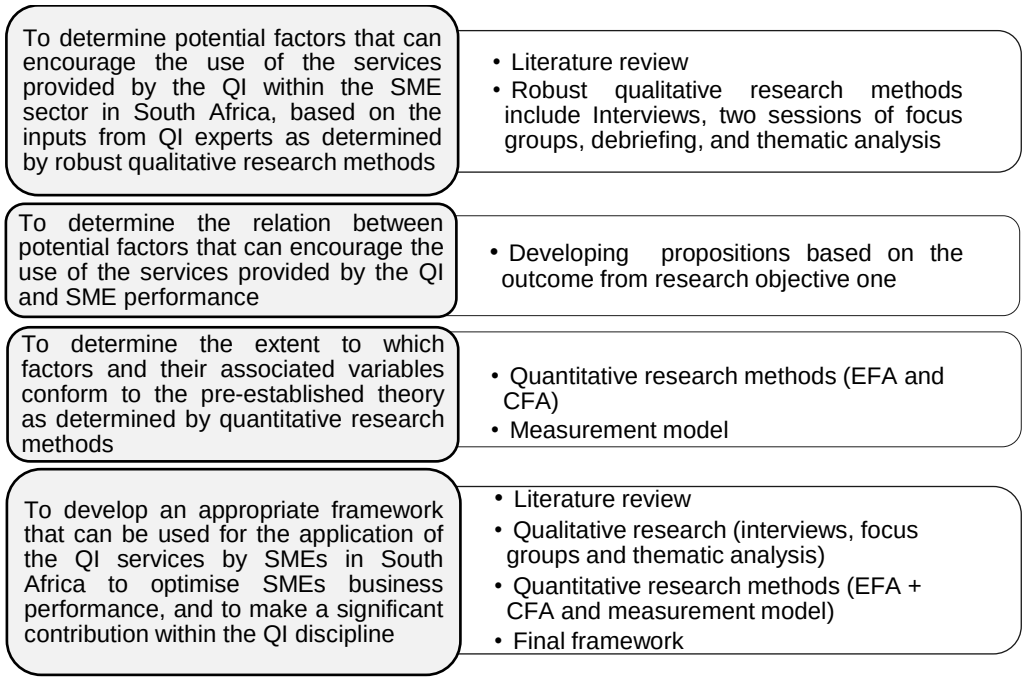

Figure 1-1: Relationship between the research objectives and research activities

Source: *Research's own*

1.9 RESEARCH SCOPE

The research focuses on Small and Medium-Sized Enterprises in South Africa as defined in the National Small Business Act (Act No. 102 of 1996), Standard Industrial Classification (SIC). Micro Enterprises were excluded from the study because of the risks associated with these enterprises. In general, most of the micro enterprises operate informally and are not formally registered with the Companies and Intellectual Property Commission (CIPC) in South Africa.

1.10 BRIEF METHODOLOGY

The study followed a sequential multi-method approach whereby qualitative exploration of the six factors were identified during the interviews and focus groups with QI experts and SME representatives respectively, followed by a quantitative approach during phase two. The findings from phase one were used to design a questionnaire which was later administered to SME associations and their representatives. A thematic analysis approach was applied during data analysis in phase one. In phase two, exploratory factor analysis was applied to identify the measurement model which was incorporated into the final framework after confirmatory factor analysis was done.

1.11 VALIDITY AND RELIABILITY

Internal validity associated with the questionnaire was considered during quantitative research in phase 2. In this case, context and construct validity were considered. In the case of reliability, internal consistency was considered using Cronbach's alpha.

1.12 RESEARCH ETHICS

UNISA's ethics policy was considered during the research. Ethical clearance was obtained before data was collected for both phase one and two (Reference Number No. 2019 – SBL-DBL-021-FA) (Appendix A).

1.13 BENEFITS AND CONTRIBUTION OF THE STUDY

The main contributions and benefits of the study are described in detail in Chapter 6 in section 6.4 and 6.5 respectively.

1.14 BRIEF DESCRIPTION OF THE LAYOUT OF THE THESIS

The following section provides the layout of the thesis:

Chapter 1: Introduction

This chapter covers the background, rationale, and justifications of the study. The chapter identifies the research problem to be addressed in the study, as well as the main research question. Four sub-objectives are stated to attain the main research question. The relationship between the sub-objectives and the research activities is defined. The scope and limitation of the study is explained, including a brief description of the methodology.

Chapter 2: Literature review

Chapter 2 includes the review of key concepts such as QI, SMEs, and SME performance. A critical literature review is considered regarding the QI from other countries such as India, Saudi Arabia, and Australia, and compared with the QI in South Africa. Furthermore, the chapter discusses the role of the QI and its impact in the economy in the context of standards, metrology, and accreditation. A critical literature review on relevant theories supporting the study is considered. The review includes a synopsis of other theories relevant to the study. A review on factors that encourage SMEs to use services provided by the QI is outlined, and the relationship between SME performance and the QI is discussed. The chapter concludes by discussing and justifying the conceptual framework used in the study.

Chapter 3: Research methodology

Chapter 3 covers the research design and methodology employed for the current study. The research philosophy, research strategy, research techniques, population and sampling, data collection instruments, and data analysis are outlined. A discussion and outcome of the pilot study is considered. The chapter

emphasises how the methodological ideas from literature are used to develop the current research plan and activities. It provides a justification for the methods and techniques used, why they were used, and any modification or adaptation linking research methodology literature to the methods used is discussed in detail. The chapter begins with qualitative research in phase 1 where data was collected through interviews and focus groups and validated using the debrief session. Phase 2 included quantitative research where data was collected, using the questionnaire constructed in phase 1. The chapter concludes by discussing the validity, reliability, and ethical issues.

Chapter 4: Qualitative Data Analysis, Findings and discussions

The chapter presents the data analysis, findings, and the discussion of the research results from phase one (qualitative approach). The overall aim of this chapter was to analyse data from the interviews done together with QI experts using thematic analysis. Themes obtained from the analysis were used to construct a questionnaire applied in phase two of the study. After data analysis, five themes were identified which include (1) awareness (2) education (3) collaboration (4) affordability and (5) requirement. The chapter further provides a discussion on how the sixth factor 'impact', which was identified during debriefing section, is explained in literature.

Chapter 5: Quantitative Data Analysis, Findings and discussions

The chapter presents the data analysis, findings, and discussion of the research results obtained from phase two during quantitative research. The overall aim of this chapter was to analyse data obtained from SME associations and their representative in South Africa. The information obtained from this chapter and the previous chapter were used to develop an appropriate framework that can be used for the application of the QI services by SMEs in South Africa. Exploratory Factor Analysis was considered during the analysis, followed by confirmatory factor analysis. Demographic information related to the industry sector from where participants were sampled, as well as the number of years participants spend in the SME sector, is considered. Reliability tests, in the form of Cronbach's alpha coefficient, were used to test the internal reliability of the constructs in the research instrument used.

Chapter 6: Summary, conclusions and recommendations

This chapter covers the conclusions, main contribution, the outcome of the study, limitations, recommendations, and suggestions for further research. The chapter discusses the contribution form a theoretical, empirical, practical, conceptual, and methodological perspective. Institutions and parties that benefit from the study are highlighted in this chapter, and conclusions and recommendations for future research are presented.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Chapter 1 focused on the background and introduced the research topic for the current study. The relationship between the research problem, the research objectives, and the research questions were covered.

The current chapter covers the literature review, including a discussion on the theories that underpin the study. Several reports in the literature, as seen in chapter 1, explained the origin, application, development, and benefits of the QI in the economy (Sun et al., 2022; PTB & UNIDO, 2010; Moljevic, 2016; Choi, Hyun, Hong & Kang, 2014; Jiang, Li and Zheng, 2019). Some of the reports measured the level of performance of the QI. For example, one of the earliest reports by Harmes-Liedtke and Oteiza Di Matteo (2011), measured the impact of the QI, and concluded that a country with a well-developed QI is expected to be economically prosperous, as compared to a country with limited or a lack of QI. A similar conclusion to Harmes-Liedtke and Oteiza Di Matteot (2011) was reached by a recent study (Kellermann, 2019), which demonstrated that there is a positive correlation between QI and the economic performance of a country.

Whilst it is noted that previous reports focused on the origin, application, development, and benefits of the QI in the economy, the current chapter mainly focused on five major themes, which include the following: (1) the benefit of the QI in the economy in the context of small business; (2) possible factors that can drive and encourage SMEs to use services provided by the QI; (3) SME performance in the context of QI services; (4) the relationship between the QI and SME performance; and (5) the theories underpinning the current study. The literature review around these five major topics provides a connection and an argument in support of the research objectives for the current study.

Before exploring literature related to the aforementioned topics, it is important to define the two key concepts, SME and the QI, as well as reviewing theories related to the two concepts.

After the introduction section, section 2.2 introduces the definition of SMEs, both from a global, and a South African context. Following section 2.2, the definition of the QI is introduced in section 2.3 from a global and a South African context.

Section 2.4 covers factors that encourage SMEs to use the services of the QI. Section 2.5 covers SME performance, including the relationship between SME performance and the QI. Section 2.6 critically reviews theories directly supporting the study, and provides a synopsis of other theories relevant to the current study. In this section, compelling arguments that include both corresponding and contradicting research on the topic are presented. Section 2.7 provides a justification for the conceptual framework, while section 2.8 summarises the chapter.

2.2 SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs)

Pobobsky (1992) refers to an international study, which identified over 50 definitions across 75 countries with considerable differences with regard to the definition of SMEs. This argument was later supported by Berisha and Pula (2015), who observed the lack of a universal definition of what constitutes an SME in literature.

2.2.1 Defining SMEs from a global level

Table 2.1 illustrates the SME definition based on the European Union (EU) standards. In this case, the criterion with respect to the number of employees is mandatory, while the other two criteria in terms of the annual turnover and the annual balance sheet are voluntary (Berisha and Pula, 2015).

Table 2-1: Definition of SME according to European Union standards

Enterprise Category	Headcount: Annual Work Unit (AWU)	Annual Turnover		Annual Balance Sheet Total
Medium-Sized	< 250	< € 50 million	**OR**	< € 50 million
Small	< 50	< € 10 million	**OR**	< € 10 million
Micro	< 10	< € 2 million	**OR**	< € 2 million

Source: *European Commission (2005)*

Comparing the definition from the EU with the one from the World Bank, as shown in Table 2.2, there appear to be clear differences, particularly with regard to the threshold on the number of employees and total annual sales. Furthermore, the

definition from the World Bank includes total assets, a criterion which is not considered in the EU.

Table 2-2: Definition of SME with World Bank (WB) standards

Enterprise Indicators	Number of Employees	Total Assets		Total Annual sales
Medium-Sized	> 50 ≤ 300	> $ 3,000,000 ≤ $ 15,000,000	**OR**	> $ 3,000,000 ≤ $ 15,000,000
Small	> 10 ≤ 50	> $ 1,00,000 ≤ $ 3,000,000	**OR**	> $ 1,00,000 ≤ $ 3,000,000
Micro	< 10	≤ $ 100, 000	**OR**	≤ $ 100, 000

Source: *Independent Evaluation Group (2008)*

Berisha and Pula (2015) and Pobobsky (1992) concurred with the reports from the EU and the World Bank, concluding that there is no consensus in literature reports regarding the definition of SME.

Despite being the most common criterion for the SME definition, the number of employees has many variances from country to country. Although many countries have a cut-off range of 0-250, the largest cut-off range of 499 was reported by Canada and the United States of America as shown in Table 2.3 (Ayyagari, Beck & Demirgüç-Kunt, 2003).

Table 2-3: Distribution of firms by number of employees from different countries

	Micro	Small	Medium	SMEs	Large
EU countries, Island, Norway and Switzerland	0 - 9	10 - 49	50 - 249	1 - 249	250 +
Australia	0 - 9	10 - 49	50 - 199	0 - 199	200 +
Canada	0 - 9	10 - 49	50 - 499	0 - 499	500 +
Japan	4 - 9	10 - 49	50 - 249	1 - 249	250 +
Korea	5 - 9	10 - 49	50 - 199	5 -199	200 +
Mexico	0 - 10	11 - 50	51 - 250	1 - 250	251 +
New Zealand	1 - 9	10 - 49	50 - 99	0 - 99	100 +
Turkey	1 -19	20 - 49	50 - 249	1 - 249	250 +
United States	1 - 19	10 - 99	100 - 499	1 - 499	500 +

Source: *OECD (2010)*

2.2.2 Defining SMEs from a South African context

In South Africa, the development of an official definition for small businesses began in 1995 with the White Paper on National Strategy for the Development and Promotion of Small Business in South Africa (Trade and Industrial Policy Strategies White paper, South Africa, 1995). The White Paper provided an initial broad classification of small businesses across four categories: survivalist, microenterprises, small enterprises, and medium-sized enterprises. The paper used the general term “small business” and the abbreviation “SMMEs”. Figure 2.1 adapted from the Small Enterprise Development Agency (SEDA), provides a hierarchical structure of a typical classification of small businesses in South Africa.

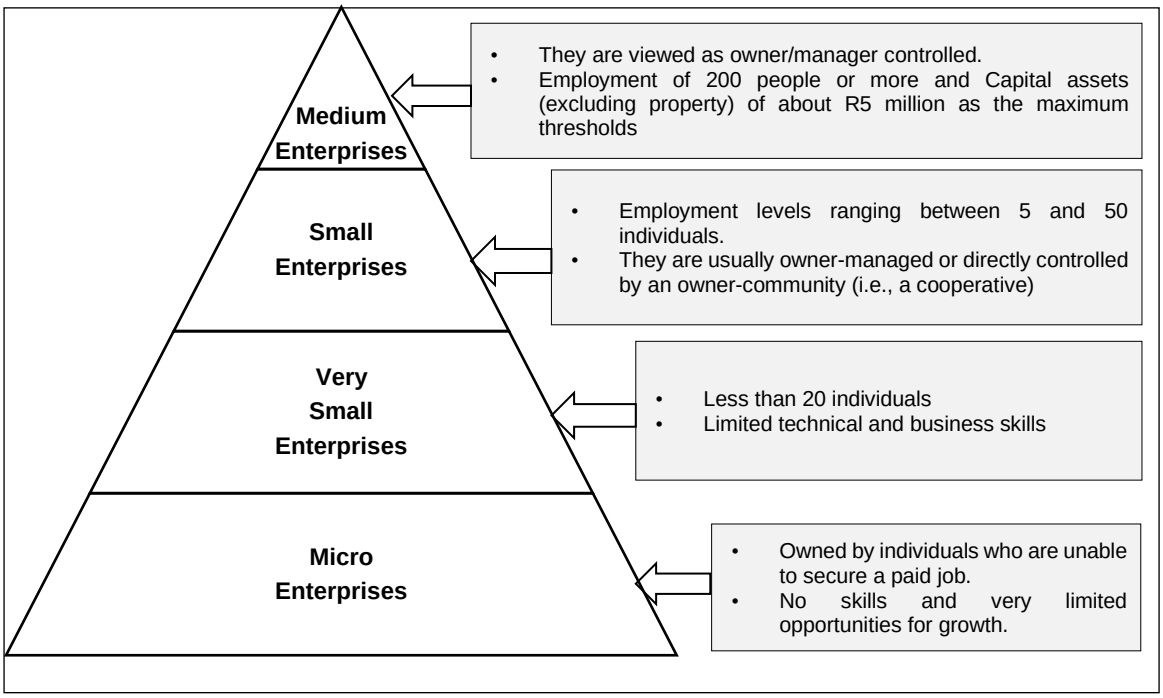

Figure 2-1: Classification of small businesses in South Africa

Source: ***Adapted from SEDA***

Following the white paper, small businesses in South Africa are defined in accordance with the National Small Business Act, NSBA (Act of 1996, as amended in 2003 and 2004) which describes small businesses as:

- A separate and distinct business entity, together with its branches or subsidiaries, if any, including co-operative enterprises and non-governmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or subsector of the economy and which can be classified as a micro-, a very small, a small or a medium enterprise (Act of 1996, as amended in 2003 and 2004).
- The NSBA distinguished SMMEs by Standard Industrial Classification or sub-sector and classified SMMEs according to their key indicators, total full-time equivalent of paid employees, the total gross asset value, and the total turnover. Since the current study is based in South Africa, this study therefore adopted the definition as described in the NSBA. However, micro enterprises were excluded from the current study because they are

generally informal in nature and not formally registered in the mainstream business (refer to Chapter 1, section 1.9 for the research scope).

2.3 THE QUALITY INFRASTRUCTURE (QI)

Quality is a level where a product or service is able to meet a predetermined requirement (ISO 9000:2015). In order to maintain quality in a country, a supporting infrastructure is needed, which is called Quality Infrastructure (Isharyadi & Kristiningrum, 2021:557)

- The QI is an internationally recognised system, which consists of key institutions; namely, standards, metrology, accreditation, market surveillance, and conformity assessment bodies such as certification, inspection, and testing (Aswal, 2020).

2.3.1 Standards

A standard is defined by the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) as a document that is established by means of consensus and is approved by a recognised body. According to the definition, the document provides, for common and repeated use, rules, guidelines, or characteristics for activities or their results aimed at the achievement of the optimum degree of order in a given context (ISO and IEC 2004a). Standards are classified into two broad categories, namely, public and private standards (Kellermann, 2019). These categories could be international, regional, and national standards.

Pearson (2015) maintains that although SMEs often view standards, such as ISO 9001 standards, as a “burden”, these businesses are able to derive benefits from such standards, which include the following:

- Consistently apply processes within the organisation.
- Commitment to Quality Management System (QMS) from all personnel.
- Understanding the role of each personnel member in the organisation.
- Being able to tender potential new customers and increase business.
- Personnel are able to respond appropriately to corrective actions to prevent risk of a more serious outcome.

- Personnel are able to prevent recurrence of problems.

The above-mentioned reports confirm that standards in many countries showed an important correlation with the performance of the company. Standards can offer guidance to companies and organizations such as SMEs in order to reduce their operational costs and increase effectiveness, as well as to standardize their products and services (Pearson, 2015; Kellermann, 2019).

2.3.2 Metrology

Kellermann (2019) defines metrology as the science of measurement, arguably the oldest of the three fundamentals of the QI. According to Guasch, Rachine, Sanchez and Diop (2007), metrology not only forms an integral part of the national quality system, but an integral part of our daily lives.

Accurate measurements allow equipment to be calibrated to produce consistent products, and tests to be performed to verify that a product or process conforms to pre-determined requirements (Guasch et al., 2007). The International Bureau of Weights and Measures (BIPM) is an international organisation established by the Metre Convention, through which Member States act together on matters related to measurement science and measurement standards (OECD/BIPM (2020).

The impact of metrology and the BIPM's work, which fosters better rules of metrology, crosses all sectors and aspects of human endeavour. Ironically, the impact of metrology and the BIPM is very difficult to quantify precisely because it is ubiquitous, but also because the benefits can rarely be attributed to metrology alone (OECD/BIPM 2020). Despite this limitation, the impact of metrology in the economy has been reported by some of the reports in literature, as discussed in detail in section 2.3.8.2.

Goncalves, Gothner and Rovira (2015) assert that metrology can be classified into different subgroups which, to some extent, are dependent on each other. These groups include the following:

2.3.2.1 Scientific Metrology, Industrial metrology and Legal metrology

Scientific metrology involves the development and organisation of the highest level of measurement standards (Tippmann, 2013). This is the level at which the seven basic units of measurement are described and disseminated. Most of the National Metrology Institutes around the world operate at this level.

Industrial metrology, on the other hand, ensures the satisfactory functioning of measurement instrument used in industry, production, and testing. The proper functioning of the measuring instruments used in production and quality controls are conformed at this level (Tippmann, 2013).

Guasch et al. (2007) define legal metrology as the legislative, administrative, and technical procedures that cover regulated areas where there is a public interest in the correctness of units, measurements, and measuring devices.

These areas cover all official measurements, measurements involved in enforcing mandatory standards, and commercial transactions that involve the use of measuring instruments for the determination of prices, such as weighing devices, taxi meters, and electric meters (Guasch et al., 2007). It is clear that the application of metrology in the aforementioned sub-groups is vital for SMEs to improve their competitiveness from a measurement perspective.

2.3.3 Conformity Assessment and Accreditation

The definition given in the EU regulatory acts is considered the leading definition for conformity assessment (Liepina, Lapina and Mazais, 2014). According to this definition, conformity assessment is the process of demonstrating whether the specific requirements relating to the product, processes, services, system, person or body have been fulfilled. This definition is based on the definition given in ISO/IEC 17000 standard for “conformity assessment-vocabulary and general principles.”

Demissie, Beshah and Ebinger (2022) opined that conformity assessment is the most technical level of the National QI services. The services are provided by different conformity assessment bodies (CABs) such as testing, inspection, and certification (Ramos Justen, Ludovico De Almeida & Souza, 2016). There are three type of conformity assessment; namely, (1) first-party conformity

assessment conducted by the supplier; (2) second-party conformity assessment conducted by the customer; and (3) third-party conformity assessment conducted by an independent third-party, including government agencies such as SANAS.

Accreditation is a type of conformity assessment activity that is internationally recognised, by which an authoritative body provides formal recognition of a body or person's competence to carry out a specific task. Conformity assessment bodies, supported by the QI key institutions, are expected to provide direct services to enterprises such as SMEs.

2.3.4 Market surveillance

Market surveillance is a set of activities by designated authorities to ensure that products comply with mandatory requirements and do not endanger any aspect of public interest. These activities can be carried out by the supplier, a certification body or the regulatory authorities (ISO, 2010).

The report from the OECD (2019), highlight the importance of market surveillance in the context of regulatory authorities across the Western Balkans and Turkey (WBT) economies. In this case, market surveillance authorities were expected to enhance their co-operation by exchanging information on unsafe products and measures carried out by national authorities. A similar approach can be assimilated for other developing countries such as South Africa, by ensuring that the QI key institutions corporate with market surveillance authorities to lock-out unsafe products within the SME sector, to ensure that products produced by SMEs do not endanger public interest.

2.3.5 Defining the QI at global level

Goncalves, Gothner and Rivira (2015) define the QI as:

> ... the totality of the policy, legal, regulatory and administrative frameworks and the institutional arrangements (public and/or private) required to establish and implement standardisation, metrology (scientific, industrial and legal), accreditation and conformity assessment services (inspection, testing and certification) necessary to provide acceptable evidence that products and services meet defined requirements.

The above definition clearly confirms the QI to be a dynamic system comprised of a number of interrelated components as illustrated by the United Nation Industrial Development Organisation (UNIDO) and depicted in Figure 2.2. The QI is expected to offer a complete package addressing the needs of the nation's citizens, of customers and consumers, and of enterprises and other organisations that offer products and services (UNIDO, 2018).

In the second and third layers, as shown in Figure 2.2, the national QI is comprised of key institutions that are strongly linked to each other and form a network with logical relations connected to the QI value chain (Rab, Yadav, Jaiswal, Haleem & Aswal, 2021). In these layers, key components of the QI are located, including conformity assessment bodies such as certification, testing, calibration, and inspection bodies.

Conformity assessment bodies (CABs) are the ones expected to provide services directly to enterprises such as SMEs. Conformity assessment bodies depend on the key QI institutions, such as metrology, for accurate measurements, standards against which products, processes, and services are assessed, and accreditation, whereby services offered by CABs can have their competence, independence, and impartiality formally verified through accreditation.

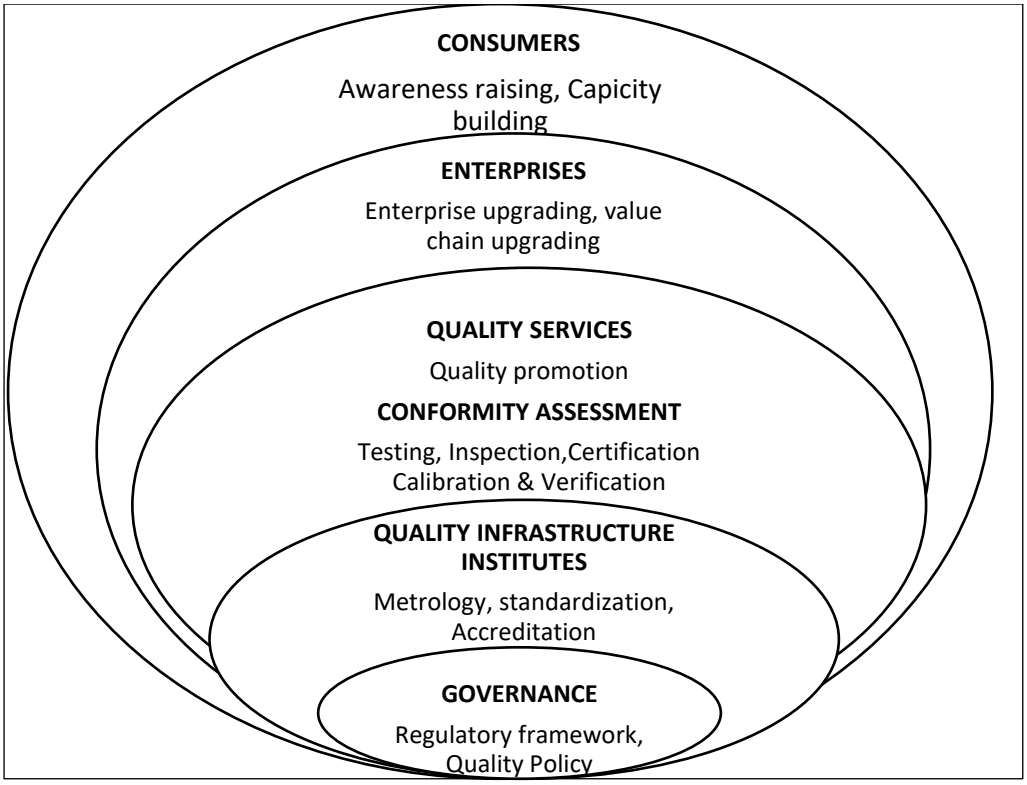

Figure 2-2: Quality Infrastructure value chain

Source: *UNIDO 2018*

Following the definition from Goncalves et al. (2015), a group of fourteen organisations, namely, "the international Network on Quality Infrastructure (INetQI, 2017)" refined the definition and adapted the definition as follows:

> The system comprising the organizations (public and private) together with the policies, relevant legal and regulatory framework, and practices needed to support and enhance the quality, safety and environmental soundness of goods, services and processes (INetQI, 2017).

The key difference between the INetQI (2017) definition and the one defined by Goncalves et al. (2015) appear to be embodied arround the purpose of the QI. In the INetQI definition, the purpose is extended to include safety and enviromental conditions. However, both definitions consider the QI as a dynamic system which relies on the policies and regulatory framework, integrated to the key institutions to achieve the intended purpose. This means that the key QI institutions need to collaborate with each other and other relevant stakeholders, such as regulators, to function effectively.

2.3.5.1 The Quality Infrastructure in India

All the three key pillars of QI (metrology, standards, and accreditation) are well placed in India (Aswal, 2020). However, according to Aswal (2020), strengthening of India's QI would require, amongst others, better synergy amongst these three pillars. The synergised QI should establish collaboration with four helices (government, university, civil society and media, and enterprises) for enhancing the growth of the economy and quality of life. The need for a robust QI by various stakeholders in the areas of implementation of regulations, industry growth, international trade, food safety, environmental monitoring, sustainable energy, and affordable health has been highlighted (Aswal, 2020).

2.3.5.2 The Quality Infrastructure in Saudi Arabia

To strengthen QI in Saudi Arabia, the calibration and measurement capabilities are required to be extended in the areas of energy, environment monitoring, biomedical, and quantum standards (Kumar & Albashrawi, 2022). Similarly, to the QI of India, Saudi Arabia recognised the need to strengthen a better synergy among three pillars (metrology, standards, and accreditation). Furthermore, Saudi Arabia recognised the need to strengthen its QI through the following: (1) establishing strong collaboration between government, university, and science and technology institutions and enterprises; (2) strengthening the legal framework, and intensively adopting legal metrology; (3) developing a strong research and development culture, and establishing more research centres; (4) improving competitiveness across priority sectors, the industrial standard enforcement mechanism, and motivating the private sector to participate in public infrastructure projects; and (5) increasing awareness of quality improvement (Kumar & Albashrawi, 2022).

2.3.5.3 The Quality Infrastructure in Australia

As compared to other countries, such as India and Saudi Arabia, the Australian QI is a sophisticated system that has continued to develop over the past 20 years (Trade and Industrial policy strategies, 2021). The standards body in Australia is privately run and concentrates on its core business of standard development. It plays an active role in the international standard-setting process. The National

Metrology Institute includes functions of scientific, regulatory, and industrial metrology and reports to the government's Department of Industry, Science, Energy, and Resources. Interacting with companies, and research on priority sectors of the national economy allow the QI of Australia to make a specific contribution to the economic development of the country (Trade and Industrial policy strategies, 2021).

2.3.5.4 The Quality Infrastructure in South Africa

In South Africa, the QI is part of the Department of Trade, Industry and Competition (DTIC), which is grouped into three clusters; namely, (1) the financial and small business development agencies; (2) regulatory agencies; and (3) the technical infrastructure, as shown in Figure 2.3

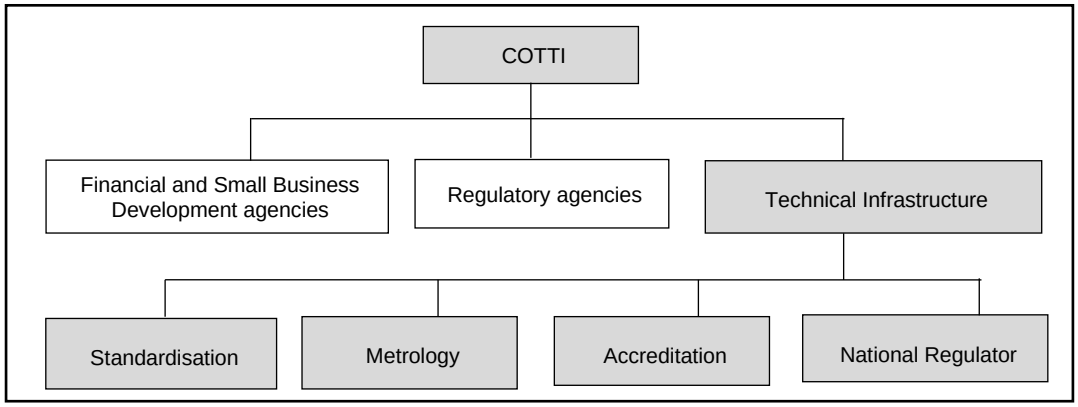

Figure 2-3: Council of trade and industrial institutions (COTII)

Source: *Researcher' own (adapted from the DTIC, 2017)*

The South African Bureau of Standards (SABS) is one of the pillars in the QI. It was established as a public entity in terms of the Standards Act, 2008 (Act No. 5 of 2008). The SABS has a mandate to develop, promote, and maintain standardisation and quality related commodities and the rendering of conformity assessment services (Demissie et al., 2022). The documented standards developed by the SABS rely on sound and validated methods, which depend on accurate measurements provided by the National Metrology Institute of South Africa (NMISA). The SABS is the main pillar of the QI as it provides the reference

framework and the basis for the comparison of products through documented standards.

The next pillar within the South African QI is the National Metrology Institute of South Africa (NMISA), a public entity established in terms of the Measurement Units and Measurement Standards Act, 2006 (Act No. 18 of 2006). Its mandate is to maintain the System International (SI) units, to develop primary scientific standards of physical quantities for South Africa, and to ensure global equivalence of those standards through key comparisons.

The South African National Accrediation System (SANAS), which was established in terms of section 3(1) of the accreditation for conformity assessment calibration and good laboratory practice act, 2006 (Act No. 19 of 2006) is the next pillar of the QI. SANAS is mandated by this Act to provide formal recognition that laboratories, certification bodies, inspection bodies, proficiency testing schemes providers and Good Laboratory Practice (GLP) test facilities are competent to carry out their specific task.

The last pillar within QI is the National Regulator for Compulsory Specifications (NRCS), established in terms of The National Regulator for Compulsory Specification Act (Act No. 5 of 2008) as a public entity. The NRCS is responsible for the administration and maintenance of compulsory specifications based on documented standards that are developed by SABS to protect human health and safety and the environment. The NRCS is also responsible for administering the legal metrology Act of 2014, which provides for the administration and maintenance of legal metrology technical regulations in order to promote fair trade.

The QI of Australia remains a model for South Africa, and Australia has successfully tackled various challenges that South Africa's QI is currently facing, and has found new solutions (Trade and Industry policy strategies, 2021). However, there is a need to enhance the QI in South African, similar to the recommendations made for the QI of India. These recommendations include areas such as implementation of regulations, international trade, food safety, environmental monitoring, and sustainable energy.

2.3.6 The Quality Infrastructure and international network

Key international players of the QI are indicated in Figure 2.4 (BIPM, 2020). The key international bodies include the Bureau of Weights and Measures (Bureau International des Poids et Mesures, BIPM), International Organization of Legal Metrology (OIML), the International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), International Laboratory Corporation (ILAC), and the International Accreditation Forum (IAF).

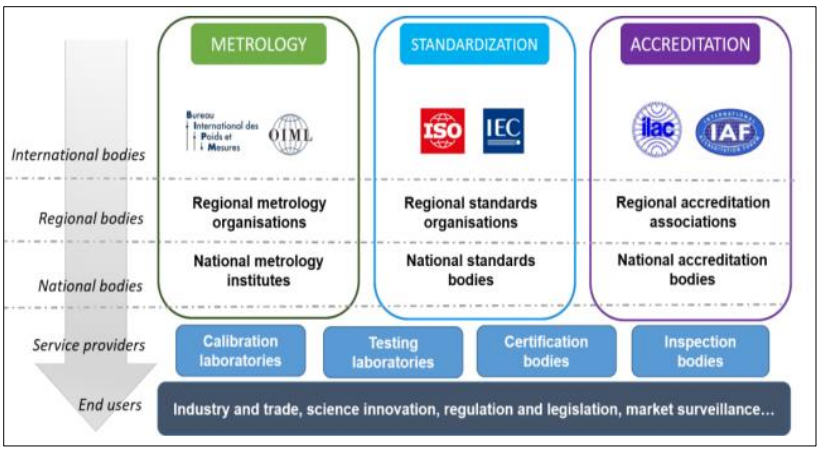

Figure 2-4: Key players in the QI system

Source: *BIPM (2020)*

In the metrology field, the International Bureau of Weights and Measures (Bureau International des Poids et Mesures, BIPM) is the intergovernmental organisation through which Member States act together on matters related to measurement science and measurement standards. In this case, the measurement standards established by national metrology institutes for each country are mutually recognised and disseminated in accordance with international procedures to ensure that metrological traceability is maintained across the entire industry (BIPM, 2022). In the field of standardisation, national standards are established and applied in accordance with international standards established by the International Organisation for Standardization (ISO) and the International Electrotechnical Commission (IEC) (Yoo, 2019).

For conformity assessment, the International Laboratory Accreditation Cooperation's (ILAC) main function is to establish an international arrangement

between member accreditation bodies based on peer evaluation and mutual acceptance (ILAC, 2022). In the case of management systems, products, processes, services, personnel, validation and verification, and other similar programmes of conformity assessment, the International Accreditation Forum (IAF) is the responsible body (IAF, 2022). Some of the key roles of the IAF include:

- maintaining and expanding the IAF Multilateral Recognition Arrangement (MLA) between Accreditation Body Members, with the aim of reducing risk to businesses and their customers and ensuring that an accredited certificate or validation/verification statement may be relied upon anywhere in the world as demonstrated in Figure 2.5 value chain;
- developing and harmonising accreditation practices across the world; and
- promoting accreditation as an effective mechanism for providing confidence in goods and services, which is essential to global trade facilitation.

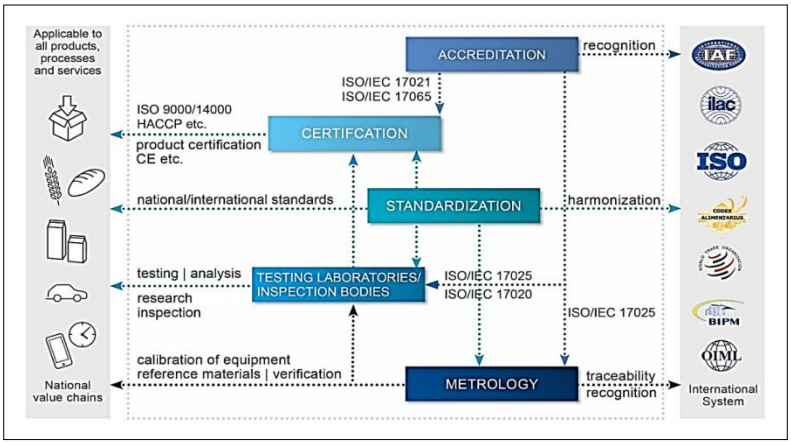

Figure 2-5: The national QI linked to the global system

Source: *Physikalisch-Technische Bundesanstalt (PTB)*

2.3.7 The role of the Quality Infrastructure

Earlier reports highlighted the effectiveness of the QI. According to these theories, the QI is able to improve trade and access markets (Racine, 2011; Guasch et al., 2007). These findings were confirmed later by studies such as the study by Cusolito and Maloney (2018), who suggested that for a firm to demonstrate quality and safety of goods and services, it is necessary to demonstrate compliance to international standards. Furthermore, the report states that standards encourage

and disseminate innovation and facilitates the development of profitable networks.

According to Blind et al. (2018), technical regulations and standards are becoming important, even beyond the European Union market. Calza, Goedhuys and Trifković (2019), on the other hand, argued that the possession of an internationally recognised standard certificate leads to a significant productivity increase.

The report from Termeer (2019), states that the ability to meet international standards has affected developing countries' opportunities to access export markets. With more complex products and processes, improving QI systems to certify quality standards, can facilitate export opportunities. The conclusion from these reports on the role of the QI can be summarised as follows:

1) Increase market access by:
    - growing exports
    - increasing product diversification
    - improving investment opportunities
    - benefiting from trade agreements
2) Improve firms' productivity by:
    - reducing cost of trade and cost of doing business
    - benefiting from economies of scale due to improved working methods and standardisation
    - enhancing innovation and technology transfer
3) Protect public good through:
    - public health and safety
    - consumer protection
    - social protections and labour conditions
    - environmental protection

2.3.8 The benefit of Quality Infrastructure in the economy

2.3.8.1 Assessment of the impact of standards in the economy

A standard is an agreed way of doing something. It could be about making a product, managing a process, delivering a service, or supplying materials. Standards can cover a huge range of activities undertaken by organisations and used by their customers (BSI, 2021). For example, standards can enhance organisational capabilities to be aligned with national and international best practices and develop internal competencies, routines, and processes that can leverage an innovation journey towards excellence (Caetano, 2017).

Furthermore, standards are thought to contribute to economic growth by serving as a component of the overall productivity. Standards also have impacts on other outcomes that directly relate to economic productivity, such as international trade and innovation (ISO, 2021).

Joyce, Stuart, Forde and Valizade (2019) demonstrated how certified companies in Europe are able to derive a number of internal and external benefits, including quality awareness, improved productivity, enhanced personnel participation and efficiency, improved organisational image, and markets penetration through standard. Joyce et al. (2019) maintains that SMEs that wish to pursue certification through standardisation should certainly expect benefits.

Wilcock and Boys (2017) opined that ISO 9001 standards offer supply chain management benefits for agrifood firms. Non-registered firms reported using the standard to formalise their monitoring procedures and improve planning, sourcing, manufacturing, and delivery efficiency. Registration helped firms formalise their quality management systems and provide guidance on improving their customer/supplier relationships and offered tools to monitor internal processes. Registered and non-registered firms reported increased customer satisfaction, market share and inventory turnover, and reduced lead times, rework, waste, and customer complaints as a result of standards.

2.3.8.2 Assessment of the impact of metrology in the economy

Although the report from the OECD and BIPM (OECD/BIPM, 2020) argued that the impact of metrology is very difficult to quantify, partly because it is ambiguous and the benefits can rarely be attributed to metrology alone, a number of reports

provide opposing view. For example, Shunashu and Pastory (2020) maintain that the importance of metrology in the economy is increasing due to rapid technological developments, innovations, and the emergence of information technology. Link (2021) maintains that economists in general rely on precise and accurate measurement, such as drug dosage treatment.

Tassey (2017) agrees with the view from Link and further identified two dimensions of the economics of measurement. The technical content of measurement science, which is based on the underlying research associated with, for example, standards, and the applied content of measurement science that is revealed through the implementation, or use of standards.

Brown (2021) concurs with the aforementioned reports and aptly states that metrology plays an important part in our everyday life, not only in health, but in technology, engineering and commercial prosperity, quality of life, and the protection of the environment. Examples provided by Brown (2021) include the reduction of waste, the efficiency of trade, enabling infrastructure to function, technology to advance, the economy to prosper, encourages global agreement, collaboration and trade, and ensures ongoing health and safety and quality of life.

King and Renedo (2020) extended the importance of metrology and provided an example of a case whereby the United Kingdom was able to achieve its target 2.4% GDP due to investment in accurate measurement and metrology. The argument from King and Renedo's report was that the UK was able to derive the following benefits over and above GDP growth: faster, more productive and efficient transfer of science into innovation, new national infra-technology that supports technologies; and support for technologies and innovation.

Kellermann (2019) summarises the impact of metrology and its impact as follows: (1) increasing the productivity of organisations; (2) supporting innovation; (3) helping to reduce the transaction costs between suppliers and customers in a market economy; and (4) helping societal groups.

2.3.8.3 Assessment of the impact of accreditation in the economy

An Accreditation Body (AB) is a statutory organisation that is usually established by an act of parliament and is internationally recognised through a Mutual Recognition Arrangement (MRA) (Kumurya, Gwarzo, Ahmad & Halliru, 2016).

Kellermann (2019) argues that the impact of conformity assessment on trade has proven to be immense, and this will increase as technology becomes more sophisticated and consumers more discerning. Furthermore, the manufacturing global value chains stretching over many countries demand the seamless integration of components and subassemblies into the final products. This requires a continuous demonstration of compliance with standards and specifications.

The International Laboratory Accreditation Corporation (2022) classifies the benefits of accreditation into four categories (Government, for regulators, for industry users, and for consumers). Kellermann (2019) agrees with the ILAC report, maintaining that accreditation has grown from just a measure of a laboratory's competence within a specific economy, to a system with general acceptance and worldwide use. Governments, regulatory authorities, businesses, and consumers utilise accreditation, which contributes to the overall development of the economy, assurance of health and safety, and environmental protection.

- **Government**

Governments and members of the International Laboratory Accreditation Corporation (ILAC) sign the Mutual Recognition Arrangement (ILAC MRA), which supports international trade.

The MRA provides governments with a framework that enhances government-to-government bilateral and multilateral international trade agreements. The aim is the recognition, both for the public and industry, and to provide industries with accredited laboratories, inspection bodies, proficiency testing providers, and producers of reference materials, including results from accredited facilities in other countries. This process allows the free-trade goals of "accredited once, accepted everywhere".

- **For regulators**

Regulators use accreditation and the ILAC MRA to meet their legislated responsibilities by providing a globally recognised framework to accept services and results from accredited facilities.

- **For industry users**

The MRA ensures that businesses that depend on the tests, inspections, calibrations, proficiency testing, and reference material data have greater confidence in the accuracy of these services and reports generated from these services. SMEs can benefit from the MRA when using the services provided by the QI key institutions (metrology, accreditation, and standardisation).

- **For consumers**

The MRA provides confidence to the general public and consumers who depend on the tests, calibration or inspection services on their samples, instruments, or products.

Hoyle (2001) confirms the difference between accreditation and certification by indicating that during the accreditation process, AB recognises a facility's technical competence to perform specific tests, measurements, or calibrations. Thus, accreditation is recognised as a stand-alone form of a very specialised technical certification, as compared to the purely quality system certification provided by ISO 9000. An accredited organisation is authorised to issue certificates of conformity to national or international standards. ISO 9000 certification, however, does not authorise organisations to issue such certificates.

Furthermore, accreditation is awarded for a specific scope of service or range of products, as is certification. However, for laboratory accreditation laboratories are accredited for very specific tests or measurements, usually within specified ranges of measurement with associated information on uncertainty of measurement and for product and test specifications. An ISO 9000 certificate for a laboratory does not accurately specify the performance characteristics of the product that the certificated organisation is capable of supplying (Hoyle, 2001).

The process of accreditation is critical, like the one of standardisation, for firms or organisations involved in businesses, since the process adds value to conformity assessment service providers and to their management in a number of ways. One such way, is that it provides assurance to the users of conformity assessment services that they are dealing with competent organisations, and provides authorities with the assurance that the output of conformity assessment service providers can be trusted.

This process provides certification bodies, testing and calibration laboratories, and inspection bodies with the means to indicate that they are conducting their work in accordance with the requirement of the standards, and can provide reliable services to organisations such as SMEs (Guasch et al., 2007). Frenz and Lambert (2014) agree with the sentiments that the process of accreditation, which is part of the quality infrastructure, ensures confidence within the market for the information provided on characteristics of goods and services that are offered Frenz and Lambert (2014).

Gonçalves and Peuckert (2011), however, indicated that no studies are available that explicitly look at the impact of accreditation from the perspective of the economy. This is due to the difficulties in separating the contribution of accreditation services from other QI components. Notwithstanding, the economic impact of accreditation is to some extent evident from some of the previous reports, such as the report by Miller (2012), who pointed out specific benefits of accredited testing services within the lighting industry with increased market shares and learning from services carried out by accredited laboratories.

It can be argued however, that while there is little economic literature on accreditation, there is a sufficient body of literature on the impact of certification on quality management and standards, especially within the academic sector. Most of the literature covers the areas of conformity assessment and is concerned with certification, mostly against the ISO 9000 series of Quality Management Standards having a positive relationship with innovation and productivity (Frenz & Lambert, 2014).

The results of this study showed a low awareness level by the general public, especially non-stakeholders, knowledge, attitude, and actual behaviour about the

work of verification and re-verification, and checking for a verification sticker, as well as ways of complaining if the instrument is not verified. In addition, the number of stakeholders working in the legal metrology area was high, and Facebook was one of the most preferred media by the public to share awareness messages (Frenz & Lambert, 2014).

2.4 FACTORS THAT ENCOURAGE SMES TO USE QUALITY INFRASTRUCTURE SERVICES

In the following sections, the literature review considers the potential factors that encourage SMEs to use the QI services. The review takes into account arrangements that can be established by various stakeholders, including the QI to ensure that SMEs use the QI services. These factors include (1) awareness; (2) collaboration; (3) education; (4) affordability; (5) requirement; and (6) impact.

2.4.1 Awareness

Awareness in the current study relates to arrangements that can be established by the QI key institutions to ensure that SME representatives are aware of the existence of the services provided by the QI.

Previous scholars identified relevant determinants for awareness. For example, Gashi and Krasniqi (2019) opined that awareness can be enhanced through education, training, and campaigning, using one-stop shop.

Galvez, Herlache, Anderko, Patel, Azar, Casco, Rubinstein, Farquhar and Condon (2021) argued that awareness can be enhanced when the relevant partners are speaking with one voice. Algharabat, Rana, Dwivedi, Alalwan, and Qasem (2018) suggest "informed consumer choice" as one of the drivers to enhance awareness.

Social media enables companies to connect with their customers, improve awareness of their brands, influence consumers' attitudes, receive feedback, help to improve current products and services, and increase sales, leading to SME performance (Algharabat et al., 2018).

Kellermann (2019:191) acknowledges that creating an understanding and a general awareness among producers and manufacturers about the benefits

associated with supplying products that comply with standards and technical regulations is not an easy task. However, Kellermann does emphasis the role that tertiary education institutions can play in awareness of the QI, as well as by using registered quality-system professionals.

2.4.2 Collaboration

Collaboration in the current study refers to the mutual engagement amongst QI key institutions as well as between SMEs representatives and the QI key institutions to ensure that the collaborating partners achieve a common goal.

Critical factors for collaboration include a no-blame culture between collaborating partners, effective communication, fair distribution of responsibility, and proactive problem solving. A number of reports emphasised the need for mutual goals, sharing responsibilities, early involvement of key participants, and trust (Philemon, Msomba, Matiko & Ramadhan, 2018; Faris, Gaterell & Hutchinson, 2022).

Smith and Thomasson (2018) offer valuable theoretical insight on the benefits of collaboration which include improvement in construction quality, risk sharing, innovation, creativity, and working relationships. Faris et al. (2022) maintain that collaboration facilitates a combination of resources and expertise to increase project performance. The empirical results indicate that three collaboration enablers, including trust, information readiness, and secure sharing of information improve supply chain collaboration, and in turn, its criticality to a firm's overall performance (Panahifar, Byrne, Salam, & Heavey, 2018).

Ahmad, Chao, Chao, Ilyas and Shujaat (2021) suggest that the size of the firm, employee training, collaboration alliances, and direct exports of SMEs all play a significant role in determining their likelihood of participating in the global value chain.

2.4.3 Education

Education in the current study refers to the steps that are taken by the QI key institutions (SABS, NMISA, SANAS, and NRCS) to ensure that SMEs acquire and assimilate knowledge about the services provided by the QI. According to da Silva Souza and Takahashi (2019), education and learning are a collective multilevel

process consisting of psychological and social processes involving intuition, interpretation, integration, and institutionalisation of knowledge (da Silva Souza & Takahashi, 2019). This means education can provide SMEs with the opportunity to integrate QI services into their management system in organisational performance in a rapidly changing environment (Kordab, Raudeliuniene & Meidute-Kavaliauskienez, 2020).

Several authors (Archer-Brown & Kietzmann, 2018; Bloodgood, 2019; Hashemi, Khadivar & Shamizanjani, 2018; Muthuveloo, Shanmugam & Teoh, 2017) confirm that knowledge management should be characterised by knowledge strategies and processes implemented in the organisation to increase the effectiveness and efficiency of business processes, achieve knowledge strategy, and sustain organisational performance.

2.4.4 Affordability

Affordability in the current study relates to arrangements that can be established by various stakeholders, including the Quality Infrastructure (QI) key institutions, to ensure that SMEs are able to afford the services provided by the QI key institutions (SABS, NMISA, SANAS, and NRCS). Despite the rhetoric and concerns that have been expressed by a few reports regarding the relationship between affordability and SMEs performance, many reports confirm a positive relationship between affordability and firm performance. For example, Sibanda et al. (2018) maintain that financial capital plays an important role in enhancing firm performance. Jaradat et al. (2018) support this conclusion, stating that financial capital plays an important role in enhancing firm performance.

According to Kersten, Harms, Liket and Maas (2017), SMEs funding indicates a significant positive on the total volume of financing and firm performance. Wellalage and Fernandez (2019) agree with Kersten et al. (2017), however, they argue from an innovative perspective, that finance is positively related to firm-level product innovation and process innovation.

2.4.5 Requirement

In the current study, meeting specified requirements relates to the arrangements that are put in place by the quality infrastructure (QI) key institutions to assist SMEs to comply with specified requirements. When products are traded between willing suppliers and willing consumers within a free-market system where there are no price controls, the “laws” of supply and demand usually take precedence (Sanetra, 2018).

Market surveillance is the last main component of the regulatory process and increases the overall value of the whole system (Sanetra, 2018). Market surveillance can be defined as “the set of activities carried out and measures taken by designated authorities to ensure that products comply with the requirements set out in relevant legislation and do not endanger health, safety or any other aspect of public interest protection” (UNECE, 2011a). As a result, SMEs are likely to have a lower capacity to comply (SME competitive outlook, 2016). In contrast, standards and requirements are linked to improvements in firms’ margins, according to a study based on a World Bank survey. Although the requirement and regulations appear burdensome for SMEs, it is still beneficial for SMEs to meet the minimum requirements, since the requirements may be linked to improve SME performance.

According to the report from UNIDO (2017), realising the benefits of technical regulations and standards and exploiting their economic potential means establishing an entire network of interdependent organisations and instruments of national QI. For such a network to be established, it is prudent to pay special attention to SMEs’ needs and challenges.

2.4.6 Impact resulting from the QI

The QI system has been identified as one of the viable tools that contribute towards the sustainability of SMEs. The "soft" and “hard” part of the QI system impact positively on the enterprise’s performance, both at the organisational and at the national level. Several reports (Fonseca, Domingues, Baylina & Calderón, 2017; Siltori, Simon Rampasso, Martins, Anholon, Silva & Souza Pinto, 2021;

Susanto, Isharyadi & Ritonga, 2018; Hussain, Eskildsen & Edgeman, 2020) identify the impact of the QI, and include the following: (1) Access to new markets; (2) Market share improvement; (3) Customer relationship improvements; (4) Productivity improvements; (5) Product quality improvement; (6) Product defect rate decreases; (7) Quality awareness improvements; (8) Delivery time improvements; (9) Internal organisation improvements; (10) Increase organisation performance; (11) Increase quality performance; (12) Better decision-making; and (13) Improve the compliance of legislation. In the case of African Continental Free Trade Area (ACfTA), Nzumile and Taifa (2021) identified the QI as one of the factors that is critical in aiding the trade and sustainable development within the ACfTA, through speeding up the delivery time, reducing goods rejection when crossing borders, environmental protection, and adding competitive advantages.

2.5 SME PERFORMANCE

In order to define SME performance in the current study, it is important to firstly understand what is meant by organisational performance. The study by Taouab and Issor (2019) considered a longitudinal view of what other scholars have said about organisational performance starting from the fifties to the twenty-first century.

This is due to the absence of a commonly agreed upon operational definition of organisational performance by the majority of scholars. According to Taouab and Issor (2019), in the first decade of the twentieth century the definition principally focused on the capabilities and the ability of the organisation to exploit the available resources to achieve the set objectives of the organisation.

SME performance, in the context of this study, follows the same argument. SMEs need to possess the necessary capabilities to exploit the necessary internal and external resources in order to effectively use the services provided by the QI to optimise their business.

2.5.1 The relationship between SME performance and QI

There is a positive relationship between QI and SME performance. For example, Siougle and Dimelis (2020) maintained that standards play an important role in the performance of firms, including SMEs.

The report from Siougle and Dimelis (2020) investigated factors that are important for improving the performance of ISO 9001 certified SMEs. Another report from Healy, O'Dwyer and Ledwith (2017) addressed the gaps in literature by exploring the product advantage activities in four manufacturing SMEs actively engaged in product development. The report argued that for SMEs, improving new product performance is critical in supporting SME survival and growth.

A different report from Sfakianaki et al. (2020) explored the association between ISO 9000 certification and business performance for SMEs enterprises in the food and beverage industry. The findings showed that certified companies in the food and beverage industry gain a number of internal and external benefits, including quality awareness, increased productivity, increased personnel participation and efficiency, improved image, and penetration into new markets.

2.6 THEORIES

The following sections provide a critical literature review on the relevant theories directly supporting the study. A justification of why theories are considered in the current study is provided.

2.6.1 Theories supporting the study

2.6.1.1 Resource Based View (RBV)

In the context of the Resource-Based View (RBV), a resource is considered a source of competitive advantage, provided the resource is able to add value to the firm, is unique and rare, and hard to imitate (Barney, 1991). Barney (1991) further argued that the resources in question should be Valuable, Rare, Inimitable, and Non-substitutable (VRIN). In other words, these resources need to be unique and difficult for a competitor to replicate.

The conceptual framework based on the RBV theory focuses on the relationship between strategy and resources within the organisation through the VRIN, which is a conceptual framework developed by Barney (1991). The VRIN framework is presented as follows:

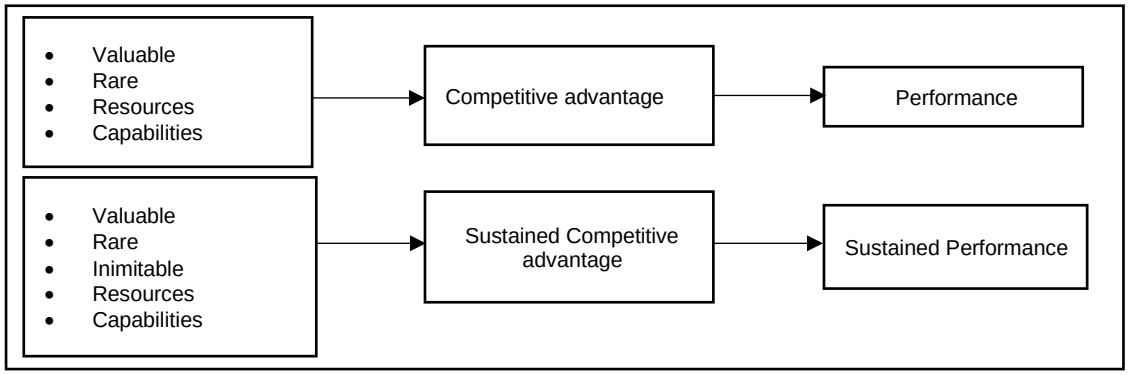

Figure 2-6: The VRIN Conceptual Framework of Barney

Source: *Barney (1991)*

Earlier reports have shown a positive relationship between SME performance and RBV. For example, the report from Wernerfelt (1984), indicated that in order to succeed, creating strategies should start with the development of organisational performance through the following: (1) establishing guidelines for using resources; (2) classifying resources; (3) showing the relationship balance between existing resources and the development of new resources; and (4) acquiring resources. This report was later supported by Crook, Ketchen, Combs and Todd (2008), who discovered that when the RBV process is implemented between strategy and operations, it is able to enhance organisational performance.

Latest reports appear to agree with the conclusions made by earlier reports in the context of the relationship between RBV and SME performance. Generally, there is a positive relationship between SME performance and RBV (Safari & Saleh, 2020; Ramon-Jeronimo, Florez-Lopez & Araujo-Pinzon, 2019; Lukovszki, Rideg & Sipos, 2020; Nurhilalia, Rahman, Mahlia, Jusni & Aditya, 2019; Ahmed, Khuwaja, Brohi, Othman & Bin, 2018).

Chumphong et al. (2020) confirm that the concept of RBV contributes to driving SME performance, thereby leading to competitive advantage. According to Kiyabo and Isaga (2020), competitive advantage from the RBV can mediate the relationship between entrepreneurial orientation and SMEs' performance for both

firm growth and personal wealth performance measures. The findings from this study imply that the resource-based view is suitable in describing not only physical resources, but also intangible resources such as entrepreneurial orientation.

The framework suggested by Barney (1991) needs to be value adding towards SMEs, in the sense that specific factors need to be identified to drive services and the capabilities of the QI key institutes towards SME performance. Rarity, on the other hand, would imply the availability of resources and how accessible they are towards SMEs. Lastly, an internal analysis of how the QI business operates and is structured needs to be considered for the success of SMEs and their performance.

2.6.1.2 Dynamic Capability

Dynamic Capability (DC) on the other hand, relates to the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (Surmeier, 2020). The resource-based view alone, according to Surmeier (2020), failed to adequately explain how firms change their resource base to remain competitive. Research on the Dynamic Capability theory addresses this gap and focuses on the processes that organisations can use to change and renew their resource base and create new opportunities.

Literature suggests the DC to comprise of four dimensions, namely, (1) sensing capability; (2) learning capability; (3) integrating capability; and (4) coordinating capability (Surmeier, 2020; Hernández-Linares, Kellermanns & López-Fernández, 2021). Sensing capability relates to the alignment of internal organisational factors with external environmental factors (Kump, Engelmann, Kessler & Schweiger, 2019). Learning capability, on the one hand, relates to the ability to acquire and assimilate knowledge (Thomas, Dorrington, Costa, Loudon, Francis & Fisher, 2017). In the case of Integrating capabilities, it is the ability to embed new knowledge into the new operational capabilities (Matarazzo, Penco, Profumo & Quaglia, 2021), whilst Coordinating capability is about the ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities (Hernández-Linares, Kellermanns & López-Fernández, 2021).

In the case of the current study, it is argued that the integration of all four dimensions is critical in the current study. Therefore, all four DC dimensions need to be considered by the SME sector. In other words, the SME sector needs to learn and become knowledgeable about the services provided by the QI, align their internal factors with the QI factors, and finally, embed the QI services into their operational capabilities.

2.6.2 Synopsis of other relevant theories

2.6.2.1 The National Standard Capability Framework

Choi, Hyun and Kang (2014) developed a framework with the objective to evaluate national capability for a standards system. The National Standard Capability Framework (NSCAF) drew its strength from total quality management (TQM) models as its theoretical basis.

Table 2-4: Categories in the NSCAF

Categories	Definitions
Laws, systems, and institutions	The nation should prepare laws and systems related to standards, establish related institutions, and secure budgets for standards and related laws and systems for each pillar. Institutions to implement laws and systems related to their size, and budgets.
Strategies and implementation plans	The nation should establish and implement strategies and implementation plans for developing national standards.
Stakeholders	The nation should clearly identify the stakeholders of national standards and their needs and then reflect these needs in standards.
Infrastructure	The nation should secure the infrastructure, including facilities, equipment, and information technology, and provide access to the infrastructure for all stakeholders.
Human resources	The nation should secure and manage human resources for national standards and create and operate mid- to long-term programmes for nurturing human resources.
Processes	The nation should establish and implement processes for the effective and efficient operation of a standards system.

Outcome	The nation should develop outcome indicators, set objectives, and manage them.

Source: *Adapted from Choi, Hyun, Hong and Kang (2014)*

The framework identified seven assessment categories that could be used to evaluate the national capability for a standard system. The seven categories include the following categories as indicated in Table 2.4. The final framework suggested by Choi et al. (2014) is depicted in Figure 2.7.

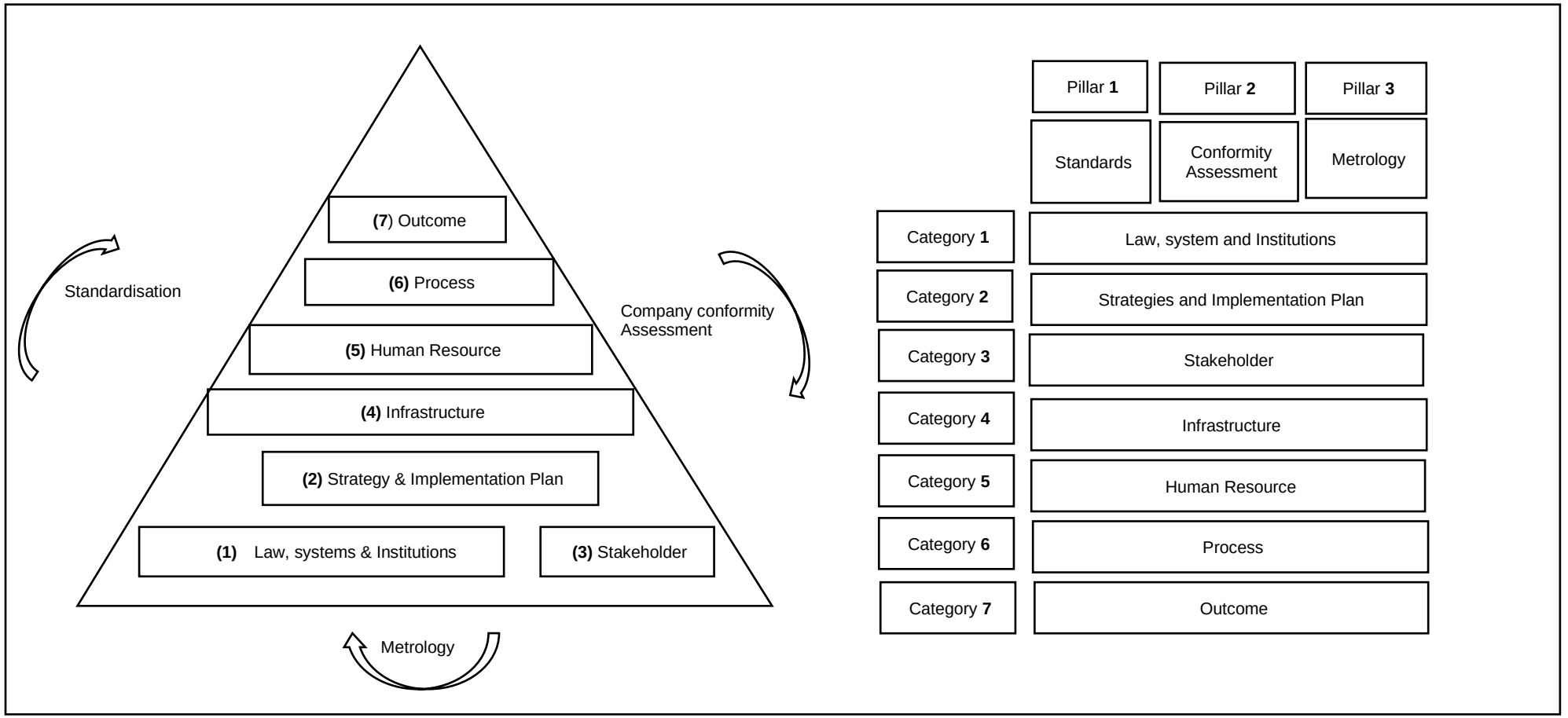

Figure 2-7: The concept of the National Standard Capability Framework

Source: *Adapted from Choi, Hyun and Kang (2014)*

The National Standard Capability Framework (NSCF), as shown in Figure 2.7, is not relevant to the objectives of the current study. The focus of the current study is on an appropriate framework that can be used for the application of the QI services by SMEs, while the NSCF is applicable to the entire national strategy in the context of its capability for standards. Although the NSCF achieved its objectives to evaluate national capability for a standards system, the study was without limitations. The study lacks an in-depth consideration of cases of one or multiple countries, taking into consideration an assessment in countries that have different population sizes, economies, import and export volumes and specific industries, such as SMEs. The NSCAF assessment could be further developed to be used for comparison purposes for countries not only in a horizontal study of a specific year, but also in a longitudinal study over several years.

2.6.2.2 The Business Excellence (BE) Model

According to Sternad et al. (2019), the most widely used Business Excellence (BE) models are specifically adapted to the needs of larger organisations. The European Foundation for Quality Management (EFQM) model, for example, was originally created by fourteen large firms in the late 1980s (Gomez-Lopez, Serrano-Bedia & Lopez-Fernandez, 2016). However, due to its holistic nature, the implementation of the EFQM model was found to be relatively complex and thus more difficult to manage for small businesses such as SMEs (Doeleman, Ten-Have & Ahaus, 2014). The Malcolm Baldrige Award, on the other hand, was dedicated to small businesses, but the framework is not specifically adapted to the needs of SMEs as the same guidelines apply for both large and small businesses (NIST, 2016).

Although there have been prior attempts to develop versions of BE models that are more attuned to the needs of SMEs, no widely used BE approach that is specifically adapted to the needs of SMEs has emerged yet (Sternad et al., 2019). During 2015 and 2016, several national partner organisations of the EFQM network started a new initiative to develop an SME-specific approach to BE, led by Quality Austria (Sternad et al., 2019). The SMEs that participated in the pilot study were used as a sample to explore the following research questions:

1) What are the motives for SME managers to consider adopting a BE approach in their companies?

2) What are the obstacles that SME managers see for adopting a BE approach in their companies?

Sternad et al. (2019) observed that even though there were attempts to improve the BE models to be suitable for SMEs, obstacles were encountered when introducing BE in SMEs. SMEs were found to be reluctant to take more encompassing quality management systems into consideration. Furthermore, the report from Sternad et al. (2019) identified the main obstacles for SMEs to adopt a BE approach as related to resource constraints, managerial and employee attitudes, and conceptual concerns.

2.6.2.3 Harmes - Liedtke theory

The study provided an overview of a QI framework from an international perspective, comparing the development and the performance of QI in a selection of 53 different nations worldwide (Harmes-Liedtke & Di Matteo, 2011). The QI was measured against the following variables; namely, Gross Domestic Product (GDP); Exports and Global Competitiveness; and Transparency. The results indicated positive correlations for all variables, supporting the expected relationship between QI development and economic performance indicators. The strength with regards to Harmes-Liedtke study is its ability to generalise the impact of the QI towards the economy based on the measured variables. However, the results from the study were not linked to small business or SMEs in particular. The model suggested by Harmes - Liedtke was without limitations since the pragmatic approach of using only freely available data made the results dependent on sometimes unsatisfactory data quality. In addition, relevant qualitative differences between identical quantitative data were not analysed in detail (Harmes-Liedtke & Di Matteo, 2011:5).

2.6.2.4 The four-pillar model proposed by Harmes-Liedtke

The model proposed by Harme-Liedtke (2010) includes and integrates different pillars within the model. As illustrated in Figure 2.8, the first pillar relates to efforts from a firm perspective. The report does not differentiate between the size of firms, and the assumption is that firms include large or small organisations. In the current study the focus was solely on the QI and SMEs and the scope did not include large organisations.

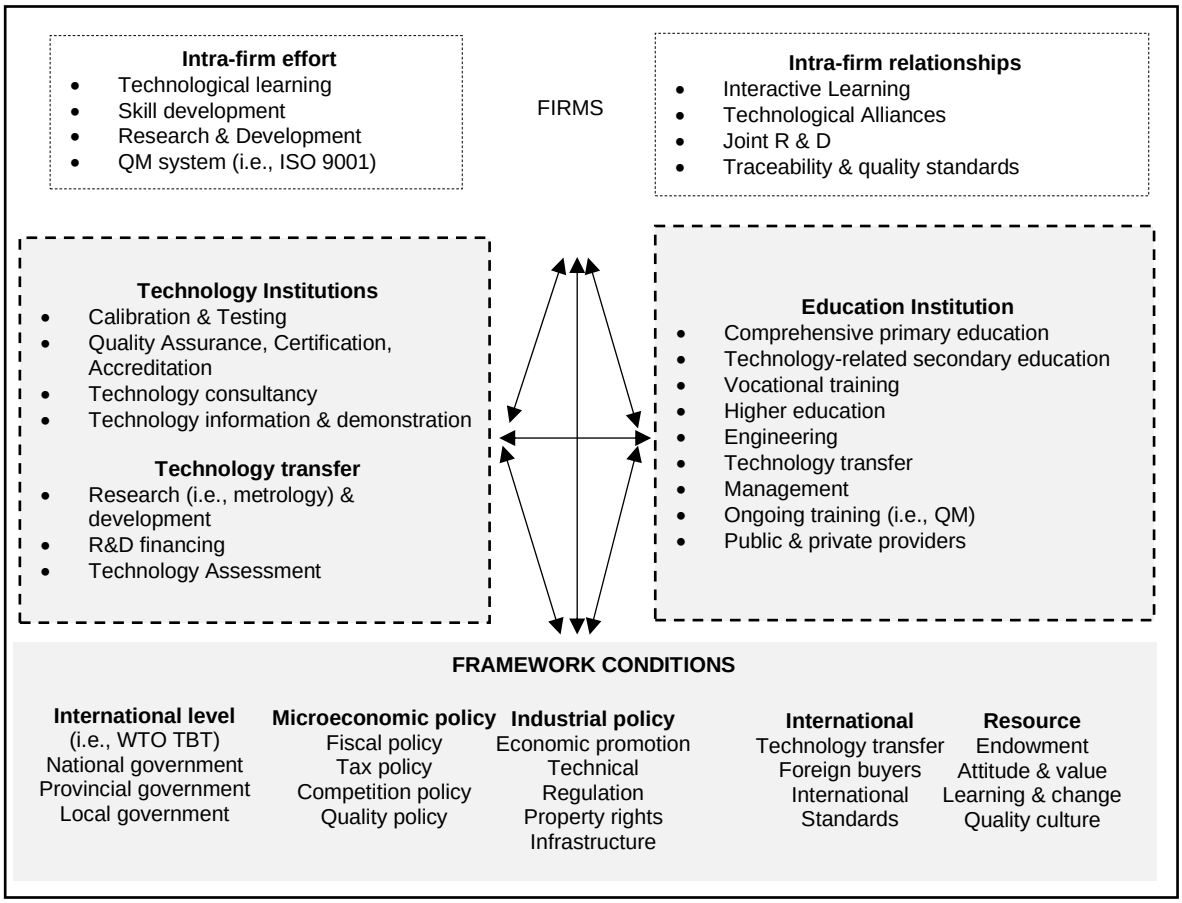

Figure 2-8: The four pillars model and the relevance of the QI

Source: *Harmes-Liedtke (2010)*

In Figure 2.8, the first pillar is the firm where a large part of innovation takes place. This area can be associated with the SMEs in the current study. The second pillar is established through the microeconomic, regulatory framework. The model suggests that the regulatory framework (second pillar) is vital because it establishes whether the firm will innovate or not. In South Africa, the National Regulator for compulsory specification (NRCS) represents the regulatory framework on behalf of the government to ensure health and safety as well as environmental protection. The third pillar comprises technology transfer institutions such as conformity assessment bodies (testing, calibration, inspection, verification). The fourth pillar is comprised of educational institutions, training institutions, or business associations.

Although the study achieved its objectives, the study was without limitations and theoretical gaps. The study focused on the system dynamics and leverage points to support innovation systems. In that sense, the identification of market failures could be

helpful to identify appropriate leverage points for system interventions. Furthermore, a better understanding of quality-driven innovation processes at the local and sectoral level would be helpful to contribute the creation of a national innovation system in developing countries from the bottom up.

Kellermann (2019) argued that the existence of QI elements within the model does not mean that these elements are already connected with each other. The task is to build bridges within bridges between each pillar to overcome fragmentations. Therefore, the proposed framework in the current study seeks to build such bridges as suggested by Kellermann (2019).

2.6.2.5 Huang, Xia, Zhang, Pan and Xi's theoretical model

Huang, Xia, Zhang, Pan and Xi (2020) proposed a theoretical model for the relevance of the QI with regard to the promotion of export quality as shown in Figure 2.9. The main contribution of this study is the model highlights the economic connections between QI and export product quality.

The model was intended to raise awareness for governments and enterprises about the significance of construction and utilisation of the QI for competitive advantages. Although the model included enterprises about the significance of using the services of the QI, the objective of the model was limited to export quality. In the current study, the objective is not limited to export, but looks beyond the achievement of exports. Further research can be conducted, based on data collected from different countries, regions, and periods, to explore if there is an improvement in the findings. Research in this topic can employ applicable statistical methods with a large sample to test the credibility of our findings.

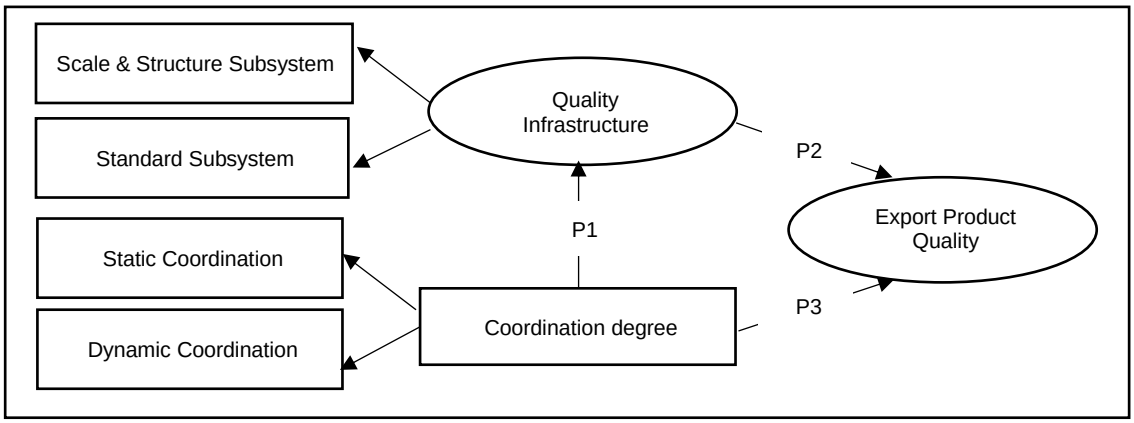

Figure 2-9: Theoretical framework of the relevance of NQI system and export quality

Source: *Huang, Xia, Zhang, Pan, and Xi (2020)*

2.7 JUSTIFICATION OF THE CONCEPTUAL FRAMEWORK

A conceptual framework assists researchers in planning their studies and provides a constant guide to keep investigations on track. Jonker and Pennink (2010) describe a conceptual framework as nothing more than an abstraction of the way the researcher chooses to perceive a specific part, function, property, or aspect of reality. According to Maxwell (2013), a conceptual framework is primarily a conception, or model, of what the research plan aims to study.

The conceptual framework for the current study was informed by a combination of: (1) factors or drivers that can encourage SMEs to use the services provided by the QI; (2) the QI framework with its key components which is linked to SME performance as discussed in chapter 2; (3) the resource-based view (RBV) which is able to drive and contribute to the performance of SMEs, as well as the dynamic capability which helps in stimulating the RBV to enhance the performance of SMEs and their competitive advantage. The conceptual framework for the current study is therefore illustrated in the following diagram, Figure 2.10.

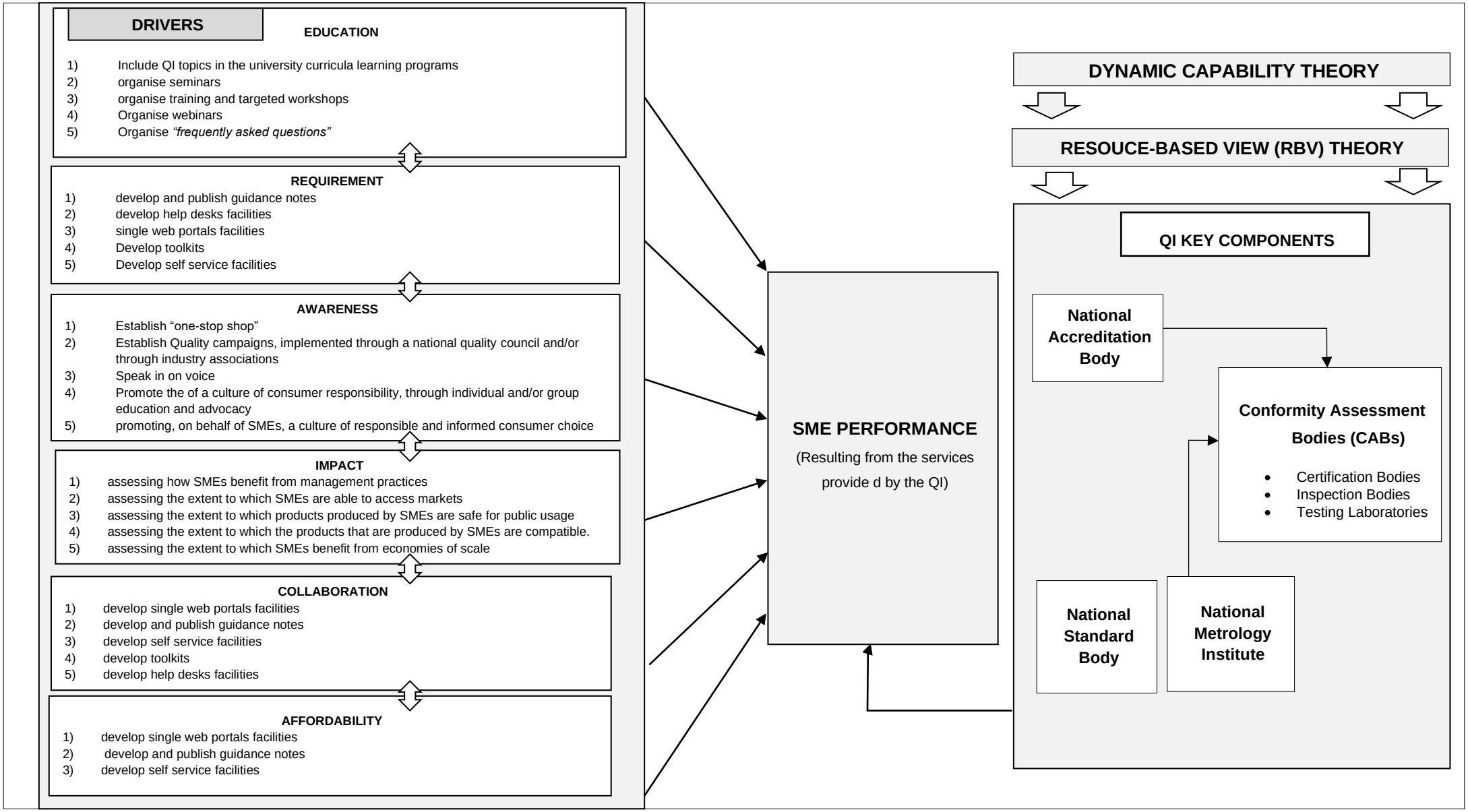

Figure 2-10: The Conceptual Framework

Source: *Researcher's own*

2.8 CHAPTER SUMMARY

In the current chapter, the literature review covers a significant amount of research that has been carried out about the application of Quality Infrastructure (QI) services by SMEs in order to optimise its business performance. The literature review mainly covered five areas.

The first area highlighted the definition of SME and the QI. The definitions were considered both from a global and a South African context. The second area discussed factors that can encourage SMEs to use services provided by the QI. The third area considered literature review on SME performance followed by the relationship between SME performance and the QI. The fourth area focused on theories supporting the study including other theories relevant to the study. The last section discussed justification for the conceptual framework for the current study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The previous chapter presented both the definition of SMEs and the QI. The chapter compared the QI from different countries, including South Africa. Furthermore, the chapter covered the benefits of the QI in the economy. Factors that can encourage SMEs to use the services provided by the QI were presented. After a discussion of SME performance, the chapter discussed the relevant theories underpinning the study and provided justification for the conceptual framework for the current study.

The current chapter builds on the work presented in the previous two chapters. The chapter focuses on five broad topics, which include the research philosophy, research design, ethical considerations, data collection, and data analysis. The method of data collection and data analysis from phase one (qualitative approach) and phase two (quantitative approach) are discussed in detail separately.

Firstly, the methodology on qualtitative research is considered, followed by quantitative research.

3.2 RESEARCH ONION

To ensure that all the relevant research methodologies are covered, the research onion, as shown in Figure 3.1, was used as a guide. Although the research onion provides a general guideline and framework, the structure in the current chapter did not necessarily follow the logic of the research onion from the outer layer to the inner layer. The emphasis is on how the research methodological ideas from literature were used to develop the current research plan and activities.

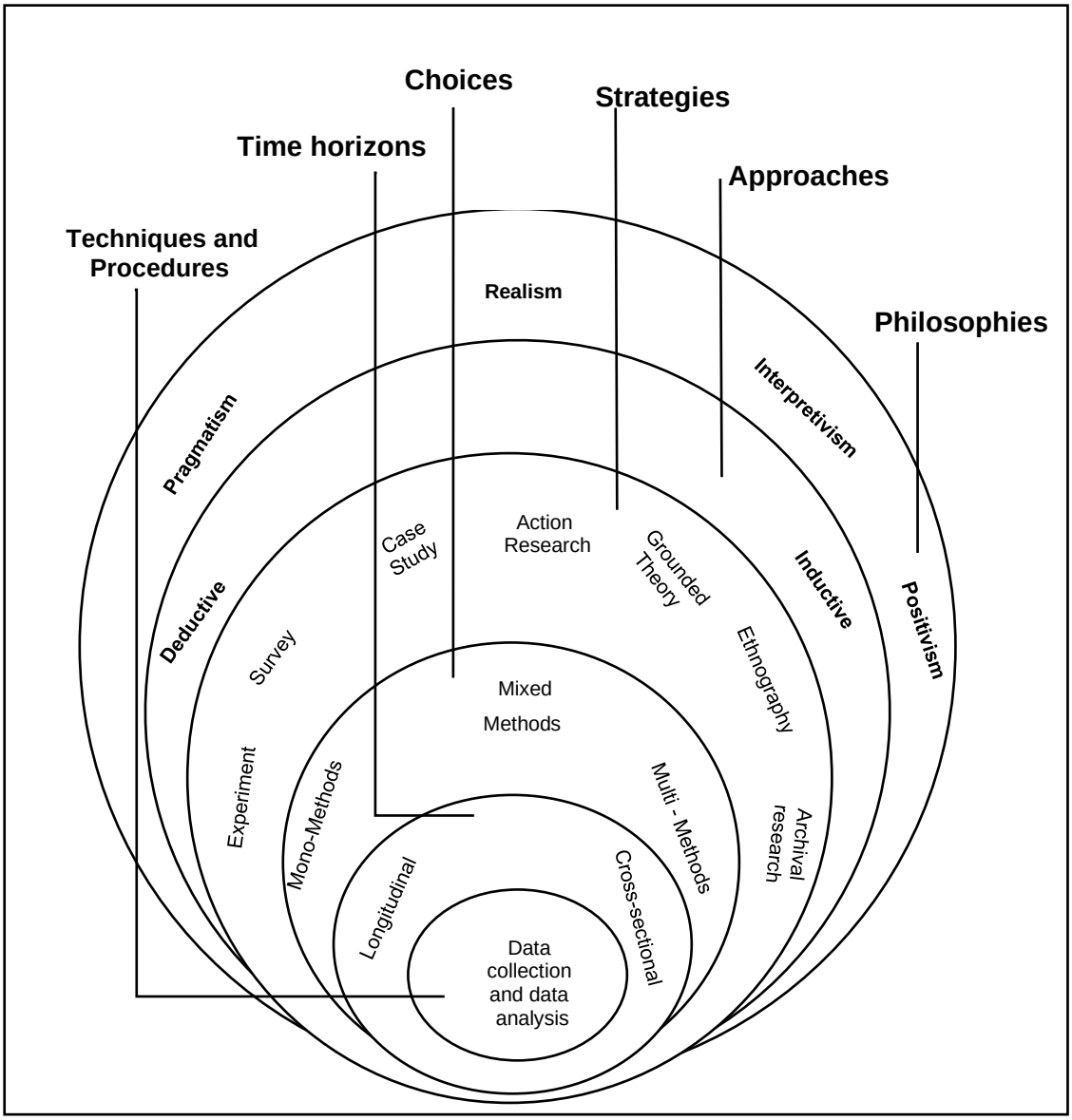

Figure 3-1: The research 'onion'

Source: *Saunders et al. (2009)*

3.3 Research philosophy

According to Creswell, Klassen, Plano Clark and Smith (2011), studies should consider a discussion on the philosophical assumptions or research paradigm as a point of departure during the research process. Table 3.1 provides a comparison of the four research philosophies in management research. This table provides a basis for the philosophical assumptions employed in the current. Section 3.3.1 provides context and reasons why this philosophical assumption was chosen.

Table 3-1: Comparison of four research philosophies in management research

	Positivism	Realism	Interpretivism	Pragmatism
Ontology The researcher's view of the nature of reality or being	External, objective, and independent of social actors	Is objective exists independently of human thoughts and beliefs or knowledge of their existence (realist), but is interpreted through social conditioning (critical realist)	Socially constructed, subjective, my change, multiple	External, multiple view chosen to best enable answering of research question
Epistemology The researcher's view regarding what constitutes acceptable knowledge	Only observable phenomena can provide credible data, facts. Focus on causality and law like generalisations, reducing phenomena to simplest elements	Observable phenomena provide credible data, facts. Insufficient data means inaccuracies in sensations (direct realism). Alternatively, phenomena create sensations which are open to Misinterpretation (critical realism). Focus on explaining within a context or contexts	Subjective meanings and social phenomena. Focus upon the details of situation, a reality behind these details, subjective meanings motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data

Source: *Saunders et al. (2009)*

3.3.1 Philosophical assumptions for the current study

Developing an appropriate framework that can be used for the application of the QI services by SMEs is a complex issue due to the different components involved. This suggests that it is possible to view this phenomenon as composed of multiple realities. Therefore, the development of this framework can be seen as having more than a single reality.

Based on this ontological position, it can be reasoned that both objective and subjective information and sources of knowledge are valid. That is, both qualitative and quantitative data are required to answer the research questions. Given these perspectives, a pragmatic philosophical assumption is appropriate for the current study.

3.4 RESEARCH DESIGN

A research design is a blueprint or overall plan for the research (Saunders, Lewis & Thornhill, 2009; Bryman & Bell, 2015). The choice of a research design for the current study was a sequential multi-method approach which includes qualitative, followed by quantitative research. An exploratory research design (face-to-face interviews) was employed during phase one (qualitative) followed by a survey design in phase two (Quantitative). Firstly, this type of research design was chosen because of its ability to answer the research questions. Secondly, due to the lack of a suitable questionnaire to be adopted or adapted, it was considered appropriate to start by generating data through interviews and the focus group, and then analysing the data in order to develop a questionnaire to be applied during quantitative research.

There are three principal ways of conducting exploratory research; namely, a search of the literature, interviewing experts in the subject matter, and by conducting focus group interviews (Saunders et al., 2009:140). This approach was appropriate for phase one (qualitative research) in the current study. A survey design on the other hand, in the opinion of Ali and Olaintain (2000), is a type of research design that studies large or small populations by selecting and analysing a sample of data collected from a group through the use of questionnaire,

telephone, or interviews. This approach was appropriate for phase two (quantitative research) of the current study since data in phase two was collected through the use of a questionnaire from a large population of SMEs in South Africa. An overview of the research design for the current study is depicted in Figure 3.2, and the details are discussed in the following sections.

During phase one, after identification of the qualitative sample, whereby ten (10) QI experts were identified for the face-to-face interviews, ethical clearance was obtained. Ethical clearance was obtained subsequent to the application that was reviewed in compliance with the UNISA policy on Research Ethics by the School of Business Leadership (SBL) Research Ethics Review Committee (Refer to Appendix A for the ethics approval certificate). Following ethical clearance, interviews commenced, and eight QI experts were interviewed after saturation was reached. The interview process was followed by two sessions of focus groups in order to validate the themes identified from the interviews. Thematic analysis was used to identify themes from both the interviews and the focus groups, and five themes were identified after thematic analysis. The use of a thematic analysis approach provides a highly flexible approach that can be modified for the needs of many studies, providing a rich and detailed, yet complex account of data (Braun & Clarke, 2006; King, 2004).

A debrief session was arranged as an external validation technique for establishing credibility of the results. The sixth theme, namely “impact” was identified during the debrief session. A questionnaire was designed, comprised of six themes identified from the interviews and focus groups. A seven-point Likert scale, because of its ability to be more reliable as compared to a five-point scale or lower scales (Russo, Giuseppe Maria, Patricia Amelia Tomei, Bernardo Serra, & Sylvia Mello, 2021), and 30 items were used as part of the questionnaire.

Before the questionnaire was administered to the SME representatives and their associations, a pilot study was undertaken as a means to determine the feasibility of the measurement instruments. After the pilot study, a second ethical clearance was obtained from the SBL Research Ethics Review Committee (Refer to Appendix A). Following the second ethical clearance, phase 2 commenced (quantitative research). After quantitative data collection, data analysis was done with the help

of a professional statistician. Results from data analysis were interpreted by the researcher and presented in the form of descriptive and inferential statistics. During data analysis, exploratory factor analysis was done to determine the measurement model, followed by confirmatory factor analysis as a means to determine the relationships between observed measures or items and the latent variables or factors.

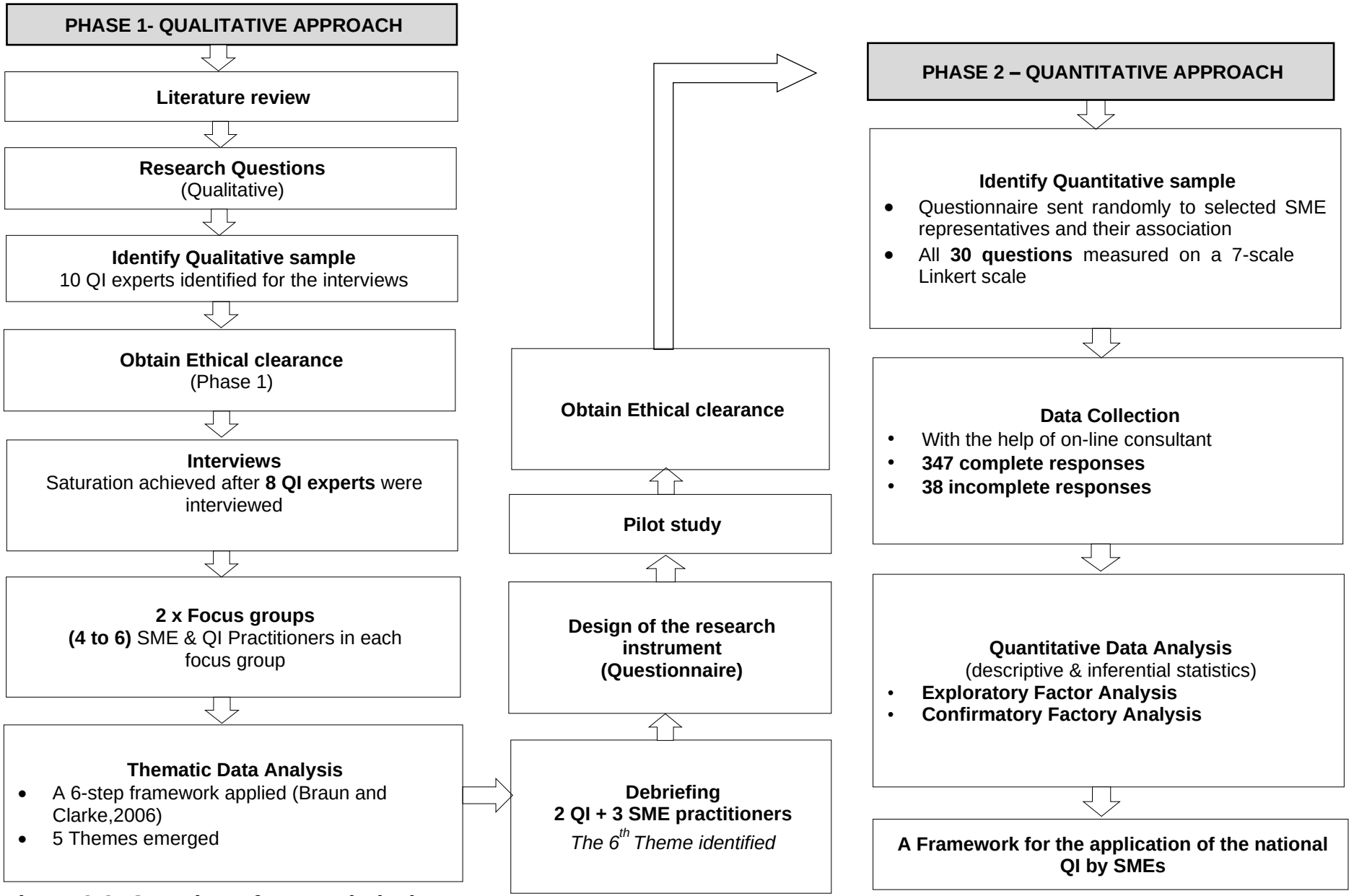

Figure 3-2: Overview of research design

Source: *Researcher's own*

3.5 RESEARCH CHOICE

The research choice for the current study is a multi-method approach. The approach includes a qualitative approach during phase one, followed by a quantitative approach in phase two. Several authors have drawn a distinction between a qualitative and quantitative approach (Bryman, 1988; Easterby-Smith, Thorpe & Jackson, 2008). The difference between qualitative and quantitative research is summarised in the following table:

Table 3-2: Difference between quantitative and qualitative data

Quantitative data	Qualitative data
Based on meanings derived from numbers	Based on meanings expressed through words
Collection results in numerical and standardised data	Collection results in non-standardised data requiring classification into categories
Analysis conducted through the use of diagrams and statistics	Analysis conducted through the use of conceptualisation

Sources: *Dey (1993)*

3.6 RATIONALE – RESEARCH APPROACH AND DESIGN

The research approach is generally divided into deductive, inductive, and abductive approaches (Reichertz, 2013). A deductive analytical approach is theory based, where the researcher seeks to use existing theory to shape the approach the researcher adopts for the qualitative research process and aspects of data analysis. An inductive approach is one whereby the researcher seeks to build up a theory that is adequately grounded in a number of relevant cases (Saunders et al., 2009).

In the current study, an abductive approach was considered appropriate and therefore employed. This type of approach enables the researcher to find the middle ground between inductive and deductive methods (Coffey & Atkinson, 1996). An abductive approach originates from a pragmatic philosophical assumption (Peirce, 1974).

In the case of the research design, the rationale for choosing this type of research design is based on the premise that there were no suitable theories for the researcher to adopt or adapt during the qualitative research process. As a result, it

was appropriate to start by generating data through interviews and the focus group, and analysing and reflecting upon what theoretical themes the data suggested in order to develop a questionnaire to be applied in phase two.

3.7 QUALITATIVE RESEARCH – PHASE ONE

3.7.1 Unit of analysis

The unit of analysis refers to the entity that is being examined and ultimately analysed to provide a conclusion that explains the outcome and addresses the research problem (Casteel & Bridier, 2021). During qualitative research, the unit of analysis was QI experts.

3.7.2 Target population

The population of interest for a particular study is comprised of the individuals, groups, organisations, or other entities one seeks to understand and to whom, or to which the study results may be generalised or transferred (Casteel & Bridier, 2021). In the current study, the population during phase one were all QI experts in South Africa who complied with the inclusion criteria as stated in section 3.8.4.

3.7.3 Inclusion and exclusion criteria

The inclusion criteria for QI experts included the following: (1) at least 10 years' experience in the Quality Infrastructure field; (2) working or have worked for one of the key institutes of the Quality Infrastructure, or working in collaboration with the QI key institutions namely, standard body, metrology institution, accreditation body or the National Regulator; and (3) sufficient international experience within the QI system.

The exclusion criterion for participants (QI experts) was that participants who met the criteria as stipulated in the inclusion criteria above, but who had not been active in the field for more than 2 years, were excluded.

Inclusion criteria for the focus groups was QI experts with at least 5 years' experience in the QI or SME sector, or who had worked for these number of years in collaboration with the QI institutions. The exclusion criterion was that participants

who met the criteria as stipulated in the inclusion criteria, but who had not been active in the field for more than 2 years were excluded.

3.7.4 Sampling strategy

Purposive sampling was chosen during qualitative approach. In this case the researcher's knowledge about the participants was used to handpick participants who are knowledgeable about the topic under study (Polit & Beck, 2004; Etikan, Musa & Alkassim, 2016).

3.7.4.1 Sample size

According to Saunders et al. (2009), a sample size for a qualitative study is ambiguous, and therefore no rules are involved. Therefore, the strategic approach to the sample size is to collect data until the themes or categories are saturated (Saunders et al., 2009; Creswell, 2014).

Deciding the number of participants for the sample in this qualitative research, was based on the recommendation provided by Casteel and Bridier (2021) as illustrated in Table 3.3.

Table 3-3: Recommended a priori sample size for qualitative research designs

Research design	Recommended a priori sample size	References
Descriptive	10 – 20	Kim & Sefcik (2017); Lincoln & Guba (1985)
Case study	12 – 15	Creswell (2013); Yin (2014)
Phenomenology	3 – 10	Sim, Saunders, Waterfield & Kingstone (2018)
Ethnography	20 – 30	Bernard (2013)
Narrative	2 – 3	Creswell (2013)
Grounded theory	20 – 30	Charmaz (2014); Creswell (2013)

Source: *Casteel and Bridier (2021)*

Because of the phenomenological nature of the current study, a sample size of up to ten QI experts was chosen, as recommended by Casteel and Bridier (2021) in Table 3.3. However, as the interviews progressed, eight QI experts were finally interviewed, as saturation was reached during the eighth interview.

3.7.5 Data collection

Qualitative research methods are developed in the social sciences to enable researchers to study social and cultural phenomena (Polit & Beck, 2004; Etikan, Musa & Alkassim, 2016). Denzin and Lincoln (2000) described qualitative research as the method that emphasise the qualities of organisations, meaning, and processes that are not examined or measured in terms of quantity, intensity, amount, or frequency. In other words, qualitative researchers often emphasise the socially constructed nature of reality, the relationship between the researcher and what is studied, and the situational constraints that shape the phenomenon of inquiry.

In the current study, qualitative research was applied during phase one and non-numerical data was collected through interviews and focus groups. Qualitative research was carried out mainly to assist with the identification of relevant themes that were used to design a questionnaire during phase two.

3.7.5.1 Data collection instrument

Semi-structured interviews were used for data collection during phase one. (Polit & Beck, 2004; Saunders et al., 2009; Etikan, Musa & Alkassim, 2016), describe semi-structured interviews as interviews in which the researcher prepares the questions in advance that need to be asked during the interview to ensure that specific topics are covered. The advantage of this type of interview is that the researcher not only gains information from what is said in response to questions, but gives respondents the freedom to respond in their own words and provide as much detail as they wish (Polit & Beck, 2004:342).

3.7.5.2 The interview guide

Details of the interview guide are provided in Appendix C. The first part of the interview guide sought to understand the general background from participants with respect to the industry sector they have been involved in and the number of years they have spent within the SME sector. The second part sought to understand the experiences of the QI experts with regard to the application of the QI services by SMEs. The last part solicited information from QI experts with regard to factors that can encourage SMEs to use the services provided by the QI. A general question was included whereby QI experts could provide their view regarding ways to improve how the QI can be applied in SMEs in South Africa.

The interview research guide was designed in such a way that “questions are sufficiently detailed to convince evaluators that no harm will befall research participants yet open enough to allow enough information to emerge during the interview” (Charmaz, 2014). It was important for the researcher to prepare the interview guide in advance. A well-planned protocol increases reliability (Yin, 2018). The following questioning approach was applied during the interview process.

- **Orienting Questions**

A few minutes of cooling period was provided to help put the participant at ease. This included showing interest in what is being shared, conveying that there are no expectations about how to answer the interview questions, showing respect for the participant’s role, and making sure that the interviewee feels that the questions are natural, rather than an interrogation (Rubin & Rubin, 2012).

- **Main Question(s)**

The main question in the interview guide was stated broadly, allowing participants to answer the questions freely and convey their experiences that they feel are important to them (Rubin & Rubin, 2012).

- **Follow up and probing Questions.**

It was important for the researcher to conduct follow up questions. Developing an interview guide that includes potential follow-up questions facilitates sharing, and helps novice researchers stay on track (Yin, 2018). In addition to follow-up questions,

probing questions were planned as part of the interview strategy. Probing questions, according to Rubin and Rubin (2012), help the researcher manage the flow of the interview, and keep the interviewee engaged in the interview process as well as on the topic.

3.7.5.3 Focus groups

Two focus group sessions were arranged subsequent to the interviews in order to validate the themes that were identified from the interviews. This type of strategy is considered as personal triangulation. Polit and Beck (2004:431) define person triangulation as a way of collecting data from different levels of persons with the aim of validating data through multiple perspectives on the same phenomenon. According to Saunders et al. (2009), a focus group discussion is a technique for obtaining qualitative information from a group of people. The aim is to gain a broad range of views on the research topic over a period of sixty to ninety minutes from a purposeful selected six to eight participants (Creswell, 2014).

Krueger (1988) maintains that focus groups should reasonably be homogeneous and unfamiliar with each other. The focus group discussion guide (Appendix D) was structured as follows:

- The first section included welcoming remarks and introduction of the research topic to the participants.
- In the second section the facilitator explained issues related to anonymity, confidentiality, and setting the ground rules.
- The third section included warm up questions whereby the facilitator provided the participants with the opportunity to introduce themselves.
- The fourth question provided participants with the opportunity to explain their individual experiences with regard to the application of the QI service by SMEs.
- In the fifth section guiding questions were asked whereby participant insights were gauged in the form of open-ended questions.
- In the sixth section the facilitator provided the participants with the opportunity to provide their concluding statements.

- In the last section the facilitator presented concluding and closing statements. Hennink (2013:68) suggested that it is good practice to pilot-test the discussion guide, because it can be difficult to predict how participants will interpret the research questions. Prior to the actual focus group discussion, the discussion guide was piloted by asking the discussion questions to a group of participants with similar characteristics.

After the pilot test, the questions, the moderator experience, and the overall structure of the discussion guide was reviewed to ensure that these are clear, logical, that the language is appropriate, there are no repetition of questions, and that they are understood by every participant,. The following questions were asked during the focus group pilot testing:

- Was enough information provided in the introduction to the group discussion?
- Were all the questions understood?
- Do any of the questions need to be re-worded?
- Is the structure of the discussion appropriate?
- Does the order of the topics need to change?
- Will the information assist to answer the research questions?
- Is the discussion guide appropriate in terms of its length and time proposed?

- **Online focus groups**

Due to the unprecedented COVID-19 pandemic, the focus group sessions were arranged online using Microsoft Teams. The use of the internet replaced real in-person meetings. However, this provided a chance to select participants for the topic. A virtual platform is convenient for participants to participate from the comfort of their own homes or surroundings. Therefore, most of the participants were willing to take part in the study. Finally, the complete session of focus group discussions can be recorded and documented easily when using (Gundumogula, 2020).

- **Moderator – focus groups**

The moderator facilitated the interaction within the focus group with a set of planned open-ended questions. The moderator planned the opening remarks, questioning sequence and physical setting effectively to make the focus group discussion successful. The level of moderator's participation or involvement varies at different stages of focus groups. At some stages it was extreme low, high, extreme high, depending on the intensity of discussion.

The moderator's involvement was dependant on the course of the discussion, whether it relates to or deviates from the topic of research. It was important that the moderator acts in a balanced way according to the situation (Gundumogula, 2020).

- **Participants during focus groups**

The two focus groups were comprised of QI and SME practitioners, mainly from the following institutions: SANAS, NMISA, SABS and from the SME sector. It was important that each participant participate fully during the discussion and was comfortable speaking with the others (Morgan, 1988). Selection of focus group participants was considered carefully to avoid the possibility of biases (Gundumogula, 2020).

3.7.6 Data analysis

A thematic analysis approach was followed during data analysis for qualitative research (phase one). This type of data analysis entails searching across a data set to identify, analyse, and report repeated patterns (Braun & Clarke, 2006). According to Kiger and Varpio (2020), a distinguishing feature of thematic analysis is its flexibility to be used within a wide range of theoretical and epistemological frameworks, and to be applied to a wide range of study questions, designs, and sample sizes.

3.7.6.1 Thematic Analysis Approach

The following six-step approach adopted from Braun and Clarke (2006) was followed to perform qualitative data analysis:

Step 1: Familiarising yourself with the data.

The first step during the analysis process was to become familiar with the entire data set. To ensure that the researcher was familiar with the data and to gain a comprehensive understanding of the content of data prior to the actual abstraction and interpretation, it was vital to listen to the voice recordings and read through the transcripts to ensure all the information was accurately captured by the transcriber.

Kiger and Varpio (2020) contended that while it can be tempting to begin coding data and searching for themes immediately, familiarising oneself with the entirety of the data set first, will provide a valuable orientation to the raw data, and is foundational for all subsequent steps.

Step 2: Generating codes.

After becoming familiar with the data, the researcher began taking notes, connecting between data items, and other preliminary ideas. During this process, the researcher started generating initial codes. A code in qualitative inquiry is a word or short phrase that symbolises a summative for a portion of language-based or visual data (Saldana, 2009:3).

Step 3: Searching for themes.

The third step involved an examination of the coded and collated data extracts to look for potential themes. The process of theme identification is fundamentally an active and interpretive process. Themes do not simply emerge from the data (Varpio, Ajjawi, Monrouxe, O'Brien & Rees (2017), instead, they are constructed by the researcher through analysing and comparing codes. At the end of this stage, the researcher was able to produce a thematic map that collates codes and data items relative to their respective themes (Braun and Clarke, 2006).

Step 4: Reviewing themes.

During the review of themes, the researcher was looking for the coded data placed within each theme to ensure a proper fit. The following questions were asked to assist in the review of themes: Does each theme adequately support the data? Are the data included coherent in supporting that theme? Does the data within each

theme have adequate commonality and coherence? At this point, data extracts were re-sorted, and themes modified, where necessary, to better reflect and capture coded data. Themes can be added, combined, divided, or even discarded.

Step 5: Defining and naming themes

During this phase, the researcher was tasked with presenting a detailed analysis of the thematic framework. Each individual theme was expressed in relation to both the dataset and the research question(s), as was each sub-theme.

Step 6: Producing the report/manuscript.

A detailed analysis of the results was written in the form of a report as described in Chapter 4. All the six steps suggested by Braun and Clarke (2006) were considered during the analysis of qualitative data.

3.8 QUANTITATIVE RESEARCH – PHASE TWO

3.8.1 Unit of analysis

The unit of analysis during phase two were SME associations and their representatives.

3.8.2 Target population

The targeted population during phase two (quantitative research) was comprised of the following: Associations representing SMEs from various SME sectors, with a total population of 628; SMEs from the Consulting Engineering South Africa (CESA) with a total population of 907; and SMEs from the South African Medical Technology Industry Association (SAMED), with a total population of 203. The total targeted population for phase two was therefore 628 + 907 + 203 = 1,738.

3.8.3 Inclusion and exclusion criteria

The inclusion criteria during phase two, was established as follows:

- At least 2 years' experience working within the SME sector.
- Participants must be working for SMEs registered with the Companies and Intellectual Commission (CIPC) of South Africa.

The exclusion criteria are participants who meet the criteria as described above, but who have not been active in the field for more than 2 years. These participants were excluded.

3.8.4 Sampling Strategy

3.8.4.1 Sampling Size

Table 3.4 presents a summary of the sample based on the 9 provinces in South Africa. Although the sample is representative of the South African context, most of the SMEs were from Gauteng, followed by Western Cape and Kwa-Zulu Natal.

Table 3-4: Summary of sampling as per geographical setting

Province	Targeted sample	Actual response
Gauteng	264	Total = 346
Western Province	233	
Kwa-Zulu Natal	76	
Limpopo	33	
Free State	33	
Eastern Cape	39	
Northwest	3	
Mpumalanga	4	
Northern Cape	0	
	Total = 646	

Source: *Researcher's own*

Gay, Mills and Airasian (2012:139) provide the following guidelines when selecting a sample:

For a smaller population N= 100 or fewer, sample the entire population:

- For a population size around 500 50% should be sampled;
- For a population size around 1,500, 20% should be sampled; and

- Beyond a certain point (about N=5,000), sampling becomes irrelevant and a sample size of 400 can be deemed adequate.

In this study, the researcher considered a sample size of 646 based on the study population of 1738, which is approximately 37% of the sample. According to Gay et al. (2012), this deemed acceptable.

3.8.5 Data Collection

3.8.5.1 Measurement instrument

A questionnaire was used during data collection in phase 2. A questionnaire is a method of gathering self-report information from respondents through self-administration of questions in a written format. Researchers can use either closed-ended (structured) or open-ended (unstructured) questionnaires to obtain the data relevant to the research study (Saunders et al., 2009). A structured questionnaire does not allow respondents to provide different options for each question. The respondent is simply required to select and mark the applicable answer (Babbie, 2010). Conversely, unstructured questionnaires allow respondents to answer the open-ended questions in their own words (Sudman & Blair, 1998). In the current study, semi-structured interviews were used. Cooper and Schindler (2014) maintain that in semi-structured interviews, respondents are encouraged to provide as much information as possible.

3.8.5.2 Questionnaire construction

The methodology used to design a measurement instrument or questionnaire is described in the guidelines by De Vellis (2003) in the following steps:

1) Determine clearly what must be measured.
2) Generate items.
3) Determine the format for measurement.
4) Have initial items reviewed by experts and pilot test the instrument.
5) Administer the questionnaire.

- **Determine what must be measured**

Parameters of what to measure was established through the literature review and an analysis of data generated during the interviews and the focus group. Based on the interviews and the focus group, the following six themes were identified (1) education (2) requirement (3) awareness (4) impact (5) collaboration and (6) awareness.

- **Generate items**

Appropriate items were constructed and selected from different literature resources. 30 items were originally included in the questionnaire and each of the six-construct had five items.

- **Determine the scaling of questions**

A seven-point Likert scale was used where 1 = strongly disagree, while 7 = strongly disagree. A seven-point Likert scale was selected because of its ability to be more reliable as compared to five-point scale or lower scales (Russo, Giuseppe Maria, Patricia Amelia Tomei, Bernardo Serra, & Sylvia Mello, 2021).

- **Have initial items reviewed by an expert**

During this stage, the supervisor closely reviewed the questionnaire and the relevance of each item. The feedback from the supervisor assisted the researcher in refining the survey questionnaire in order to improve the quality and content of the questionnaire. For example, the supervisor suggested the inclusion of a section explaining the definition of the Small and Medium-Sized Enterprises, (SMEs) as well as the definition of the Quality Infrastructure in the context of South Africa. In the end, the definitions of the key concepts were included in the questionnaire to provide more clarity to respondents.

3.8.5.3 Pilot testing

Leedy and Ormrod (2015) define a pilot study as a brief exploration to determine the feasibility of measurement instruments to be used in a more exhaustive, follow up research study. In the current study, the pilot study was based on recommendations from Saunders, Lewis and Thornhill (2016). Saunders et al. (2016), for example, suggest considering the following questions during pilot studies: how long the

questionnaire took to complete, the clarity of instructions, whether the respondents felt uneasy to answer certain questions, whether all questions were clear and unambiguous and whether there were any major omissions.

The questionnaire was randomly distributed to 30 possible SMEs in South Africa who were not sampled for the main study. The respondents were asked to complete the questionnaire and then to provide their comments on the clarity and content of the questionnaire. A total of 17 completed questionnaires were returned and checked to see whether they had been completed appropriately. The results from the questionnaire indicated that all parts of the questionnaire were completed satisfactorily. The majority of the respondents specified that the questionnaire was clearly structured, not ambiguous, and did not contain irrelevant ideas.

3.8.5.4 Administering the questionnaire

A questionnaire was distributed electronically through the help of an external consultant after being loaded into the electronic survey tool. The use of the electronic survey tool was managed by the external consultant and ensured impartiality and integrity of data. The respondents submitted the completed questionnaire directly to the external consultant.

3.8.6 Data Analysis

Gravetter and Wallnau (2017) describe descriptive statistics as statistical procedures used to summarise, organise, and simplify data, whereby data is presented in numerical and graphical forms. Graphical techniques usually present data in a way that allows the reader to extract information, while numerical techniques make use of summary statistics (Keller, 2018).

In the case of the current study, descriptive statistics were computed for the demographic information and for all the scale items in the questionnaire, and presented in the form of frequencies, proportions, means and standard deviations, and coefficients of variation for numerical data. Inferential statistics, on the other hand, were used as a method to reach conclusions or inferences regarding characteristics of a population based on the sampled data (Keller, 2018).

In this study, the software program, Statistical Package for the Social Sciences (SPSS), was used to present data for data analysis. The following statistical techniques were used in this research: factor analysis was used to extract the most relevant and significant factors, Cronbach's alpha was used for the evaluation of internal reliability of the research instrument, skewness and kurtosis tests were used for the evaluation of the normal distribution of data, and confirmatory factor analysis (CFA) was used to verify the factor structure of a set of observed variables.

3.9 VALIDITY: DATA GATHERING INSTRUMENT (QUESTIONNAIRE)

During quantitative research (phase 2), a questionnaire was used for the collection of data as part of the research design. Internal validity is the ability of the questionnaire to measure what it intends to measure (Saunders et al., 2009).

3.9.1 Content validity

Content validity is the extent to which the measurement questions adequately cover the investigative questions (Saunders et al., 2009). For the purpose of the current study, content validity was managed by ensuring that the researcher and the supervisor discussed the questions. Furthermore, a pilot study was arranged before the questionnaire was administered to participants.

According to Saunders et al. (2009), pilot testing ensures that there is refinement to the questionnaire so that respondents do not encounter any problems in answering the questions, and there are no problems in recording the data. Furthermore, pilot testing enables the researcher to obtain some assessment of the questions' validity of the data collected. Preliminary analysis using the pilot test ensures that the questions are answered correctly.

3.9.2 Construct validity

Construct validity relates to the extent in which the questionnaire measures the constructs that are intended to be measured (Saunders et al., 2009; Leedy & Ormrod, 2005). In the current study, construct validity was confirmed through exploratory factor analysis and from literature.

3.9.3 Criterion validity

According to Polit and Beck (2004:715), criterion validity is concerned about the degree to which scores on an instrument are correlated with some external criterion. During the current study, criterion validity was achieved through statistical correlation whereby assessment of the data from the questionnaire was compared with that specified in the criterion.

3.9.4 Internal validity during the research design

In order to enhance the internal validity of the research design, the researcher ensured that the research design, as described from sections 3.3. to 3.5, was followed, and control mechanisms were considered.

The researcher ensured that bias was detected and controlled as the research design was followed and implemented. Measures, such as the correct sampling strategy and receiving a reasonable response rate in accordance to the research design strategy, was taken into account to ensure that internal validity related to the research design was maintained.

3.9.5 External validity during the research design

According to Saunders et al. (2009), external validity relates to the extent to which the research results from a particular study are generalisable to all relevant contexts. There are several aspects of the research design that may affect the research validity from an external context. Table 3.5 identifies the type of threats, the description of the threats, and the actions taken to minimise or reduce the threats.

Table 3-5: External validity

Type of threat	Description of threat	Response and actions taken by the researcher
Expectancy effects	Participants may behave in a particular manner largely because they are aware of their participation. If a certain type of behaviour is elicited the participants may influence the results and the final results may not be generalised	Participants were randomly selected. Therefore, participants did not know in advance if they were selected since the selection was purposeful
Novelty effects	When there is a new system or innovation in place, participants might alter their behaviour in various ways. Participants maybe enthusiastic or equally sceptical about the new system or innovation. Results may reflect reflection to the novelty rather than the intrinsic nature of the intervention. Once the innovation becomes familiar results may be different.	The introduction of the QI system was not going to influence the results since the QI system was not a completely new system to QI experts during the interviews.
Measurement effects	The results may not be applicable to a group of respondents who were not exposed to the same data collection	The researcher made sure that there was a representative selection of participants from different SMEs.

Source: *Adapted from Polit and Beck (2004)*

3.10 RELIABILITY

According to Hair, Black, Babin and Anderson (2014), reliability is the extent to which a variable is consistent in what it is intended to measure. Leedy and Ormrod (2015) defined reliability as the extent to which a measurement instrument yields consistent information about the characteristic being measured.

Hair et al. (2014) maintained that reliability is a measure of internal consistency and the inter-correlatedness of scale items. If a number of scale items measure the same construct, it is expected that all those scale items would be correlated with each other. Thus, a low measure of correlation indicates low internal consistency within the scale items. In such instances, the scale items may need to be investigated for errors. In quantitative research, internal reliability is concerned with whether all study variables are measuring the same thing (Salkind, 2018).

The internal consistency in the current study was assessed by Cronbach's coefficient alpha (α). Cronbach's alpha was used to measure the reliability, that is, the internal consistency of each dimension. According to Bryman and Bell (2015), Cronbach's alpha is a commonly used method for internal reliability. A 'high' value of alpha is often used (along with substantive arguments and possibly other statistical measures) as evidence that the items measure an underlying (or latent) construct. The guidelines provided by Ellis (2017) were used to determine the level of reliability where the rules of thumb were that if the reliability coefficient was > 0.65, it was regarded as acceptable, and values above 0.70 were regarded as more than adequate.

3.11 TRUSTWORTHINESS AND AUTHENTICITY (QUALITATIVE RESEARCH)

According to Polit and Beck (2004), the following four criteria have been proposed for establishing trustworthiness of qualitative data, namely: Credibility, dependability, conformability, transferability. Authenticity will also be discussed by the researcher as part of establishing trustworthiness. According to Strang (2015), honest and fair viewpoints from the participants imply authenticity of the finding of the study. The following sections discuss the five criteria and measures that were taken by the researcher to ensure trustworthiness of qualitative data:

3.11.1 Credibility

Polik and Beck (2004) define credibility as confidence in the truth of the findings. The researcher has spent enough time learning about the quality infrastructure and the behaviour and characteristics of SMEs in South Africa. Furthermore, the researcher has spent a reasonable length of time talking to experts, both within the QI and SMEs, fraternity. This was done to gain confidence and to enhance the credibility of the research and the results.

3.11.2 Dependability

The dependability of qualitative data refers to the stability of data over time and over conditions (Polik & Beck, 2004:434). For the purpose of the current study, peer evaluation, in other words, external audit of the data was conducted by peers, for data collected during the interviews. Furthermore, there was engagement with the supervisor to evaluate data for its quality.

3.11.3 Conformability

Conformability, according to Polik and Beck (2004), refers to the objectivity or neutrality of the data. It is the degree of neutrality and the extent to which the findings are only shaped by the respondents and not by the researcher's bias or interest. The researcher ensured conformability by strictly following the research methodology or procedure which was presented to a panel of experts during the university colloquium.

3.11.4 Transferability

Transferability is the extent to which the findings can be transferred to another setting or group (Polik & Beck, 2004). During this study, transferability was assessed by checking the themes identified during the interviews. A 'debrief' session was arranged with participants who were not part of the interviews.

3.11.5 Authenticity

According to Strang (2015), authenticity refers to the truthfulness of origin, and whether the evidence is genuine. In the current study, the researcher ensured authenticity by referring to peer reviewed journals and sources that are credible.

3.12 ETHICS

From the research context, ethics refers to the appropriateness of the researcher's behaviour in relation to the rights of those who are affected by the research (Saunders et al., 2009). The following table provides a summary of ethical issues considered by the researcher during the research process. The researcher's conduct was guided by these ethical issues throughout the study. Measures and actions that were taken by the researcher to maintain a high level of ethical behaviour are also described in Table 3.6.

Table 3-6: Summary of ethical issues to address during research process

Phase of research process	Ethical issues and actions taken by the researcher
Throughout the research process	The researcher acknowledged the work of others when used in the research process. Throughout this study work from other authors was acknowledged in the bibliography and in-text referencing.
Solicitation of access	The researcher respected the right to privacy for participants; the right to voluntary participation; and the right to withdraw from the process. This was confirmed as the researcher sought consent from all participants. Secondly, the researcher completed the ethical clearance form and did not engage or collect data before obtaining ethical clearance from the university
Data collection	The researcher respected and maintained confidentiality for the data provided by participants. The researcher avoided harming participants through physical pain or through psychological effects such as embarrassment, stress, or discomfort when collecting data. Again, the researcher completed the ethical clearance form and did not engage or collect data before obtaining ethical clearance from the university
Data analysis and interpretation	The researcher avoided the effects that could eventually harm the participants arising from the way data was used, analysed, and reported. Again, the researcher completed the ethical clearance form and did not engage or collect data before obtaining ethical clearance from the university.

Source: *Adapted from Saunders et al. (2009)*

3.13 CHAPTER SUMMARY

Chapter 3 looked at aspects such as the research philosophy, research design, ethical issues, data collection, and data analysis, from both qualitative and quantitative research.

The following chapter focuses on the results obtained from the qualitative phase. Five important themes derived from both the interviews and the focus groups are discussed. A debrief session to validate the five themes was discussed.

CHAPTER 4: QUALITATIVE DATA ANALYSIS, FINDINGS AND DISCUSSION OF RESEARCH RESULTS

4.1 INTRODUCTION

Chapter 3 covered the research design and methodology which were applied in the study. In the current chapter the results from phase one (qualitative approach) are presented. As discussed in Chapter 3, this study followed a multi-method approach whereby face-to-face interviews with QI experts were conducted during phase one (qualitative approach), followed by an online questionnaire which was administered to SME representatives and their associations in phase two (Quantitative approach).

The overall aim of this study was to develop a suitable framework that can be used for the application of the QI services by SMEs in South Africa in order to optimise their business performance. The main aim was achieved by answering the following specific research questions:

- What are the potential factors that can encourage the use of the services provided by the QI within the SME sector in South Africa, based on the inputs from QI experts as determined by qualitative research methods?
- What is the relation between potential factors that can encourage the use of the services provided by the QI and SME performance?
- To what extent do these factors and their associated variables conform to the pre-established theory as determined by quantitative research methods?
- What is an appropriate framework that can be used for the application of the QI services by SMEs in South Africa to optimise SMEs business performance, contributes for policy direction and to facilitate trade?

The current chapter is structured as follows: after the introduction, which includes the background information from the respondents and a summary of the methodology used, section 4.2 presents an analysis of the results, which includes the background information from the respondents and a summary of the methodology used.

4.2 DESCRIPTION OF THE DEMOGRAPHIC PROFILE OF THE PARTICIPANTS

Participants included the QI experts across South Africa and were selected through purposive selection considering the inclusion criteria as defined chapter 3, section 3.7.3. A total of eight (8) QI experts took part in the interviews. All participants were

from Gauteng Province except one participant who was interviewed from the Western Cape Province, and the interview was conducted telephonically. The telephonic interview did not compromise the outcome or the quality of the interview since data was transcribed in the same manner as data from the face-to-face interviews.

Participants were regarded as a unique pool of experts who could provide rich and exceptional descriptions of the QI system and its dimensions in South Africa. The experts have been involved, at different capacities, in the work related to the QI in South African and internationally.

4.3 THE METHODOLOGY REVISITED

Appendix F describes the interview transcript from each participant. After designing the interview guide, the concept interview guide was validated by consulting peers within the QI. Data were gathered using semi-structured interviews. Semi-structured interviews are more dynamic for use in qualitative research compared to other types of interviews because they allow researchers to acquire in-depth information and evidence from interviewees while considering the focus of the study. Secondly, this type of interview allows for flexibility and adaptability, allowing the researcher to gather rich data.

Each interview was planned to take no longer than 45 minutes. The total interview time from the eight participants was 415 minutes, and the average length of each interview was 51 minutes. A thematic analysis approach was used to analyse data. This type of data analysis allows themes to be actively constructed and derived from a data set that answers the research questions. Furthermore, thematic data analysis is able to demonstrate the paradigmatic orientations and assumptions to ensure the trustworthiness of their findings and interpretations (Kiger & Varpio, 2020).

Kiger and Varpio further maintained that a thematic analysis is an appropriate method of analysis for seeking to understand experiences, thoughts, or behaviours across a data set. This argument is in line with the purpose of the current study. The analysis was based on the most widely accepted six-step framework as defined by Braun and Clarke (2006). Braun and Clarke's framework entails the following steps: (1) familiarising oneself with the data; (2), generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes; and (6) producing the

report. Figure 4.1 illustrates these different steps, which are briefly described in the following sections.

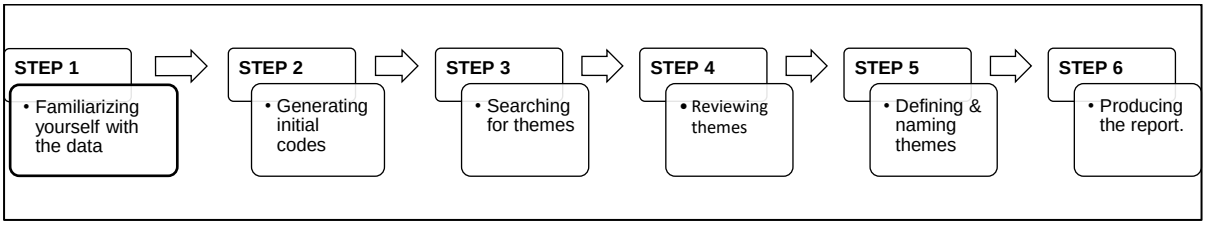

Figure 4-1: Six-step framework (thematic analysis)
Source: *Adapted from Braun and Clarke (2006)*

Step one: Familiarisation with the data

Braun and Clarke (2006) underscored that this process requires researchers to write down a plethora of notes and memos, annotate transcripts, underline, highlight, and group documents. Accordingly, in this study there was a need to repeatedly listen to participants' audio recording and read the interview transcripts.

This process involved reading the entire dataset several times to be intimately familiar with the data. Furthermore, it was necessary to be able to identify appropriate information that may be relevant to the research question(s). Since data was transcribed by an external professional consultant, it was beneficial to listen to audio recordings to achieve a greater contextual understanding of the data. Although this phase was quite time consuming and required a degree of patience, it was important to afford equal consideration across the entire dataset, and to avoid the temptation of selective reading (Braun & Clarke 2006).

Step two: Generating initial codes

The process of generating initial codes was undertaken to produce shorthand descriptive labels for pieces of information that were of relevance to the research questions. During this phase there was a need to work systematically through the entire data analysis, attending to each data item with equal consideration, and identifying aspects of data items that were important and informative in developing relevant themes. After the time spent immersed in the data analysis, the generation of initial codes commenced. With no pre-conceptualised theoretical framework to shape the analytical lens, it was vital to rely on data-driven, inductive coding and to look for emerging codes.

Both semantic and latent analyses were considered during the initial coding phase. Using this approach, codes were identified as brief, but with sufficient detail to be able to stand alone, and to inform the underlying commonality among constituent data items in relation to the subject of the research (Braun & Clarke, 2006).

Step three: Generating themes

After intuitively deciding saturation had been reached with coding and recoding of data sources included in the thematic analysis, it was necessary to move from codes to themes. According to Braun and Clarke (2006:82), themes are a "patterned response or meaning within the data set" that somehow relates to the research questions.

Searching for themes was considered to be an active process in which themes are actively constructed, rather than discovered. In tandem with this, it was necessary to be active during the analysis rather than be passive in order to generate themes.

During the generation of themes, the focus shifted from the interpretation of individual data items within the dataset, to the interpretation of aggregated meaning and meaningfulness across the dataset. The coded data was reviewed and analysed with the intent to determine how different codes may be combined according to shared meaning to form themes or sub-themes.

Step four: reviewing potential themes

During this phase it was necessary to conduct a recursive review of the candidate themes in relation to the coded data items and the entire dataset (Braun & Clarke 2006). Themes constructed in the previous phase were reviewed and cross-checked against the entire code system. The themes, data, and research questions needed to be relevant and in alignment. A series of key questions, as proposed by Braun and Clarke (2012), were followed when reviewing potential themes. The questions were as follows:

- Is this a theme?
- If it is a theme, what is the quality of this theme (does it tell me something useful about the data set and my research question)?
- What are the boundaries of this theme (what does it include and exclude)?
- Are there enough (meaningful) data to support this theme (is the theme thin or thick)?

- Are the data too diverse and wide ranging (does the theme lack coherence)?

The analysis involved two levels of review during this step. Level one was a review of the relationships between the data items and codes that inform each theme and sub-theme. If the codes form a coherent pattern, it was important to assume that the candidate theme or sub-theme makes a logical argument and may contribute to the overall narrative of the data. At level two, the candidate themes were reviewed in relation to the data set. Themes were assessed as to how well they provide the most apt interpretation of the data.

Step five: defining and naming themes.

This phase is closely related to the previous one. While reviewing the emerging themes and constructing the overarching themes, it was important to make sure that the overarching themes are not repetitive, or they do not overlap. A summary of themes identified is shown in Figure 4.2.

Step six: Producing the report/manuscript.

A detailed analysis of the results is written in the form of a report as described in the current Chapter 4, and part of the report is expected to be included in the article to be published by the researcher under the guidance of the supervisor.

4.4 EMPIRICAL FINDINGS

4.4.1 Findings from the interviews and focus groups

The interviews, focus groups, and the thematic analysis, as described in the methodology in the previous section, resulted in the following five dimensions or themes:

1. Awareness
2. Education
3. Collaboration
4. Requirement
5. Affordability

The total number of counts, extracted from Figure 4.2, for the five factors was 42, as indicated in Table 4.1. Awareness had the largest number of counts, followed by education, with collaboration having the least number of counts.

Table 4-1: Number of counts per factor

Factor	Number of counts
Awareness	12
Collaboration	6
Education	9
Affordability	7
Requirement	8

4.4.2 Findings from the Debrief session

Following the five (5) themes identified during the interviews and focus groups, a debriefing session was arranged to validate the themes. Polit and Beck (2004:432) describe debriefing as an external validation technique for establishing credibility of the results. Participants during the debriefing included two QI experts who were not involved during the interviews, as well as three SME practitioners. The theme “Impact from the QI” was identified, resulting in six themes identified from interviews, focus groups, and debriefing.

The theme “impact” in this study means the ability of the QI key institutions to assure the quality of products and services for SMEs to access and compete in domestic and foreign markets, broadening their trade and investment opportunities. The importance of the theme “*Impact from the QI”* is supported by a number of reports as detailed in section 2.4.6.

Figure 4.2 provide a summary of themes and their description as identified during qualitative research.

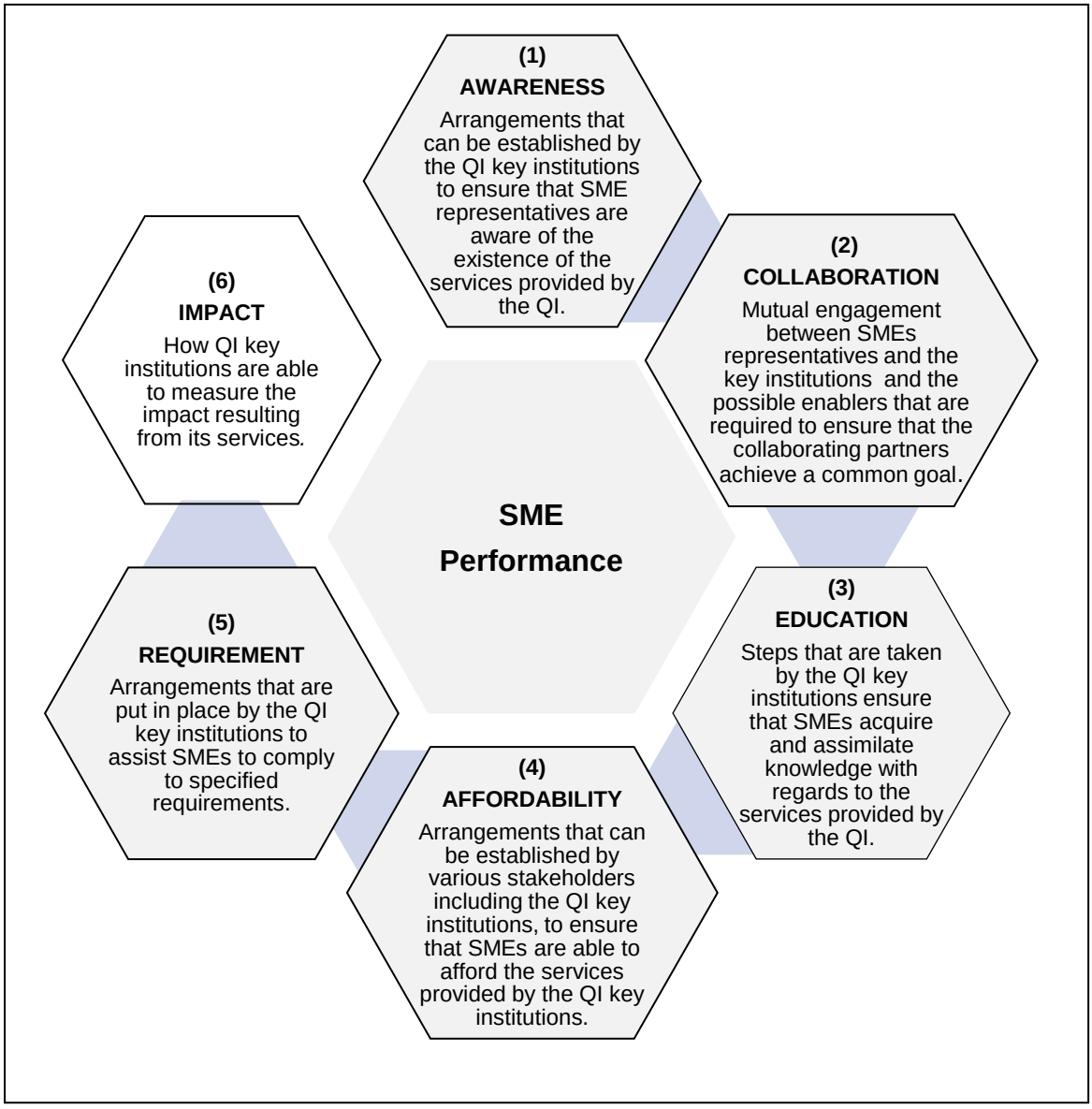

Figure 4-2: Summary of themes and their descriptions

Source: *Researcher's own*

4.5 DISCUSSIONS OF EMPIRICAL FINDINGS AND PROPOSITIONS

4.5.1 Identification of participants

For anonymity, participants' names were not used as references for the participants' verbatim quotes. Rather, they were indicated by the following approach:

- **[1st participant],** identifies the first participant.
- **[2nd participant],** identifies the second participant.
- **[3rd participant],** identifies the third participant.
- **[4th participant],** identifies the fourth participant.

- **[5th participant],** identifies the fifth participant.
- **[6th participant],** identifies the sixth participant.
- **[7th participant],** identifies the seventh participant.
- **[8th participant],** identifies the eighth participant.

Participant's own words is identified as **[1]**

The corresponding initial code is identified as **[1.1]**, while the corresponding theme is identified as **[1.1.1].**

For example, the participant's own words, as shown in column two, second row in Table 4.2 is indicated as **[1]** and the actual words are as follows:

> "Something like quality infrastructure and how it feeds into your everyday life should be taught at elementary school, so that as you grow you understand why there are things in place, why is there a National Credit Regulator, why is there a legal metrology act, what is it doing? We need to educate from the ground up, right now there's very little quality education at tertiary institution, why? Because there's nothing at the bottom, so if we can start from scratch, and I'll give you an example of what I saw in Germany when I paid a visit with the German agency GIZ, they show us that in terms of water efficiency, energy efficiency, these things are being taught at grass roots level, so when a child grows up they know that to leave a room with bright lights on while I'm not using the room".

The corresponding initial code in column four is indicated as **[1.1]** and is highlighted in italics in column two.

The final theme **(awareness)** in column five is indicated as **[1.1.1].**

4.5.2 Propositions

A number of propositions were constructed that are aligned to the following research question as stated in chapter 1, section 1.5:

- What is the relationship between potential factors that can encourage the use of the services provided by the QI and SME performance?

The following sections discuss the findings from qualitative research which provide empirical support for the propositions aligned to the above research question.

4.5.2.1 Awareness

Awareness relates to arrangements that key QI institutions can make to ensure that SME representatives are aware of the services provided by the QI.

- **Proposition 1:** SME awareness about the QI services is likely to enhance SMEs performance.

This dimension seemed to be one of the drivers to encourage SME to use the services provided by the QI. Awareness had the highest count of 12 times, compared to other dimensions as seen in Table 4.2, meaning that it is perceived as an important factor. During the interviews, several participants agreed that awareness is a critical factor for SME performance. For example, one participant cited awareness and asked the question as follows:

> "… Are they aware of the composition of the brick? Are they aware of the safety requirements? Are they aware of the size requirements?" **[2nd participant], [5.1]**

In this case, the participant argued that although SMEs are involved in manufacturing processes such as the manufacturing of bricks, they are unaware of the expected requirement for manufacturing quality bricks. The other participants opined that an awareness program for SMEs that they initiated before was very successful. During the interview, he presented his view as follows:

> "… we saw at that time when NMISA and SANAS started to together go to SMEs, we had the programme, we had the toolkit, we went, we worked it through with the SMEs, and it really made them very aware of quality, and especially good measurement also accreditation quality systems…" **[1st participant], [2.1]**

In this case the participant emphasised the progress made when the two QI institutes collaborated and established an awareness programme for SMEs.

4.5.2.2 Collaboration

Collaboration relates to the mutual engagement amongst QI key institutions as well as between SMEs representatives and the QI key institutions to ensure that the collaborating partners achieve a common goal.

Proposition 2: Collaboration amongst the QI key institutions, as well as between SMEs representatives and the QI, is likely to enhance SME performance.

Although collaboration had the lowest count of 6 times compared to other dimensions, as seen in Table 4.2, this dimension is one of the critical drivers to encourage SMEs to use the services provided by the QI. For example, one of the participants described the importance of key components of the QI working in a coordinated manner to ensure that SMEs benefit from the QI expertise. In his own words, one of the participants said:

> "…We've got experts within the DTI technical infrastructure, we need to coordinate our efforts by identifying what are the priority sectors within the SMME which would benefit from our collective expertise…" **[6th participant], [13]**

Another participant expressed concern about the QI key institutions working in silos. In his own words, the participant asserted that:

> "…the technical infrastructure institutes have a way of conducting their activities at a certain level in silos and I think that level is too expensive and too sophisticated for what most SMEs require..." **[7th participant], [15:1]**

The same participant indicated that coordination amongst the QI key institution is not fully entrenched. In this regard, the participant indicated the following:

> "In the South African context we do have an administrative part of that, and I put it in, and I put it in quotes because it exists when you look at it, but it's only three of four people in the unit to coordinate the quality infrastructure for a country as big as ours, while supporting the rest of the SADC region, so it is inadequate and it does not have a policy guiding position that guides it so that coordination will be able to be done…" **[7th participant], [15:1]**

The assertion from the above participant was confirmed by another participant as follows:

> "…I know SANAS also carried on with certain things alone. So, I think it is a great pity that SEDA at that time were not able to really pull this together, coordinate it, get the program going with all the pillars and they really could have run out a big quality infrastructure program for SMEs. So, my assessment at the moment is fragmented…" **[1st participant], [14:1]**

One participant noted that the absence of a national quality policy led to the QI institutions working in silos. The participant explained as follow:

> "…And so, I think in general, the quality policy or the national quality policy is to be developed to provide a means for these organisations to talk to one another, to be, you know, in tune with what has to be done and not to be islands. So, in other words, to work together…"**[2nd participant], [16:1]**

4.5.2.3 Education

Education relates to the steps that are taken by the QI key institutions to ensure that SMEs acquire and assimilate knowledge with regard to the services provided by the QI.

Proposition 3: For SMEs to be educated about the services provided by the QI is likely to increase SME performance.

Education has the second highest count of 9 times, after awareness, and seems to be one of the critical drivers encouraging SMEs to use the services provided by the QI. However, one participant agreed that although there is huge value to educating SMEs about the QI, there is a challenge in educating this sector. The participants described this situation as follows:

> "…And there's a huge problem to educate them as to the value of an accredited service provider in the sense of an accredited laboratory. It is even a big problem in SMEs…" **[1st participant], [19:1]**

Nevertheless, several participants saw the need to educate SMEs about the QI and its services. The participants presented their view as follows:

> "…somehow, we need to have a way to communicate what the intentions are about the services of the quality infrastructure…" **[2nd participant], [20:1]**

> "…. And I think it comes back to the fact that as technical infrastructure institutes we are not doing enough to educate the SME's about where it is appropriate to have all these technologies, accreditation, and traceability, all of those things…." **Extract from focus group 1 [21:1]**

> "…do we have a body in that teaches the SMEs about the quality infrastructure **Extract from focus group 1 [24:1]**

> "…the important thing is if you're an SMME you need to understand what value you get from using the services from the quality infrastructure…"**Extract from focus group 2 [25:1]**

> "…You'll find an SME was interested in getting accredited and the first thing they will enquire is what does the process involve?" **Extract from focus group 1 [23:1]**

One participant offered a suggestion on how to respond positively to educate SMEs about the QI and its services. His suggestion was as follows:

> "I think a partnership style of service delivery from the quality infrastructure is critical and the exposure about its service…" **Extract from focus group 2 [27:1]**

4.5.2.4 Affordability

Affordability relates to arrangements that can be established by various stakeholders, including the QI key institutions, to ensure that SMEs are able to afford the services provided by the key QI institutions.

Proposition 4: The ability for SMEs to afford services provided by the QI is likely to increase SME performance.

Affordability has the second least count of 7 times, just above collaboration by one count. However, several participants, both from face-to-face interviews and focus groups, agreed that affordability should be considered one of the drivers to encourage SMEs to use the services of the QI **[6th participant], [28:1], [1st participant], [29:1], [4th participant], [30:1], extract from focus group 2 [31:1], extract from focus group 2 [32:1] and extract from focus group 2 [33:1].**

From this group of participants, one participant asserted that:

> "…Yes, it's something that most SME's they complain about the cost of getting these services…" **extract from focus group 1 [34:1]**

4.5.2.5 Requirement

Requirement relates to the arrangements that are put in place by the QI key institutions to assist SMEs to comply with specified requirements.

Proposition 5: The ability for SMEs to comply with specified requirements is likely to increase SME performance.

Requirement has the third count of 8 times, as per Table 4.1. According to the participants from both the interviews and the focus groups, this dimension seemed to be one of the drivers to encourage SME to use the services provided by the QI. One of the participants argued that:

> "…And for them to be able to compete on an equal footing with larger competitors, the product or the service is expected to meet the minimum requirements and these minimum requirements need to have been tested against a certain specification and so on and so forth.". **[6th participant], [36:1]**

Participant number 7 confirmed Participant number 6's argument that there is a need for SMEs to meet specified requirements for export purposes. Participant 7 presented his argument as follows:

> "…in the small and medium enterprise space those that make a huge effort to educate themselves, investigate what they need to do and so on are the ones that one would need to export, because in the export markets the quality requirements are set very clearly, and they are enforced…" **[7th participant], [37:1]**

Participant number 8 agreed with both Participant number 6 and 7. However, Participant number 8 emphasised that where products are not meeting the specified requirements, there is a need to establish an effective system to lock them out of the country. Participant number 8 maintained that:

> "…and we don't have a good system to actually keep them out, we should be able to keep products that don't meet requirements out of our market, if we can do that then it will mean that the products that meet our requirements are the only ones that come in…"**[8th participant], [35:1]**

One participant from the first focus group suggested as follows:

> "…If she knows what the goal posts are and for example if there is now a specification, a regulated specification for the manufacture of sanitiser then everybody that's manufacturing sanitiser is playing by the same rules." **Extract from focus group 1 [39:1]**

4.5.2.6 Impact due to the QI

Following the five (5) themes identified during the interviews and focus groups, a debriefing session was arranged to validate the themes. Polit and Beck (2004:432) describe debriefing as an external validation technique for establishing credibility of the results. Participants during the debriefing included two QI experts who were not involved during the interviews, as well as three SME practitioners. The theme, "Impact from the QI", was identified, resulting in six themes identified from interviews, focus groups, and debriefing.

The theme "impact" in this study means the ability of the QI key institutions to assure the quality of products and services for SMEs to access and compete in domestic and foreign markets, broadening their trade and investment opportunities.

The importance of the theme "*Impact from the QI"* is supported by a number of reports, as detailed in section 2.4.6. The final themes and their descriptions are illustrated in the following diagram.

Proposition 6: The ability for SMEs to realise the impact from the QI is likely to increases SME performance.

Table 4-2: Participants extracts, initial codes, and themes

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[1]** Something like quality infrastructure and how it feeds into your everyday life should be taught at elementary school, so that as you grow you understand why there are things in place, why is there a National Credit Regulator, why is there a legal metrology act, what is it doing? We need to educate from the ground up, right now there's very little quality education at tertiary institution, why? Because there's nothing at the bottom, so if we can start from scratch, and I'll give you an example of what I saw in Germany when I paid a visit with the German agency GIZ, they show us that in terms of water efficiency, energy efficiency, these things are being taught at grass roots level, so when a child grows up they know that to leave a room with bright lights on while I'm not using the room.	Face-to-face interview with the **6th participant** (QI expert)	**[1.1]** Something like quality infrastructure and how it feeds into your everyday life should be taught at elementary school, so that as you grow you understand why there are things in place, why is there a National Credit Regulator, why is there a legal metrology act, what is it doing?	**[1.1.1]** Awareness

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[2]** …we saw at that time when NMISA and SANAS started together to go to SMEs, we had the programme, we had the toolkit, we went, *we worked it through with the SMEs, and it really made them very aware of quality, and especially good measurement also accreditation quality systems*	Face-to-face interview with the **1st Participant** (QI expert)	**[2.1]** We worked it through with the SMEs, and it really made them very aware of quality, and especially good measurement also accreditation quality systems.	**[2.1.1]** Awareness
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[3]** So basically accreditation, I do think that it's been taken up quite well by SMEs, but of course the more technologically advanced SMEs.	Face-to-face interview with the **1st participant** (QI expert)	**[3.1]** So basically accreditation, I do think that it's been taken up quite well by SMEs, but of course the more technologically advanced SMEs	**[3.1.1]** Awareness
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[4]** Even with bananas. If I want to push my bananas into the market, there's an ISO standard, and what standard is that and get that standard, get it on the door and this is my starting point. I need to have all these things in place, there's a measurement part of that, so the next very important thing is the measurement part. And that is where we work mostly in, and not so	Face-to-face interview with the **1st participant** (QI expert)	**[4.1]** ... we just make them aware of what do you need? What accuracy do you need? ... if you need this accuracy, this is the type of measurement equipment or measuring equipment that you would then need, and then where do you get this? Where do you get this	**[4.1.1]** Awareness

Research Question	Participant's own words	Type of interview	Initial codes	Themes
	much to assist them, *we just make them aware of what do you need? What accuracy do you need?* Sometimes they get totally confused and they think they need the metrological accuracy that we are talking about, so we make very sure that we assess what accuracy do they need and that they don't go overboard, and we assist them to say, this is what you need. It may be that even a bucket is enough to measure the amount of water that you need for the process, but otherwise we show them, *if you need this accuracy, this is the type of measurement equipment or measuring equipment that you would then need, and then where do you get this? Where do you get this calibrated? Of course now at a point where you want to get accredited as well…*		calibrated? Of course, now at a point where you want to get accredited as well…	

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[5]** Well, let's look at… There's a very good example. Are they aware of the composition of the brick? Are they aware of the safety requirements? Are they aware of the size requirements? Just three little things, I don't know. I would say knowledge. They may not be. And they may not know there's a regulation that says a brick has got to have a certain compressibility, must have a certain size. So they're going to be… So fine, you can supply the informal sector, perhaps. You can supply the informal sector, but if you want to build a house that meets building code regulations…	Face-to-face interview with the **2nd participant** (QI expert)	**[5.1]** Are they aware of the composition of the brick? Are they aware of the safety requirements? Are they aware of the size requirements?	**[5.1.1]** Awareness
What are the most critical limitations that can limit SMEs from applying services provided by the National Quality Infrastructure?	**[6]** The critical limitation for small business to get access to the quality infrastructure is, they don't know what they don't know, accessibility of the quality infrastructure is a little bit of a dark secret, people don't know about standards until it bites them, they may be rejected when they submit a tender, because they don't know about it, or they may find they can't	Face-to-face interview with the **3rd participant** (QI expert)	**[6.1]** …they don't know what they don't know, accessibility of the quality infrastructure is a little bit of a dark secret, people don't know about standards until it bites them…	**[6.1.1]** Awareness

Research Question	Participant's own words	Type of interview	Initial codes	Themes
	get their product exported because all of a sudden they can't provide a certificate of conformity that they never knew about, these things are not obvious, the biggest, one of the first limitations is the awareness of the services,			
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[7]** …what you need is to have the majority of people being aware of quality when they buy products on the market.	Face-to-face interview with the **8th Participant** (QI expert)	**[7.1]** …being aware of quality when they buy products on the market.	**[7.1.1]** Awareness
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[8]** …the next driver that it can work is the one-of ensuring that there is actually awareness, general awareness about quality and that is the quality culture so that requires a whole lot of awareness programs throughout various stakeholders within the quality infrastructure value chain	Face-to-face interview with the **8th participant** (QI expert)	**[8.1]** …general awareness about quality and that is the quality culture	**[8.1.1]** Awareness

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[9]** … lack of awareness and if that lack of awareness is not there, due to lack of awareness they will not be able to use the available quality infrastructure opportunities that are there in the country	Focus group 1 (Extract from QI practitioner)	**[9.1]** …due to lack of awareness, they will not be able to use the available quality infrastructure opportunities that are there in the country.	**[9.1.1]** Awareness
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[10]** Okay, I indicated costs and *lack of awareness* and in my head was actually asking about do we have a body in that teaches the SME's about the quality infrastructure. Thank you.	Focus group 1 (Extract from QI practitioner)	**[10.1]** … lack of awareness	**[10.1.1]** Awareness
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[11]** Yeah of course there's a lot that needs to be improved and in relation to SME's, I will still stand by that issue of awareness. They need to know what is in it, what is there, what system is in place in the country that can assist their businesses. We really need to start there and secondly the technical infrastructure institutions must put in place some form of a program that will be able to assist the SMME's	Focus group 1 (Extract from QI practitioner)	**[11.1]** I will still stand by that issue of awareness. They need to know what is in it, what is there, what system is in place in the country that can assist their businesses	**[11.1.1]** Awareness

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[12]** …I think in addition to the cost, even before that I think the limitation to the business itself is the *lack of awareness of which services the business would require from the quality infrastructure.*	Focus group 2 (Extract from QI practitioner)	**[12.1]** Lack of awareness of which services the business would require from the quality infrastructure.	**[12.1.1]** Awareness
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[13]** We've got experts within the DTI technical infrastructure; *we need to coordinate our efforts by identifying what are the priority sectors within the SMME* which would benefit from our collective expertise.	Face-to-face interview with the **6th participant** (QI expert)	**[13.1]** …we need to coordinate our efforts by identifying what are the priority sectors within the SMME…	**[13.1.1]** Collaboration
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[14]** So, we later carried on, but then it was less organised, and we carried on only as NMISA alone. I know SANAS also carried on with certain things alone. So, I think it is a great pity that SEDA at that time were not able to really pull this together, coordinate it, get the program going with all the pillars and they really could have run out a big quality	Face-to-face interview with the **1st participant** (QI expert)	**[14.1]** I know SANAS also carried on with certain things alone. So, I think it is a great pity that SEDA at that time were not able to really pull this together, coordinate it, get the program going with all the pillars and they really could have run out a big quality infrastructure program for	**[14.1.1]** Collaboration

Research Question	Participant's own words	Type of interview	Initial codes	Themes
	infrastructure program for SMEs. So my assessment at the moment is fragmented,		SMEs. So my assessment at the moment is fragmented,	
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[15]** Because policy will then lead to regulation obviously, so then coordination and what I foresee and what I've seen in economies like the Chinese economy, the moment they put their national quality policy together then they established a quality coordinating directorate in the ministry whose role was to ensure, and they resourced it. *In the South African context we do have an administrative part of that, and I put it in, and I put it in quotes because it exists when you look at it, but it's only three of four people in the unit to coordinate the quality infrastructure for a country as big as ours, while supporting the rest of the SADC region, so it is inadequate and it does not have a policy guiding position that guides it so that coordination will be able to be done…*	Face-to-face interview with the **7th participant** (QI expert**)**	**[15.1]** In the South African context we do have an administrative part of that, and I put it in, and I put it in quotes because it exists when you look at it, but it's only three of four people in the unit to coordinate the quality infrastructure for a country as big as ours, while supporting the rest of the SADC region, so it is inadequate and it does not have a policy guiding position that guides it so that coordination will be able to be done…	**[15.1.1]** Collaboration

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[16]** Most countries have got elements of the technical or quality infrastructure and then afterwards they're looking to find a way to harmonise or integrate the stuff together. And so, I think in general, the quality policy or the national quality policy is to be developed to provide a means for these organisations to talk to one another, to be, you know, in tune with what has to be done and not to be islands. So in other words, to work together…	Face-to-face interview with the **2nd participant** (QI expert)	**[16.1]** And so, I think in general, the quality policy or the national quality policy is to be developed to provide a means for these organisations to talk to one another, to be, you know, in tune with what has to be done and not to be islands. So in other words, to work together.	**[16.1.1]** Collaboration
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[17]** It's very easy to confuse what's between the SABS, between NRCS, between NMISA, but you are very possible to know about SANAS because they are the only accreditation body in the country, but I think they're also non-existence to the SMME	Focus group 2 (Extract from the Quality Infrastructure practitioner)	**[17.1.1]** It's very easy to confuse what's between the SABS, between NRCS, between NMISA, but you are very possible to know about SANAS because they are the only accreditation body in the country	**[17.1.1]** Collaboration
Is there anything else that you think should be improved with regard to how the Quality Infrastructure	**[18]** I would say that we must get out of our ivory tower syndrome and come down to earth and engage at an appropriate level, because *the technical infrastructure institutes have*	Focus group 1 Extract from the Quality Infrastructure practitioner	**[18.1]** … the technical infrastructure institutes have a way of conducting their activities at a certain level in silos and I think that level is too	**[18.1.1]** Collaboration

Research Question	Participant's own words	Type of interview	Initial codes	Themes
services are being applied by small businesses in South Africa?	*a way of conducting their activities at a certain level in silos and I think that level is too expensive and too sophisticated for what most SME's require.* So, I think what is necessary for us, is to get out of this ivory tower at this high level and come down to earth, and engage at an appropriate level a fit for purpose level		expensive and too sophisticated for what most SME's require.	
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[19]** … and there's a huge problem to educate them as to the value of an accredited service provider in the sense of an accredited laboratory. It is even a big problem in SMEs…	Face-to-face interview with the **1st participant** (QI expert)	**[19.1]** …And there's a huge problem to educate them as to the value of an accredited service provider in the sense of an accredited laboratory. It is even a big problem in SMEs…	**[19.1.1]** Education
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[20]** That's my view. In other words, somehow, we need to have a way to communicate what the intentions are about the services of the quality infrastructure and who does what so there is better understanding of what's required…	Face-to-face interview with the **2nd participant** (QI expert)	**[20.1]** … somehow, we need to have a way to communicate what the intentions are about the services of the quality infrastructure	**[20.1.1]** Education

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[21]** If this one and …that is to say that I think the drivers are, and it comes back to what I said earlier about the target, in other words the specifications that the product needed to meet. Because if I'm manufacturing carpets, the technical specifications are going to be a lot less onerous than if I am manufacturing drugs. So, the drivers are largely dependent on what the product is that I want to sell into the marketplace. And I think that that is something that is not well understood by the SME's. You will find SME's that are trying to play in a technologically advanced space with no technical specifications and very little in the way of accreditation calibration and all the things that are necessary to play in that space versus others that are playing in an essentially non-technical space, but then are running after all these very costly aspects to try and improve the quality of their product. *And I think it comes back to the fact that as technical infrastructure institutes we are not doing enough to educate the*	Focus Group 1 (Extract from the Quality Infrastructure practitioner)	**[21.1]** … and I think it comes back to the fact that as technical infrastructure institutes we are not doing enough to educate the SME's about where it is appropriate to have all these technologies, accreditation, and traceability, all of those things….	**[21.1.1]** Education

Research Question	Participant's own words	Type of interview	Initial codes	Themes
	SME's about where it is appropriate to have all these technologies, accreditation, traceability, all of those things….			
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[22]** *I mean short answer for me is education.* But fortunately, enough I have a quality background because I have a BTech in quality and in from my previous work, I worked a lot in the quality space, I worked in the laboratory so I understand the imperative of having your quality service in your quality product.	Focus group 1 (Extract from SME practitioner)	**[22.1]** I mean short answer for me is education…	**[22.1.1]** Education
What is your experience with regards to the impact of the South African National Quality Infrastructure towards SME performance?	**[23]** Just from my experience. So, for example, *you'll find an SME was interested in getting accredited and the first thing they will enquire is what does the process involve?* The moment you outline the process you don't see them ever again. So, there is a reason for that; one is hearing that for the first time it sounds very complicated,	Focus group 1 (Extract from QI practitioner)	**[23.1]** You'll find an SME was interested in getting accredited and the first thing they will enquire is what does the process involve?	**[23.1.1]** Education

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[24]** Okay, I indicated costs and lack of awareness and in my head was actually asking about *do we have a body in that teaches the SMEs about the quality infrastructure.* Thank you.	Focus group 1 (Extract from QI practitioner)	**[24.1]** …do we have a body in that teaches the SMEs about the quality infrastructure	**[24.1.1]** Education
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[25]** Okay thanks, if anything knowledge is important, the important thing is if you're an SMME you need to understand what value you get from using the services from the quality infrastructure	Focus group 2 (Extract from QI practitioner)	**[25.1]** …the important thing is if you're an SMME you need to understand what value you get from using the services from the quality infrastructure	**[25.1.1]** Education
Is there anything else that you think should be improved with regard to how the Quality Infrastructure services are being applied by small businesses in South Africa?	**[26]** If I may while I still have the stage. I think the communication will be reaching the right audience at any given point in time, if you look at the marketing strategies of many agencies within the technical infrastructure, it's basically you preaching to the converted. And then at some extent you've got to be proactive in looking for that	Focus group 2 (Extract from QI practitioner)	**[26.1]** What your business as SMEs will be needing from the quality infrastructure down the line it is very difficult to relate to..	**[26.1.1]** Education

Research Question	Participant's own words	Type of interview	Initial codes	Themes
	information as it relates to your company as an SMME, somebody spoke about visibility earlier on. I think unless you are going to be proactively looking for information*. What your business as SMEs will be needing from the quality infrastructure down the line it is very difficult to relate to.*			
Is there anything else that you think should be improved with regard to how the QI services are being applied by small businesses in South Africa?	**[27]** I think a partnership style of service delivery from the quality infrastructure is critical and the exposure about its service or you know maybe assist in helping the SMME's to look at the other options or the variety of ways to improve their services that they are providing, or the product that they are providing.	Focus group 2 (Extract from SME practitioner)	**[27.1]** I think a partnership style of service delivery from the quality infrastructure is critical and the exposure about its service	**[27.1.1]** Education
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[28]** An SMME seeking to compete with a large multinational that run into several hurdles, one of them being that there would be demands made on the quality of their product or their service or whatever. And for them to be able to compete on an equal footing with larger competitors, the product or the service is expected to meet the minimum requirements and	Face-to-face interview with the **6th participant** (QI expert)	**[28.1]** …and then they find the cost of doing these tests is very, very high	**[28.1.1]** Affordability

Research Question	Participant's own words	Type of interview	Initial codes	Themes
	these minimum requirements need to have been tested against a certain specification and so on and so forth. So for the small guys that do not know this offhand, they will just come up with a product and then boom, they want to put it to the shelves, and then if it is something – for instance, food – there are stringent quality tests that need to be passed before you can put something on the shelves. They find themselves that already they have produced this wonderful product and then there are these tests that need to be done retrospectively*, and then they find the cost of doing these tests is very, very high*			
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[29]** Exactly. As I just said, for the conformity assessment services cost is a big problem for them, and for the SMEs and if it's not technologically advanced SMEs with good funding behind them, and so on, then it's really a problem.	Face-to-face interview with the **1st participant** (QI expert)	**[29.1]** As I just said, for the conformity assessment services cost is a big problem for them	**[29.1.1]** Affordability
What do you think are the most critical drivers that can	**[30]** So now would be the most critical driver, then the next one is, once they know this is what test or inspection	Face-to-face interview with the	**[30.1]** … the next critical driver is cost	**[30.1.1]** Affordability

Research Question	Participant's own words	Type of interview	Initial codes	Themes
assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	certification, I require to meet this customer's requirements, be a local one like Woolworths or an international one like Tesco or whatever, and I'm just using supermarkets at the moment, if they then satisfy that*, the next critical driver is cost*	**4th participant** (QI expert)		
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[31]** Yes sure. *Basically, the cost and also the requirement,* and I can make an example, because it's almost as if this meetings for me because I've been through all this.	Focus group 2 (Extract from SME practitioner)	**[31.1]** Basically, the cost….	**[30.1.1]** Affordability
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[32]** I will also tend to agree with what the other colleagues are saying*, the costs are really something that is prohibitive.*	Focus group 2 (Extract from QI practitioner)	**[32.1]** the costs are really something that is prohibitive	**[32.1.1]** Affordability

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[33]** *I think in addition is the cost,* even before that I think the limitation to the business itself is the lack of awareness of which services the business would require from the quality infrastructure.	Focus group 2 (Extract from QI practitioner)	**[33.1]** I think in addition is the cost	**[33.1.1]** Affordability
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[34]** Okay thank you. What I've realised from what my colleague just said about the quality, yes it's something that most SME's they complain about the cost of getting these services	Focus group 1 (Extract from QI practitioner	**[34.1]** Yes it's something that most SME's they complain about the cost of getting these services	**[34.1.1]** Affordability
Is there anything else that you think should be improved with regard to how the Quality Infrastructure services are being applied by small businesses in South Africa?	**[35]** We are not able to enforce the requirements to incoming products from foreign markets as well as we could, that is really one of the drivers why we don't have good quality in our market, is the fact that products coming in from other markets are able to get in, *and we don't have a good system to actually keep them out, we should be able to keep products that don't meet requirements out of our market, if we can do that then it will*	Face-to-face interview with the **8th participant** (QI expert)	**[35.1]** …and we don't have a good system to actually keep them out, we should be able to keep products that don't meet requirements out of our market, if we can do that then it will mean that the products that meet our requirements are the only ones that come in…	**[35.1.1]** Requirement

Research Question	Participant's own words	Type of interview	Initial codes	Themes
	mean that the products that meet our requirements are the only ones that come in…			
Is there anything else that you think should be improved with regard to how the Quality Infrastructure services are being applied by small businesses in South Africa?	**[36]** An SMME seeking to compete with a large multinational that run into several hurdles, one of them being that there would be demands made on the quality of their product or their service or whatever*. And for them to be able to compete on an equal footing with larger competitors, the product or the service is expected to meet the minimum requirements and these minimum requirements need to have been tested against a certain specification and so on and* so forth.	Face-to-face interview with the **6th participant** (QI expert	**[36.1]** And for them to be able to compete on an equal footing with larger competitors, the product or the service is expected to meet the minimum requirements and these minimum requirements need to have been tested against a certain specification and so on and so forth.	**[36.1.1]** Requirement
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[37]** Let me use a typical example, let me use a basic one, in the small and medium enterprise space those that make a huge effort to educate themselves, investigate what they need to do and so on are the ones that one would need to export, because in the export markets the quality requirements are set very clearly, and they are enforced.	Face-to-face interview with the **7th participant** (QI expert)	**[37.1]** …in the small and medium enterprise space those that make a huge effort to educate themselves, investigate what they need to do and so on are the ones that one would need to export, because in the export markets the quality requirements are	**[37.1.1]** Requirement

Research Question	Participant's own words	Type of interview	Initial codes	Themes
			set very clearly, and they are enforced…	
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[38]** Right. The critical drivers I would think is what are the customary requirements they are trying to satisfy, and where are they coming from? *If it is a national standard that they're wanting to comply to, and if they're wanting test results to satisfy a customer, that their product or service are meeting those requirements, then that would be the driver.*	Face-to-face interview with the **4th participant** (QI expert)	**[38.1]** If it is a national standard that they're wanting to comply to, and if they're wanting test results to satisfy a customer, that their product or service are meeting those requirements, then that would be the driver.	**[38.1.1]** Requirement
What do you think are most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure?	**[39]** Okay, So I think I would like to take one big step back and I would like to say that the biggest problem is the fact that it's not clear to her as a SME what the requirements are, what the goal posts are and that is important because; *If she knows what the goal posts are and for example if there is now a specification, a regulated specification for the manufacture of sanitiser then everybody that's manufacturing sanitiser is playing by the same rules.*	Focus group 1 (Extract from QI practitioner)	**[39.1]** If she knows what the goal posts are and for example if there is now a specification, a regulated specification for the manufacture of sanitiser then everybody that's manufacturing sanitiser is playing by the same rules.	**[39.1.1]** Requirement

Research Question	Participant's own words	Type of interview	Initial codes	Themes
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[40]** Like what my colleague said previously you find that the use as such is a bit too much driven by the end user request or requirement*. You find that in certain cases they are imposed on the SMEs as a requirement down the line of the value chain of their businesses, because it's a regulatory requirement, and depending where you operate on. In certain cases, it's either voluntary or regulatory if the SME leadership really sees some gain in implementing quality infrastructures services.*	Focus group 1 (Extract from QI practitioner)	**[40.1]** You find that in certain cases they are imposed on the SMEs as a requirement down the line of the value chain of their businesses, because it's a regulatory requirement, and depending where you operate on. In certain cases, it's either voluntary or regulatory if the SME leadership really sees some gain in implementing quality infrastructures services	**[40.1.1]** Requirement
What do you think are the most critical drivers that can assist SMEs to apply services provided by the QI in South Africa in order to optimise their business performance?	**[41]** Basically the cost and yes sure also *the requirement*, and I can make an example, because it's almost as if this meeting's for me because I've been through all this. Basically, you get a company. I was using mixer to make my concrete, and to get the quality manual…*And also the infrastructure that was required to have in place so that you can be rendered accredited…*	Focus group 2 (Extract from SME practitioner)	**[41.1]** the requirement … and also, the infrastructure that was required to have in place so that you can be rendered accredited…	**[41.1.1]** Requirement

4.6 CHAPTER SUMMARY

Chapter 4 followed on the discussion in Chapter 3, which looked at aspects such as the research philosophy, research strategy, population, and sampling, and the research design employed in the current study. The current chapter focuses on the results obtained from the qualitative phase. Five important themes, which include awareness, collaboration, education, affordability, and requirement, were identified after thematic analysis was conducted. The five themes were supported with excerpts from the interviews and focus groups. A debrief session was arranged to validate themes. The theme, impact from the QI, was identified during the debrief, resulting in six themes identified from the interviews, focus groups, and the debrief.

The following chapter focuses on the findings and discusses the results of the quantitative research.

CHAPTER 5: QUANTITATIVE DATA ANALYSIS, FINDINGS AND DISCUSSION OF RESEARCH RESULTS

5.1 INTRODUCTION

Chapter 5 covers the results obtained from phase two (quantitative research). Exploratory Factor Analysis was done, followed by confirmatory factor analysis (Hair et al., 2009). In other words, the researcher was able to leverage the potential confirmation of the CFA after using EFA to confirm an appropriate measurement model.

A questionnaire was used to collect data from the relevant SME representatives and their associations. Data collection was carried out with the assistance of an external on-line consultant. The use of an on-line consultant was to ensure impartiality and data integrity during data collection. Respondents were expected to rate the items or variables from a scale of one to seven on the Likert-scale, where one indicated low agreement (Strongly Disagree) and seven high agreement (Strongly Agree). The use of a 7-point scale has been shown to be more reliable compared to a 5-point scale (Russo et al. 2021).

In the current chapter, after the introduction, section 5.2 covers demographic information while section 5.3 discusses reliability tests. Section 5.4 discusses tests that confirm the appropriateness of the EFA. Section 5.5 covers different steps required for EFA, while section 5.6 outlines steps for CFA. The last section covers the chapter summary.

5.2 DEMOGRAPHIC INFORMATION

A description of participants allows readers and researchers to determine who research findings may be generalised to, and for comparisons to be made across replications of studies. Furthermore, this type of data provides information needed for research syntheses and secondary data analyses (Bein, 2009).

Descriptive data analysis was done on the background information collected from the respondents. The total number of years respondents were employed in the SME sector, and the industry sector from which respondents were sampled, were considered. This involved data summaries and descriptive statistics to identify patterns

in the data. Data included frequencies and cross-tabulations, percentages, histograms and pie charts.

5.2.1 Industry sector from where participants were sampled

Table 5.1 shows the industry frequency distribution of the respondents from different sectors. Although the results indicate that the majority of respondents came from the manufacturing (45.6%) sector, and fewer were from the cosmetic industry (1.6%), the results can be generalised since critical industry sectors were represented in the study. Figure 5.1 illustrates the results from the frequency distribution and the pie charts.

Table 5-1: Industry sector from where participants were sampled

	Frequency	**Percent**
Manufacturing	175	45.6
Agriculture	15	3.9
Construction	33	8.6
Cosmetics	6	1.6
Mining	21	5.5
Automotive	27	7.0
Engineering	24	6.3
Other (e.g., medical devices)	83	21.6
Total	**384**	**100**

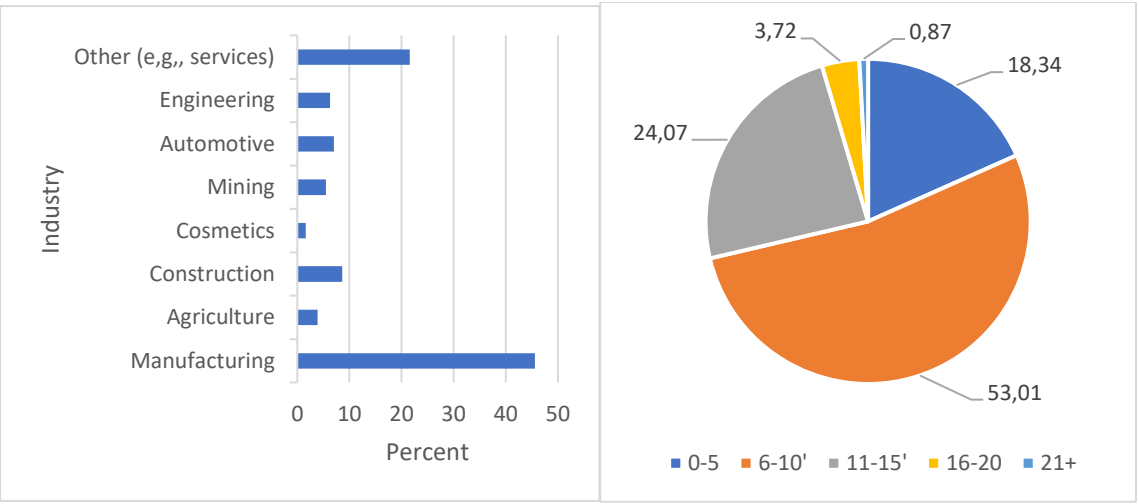

Figure 5-1: Frequency distribution and pie chart showing the total number of years respondents are employed in the SME sector

Source: *Researcher's own*

5.2.2 Total number of years participants employed in the SME sector

Table 5.2 shows the frequency distribution of the total number of years the respondents had been employed in the SME sector. The results indicate that the majority of respondents had been employed in the SME sector for between 6 and 10 years (53.4%). There were even those, although a very small percentage, who had been employed for more than 21 years (0.8%).

Table 5-2: Frequency distribution and cumulative percentage (Total number of years respondents are employed in the SME sector)

Years	Frequency	Percent	Valid percent	Cumulative percent
0 – 5	68	17.7	18.7	18.7
6 – 10	194	50.5	53.4	72.1
11 – 15	85	22.1	23.4	95.5
16 – 20	13	3.4	3.6	99.1
21 +	3	0.8	0.8	99.9
Total	363	94.5	100.0	
Missing	21	5.5		
Grand Total	**384**	**100.0**		

5.3 RELIABILITY TEST

According to Leedy and Ormrod (2010), reliability is defined as the consistency with which a measurement instrument yields certain consistent results when the entity being measured has not changed. Internal reliability is a measure of stability and consistency in a measurement. Validity on the other hand, is the extent to which the test instrument the researcher uses actually measures what it is intended to measure (Taber, 2018).

Cronbach's alpha coefficient (α) is normally used to test the internal reliability of the constructs in the research instrument, and this study was no exception. The normal range of α values is between 0.00 and + 1.00. Higher values closer to +1 reflect higher reliability and a higher degree of internal consistency. Reliability coefficients > 0.65 are regarded as acceptable and values above 0.70 are regarded as more than adequate (Ellis, 2017). However, when a researcher has unreliable measures, relationships between variables usually appear to be weaker (Warner, 2008).

Table 5-3: Description of the constructs that were measured using the questionnaire

Item	Explanation
AWARENESS	Relates to arrangements that can be established by QI key institutions to ensure that SME representatives are aware of the existence of the services provided by the QI.
Awareness 1	A "one-stop shop" should be established to provide awareness with regard to the services provided by the QI key institutions.
Awareness 2	Quality campaigns, implemented through a national quality council and/or through industry associations should be established to provide awareness with regard to the services provided by the QI key institutions.
Awareness 3	Awareness about the services provided by the QI key institutions can be enhanced if the QI key institutions speak in one voice.
Awareness 4	Awareness about the services provided by the QI key institutions can be enhanced if the QI promotes the development of a culture of consumer responsibility through

Item	Explanation
	individual and/or group education and advocacy on behalf of SMEs.
Awareness 5	Awareness about the services provided by QI key institutions can be enhanced if the QI promote, on behalf of SMEs, a culture of responsible and informed consumer choice.
COLLABORATION	Refers to the mutual engagement amongst QI key institutions as well as between SMEs representatives and the QI key institutions to ensure that the collaborating partners achieve a common goal.
Collaboration 1	Collaborating partners, namely QI key institutions and SMEs, should provide information accurately in order to make quick common decisions
Collaboration 2	Collaborating partners, namely QI key institutions and SMEs, should always have information readily available in order to enhance the level of trust amongst the partners
Collaboration 3	Collaborating partners, namely QI key institutions and SMEs, should take decisions as a collective instead of individuals
Collaboration 4	Collaborating partners, namely QI key institutions and SMEs, should share risks in order to minimise individual QI key institution vulnerability and weakness.
Collaboration 5	Collaborating partners, namely QI key institutions and SMEs, should create an enabling environment in order to achieve a common goal.
EDUCATION	Refers to the steps that are taken by the QI key institutions (SABS, NMISA, SANAS, and NRCS) to ensure that SMEs acquire and assimilate knowledge with regard to the services provided by the QI.
Education 1	The QI key institutions should ensure that QI topics are included in the curricula of universities through on-site or distance learning programs for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.
Education 2	The QI key institutions should organise seminars for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.
Education 3	The QI key institutions should organise training and targeted workshops for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.

Item	Explanation
Education 4	The QI key institutions should organise webinars for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.
Education 5	The QI key institutions should organise a platform such as “frequently asked questions” for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.
AFFORDABILITY	Relates to arrangements that can be established by various stakeholders, including the Quality Infrastructure (QI) key institutions, to ensure that SMEs are able to afford the services provided by the QI key institutions (SABS, NMISA, SANAS and NRCS).
Affordability 1	The QI key institutions should subsidise SMEs certification and accreditation programs in order to ensure that SMEs are able to afford its services.
Affordability 2	The QI key institutions should subsidise a consultancy fee on behalf of the SMEs in order to ensure that SMEs are able to afford the services provided by the QI key institutions.
Affordability 3	The QI key institutions should subsidise training programs on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions.
Affordability 4	The QI key institutions should subsidise internal audits programs on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions
Affordability 5	The QI key institutions should subsidise the measurement activities (testing and/or calibration of equipment) on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions.
REQUIREMENT	Refers to the arrangements that are put in place by the Quality Infrastructure (QI) key institutions to assist SMEs to comply to specified requirements.
Requirement 1	The QI key institutions should be able to develop and publish guidance notes to assist SMEs to understand how to comply to specified requirements
Requirement 2	The QI key institutions should be able to develop help desks facilities to assist SMEs to understand how to comply to specified requirements

Item	Explanation
Requirement 3	The QI key institutions should be able to develop single web portals facilities to assist SMEs to understand how to comply with specified requirements.
Requirement 4	The QI key institutions should be able to develop toolkits to assist SMEs to understand how to comply with specified requirements.
Requirement 5	The QI key institutions should be able to develop self service facilities to assist SMEs to understand how to comply to specified requirements
IMPACT	Refers to how the Quality Infrastructure (QI) key institutions are able to measure the impact resulting from its services.
Impact 1	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing how SMEs benefit from management practices (example; better quality, better service delivery).
Impact 2	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which SMEs are able to access markets.
Impact 3	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which products produced by SMEs are safe for public usage.
Impact 4	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which the products that are produced by SMEs are compatible with one another.
Impact 5	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which SMEs benefit from economies of scale (the economies of scale in this context mean cost of reduction associated with a larger scale of production).

The overall reliability statistics for this study's constructs are shown in Table 5.4. The results indicate that the reliability levels of the constructs were good, between 0.787 (for Affordability) to 0.936 (for Requirement). The inter item correlations and alpha values indicated that no item should be removed because reliability values fluctuated between 0.6730 (Affordability 3) to 0.9257 (Collaboration 4) and reliability values are acceptable within this range.

Table 5-4: Overall reliability statistics

Variables	Cronbach's Alpha	No. of items
Awareness	0.864	5
Collaboration	0.932	5
Education	0.915	5
Affordability	0.787	5
Requirement	0.936	5
Impact	0.919	5
Total	0.899	30

Reliability tests for each item were considered and the results were good as shown in the following tables. Cronbach's alpha for each item ranges from 0.6730 (affordability 3) to 0.9257 (collaboration 5).

Table 5-5: Reliability statistics for each item

Item	Observations	Sign	Item-test correlation	Item-rest correlation	Average interitem Covariance	Alpha
Awareness						
Awareness 1	350	+	0.7560	0.6264	.3453	0.8495
Awareness 2	350	+	0.8270	0.7270	.3191	0.8260
Awareness 3	350	+	0.8204	0.6982	.3060	0.8322
Awareness 4	350	+	0.8435	0.7359	.2981	0.8220
Awareness 5	350	+	0.7797	0.6413	.3250	0.8467
Test scale					.3187	0.8640
Collaboration						
Collaboration 1	350	+	0.8833	0.8116	.78736	0.9182
Collaboration 2	350	+	0.9129	0.8630	.7896	0.9088
Collaboration 3	349	+	0.9035	0.8432	.7723	0.9118

Item	Observations	Sign	Item-test correlation	Item-rest correlation	Average interitem Covariance	Alpha
Collaboration 4	349	+	0.8548	0.7703	.8167	0.9257
Collaboration 5	349	+	0.8836	0.8170	.8054	0.9169
Test scale					.7943	0.9310
Education						
Education1	349	+	0.8111	0.7284	.3322	0.9080
Education2	350	+	0.9022	0.8382	.2775	0.8834
Education3	350	+	0.8471	0.7457	.2889	0.9044
Education4	349	+	0.9120	0.8558	.2777	0.8799
Education5	349	+	0.8531	0.7619	.2930	0.8998
Test scale					.2939	0.9146
Affordability						
Affordability 1	348	+	0.4970	0.2977	.8683	0.8177
Affordability 2	349	+	0.8556	0.7468	.5329	0.6828
Affordability 3	349	+	0.8718	0.7643	.5006	0.6730
Affordability 4	349	+	0.8607	0.7507	.5196	0.6799
Affordability 5	349	+	0.5550	0.3083	.8152	0.8289
Test scale					.6474	0.7867
Requirement						
Requirement 1	349	+	0.9068	0.8522	.4569	0.9173
Requirement 2	349	+	0.8823	0.8128	.4633	0.9249
Requirement 3	349	+	0.9180	0.8701	.4539	0.9141
Requirement4	348	+	0.9107	0.8561	.4699	0.9229
Requirement5	349	+	0.8768	0.8040	.4624	0.9240
Test scale					.4613	0.9355
Impact resulting from the QI						
Impact1	349	+	0.8226	0.7201	.3846	0.9153
Impact2	350	+	0.9134	0.8579	.3488	0.8874
Impact3	350	+	0.9066	0.8538	.3663	0.8899
Impact4	350	+	0.8461	0.7537	.3744	0.9089
Impact5	350	+	0.8635	0.7805	.3683	0.9034
Test scale					.3685	0.9193

5.4 TESTS TO CHECK THE APPROPRIATENESS OF EXPLORATORY FACTOR ANALYYSIS (EFA)

The following tests were done to check whether EFA was appropriate or not:

5.4.1 Sample size

As explained in section 3.11.2, a total of 384 completed questionnaires were received from SME associations and their representatives. The final number of useable responses was 346, resulting in a response rate of 19.9%. As confirmed by Hair et al. (2009), the response rate was adequate for EFA to proceed.

5.4.2 Normality

Normality tests, on the other hand, were checked by confirming the skewness and kurtosis as shown in Appendix K. The values for symmetry for skewness close to zero and kurtosis of between (-2) and (+2) are considered acceptable according to George and Mallery (2016). In this study, results from skewness and kurtosis did not comply with the criteria stated above. However, the maximum likelihood method, which is considered to be insensitive to the deviation from normality, was applied during the analysis to mitigate this risk (Fuller & Hemmerle, 1966).

5.4.3 Correlation analysis

Although care was taken when selecting the variables and participants, it was important to confirm that the measured variables were sufficiently intercorrelated to justify exploratory factor analysis. Correlations are expected to exceed ±.30 otherwise EFA may be inappropriate (Hair et al., 2009).

Depending on the variable type, different methods can be used to obtain the correlation matrix: Pearson is used for quantitative variables, Spearman for ordinal variables, and Cramer's V for nominal variables (Sarmento & Costa, 2017). Since the current study involved quantitative variables, Pearson correlation coefficient was used to measure the relationships between the variables.

Appendix I indicates many of these variables correlate with one another as expected. The correlation ranges from r = 0.0107 (low correlated between affordability 3 and education 4) to r = 0.8892 (high correlated between requirement 5 and requirement 4).

5.5 EXPLORATORY FACTOR ANALYSIS

After verifying the appropriateness of EFA, the analysis commenced. The following sections discuss relevant steps that were considered during exploratory factor analysis (EFA). These steps are indicated in the right part of the following diagram:

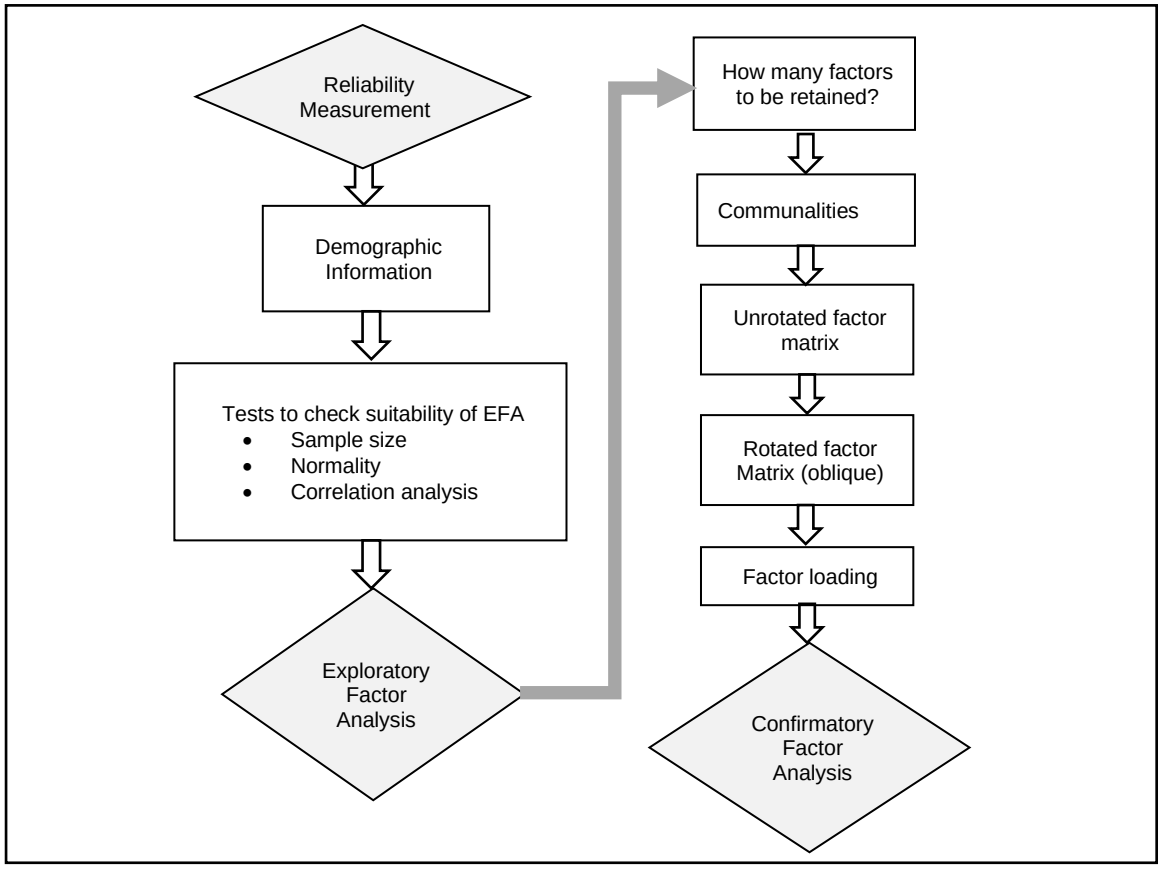

Figure 5-2: Overview of the Exploratory Factor Analysis

Source: *Researcher's own*

5.5.1 Number of factors to be retained

Three techniques were considered to identify the number of factors that needed to be retained (Sarmento & Costa, 2017), namely, (1) Variance (eigenvalues), (2) scree plot, and (3) percentage of variance explained.

5.5.1.1 Variance (Eigenvalues)

The first and most popular technique for deciding on the retention of factors is Kaiser's eigenvalue (eigenvalues greater than 1 are retained), (Fabrigar, MacCallum, Wegener & Strahan, 1999). Using the criterion, six factors need to be retained, as indicated in Table 5.3 (column A). However, this technique has not been free from criticism. For

example, Zwick and Velicer (1986) argue that this technique may overestimate or underestimate the number of factors to retain.

5.5.1.2 Scree plot

Another technique that was considered to make decision with regard to the number of factors to retain is the scree plot (Cattell & Vogelmann, 1977). In the scree plot the eigenvalues are represented in descending order connected to a line. In the line, one will determine where there is a noticeable change in shape known as 'the elbow'. Only factors above and excluding this point are then retained. Considering the results in Figure 5.3, a noticeable elbow appears at the seventh eigenvalue. However, six factors were retained since factors above and excluding the one on the line are the ones to be retained.

Table 5-6: Unrotated communalities

Factor analysis/correlation			Number of obs. =	347
Method: principal factors			Retained factors =	17
Rotation: (unrotated)			Number of params =	374
Factor	**A Eigenvalue**	**Difference**	**B Proportion**	**C Cumulative**
Factor1	8.97376	4.70636	0.4054	0.4054
Factor2	4.26739	1.64274	0.1928	0.5982
Factor3	2.62466	0.63255	0.1186	0.7168
Factor4	1.99211	0.24052	0.0900	0.8068
Factor5	1.75158	0.62221	0.0791	0.8859
Factor6	1.12937	0.36875	0.0510	0.9369
Factor7	0.76062	0.31278	0.0344	0.9713
Factor8	0.44783	0.04340	0.0202	0.9915
Factor9	0.40443	0.03831	0.0183	1.0098
Factor10	0.36612	0.17158	0.0165	1.0263

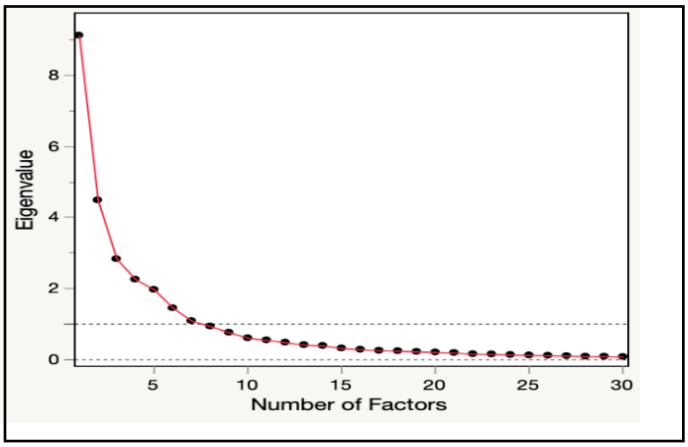

Figure 5-3: Scree plot

5.5.1.3 Percentage (%) of variance explained

Another technique that was used is the percentage of variance (% Var). "*Cumulative %*" in column (C) shows the percentages of the total variance explained by the factors, which is 93,75 greater than 60% (Hair et al., 1998).

5.5.2 Estimation of communalities

After identifying the number of factors to retain, communalities were computed to identify items which were unlikely to be associated with any underlying factors. In other words, communality values assess how well each variable is explained by the factors. A variable with variance that is completely unexplained by factors has a communality of zero (Field, 2013). Common variance ranges between 0 and 1 (Hair et al., 2009).

Table 5.7, shows the communalities for the variables. In the current study, communality values range from 0.52 to 0.85**.** It is important to note that for item 1 (B4-1) and 5 (B4-5) under affordability, communality values were low, 0.22 and 0.21 respectively, an indication that these two variables could possibly be unexplained by the other variables.

Table 5-7: Communalities of variables

Items	extracts
B1-1 A “one-stop shop” should be established to provide awareness with regard to the services provided by the QI key institutions	0.51714
B1-2 Quality campaigns, implemented through a national quality council and/or through industry associations should be established to provide awareness with regard to the services provided by the QI key institutions.]	0.64069

Items	extracts
B1-3 Awareness about the services provided by the QI key institutions can be enhanced if the QI key institutions speak in one voice.	0.60681
B1-4 Awareness about the services provided by the QI key institutions can be enhanced if the QI are promoting the development of a culture of consumer responsibility, through individual and/or group education and advocacy on behalf of SMEs.	0.65635
B1-5 Awareness about the services provided by QI key institutions can be enhanced if the QI are promoting, on behalf of SMEs, a culture of responsible and informed consumer choice.	0.52940
B2-1 Collaborating partners, namely QI key institutions and SMEs, should provide information accurately in order to make quick common decisions	0.74977
B2-2 Collaborating partners, namely QI key institutions and SMEs, should always have information readily available in order to enhance the level of trust amongst the partners	0.81927
B2-3 Collaborating partners, namely QI key institutions and SMEs, should take decisions as a collective instead of individuals	0.78694
B2-4 Collaborating partners, namely QI key institutions and SMEs, should share risks in order to minimise individual QI key institution vulnerability and weakness.	0.67895
B2-5 Collaborating partners, namely QI key institutions and SMEs, should create an enabling environment in order to achieve a common goal	0.71655
B3-1 The QI key institutions should ensure that the QI topics are included in the curricula of universities through on-site or distance learning programs for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	0.63879
B3-2 The QI key institutions should organise seminars for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	0.74755
B3-3 The QI key institutions should organise training and targeted workshops for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	0.68778
B3-4 The QI key institutions should organise webinars for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions	0.79754

Items	extracts
B3-5 The QI key institutions should organise a platform such as “frequently asked questions” for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	0.68778
B4-1 The QI key institutions should subsidise SMEs certification and accreditation programs in order to ensure that SMEs are able to afford its services	0.21845
B4-2 The QI key institutions should subsidise consultancy fee on behalf of the SMEs in order to ensure that SMEs are able to afford the services provided by the QI key institutions	0.85035
B4-3 The QI key institutions should subsidise training programs on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions	0.84391
B4-4 The QI key institutions should subsidise internal audits programs on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions	0.81685
B4-5 The QI key institutions should subsidise the measurement activities (testing and/or calibration of equipment) on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions	0.20857
B5-1 The QI key institutions should be able to develop and publish guidance notes to assist SMEs to understand how to comply to specified requirements	0.76889
B5-2 The QI key institutions should be able to develop help desks facilities to assist SMEs to understand how to comply to specified requirements	0.72083
B5-3 The QI key institutions should be able to develop single web portals facilities to assist SMEs to understand how to comply with specified requirements	0.79472
B5-4 The QI key institutions should be able to develop toolkits to assist SMEs to understand how to comply with specified requirements.	0.76491
B5-5 The QI key institutions should be able to develop self service facilities to assist SMEs to understand how to comply to specified requirements	0.76869
B6-1 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing how SMEs benefit from management practices (example; better quality, better service delivery)	0.60989

Items	extracts
B6-2 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which SMEs are able to access markets	0.80420
B6-3 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which products produced by SMEs are safe for public usage	0.80972
B6-4 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which the products that are produced by SMEs are compatible with one another	0.67985
B6-5 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which SMEs benefit from economies of scale (the economies of scale in this context mean cost of reduction associated with a larger scale of production)	0.70368

5.5.3 Unrotated, rotated factor matrix and factor loading

Table 5-8: Unrotated factor matrix

Factor analysis/correlation		Number of obs =	347
Method: principal factors		Retained factors =	17
Rotation: (unrotated)		Number of params =	374
Factor	**Eigenvalue**	**Difference**	**Proportion**	**Cumulative**
Factor1	8.97376	4.70636	0.4054	0.4054
Factor2	4.26739	1.64274	0.1928	0.5982
Factor3	2.62466	0.63255	0.1186	0.7168
Factor4	1.99211	0.24052	0.0900	0.8068
Factor5	1.75158	0.62221	0.0791	0.8859
Factor6	1.12937	0.36875	0.0510	0.9369
Factor7	0.76062	0.31278	0.0344	0.9713
Factor8	0.44783	0.04340	0.0202	0.9915
Factor9	0.40443	0.03831	0.0183	1.0098
Factor10	0.36612	0.17158	0.0165	1.0263

Note: LR test: independent vs. saturated: chi2(435) = 9272.12 Prob>chi2 = 0.0000

The first columns above list all of the factors that can be found within the data set before rotation. As factor analysis always extracts as many factors as there are variables, in this case there were 10 factors extracted in total. One is only interested in extracting factors that account for a meaningful amount of variance.

Table 5-9: Rotated factor loadings (pattern matrix) and unique variances

Factor analysis/correlation	Number of observations = 347
Method: maximum likelihood	Retained factors = 6
Rotation: oblique promax (Kaiser off)	Number of params = 165
	Schwarz's BIC = 2622.32
Log likelihood = -828.5886	Akaike's) AIC = 1987.18

Factor	Variance	Proportion
Factor1	6.81122	0.3335
Factor2	6.21307	0.3042
Factor3	5.51558	0.2700
Factor4	5.09349	0.2494
Factor5	4.59051	0.2247
Factor6	3.34324	0.1637

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Uniqueness
Awareness1			0.5843				0.4848
Awareness2			0.7304				0.3634
Awareness3			0.7539				0.3515
Awareness4			0.8111				0.3525
Awareness5			0.7423				0.4815
Collaboration1					0.8532		0.2148
Collaboration2					0.9306		0.1444
Collaboration3					0.8556		0.2650

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Uniqueness
Collaboration4					0.7524		0.3931
Collaboration5					0.8496		0.2831
Education1	0.6319						0.3453
Education2	0.8935						0.2399
Education3	0.6724						0.3811
Education4	0.9566						0.1785
Education5	0.8170						0.2877
Affordability1							0.8124
Affordability2						0.9469	0.1037
Affordability3						0.9147	0.1521
Affordability4						0.8970	0.1535
Affordability5							0.8264
Requirement1		0.7301					0.3720
Requirement2		0.6783					0.4162
Requirement3		0.7793					0.2900
Requirement4		0.9869					0.0966
Requirement5		0.9646					0.1503
Impact1				0.7806			0.4125
Impact2				0.9015			0.2091
Impact3				0.9194			0.1730
Impact4				0.7928			0.3282
Impact5				0.7773			0.3116

Note: a. LR test: independent vs. saturated: chi2(435) = 9272.12 Prob>chi2 = 0.0000

b. LR test: 6 factors vs. saturated: chi2(270) = 1586.34 Prob>chi2 = 0.0000

c. Blanks represent abs(loading)<.4)

Rotation maximises the loading of each of the variables onto one factor, while minimising its loading on the others. This optimises the factor loadings, which also brings the eigenvalues more into line with one another. When reporting how much variance each factor accounts for, one wants to use this set of columns.

It is not impossible for variables to have salient cross-loadings on two or more factors, especially when oblique (non-orthogonal) rotation methods are used. An oblique rotation method was used because the latent variables, the common factors, were correlated. Loadings represent the degree to which each of the variables “correlates” with each of the factors; they range from -1 to 1. Inspection of factor loadings revealed the extent to which each of the variables contributed to the meaning of each of the factors.

The Maximum likelihood factor method was finally used, and the oblique rotation method was applied to make items load on only one factor. Rotation makes sharper distinctions in the meanings of the factors. Uniqueness gives the proportion of the common variance of the variable not associated with the factors. Uniqueness is equal to 1 – communality. In the table, blanks mean that the loading is below 0.4.

5.5.4 Measurement model

Twenty-eight items were subjected to principal axis factoring to assess the dimensionality of the data. Six factors were extracted explaining 93.69% of the variance. This was decided based on eigenvalues, cumulative variance, and the scree plot. Items that load on the first dimension suggest it represents education, followed by requirement, awareness, impact, collaboration, and lastly affordability. Affordability was represented by three items as shown in the following measurement model.

Table 5-10: Measurement structure obtained from EFA

Factor 1 (Education)	Factor 2 (Requirement)	Factor 3 (Awareness)	Factor 4 (Impact)	Factor 5 (Collaboration)	Factor 6 (Affordability)
B2-2 The QI topics should be included in the curricula of universities through on-site or distance learning programs **B2-3** Organise seminars **B2-5** Organise training and targeted workshops **B2-1** Organise webinars **B2-4** Organise "Frequently asked questions"	**B5-1** Develop and publish guidance notes **B5-3** Develop self service facilities **B5-2** Develop single web-portal facilities **B5-5** Develop toolkits **B5-4** Develop self-services facilities	**B6-2** Establish a "One-stop shop" **B6-3** Establish national quality council and/or through industry associations **B6-1** QI key institutions should speak in one voice. **B6-4** Promoting the development of a culture of consumer responsibility, through individual and/or group education and advocacy **B6-5** Promote, on behalf of SMEs, a culture of responsible and informed consumer choice.	**B3-4** Evaluate & measure the extent to which SMEs benefit from QI management systems **B3-2** Evaluate & measure the extent SMEs access markets **B3-5** Evaluate & measure the impact from QI services on SMEs **B3-3** Evaluate & measure the impact due to compatibility of products produced by SMEs **B3-1** Evaluate & measure the extent SMEs benefit from the economics of scale	**B1-4** Provide information accurately to make quick common decisions **B1-5** Have information readily available **B1-3** Take decisions as a collective instead of individuals **B1-2** Share risks to minimise individual QI key institutions vulnerability and weakness. **B1-1** Create an enabling environment	**B4-1** Subsidise SMEs certification and accreditation programs **B4-2** Subsidise training programs **B4-3** Subsidise consultancy fees **B4-4** Subsidise internal audits programs **B4-5** Subsidise the measurement activities (Testing and/or calibration of equipment)

Source: *Researcher's own*

5.6 CONFIRMATORY FACTORY ANALYSIS

Confirmatory factor analysis (CFA) started with defining the individual constructs. The structure identified in Table 5.10 was used to identify the constructs which informed the measurement model required for the CFA.

The measurement model is comprised of twenty-eight (28) observed variables (items) and six (6) constructs. Each construct has five items, except affordability, which has three items. All constructs are correlated with one another, and the assumption is that there is no cross loading between the variables.

In the current study, a 7-point Likert- scale was used for the collection of data, as discussed in the methodology chapter. The reliability of the scale was discussed in section 5.3 and construct validity for the measurement model was confirmed during EFA and from literature.

The next step was the development of the overall measurement model. Each construct is related to only one variable and there is no cross loading between the constructs and the variable. In other words, one-dimensionality exists amongst the variables. The correlation between each construct is shown in Table 5.11, illustrating the relationship between the constructs.

Table 5-11: Correlation values between constructs

	Awareness score	**Collaboration score**	**Education score**	**Affordability score**	**Requirements score**	**Impact score**
Awareness score	1.0000	0.1737	0.5809	0.0716	0.4196	0.3052
Collaboration score	0.1737	1.0000	0.1293	0.3814	0.1937	0.1816
Education score	0.5809	0.1293	1.0000	-0.0067	0.5081	0.3717
Affordability score	0.0716	0.3814	-0.0067	1.0000	0.0129	0.0019
Requirement score	0.4196	0.1937	0.5081	0.0129	1.0000	0.3492
Impact score	0.3052	0.1816	0.3717	0.0019	0.3492	1.0000

The correlation between the constructs ranges from about 0.13 to 0.58, except in the case of affordability where the correlation was very low, about 0.0019 between, affordability and impact.

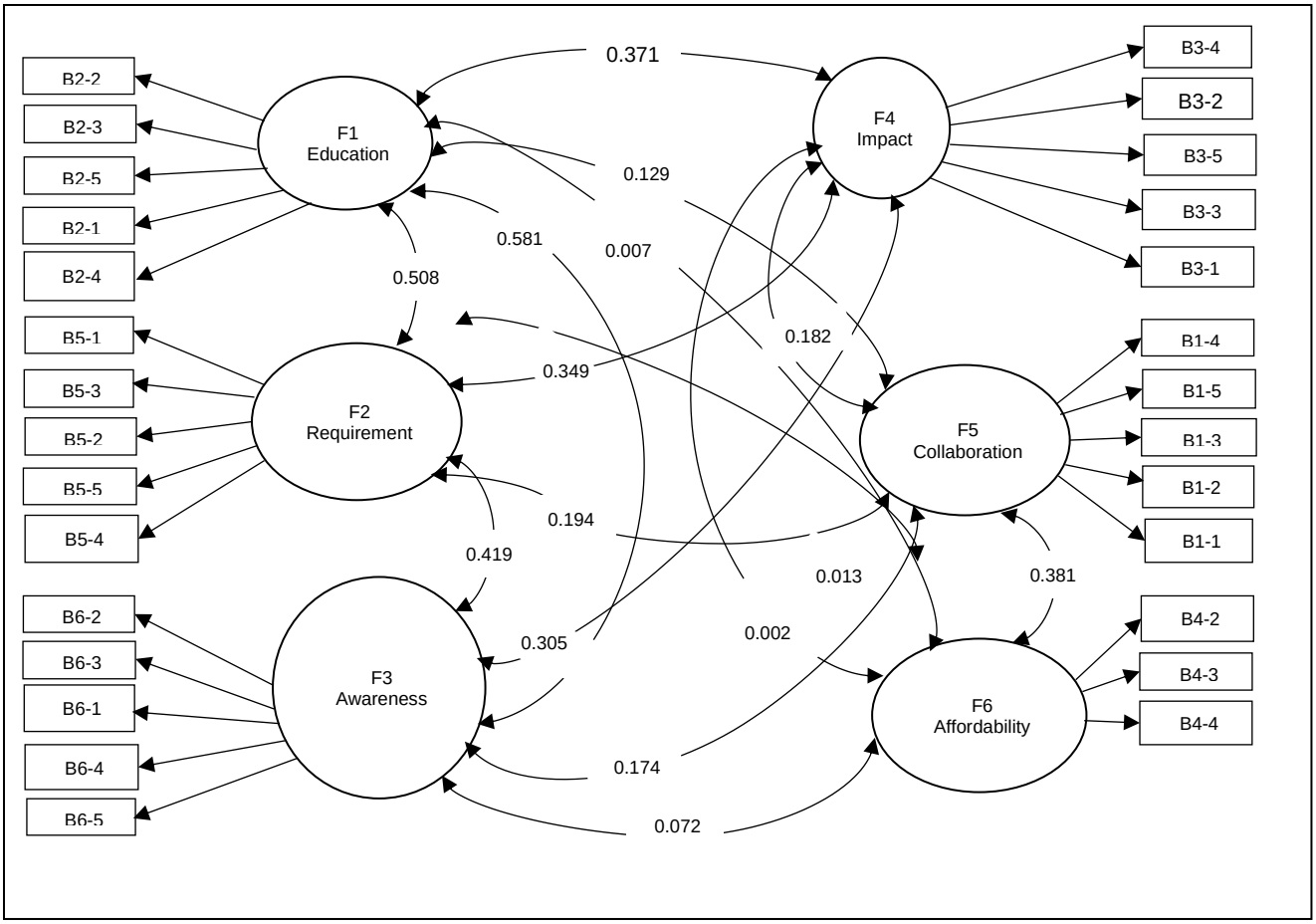

Figure 5-4: Correlation between factors

Source: *Researcher's own*

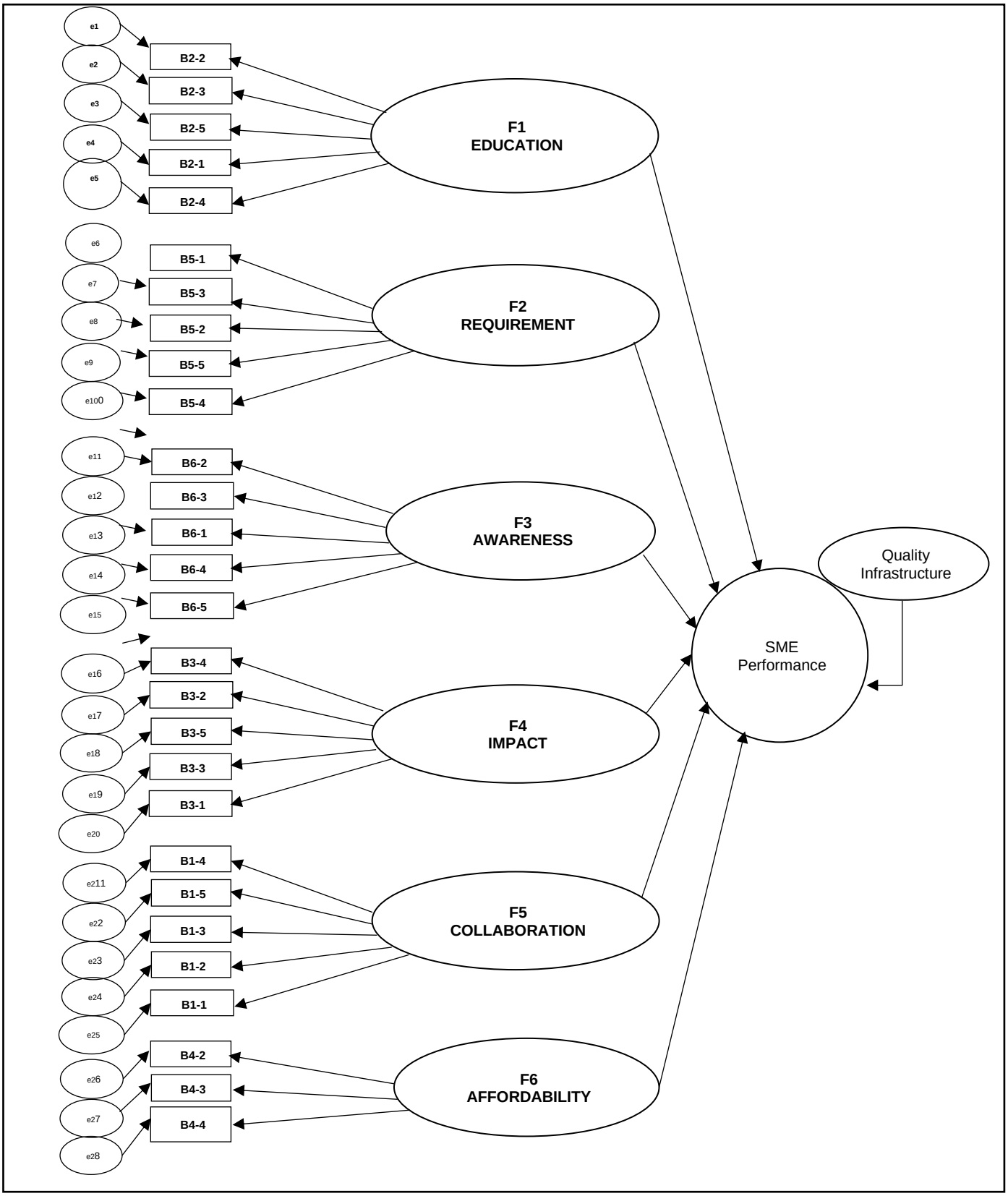

Figure 5-5: Measurement model with their associated items

Source: *Researcher's own*

5.7 THE DEVELOPED FRAMEWORK

In the first and second chapters of this thesis, we learnt that the Quality Infrastructure (QI) system is a viable tool that possesses the potential to improve performance in small businesses. The QI is comprised of key institutes, namely standardisation, accreditation, metrology, and conformity assessment bodies which are considered the "hard" part of the QI system. In South Africa, the National Regulator for Compulsory Specification (NRCS) is included as one of the key institutions of the QI. The QI system can contribute towards the competitiveness and survival of SMEs, and has the potential to instil trust to quality of products and services.

Figure 5.6 shows the framework that can be used for the application of the QI services by SMEs in South Africa. The new, suggested framework illustrates the research findings of this research, depicting factors that can encourage SMEs to use the services provided by the QI and their observed variables. The main potential drivers that can encourage SMEs to use the services provided by the QI in South Africa include *education, requirement, awareness, impact, collaboration, and affordability*. The following sections discuss how the framework can be applied in a practical way:

5.7.1 Definitions of the factors

Education - In this context means the steps that are taken by the QI key institutions to ensure that SMEs acquire and assimilate knowledge with regard to the services provided by the QI.

Requirement - In this context means the arrangements that are put in place by the (QI key institutions to assist SMEs to comply with specified requirements.

Awareness - In this context means arrangements that can be established by the QI key institutions to ensure that SME representatives and their associations are aware of the existence of the services provided by the QI.

Impact - In this context means, ow the QI key institutions are able to measure the impact resulting from its services.

Collaboration - In this context means the mutual engagement amongst QI key institutions as well as between SMEs representatives and the QI key institutions to ensure that the collaborating partners achieve a common goal.

Affordability - In this context means arrangements that can be established by various stakeholders, including the QI key institutions, to ensure that SMEs are able to afford the services provided by the QI.

1. Education
    a) Collaborating with education institutes to include QI into appropriate curricula.
    b) To disseminate the QI services with seminar workshop.
    c) To organise training of the QI services to members of the SME management.
    d) To organise information sharing via webinars with SMEs.
    e) To organise platforms with frequently asked questions to assist SMEs with information.
2. Requirement
    a) To develop help desk facilities as one-stop point of contact to provide centralised information and support to SMEs.
    b) To develop and publish guidance notes to share best practices and experiences with members of the SMEs.
    c) To develop single web portal facilities to bring information into a single user interface for SMEs.
    d) To develop online toolkits to assist SMEs to access information remotely.
    e) To develop appropriate self-service facilities to assist SMEs to access information on their own.
3. Awareness
    a) To develop a centralised platform to assist SMEs to access information in one place.
    b) To collaborate with industry associations to establish quality campaigns to promote awareness for SMEs.
    c) To provide a platform to ensure that the units of the QI articulate the same goals on for matters related to SMEs.
    d) To promote a culture of consumer responsibility, through individual and/or group education with members of the SMEs.
    e) To promote, on behalf of SMEs, a culture of responsibility that will facilitate an informed consumer choice.

4. Impact resulting from the QI
    a) To evaluate and measure the impact resulting from QI services by assessing how SMEs benefit from management practices through better quality and better service delivery.
    b) To evaluate and measure how SMEs can access markets by producing goods of higher value.
    c) To evaluate and measure how products produced by SMEs are safe for public usage by setting technical regulations to guarantee conformity.
    d) To evaluate and measure how products produced by SMEs are compatible by checking how their product is integrated in a broader number of value chains.
    e) To evaluate and measure how SMEs benefit from the economics of scale by reviewing their cost reduction associated with a larger scale of production.
5. Collaboration
    a) To provide information accurately within the QI units to make quick common decisions on behalf of SMEs.
    b) To have information readily available within the units of the QI in order to enhance the level of trust amongst members of the SMEs.
    c) To take decisions on behalf of SMEs as a collective than as individual members of the QI units.
    d) To share risks as a collective and minimise individual vulnerability to avoid affecting members of the SMEs negatively.
    e) To create an enabling environment to achieve a common goal for members of the SMEs.
6. Affordability
    a) To support and subsidise SMEs financially with consultancy fees for activities related to the conformality.
    b) To support and subsidise SMEs financially for training programs related to conformity.
    c) To support and subsidise SMEs financially for training related to internal audits.

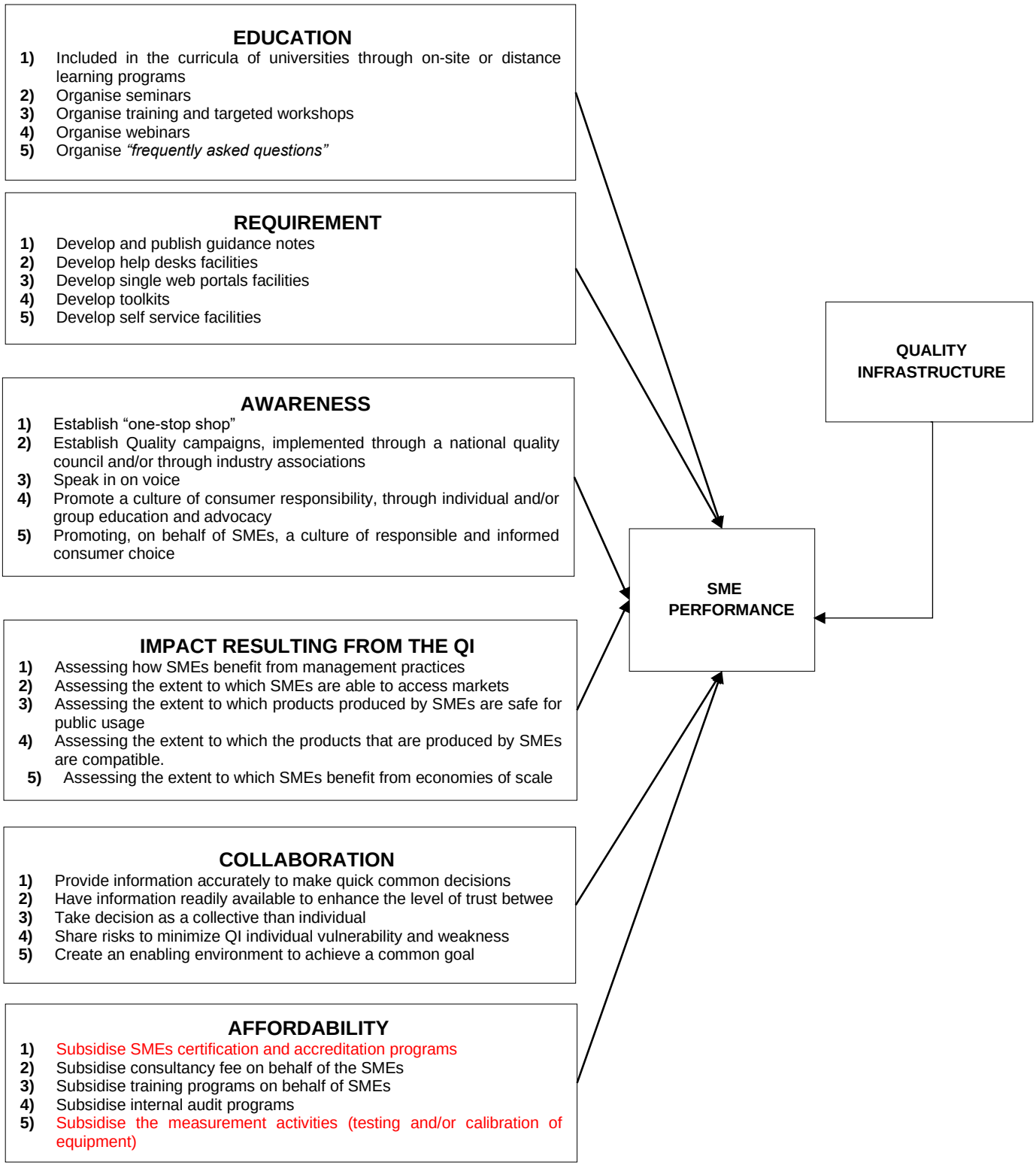

Figure 5-5: Measurement model with their associated items

Source: Researcher's own

5.8 CHAPTER SUMMARY

This chapter reported on the results of phase two of the research study, emphasising the quantitative data analysis and its interpretation. The first part of the chapter reported on the reliability of the data, followed by the background information of the respondents. The second part of the chapter focussed on the exploratory factor analysis (EFA) which provided a measurement model that was incorporated into the final framework.

The measurement model consisted of 28 variables represented by six primary constructs, namely, education, requirement, awareness, impact, collaboration, and affordability. The next chapter covers the findings, conclusions, and recommendations.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

The current chapter provides answers to the research objectives. The main purpose of the study was to develop a framework that can be used for the application of the Quality Infrastructure services by SMEs in South Africa to optimise their business performance. Chapter 1 introduced the study while Chapter 2 provided an extensive literature review. Chapter 3 covered the research design and methodology. Chapter 4 and 5 presented the research findings from the qualitative and quantitative research respectively.

The aim of the current chapter is to draw conclusions from the previous chapters and to determine whether the research objectives stipulated in Chapter 1 have been achieved, and if achieved, how they were achieved. The current chapter also presents the recommendations, limitations and discusses the main contributions of the study.

6.2 DISCUSSION OF THE RESEARCH OBJECTIVES

Informed by the research problem as outlined in Chapter 1, section 1.3, this section reports on whether the research objectives were achieved or not. The study was underpinned by the following main research questions:

What are the potential factors which can be incorporated into a framework ***that can encourage SMEs to use services provided by the QI in developing countries?***

The main research question was supported by the following four sub-objectives:

- **Research Objective 1** - to determine potential factors that can encourage the use of the services provided by the QI within the SME sector in South Africa, based on the inputs from QI experts as determined by a combination of robust qualitative research methods.
- **Research Objective 2** – to determine the relationship between potential factors that can encourage the use of the services provided by the QI and SME performance.
- **Research objective 3** - to determine the extent to which the factors and their associated variables conform to the pre-established theory as determined by quantitative research methods.

- **Research objective 4** - to develop an appropriate framework that can be used for the application of the QI services by SMEs in South Africa to optimise SMEs business performance, and to make a significant contribution within the QI discipline.

6.2.1 Research objective 1

To determine potential factors that can encourage the use of the services provided by the QI within the SME sector in South Africa, based on the inputs from QI experts as determined by a combination of robust qualitative research methods.

Due to a lack of a suitable questionnaire in literature that could be adopted or adapted, it was decided to develop a questionnaire for the current study to answer the research objectives. Possible themes were identified during the interviews with QI experts in South Africa. Subsequent to the interviews, two focus group sessions were conducted with the aim of enhancing data richness from the interviews. The focus groups were comprised of QI and SME practitioners. Five themes subsequently emerged from the interviews and the focus groups.

To validate the five themes that emerged from the interviews, a *debrief* session was arranged with QI experts and SME practitioners. Participants during the *debrief* session were not the same participants who were involved in the interviews and focus group. This type of arrangement was to ensure independence and data integrity. During the *debrief* session, another theme emerged. Therefore, the following are the six themes that were finally identified from interviews, the focus groups, and the “debrief” session:

1. Education
2. Requirement
3. Awareness
4. Impact resulting from the QI
5. Collaboration
6. Affordability

Identification of the six themes resulted into the attainment of the first research objective, namely:

6.2.2 Research objective 2

To determine the relationship between potential factors that can encourage the use of the services provided by the QI and SME performance. This objective was achieved by developing six propositions which were aligned to the above research objective.

Empirical findings from qualitative research, as discussed in chapter 4, support the following propositions:

- **Proposition 1:** SME awareness about the QI services is likely to enhance SMEs performance.
- **Proposition 2:** Collaboration amongst the QI key institutions, as well as between SMEs representatives and the QI, is likely to enhance SME performance.
- **Proposition 3:** Educating SMEs about the services provided by the QI is likely to increase SME performance.
- **Proposition 4:** The ability for SMEs to afford services provided by the QI is likely to increase SME performance.
- **Proposition 5:** The ability for SMEs to comply to specified requirement is likely to increase SME performance.
- **Proposition 6:** The ability for SMEs to realise the impact from the QI services is likely to increase SME performance.

6.2.3 Research objective 3

To determine the extent to which the factors and their associated variables conform to the pre-established theory as determined by quantitative research methods. The third research objective was to determine the extent to which the factors and their associated variables conform to the pre-established theory. In order to achieve this objective, exploratory factor analysis (EFA) was conducted to determine the measurement structure. EFA not only offers the possibility of gaining a clear view of the data, but also the possibility of using its output in subsequent analyses (Field 2000).

After a positive confirmation of the reliability and correction analysis, EFA commenced. During EFA the Maximum Likelihood Factor (MLF) method was used for factor

extraction, and six factors were retained. Communality tests were done to determine the proportion of each variable's variance that can be explained by the factors, and to decide which of the variables to include or exclude from the EFA. Following factor loading the factor structure was identified as shown in Table 5.10.

Once Exploratory Factor Analysis was done, Confirmatory factor analysis (CFA) commenced. The following steps were considered during CFA. The first step was to *"define"* the measurement model. The measurement model was comprised of six constructs that emerged from the interviews and focus groups. The variables associated with each factor, or constructs in the measurement model were obtained mainly from literature.

As discussed previously, a 7-point Likert scale was used for all the variables since this type of scale is proven to be more reliable compared to a 5-point scale (Russo et al., 2021). Scale reliability was achieved during pilot testing when the questionnaire was developed.

The second step was to *"develop"* the overall measurement model. The overall measurement model that was developed is shown in Figure 5.6 and consists of six factors and 28 variables. Each factor has five (5) variables, except affordability with three (3) variables.

All constructs are correlated with one another, and each variable relates to only one construct, that is, all cross-loadings are zero. The measurement model and its constructs were confirmed, as described in detail in section 5.6.

The aforementioned steps and the confirmatory factor analysis as described in detail in section 5.6, provide answers to objective two. That is:

> The extent to which the factors and their associated variables conform to the pre-established theory.

6.2.4 Research objective 4

Objective four was intended to achieve the main output of the study, that is:

- To develop an appropriate *framework that can be used for the application of the QI services by SMEs in South Africa to optimise SMEs business performance, and to make a significant contribution within the QI discipline.*

Objective four is the culmination of objective one, two and three, and the final developed framework is illustrated in Figure 5.6, providing the main output of the current study, that is; an appropriate framework that can be used for the application of the QI services by SMEs in South Africa to optimise SMEs business performance, and to make a significant contribution within the QI discipline.

6.3 DISCUSSION OF THE MAIN OUTPUT AND A COMPARISON OF EMPIRICAL RESULTS WITH THE THEORETICAL FINDINGS

In the first and second chapters of this thesis, we learnt that in order to maintain quality in a country, a supporting infrastructure, called a Quality Infrastructure system, is needed. This system is considered to be a viable tool that possesses the potential to improve performance in small businesses.

The QI system is comprised of standardisation, accreditation, metrology, and conformity assessment, which are considered the "hard" part of the QI system. Other factors include educational systems for quality, quality awareness, level of knowledge for quality, and enterprises in quality, which are considered as the “soft” part of the QI system. The new, suggested framework illustrates the research findings of this research, depicting driving forces or factors for improving performance and the success of the SMEs.

6.3.1 Awareness

Quality awareness was found to be one of the determinants of the use of the services of the QI system, and considered as one of the factors affecting SME performance. Quality awareness is a soft part of the Quality Infrastructure system and is able to improve performance in small businesses.

Empirical findings identified in chapter 4 revealed that *Quality awareness* has the ability to encourage SMEs to use the services provided by the QI key institutions. These finding are in agreement with the findings from literature reports. For example, Kellermann (2019:312) argued that SMEs are often unaware that by using standards, they can boost efficiency, increase confidence in their clients, and open new markets. The same report from Kellermann concluded that in the context of Regional Accreditation Bodies (RAB), member states may establish national accreditation focal points (NAFPs) to act as liaisons between the RAB and entities wishing to be

accredited. These NAFPs are often tasked with promoting the role of accreditation through awareness seminars, training of potential accredited organisations, and so on.

Lack of quality awareness among leaders of an organisation can lead to poor convergence of QI elements, resulting in performance decline according to Huang et al. (2020).

There are benefits for increasing quality awareness, such as gains in productivity, increased personnel participation and efficiency, improved image, and penetration into new markets. Therefore, quality awareness should be enhanced in order to encourage the use of the application of QI services by SMEs in South Africa.

Government should increase the awareness level of the general public, especially non-stakeholders, in terms of knowledge, attitude, and actual behaviour.

6.3.1.1 Ways of enhancing awareness

The following are possible ways to enhance awareness:

- By developing a centralised platform to assist SMEs to access information in one place.
- By collaborating with industry associations to establish quality campaigns to promote awareness for SMEs.
- By providing a platform to ensure that the units of the QI articulate the same goals for matters related to SMEs.
- By promoting a culture of consumer responsibility, through individual and / or group education with members of the SMEs.
- By promoting, on behalf of SMEs, a culture of responsibility that will facilitate an informed consumer choice.

By considering the above, it is expected that the awareness of the QI by SMEs will be improved. Kumar and Albashrawi (2022) agree, and argue that in order to enhance the awareness of the QI, it is very important to improve competitiveness across priority sectors.

6.3.2 Collaboration

Collaboration has been found to be a determinant of the use of the services of the QI system. According to the literature, collaboration has a mediating effect on the impact of market orientation on organisation performance, and a significant direct effect on the SME's performance (Ahmad, Chao, Chao & Ilyas, 2021).

Kellermann (2019) argued that various elements of the QI need to be interrelated and that collaboration of their responsibilities and services is an important parameter which cannot be overlooked.

This implies that this framework could benefit SMEs by enhancing collaboration with the QI institutions.

6.3.2.1 Ways of enhancing collaboration

The following are ways in which collaboration can be enhance:

- By providing information accurately within the QI units to make quick common decisions on behalf of SMEs.
- By ensuring that information is readily available within the QI key institutions in order to enhance the level of trust amongst members of the SMEs.
- By taking decisions on behalf of SMEs as a collective, rather than as individual members of the QI units.
- By sharing risks as a collective and minimising individual vulnerability to avoid affecting members of the SMEs negatively.
- By creating an enabling environment to achieve a common goal for members of the SMEs.

Previous reports in literature agree with these conclusions and further suggest enablers to enhance collaboration. For example, Kumar and Albashrawi (2022) suggest that the establishment of strong collaboration between four helices (government, university, science and technology institutions, civil society and media, and enterprises) strengthens the legal framework, and legal metrology.

6.3.2.2 Benefits of Collaboration

Benefits of collaboration may include:

- improvement in construction quality;

- risk sharing;
- innovation;
- creativity;
- a working relationship (Smith & Thomasson's, 2018:192), and
- facilitating a combination of resources and expertise to increase project performance (Faris et al., 2022).

6.3.2.3 Barriers to Collaboration

The barriers to collaboration, which must be avoided, include lack of commitment, communication, and breach of trust (Deep, Gajendran & Jefferies's, 2021).

6.3.3 Education

Education has been found to be one of the most important determinants in the use of the services of the QI system. As mentioned above, there is a need for further education, training, and promotional and awareness campaigns through the use of a one-stop shop. Organisations need to acquire and assimilate knowledge regarding the services provided by the QI. According to the literature, SMEs are being challenged by a lack of education and knowledge. This means that business organisations could benefit from the framework by furthering their education and enhancing their knowledge with regard to the functioning of the QI institutions.

The process of education and learning consists of psychological and social processes that involve intuition, interpretation, integration, and institutionalisation of knowledge (da Silva Souza & Takahashi, 2019). By using this framework, knowledge management practice and organisational learning should be enhanced in order to achieve sustainable organisational performance in SMEs' business environment.

Knowledge strategies and processes should be implemented in SMEs to increase the effectiveness and efficiency of business processes, achieve knowledge strategy, and sustain organisational performance (Archer-Brown & Kietzmann's, 2018).

6.3.3.1 Ways of enhancing education

The following are ways in which education can be enhanced:

- Through collaborating with education institutes to include QI into appropriate curricula.

- By disseminating the QI services with seminar workshops.
- By organising training of members of the SME management in QI services.
- By organising information sharing with SMEs via webinars.
- By organising platforms with frequently asked questions to assist SMEs with information.

6.3.4 Affordability

It has been found that there is a positive relationship between the total volume of financing and firm performance, and between formal finance and firm-level product innovation and process innovation (Wellalage & Fernandez, 2019). This calls for financial institutions to assist SMEs to access financial capital as it plays an important role in enhancing firm performance. Financial accessibility constraints have been found to be negatively associated with SMEs' performance.

6.3.4.1 Ways of enhancing affordability

The following are ways in which affordability can be enhanced:

- To support and subsidise SMEs financially with consultancy fees for activities related to conformality.
- To support and subsidise SMEs financially for training programs related to conformity.
- To support and subsidise SMEs financially for training related to internal audits.

We have seen in previous chapters that the QI is a viable system to assist in penetrating international trade. However, Blind et al. (2018) argued that cost can be a barrier to trade.

6.3.5 Requirements

There are requirements for encouraging SMEs to use the services of the QI system for benefits that include sustainable performance. These include:

- *Policy and regulations*. Policy, legal, regulatory and administrative frameworks, and institutional arrangements (public and/or private) are required to establish and implement standardisation, metrology (scientific, industrial and legal), accreditation and conformity assessment services (inspection, testing, and

certification) necessary to provide acceptable evidence that products and services meet defined requirements.

- *Conformity Assessment.* The conformity assessment at the centre of the system shows two entry points: namely, a voluntary and a regulatory domain, supplier, and the customer. The voluntary sector articulates customer requirements, and the regulated sector is where Government acts as legislator and regulator of technical regulations.
- *Strategic partners of the QI system*. These are companies, business associations, business support organisations, and universities, which collaborate in the definition of requirements for products and services.
- *Free Market System.* Products should be traded between willing suppliers and willing consumers within a free-market system. Where there are no price controls, the “laws” of supply and demand should take precedence.
- *Market surveillance.* This is the regulatory process, which increases the overall value of the whole system. Market surveillance ensures that products placed on the market, whether imported or produced locally, conform to national technical regulations and are not counterfeit or pirated. Market surveillance should be conducted solely to ensure that products comply with mandatory requirements, whereas conformity assessment (example, in the form of certification) has additional standards, such as audit criteria, based on both commercial and regulatory requirements.

6.3.5.1 Ways of enhancing requirements

The following are ways in which QI key institutions can assist SMEs to meet specified requirements:

- By developing help desk facilities as a one-stop point of contact to provide centralised information and support to SMEs.
- By developing and publishing guidance notes to share best practices and experiences with members of the SMEs.
- By developing single web portal facilities to bring information into a single user interface for SMEs.
- By developing online toolkits to assist SMEs to access information remotely.

- By developing appropriate self-service facilities to assist SMEs to access information on their own.

6.3.6 Impact resulting from the QI

According to the developed framework, SMEs should expect benefits from this framework. The QI system has been identified as one of the viable tools that contribute towards the sustainability of SMEs. The *"soft"* part and *"hard"* part of the QI system impacts positively on the enterprises' performance, both at the organisational level and at the national level.

6.3.6.1 Some of the benefits of the QI in the economy

- *Standards.* As seen in chapter 2, Standards cover a range of activities undertaken by organisations to enhance organisational capabilities to be aligned with national and international best practices, and to develop internal competencies, routines, and processes that can leverage an innovation journey towards excellence (Caetano, 2017). In this way, standards improve the efficiency of the use of capital or labour. In addition, Standards have impacts on other outcomes that directly relate to economic productivity, such as international trade and innovation.
- *Impact of Metrology on the Economy.* International and domestic experience has shown that the level of metrological support for the production of products and services is directly related to their quality. Metrology is an important link in the system of ensuring the quality of products and services at all stages of the life cycle (Makarov, Blatova, Fedorov & Budagov, 2020).

6.4 CONTRIBUTION OF THE STUDY

6.4.1 Direct contribution to the body of knowledge

The relationship between the QI and SME performance is an area that has not been explored in the QI research, in particular for developing countries. This study has added new insights to academic discourse within the SME and QI sector by:

- Identifying six significant factors that can be used by the QI key institutions to encourage SMEs in South Africa to use services provided by the QI.
- Developing a framework that can be used for the application of the QI services in developing countries. The self-constructed framework from this study is an

important tool that can be used in future research, and as guide for those who wish to evaluate QI for developing countries.

6.4.2 Contribution from a practical level

At a practical level, the outcome of this study identified 28 items associated with the six factors that can be implemented from a practical perspective by the QI key institutions. In order to enhance collaboration between the QI key institutions, there should be increased awareness and education about the QI services. Additionally, arrangements put in place by the QI key institutions in complying with specified requirements, and the impact provided by the QI should be considered.

6.4.3 Contribution from a policy perspective

Policy makers will benefit from the developed framework to provide policy direction in cases such as the formulation of a National Quality Policy for developing countries in particular.

6.4.4 Contribution to international trade

The developed framework will be critical in aiding the trade and sustainable development within the context of ACfTA through speeding up the delivery time, reducing goods rejection at crossing borders, environmental protection, and adding competitive advantages (Nzumile & Taifa, 2021)

6.4.5 Methodological contribution

Results presented in Figure 5.4 (Correlation between factors) provide a good foundation that can contribute to system dynamics modelling in the context of the Quality Infrastructure.

6.5 BENEFITS OF RESEARCH

The main outcome of the will assists the department of trade, industry, and competition to provide policy direction in the context of the QI, for SMEs in South Africa to optimise their business performance.

The following organisations should also benefit from the developed framework:

- The QI key institutions to enhance their collaboration and collectively establish strategies to encourage SMEs in South Africa to use the QI services.

- Other interested parties, such as non-government organisations and Small Enterprise Development Agencies will also benefit from the study.
- Private sector enterprises are in many cases the ones demanding QI. To promote a quality culture among private enterprises, it is crucial to create the link between the services offered by national quality infrastructure institutions and private sector enterprises. Instilling this link will assist to entrench the National Quality Policy (NQP) of South Africa.

6.6 LIMITATIONS

Notwithstanding its contributions as explained above, this study is not without limitations, which are accordingly acknowledged.

Polit and Beck (2004:101) maintained that the researcher should be in the best position possible to discuss issues related to the study limitations, such as sample deficiencies, design problems, and weakness in data collection.

In the current study, although all face-to face interviews were conducted just before the first national lockdown in South Africa due to the global COVID-19, focus groups were conducted virtually using the Microsoft (MS) Teams platform.

During the use of the MS Teams platform, the researcher and the moderator could not see and observe the participants completely. At times they were only partially visible, depending on how the person was positioned in front of the camera. This made it difficult to interpret facial expressions, body language, and to some extent other non-verbal signals. There was a potential risk that another uninvited person could be present in the room (not visible) with one of the participants, leading to a breach of confidentiality and impartiality.

6.7 RECOMMENDATIONS FOR FURTHER RESEARCH

The research found two items associated with affordability to be insignificant since their “item-test correlation” values indicated that the two items were less correlated compared to the overall scale, as shown in Table 5.5. The two items were subsequently removed from the final framework, namely (1) subsidising SMEs certification and accreditation programs; and (2) subsidising the measurement activities (testing or calibration programs).

These findings provide an opportunity for further research to investigate why the two items appear not to be measuring the same as the other items. Kellermann (2019) maintained that although the SME sector needs support, demanding below-cost QI services is not an appropriate strategy since the QI key institutions will not be financially sustainable. Kellermann argues that technical support from the QI institution for the SMEs is a better approach.

Another area for future research would be to investigate possible mediating and/or moderating variables that could assess the relationship between the six factors, namely, *education, requirement, awareness, impact, collaboration and affordability*, and *SME performance*, as a dependent variable.

6.8 CHAPTER SUMMARY

The study aimed to develop a framework that can be used for the application of the QI services by SMEs in South Africa to optimise their business performance. This chapter provided the conclusions of the research project in terms of the findings and results in relation to the research problem and objectives.

A comparison between the findings and theories from literature was presented. The chapter concluded with presentation of the main contributions of the study and presented limitations as well as recommendations for future research.

REFERENCES

Ahmad, Z., Chao, L., Chao, W., Ilyas, S. & Shujaat, A.S., 2021, December. Collaboration Alliances, GVC Participation and SME'S Performance, A Post CPEC Quantitative Analysis. In 2021 3rd International Conference on E-Business and E-commerce Engineering: 179 -185.

Ahmed, A., Khuwaja, F.M., Brohi, N.A., Othman, I. & Bin, L. 2018. Organizational factors and organizational performance: A resource-based view and social exchange theory viewpoint. *International Journal of Academic Research in Business and Social Sciences*, *8*(3): 579 - 599.

Ali, A & Olaitan, S. (2000), Writing a research article for publication. In S. O. Olaitan, A. Ali, E. O. Eyoh & G. Sowande (eds) Research skills in education and social sciences. O NITSHA Cape Publishing International Ltd.

Al Kiyumi, H.S. & Matriano, M.T. 2021. A critical study on entrepreneur's perception on sme's opportunities and challenges: case of Oman. *Advances in Social Sciences Research Journal*, 8(1): 421 - 455.

Algharabat, R., Rana, N.P., Dwivedi, Y.K., Alalwan, A.A. & Qasem, Z. 2018. The effect of telepresence, social presence and involvement on consumer brand engagement: An empirical study of non-profit organizations. *Journal of Retailing and Consumer Services*, 40: 139 -149.

Archer-Brown, C. & Kietzmann, J. 2018. Strategic knowledge management and enterprise social media. *Journal of Knowledge Management*, 22(6): 1288-1309.

Aswal, D.K. 2020. Quality infrastructure of India and its importance for inclusive national growth. *MAPAN*, 35(2): 139 -150.

Ayyagari, M., Beck, T.& Demirgüç-Kunt, A. 2003. Small and medium Enterprises. *Small Business Economics*, 29(4): 415 - 434.

Babbie, E. 2010. Research design. *The practice of social research*, 12th edition. London: Wadsworth.

Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of management*, 17(1): 99 -120.

Becker, B.E. & Huselid, M.A. 2006. Strategic human resources management: where do we go from here? *Journal of management*, *32*(6): 898 - 925.

Beins, B. 2009. *Research methods: A tool for life*, 2nd edition. Boston, MA: Pearson.

Berisha, G. & Pula, J.S. 2015. Defining small and medium enterprises: a critical review. *Academic Journal of Business, Administration, Law and Social Sciences*, 1(1): 17- 28.

Blind, K., Mangelsdorf, A. & Pohlisch, J. 2018. The effects of cooperation in accreditation on international trade: Empirical evidence on ISO 9000 certifications. *International Journal of Production Economics*, *198*: 50-59.

Bloodgood, J. M. 2019. Knowledge acquisition and firm competitiveness: The role of complements and knowledge source. *Journal of Knowledge Management,* 23(1), 46-66.

Braun, V. & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2): 77-101.

Braun, V., & Clarke, V. 2012. Thematic analysis. In H. Cooper (Ed.), *APA handbook of research methods in psychology Vol 2: Research designs,* American Psychological Association, 57-71.

Brinkmann, S. & Kvale, S. 2015. Conducting an interview. *Interviews. Learning the craft of qualitative research Interviewing*: 149-166.

Brown, R.J. 2021. Measuring measurement–What is metrology and why does it matter? *Measurement*, 168: 108408

Bryman, A. 1988. “Quantity and quality in social research,” London: Unwin Hyman.

Bryman, A. and Bell, E. 2015. Business research methods, 4 th edition. Oxford: Oxford University Press

Bryman, A. and Bell, E. 2015. Business research methods, 4 th edition. Oxford: Oxford University Press

Caetano, I. 2017. Standardization and innovation management. *Journal of innovation management*, *5*(2): 8-14.

Casteel, A., & Bridier, N. L. (2021). Describing populations and samples in doctoral student research. International Journal of Doctoral Studies, 16, 339-362. DOI:10.28945/4766

Centre, I.T. (2016), SME Competitive Outlook.2016: Meeting the standard for Trade, Google Books. United Nations. Available at:https://books.google.com/books/about/SME_Competitiveness_Outlook_2016.html?id=SFvjDwAAQBAJ, (Accessed: 13 January, 2018).

Calza, E., Goedhuys, M. and Trifković, N., 2019. Drivers of productivity in Vietnamese SMEs: The role of management standards and innovation. *Economics of Innovation and* New Technology, 28(1): 23-44.

Charmaz, K. 2014. *Constructing grounded theory*, 2nd edition. Thousand Oaks, CA: Sage.

Cattell, R. B., & Vogelmann, S. 1977. A comprehensive trial of the scree and KG criteria for determining the number of factors. *Multivariate Behavioral Research,* 12*(*3): 289–325. DOI.10.1207/s15327906mbr1203_2

Chen, Y.-F., Deng, S.-X. 2021. Analysis of restrictive factors in the integrated development of national quality infrastructure (NQI). *China Insp. Test. 29*, 6–8, 12.

Choi, D.G., Hyun, O.S., Hong, J.I. & Kang, B.G. 2014. Standards as catalyst for national innovation and performance–a capability assessment framework for latecomer countries. *Total Quality Management & Business Excellence*, 25(9-10): 969-985.

Chumphong, O., Srimai, S. & Potipiroon, W. 2020. The resource-based view, dynamic capabilities and SME performance for SMEs to become smart enterprises. *ABAC ODI Journal Vision. Action. Outcome*, 7(2): 129 - 146.

Coffey, A., & Atkinson, P. 1996. Making sense of qualitative data: Complementary research strategies. California, SAGE.

Cooper, D.R. & Schindler, P.S. 2014. *Business Research Methods*, 12th edition. New York: McGraw-Hill

Creswell, J.W. 2014. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 4th edition. Thousand Oaks, California, SAGE Publications.

Creswell, J.W., Klassen, A.C., Plano Clark, V.L. & Smith, K.C. 2011. Best practices for mixed methods research in the health sciences. *Bethesda (Maryland): National Institutes of Health*, *2013*: 541-545.

Crook, T.R., Ketchen , D.J., Combs, J.G. and Todd, S.Y., 2008. Strategic resources and performance: a meta-analysis. *Strategic management journal*, *29*(11): 1141-1154.

Cusolito, A.P. and Maloney, W.F., 2018. Productivity revisited: Shifting paradigms in analysis and policy. World Bank Publications.

da Silva Souza, C.P. & Takahashi, A.R.W. 2019. Dynamic capabilities, organizational learning and ambidexterity in a higher education institution. *The Learning Organization*.

Deep, S., Gajendran, T., & Jefferies, M. 2021. A systematic review of 'enablers of collaboration' among the participants in construction projects, *International Journal of Construction Management*, 21(9): 919-931.

Demissie, M., Beshah, B. and Ebinger, F. 2022. A comprehensive review of the national quality infrastructure framework. *International Journal of Productivity and Quality Management*, 37(3): 361-383.

Denzin N.K. & Lincoln, Y.S. 2000. *Handbook of Qualitative Research.* 2nd edition. Thousand Oaks Calif: Sage Publications.

De Vellis, R. F. 2003. *Scale Development: Theory and Applications*. 2nd edition . Thousand Oaks, CA: Sage Publications.

Dey, I. 1993. *Qualitative Data Analysis*. London, Routledge.

Doeleman, H.J., ten-Have, S. and Ahaus, C.T.B., 2014. Empirical evidence on applying the European Foundation for Quality Management Excellence Model, a literature review. *Total Quality Management & Business Excellence*, *25*(5-6): 439-460.

Don-Solomon, A. & Eke, G.J. 2018. Ontological & epistemological philosophies underlying theory building: A scholarly dilemma or axiomatic illumination - The business research perspective. *European Journal of Business and Innovation Research*, 6(2): 1-7.

dos Reis, M.C. & de Almeida, M.F.L. 2021. Quality infrastructure and innovation in the Brazilian information technology services: evidence from the National Innovation

Survey. *Journal of Physics: Conference Series*, 1826(1):012025. DOI.10.1088/1742-6596/1826/1/012025

DTIC (2017), Accessed at: thedtic.gov.za/agencies, (Accessed: February 15, 2017)

Easterby-Smith, M., Thorpe, R. & Jackson, P. 2008. *Management research: an introduction*. 3rd edition. London, Sage.

Ellis, J.L., 2017. Factor analysis and item analysis. *Applying statistics in behavioural research*, pp.11-59.

Etikan, I., Musa, S.A. & Alkassim, R.S. 2016. Comparison of convenience sampling and purposive sampling.*American Journal of Theoretical and applied Statistics*, 5(1): 1-4.

European Commission. 2005. *The New SME Definition: User Guide and Model Declaration*. Enterprise and Industry. Brussels: Office for Official Publications of the European Communities.

Fabrigar, L. R., MacCallum, R. C., Wegener, D. T., & Strahan R. 1999. Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods* 4(3): 272-299.

Faris, H., Gaterell, M. & Hutchinson, D. 2022. Investigating underlying factors of collaboration for construction projects in emerging economies using exploratory factor analysis. *International journal of construction management*, 22(3): 514-526.

Field, A. 2000. *Discovering Statistics using SPSS for Windows*. Thousand Oaks, CA: Sage publications.

Field, A. 2013. *Discovering Statistics Using IBM SPSS Statistics*. California: SAGE.

Fonseca, L., Domingues, J.P., Baylina, P. and Calderón, M. 2017. Management system certification benefits: where do we stand?. *Journal of Industrial Engineering* and Management, 10(3): 476-494.

Frenz, M. & Lambert, R. 2014. The economics of accreditation. *NCSLI,* 9(2): 42-50.

Fuller, E.L. Jr. & Hemmerle, W.J. 1966. Robustness of the maximum-likelihood estimation procedure in factor analysis. *Psychometrika*, 31(2): 255-266.

Fungwe, R. & Kabubi, M. 2020. Exploring Operational Challenges Faced by Small and Medium-Sized Enterprises (SMEs): Case Study of Lusaka Central Business District. *The International Journal of Multi-Disciplinary Research*. 2(1): 23-32.

Galvez, M.P., Herlache, A., Anderko, L., Patel, S.S., Azar, C., Ardon Casco, K., Mindel Rubinstein, W., Farquhar, D. & Condon, S., 2021. Speaking with one voice: lessons learned on effective communication of environmental health risk. *Environmental Justice*, 14(4): 235-242.

Gashi, K. & Krasniqi, A.D.I. 2019. The One-Stop Shop Approach: New Public Management Model in Transition Countries. *European Scientific Journal ESJ*, *15*(1):185-198.

Gay, L., Mills, G. and Airasian, P. 2012. Correlational research. *Educational research: Competencies for analysis and applications*, pp.203-226.

Gravetter, F.J. and Wallnau, L.B. 2017. Statistics for the behavioral sciences. 10th edition. Boston: Cengage Learning

George, D., & Mallery, P. (2016). IBM SPSS Statistics 23 Step by Step: A Simple Guide and Reference (14th ed.). New York: Routledge.

Gherghina, Ș.C., Botezatu, M.A., Hosszu, A. & Simionescu, L.N. 2020. Small and medium-sized enterprises (SMEs): The engine of economic growth through investments and innovation. *Sustainability*, 12(1): 347.1273-1296.

Gómez-López, R., Serrano-Bedia, A.M. & López-Fernández, M.C. 2016. Motivations for implementing TQM through the EFQM model in Spain: an empirical investigation. *Total Quality Management & Business Excellence*, 27(11-12): 1224-1245.

Gonçalves, J. and Peuckert, J. (1970) *[PDF] measuring the impacts of quality infrastructure impact theory , Empirics and study design: Semantic scholar*, Available at: https://www.semanticscholar.org/paper/measuring-the-impacts-of-qulaity-infrastructure-,-Gon%C3%A7alves-Peuckert/74c2bf59d40c31593f794417813aa8580de55668 (Accessed: 18 February, 2018).

Gonçalves, J., Göthner, K.C. and Rovira, S., 2015. Measuring the impact of quality infrastructure in Latin America: Experiences, achievements and limitations. *Measuring*

the impact of quality infrastructure in Latin America: Experiences, achievements and limitations, *Inicio*. ECLAC. Available at: https://repositorio.cepal.org/handle/11362/37771, (Accessed: 01 November 01, 2017).

Göthner, K.C., Peuckert, J. & Rovira, S. 2011. Impact Studies-QI Impact of the Quality Infrastructure in Latin America: Institutions, Practices and Challenges for Public Policies. *PTB Mitteilungen*, 121(4): 435.

Group, Independent Evaluation.(2008).Financing micro, small, and medium Enterprises: An Independent Evaluation of IFC's experience with Financial intermediaries in frontier Countries.The World Bank. Retrieved from http://econpapers. repec.org/repec:wbk:wbpubs:648, (Accessed, 13 March 2018).

Guasch, J. L., Racine, J.-L., Sánchez, I., & Diop, M. 2007. *Quality Systems and Standards for a Competitive Edge*. Washington, D.C.: The World Bank.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research*. Sage Publications, Inc.

Gundumogula, M. 2020. Importance of focus groups in qualitative research. *International Journal of Humanities and Social Science (IJHSS)*, 8(11): 299-302.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. 1998. *Multivariate Data Analysis*. Vol. 5, No. 3: 207-219, Upper Saddle River, NJ: Prentice Hall.

Hair Jr., J.F., Black, W.C., Babin, B.J. & Anderson, R.E. 2009. *Multivariate Data Analysis*, 7th Edition. Upper Saddle River, Prentice Hall.

Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. 2014. Multivariate data analysis, 7 th edition. Harlow: Pearson Education.

Harmes-Liedtke, U. 2010. The relevance of quality infrastructure to promote innovation systems in developing countries. *Physikalisch-Technische Bundesanstalt*, pp.1-29.

Hashemi, P., Khadivar, A. & Shamizanjani, M. 2018. Developing a domain ontology for knowledge management technologies. *Online Information Review*, 42 (1): 28-44.

Harmes-Liedtke, U., & Di Matteo, J. J. O. 2011. *Measurement of quality infrastructure. Physikalisch Technische Bundesanstalt* Discussion Paper 5/2011. Physikalisch Technische Bundesanstalt. Available at: from https://www.researchgate.net/publication/274638349_Measurement_of_Quality_Infrastructure, (Accessed: 22 January, 2020)

Healy, B., O'Dwyer, M. & Ledwith, A. 2017. An exploration of product advantage and its antecedents in SMEs. *Journal of Small Business and Enterprise Development*, 25(1): 129-146.

Hennink, M.M. 2013. *Focus group discussions*. New York: Oxford University Press.

Hernández-Linares, R., Kellermanns, F.W. & López-Fernández, M.C., 2021. Dynamic capabilities and SME performance: The moderating effect of market orientation. *Journal of Small Business Management*, *59*(1): 162-195.

Hoyle, D. 2001. ISO 9000 Quality Systems Handbook, 4th edn. Woburn: Butterworth-Heinemann.

Huang, M., Xia, T., Zhang, H., Pan, E. & Xi, L. 2020. Relevance of quality infrastructure with promoting export quality: Evidence from emerging markets. *The Journal of Grey System*, 32(4): 32 - 51.

Hussain, T., Eskildsen, J.K. and Edgeman, R. 2020. The intellectual structure of research in ISO 9000 standard series (1987–2015): A Bibliometric analysis. *Total* Quality Management & Business Excellence, 31(11-12): 1195-1224.

Index, S.P. 2019. Western Balkans and Turkey 2019. *Assessing the implementation* of the small business act for Europe.

Isharyadi, F. and Kristiningrum, E., 2021. Profile of system and product certification as quality infrastructure in Indonesia. *Open Engineering*, 11(1): 556-569.

International Laboratory Accreditation Corporation, 2021, ILAC, retrieved from Ilac.org, (Accessed: 01 September 2021)

International Network on Quality Infrastructure, Quality Infrastructure, INetQI, Available at: https://www.inetqi.net/, (Accessed: 20 November 2020).

International Organization for Standardization. ISO 9000:2015 Quality management systems - Fundamentals and vocabulary. Geneva: ISO; 2015.

ISO/IEC. 2004. ISO/IEC 17000:2004 *Conformity Assessment—Vocabulary and General Principles*. International Organization for Standardization and International Electrotechnical Commission, Geneva. ISO.

ISO. 2010. *Building trust – The Conformity Assessment Toolbox*. Geneva: International Organisational of Standards.

ISO. 2021. Standards & economic growth: ISO members' research on the impact of standards on their national economies. Geneva: International Organisational of Standards. Available at: https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100456.pdf, (Accessed: 21 April 2022)

Jaeger, M., & Adair, D. 2016. Perception of TQM benefits, practices and obstacles: The case of project managers and quality management representatives in Kuwait. *The TQM Journal*, 28(2): 317-336.

Jaradat, Z.A., Taha, R.B., Zin, R.B.M. & Zakaria, W.Z.W. 2018. The impact of financial accessibility constraints and government regulations on the organisational performance of small-and-medium-sized enterprises. *Journal of Business and Retail Management Research*, 13(1): 108-120.

Jiang, J.-D., Li, X.-Z., Zheng, L.-W. 2019. National Quality Infrastructure: A Review. *Ind. Eng. Manag*, 24: 198–205.

Jonker, J. and Pennink, B., 2010. The essence of research methodology: A concise guide for master and PhD students in management science. Springer Science & Business Media.

Joyce, S., Stuart, M., Forde, C. & Valizade, D. 2019. Work and social protection in the platform economy in Europe. *Advances in industrial and labor relations*, 25

Keller, G. 2018. Statistics for management and economics. 11th edition. Mason: Cengage Learning.

Kellermann, M. and Keller, D.P., 2014. Leveraging the Impact of Business Environment Reform: The Contribution of Quality Infrastructure—Lessons from Practice. *The Donor Committee for Enterprise Development. Working Paper*.

Kellermann, M. 2019. Ensuring quality to gain access to global markets: a reform toolkit. World Bank Publications.

Kellermann, M., 2019. Ensuring quality to gain access to global markets: a reform toolkit. World Bank Publications.

Kersten, R., Harms, J., Liket, K. & Maas, K. 2017. Small Firms, large Impact? A systematic review of the SME Finance Literature. *World development*, *97*: 330-348.

Kiyabo, K. and Isaga, N., 2020. Entrepreneurial orientation, competitive advantage, and SMEs' performance: application of firm growth and personal wealth measures. Journal of Innovation and Entrepreneurship, 9: 1-15.

Kiger, M.E. & Varpio, L., 2020. Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical teacher*, *42*(8): 846-854.

King, M. & Renedo, E., 2020. Achieving the 2.4% GDP target: The role of measurement in increasing investment in R&D and innovation., s.l.: NPL.

King N. 2004. Using templates in the thematic analysis of text. In Cassell C., Symon G. (Eds.), *Essential guide to qualitative methods in organizational research* (pp. 257–270). London, UK: Sage.

Kordab, M., Raudeliūnienė, J. & Meidutė-Kavaliauskienė, I. 2020. Mediating role of knowledge management in the relationship between organizational learning and sustainable organizational performance. *Sustainability*, 12(23): 10061.

Korea. In 19th International Congress of Metrology (CIM2019) (p. 04002). EDP

Krueger, R.A. 1988. *Focus Groups. A Practical Guide for Applied Research*. Thousand Oaks, California: Sage Publications.

Kuhn, T. S. 1962. *The structure of scientific revolutions*. Chicago, IL: University of Chicago Press.

Kumar, V. & Albashrawi, S. 2022. Quality Infrastructure of Saudi Arabia and Its Importance for Vision 2030. *MAPAN*, 37(1): 97-106.

Kump, B., Engelmann, A., Kessler, A. & Schweiger, C. 2019. Toward a dynamic capabilities scale: measuring organizational sensing, seizing, and transforming capacities. *Industrial and Corporate Change*, 28(5): 1149-1172.

Kumurya A. S, Gwarzo M.Y, Ahmad M.B & Halliru A.H. 2016. Laboratory quality management system for medical testing and diagnostic laboratory. A review of an

avenue to accreditation and beyond. *The European Journal of Logistics, Purchasing and Supply Chain Management*, 4(1): 19-31

Leedy, P.D. & Ormrod, J.E. 2010. *Practical research: planning and design*. 9th edition. Upper Saddle River: Merrill.

Leedy, P.D. & Ormrod, J.E. 2005. *Practical research* (Vol. 108). Saddle River. NJ, USA: Pearson Custom.

Leedy, P.D. & Ormrod, J.E. 2015. Practical research: Planning and design. Eleventh edition. Edinburgh Gate: Pearson Educatio

Liepina R, Lapina I & Mazais J. 2014. Contemporary issues of quality management: relationship between conformity assessment and quality management. *Procedia Social and Behavioral Sciences*, 110: 627-637.

Link, A.N., 2021. The economics of metrology: An exploratory study of the impact of measurement science on US productivity. *Economics of Innovation and New Technology*, pp.1-10.

Link, A.N. 2021. The Economics and Science of Measurement: A Study of Metrology. London: Routledge.

Lukovszki, L., Rideg, A. & Sipos, N. 2021. Resource-based view of innovation activity in SMEs: an empirical analysis based on the global competitiveness project. *Competitiveness Review: An International Business Journal*, 31(3): 513-541.

Magodi, A.Y., Daniyan, I.A. & Mpofu, K. 2022. An investigation of the effect of the ISO 9001 quality management system on small and medium enterprises in Gauteng, South Africa. *South African Journal of Industrial Engineering*, *33*(1): 126-138.

Makarov, V.V., Blatova, T.A., Fedorov, A.V. and Budagov, A.S. 2020. Metrology in ensuring the quality of products and services in digital economy. *European Proceedings of Social and Behavioural Sciences EpSBS,* 490-498.

Maresova P, Hajek L, Krejcar O, Storek M, Kuca, K. New regulations on medical devices in Europe: are they an opportunity for growth? Admin Sci. (2020) 10:16. DOI: 10.3390/admsci10010016

Matarazzo, M., Penco, L., Profumo, G. & Quaglia, R. 2021. Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective. *Journal of Business Research*, *123*: 642-656.

Maxwell, JA. 2013. *Qualitative research design: an interactive approach.* Thousand Oaks, California: SAGE.

Miller, P. 2012. Passing the test, *Lux Magazine*, 7: 133-134.

Moljevic, S. 2016. Influence of quality infrastructure on regional development. *International Journal for Quality Research*, 10(2): 433 - 452.

Mooi, E. & Sarstedt, M. 2011. *A concise guide to market research: The process. Data and Methods Using IBM SPSS Statistics.* Berlin, Heidelberg: Springer.

Morgan D.L. 1988. Focus groups as qualitative research. London: Sage.

Murphy, W. H., & Leonard, D. 2016. Quality management (QM) leads to healthier small businesses. *Journal of Small Business and Enterprise Development*, 23(4): 1104 - 1119.

Muthuveloo, R., Shanmugam, N. & Teoh, A.P. 2017. The impact of tacit knowledge management on organizational performance: Evidence from Malaysia. *Asia Pacific Management Review*, 22(4): 192-201.

Nzumile, J.M. and Taifa, I.W., 2021. Emperical analysis of the quality infrastructure in trade facilitation within the African Continental Free Trade. *Business Education Journal*, 10:(1):1-12

NIST. 2016. 2015–2016 Baldrige excellence framework. Available at: http://www.nist.gov/baldrige/publications/business_nonprofit_criteria.cfm, (Accessed 02 January 2020)

Nurhilalia, N., Rahman Kadir, A., Mahlia, M., Jusni, J. & Adtya, H.P.K.P. 2019. Determinant of market orientation on SME performance: RBV and SCP perspective. *Journal of Distribution Science*, 17(9): 35-45.

Nyoni, T. & Bonga, W.G. 2018. Anatomy of the small & medium enterprises (SMEs) critical success factors (CSFs) in Zimbabwe: Introducing the 3E model. *Dynamic Research Journals' Journal of Business & Management (DRJ-JBM)*, 1(2): 01-18.

OECD (2017), “Enhancing the Contributions of SMEs in a Global and Digitalised Economy”, *Meeting of the OECD Council at Ministerial Level*, Available at: https://www.oecd.org/mcm/documents/C-MIN-2017-8-EN.pdf, (Accessed: 20 June 2018).

OECD. (2010). SMEs, Entrepreneurship, and Innovation. Paris: OECD.

OECD. (2019). SME Policy Index: Western Balkans and Turkey 2019: Assessing the Implementation of the Small Business Act for Europe*,* SME Policy Index, OECD Publishing, Paris. Available at: https://doi.org/10.1787/g2g9fa9a-en, (Accessed. 25 June 2018).

OECD/BIPM (2020), “International Regulatory Co-operation and International Organisations: The Case of the International Bureau of Weights and Measures (BIPM)”, OECD and BIPM.

Panahifar, F., Byrne, P.J., Salam, M.A. and Heavey, C., 2018. Supply chain collaboration and firm’s performance: the critical role of information sharing and trust. *Journal of Enterprise Information Management*, *31*(3): 358-379.

Parliament of the republic of South Africa, white paper on national strategy for the development and promotion o1f small business in South Africa, Cape Town, 20 March 1995, WPA/1995.

Parvin, M., Asimiran, S.B. & Ayub, A.F.B.M. 2021. Impact of introducing e-commerce on small and medium enterprises–a case on logistics provider. *Society and Business Review*. 13(1): 1-21.

Patton, M. Q. 2002. Qualitative research and evaluation methods (3rd ed.). Thousand Oaks, CA: Sage Publications.

Pearson, M. 2015. The small business owner’s simplified guide to ISO 9001 and Business Improvement. London: BSI Group.

Peirce, C. S. 1974. *Collected papers of Charles Sanders Peirce*. Harvard University Press.

Philemon, E., Msomba, Z., Matiko, S. & Ramadhan, S.M. 2018. Identification of enabling factors for collaboration in management of risk in construction projects: A literature review. *International Journal of Engineering Research & Technology (IJERT)*, *7*(2): 152-159.

Physikalisch Technische Bundesanstalt, PTB, 2010, Discussion Paper: The Relevance of Quality Infrastructure to promote Innovation system in Developing country, Braunschweig.

Pobobsky, G. 1992. Small and medium enterprises and labour law. *International Labor Review*, 131(6).

Polit, D.F. & Beck, C.T. 2004. *Nursing research: Principles and methods*. Philadelphia: Lippincott Williams & Wilkins.Publications.

Quality Infrastructure: UNIDO's unique approach, 2018, Available at: https://www.unido.org/sites/default/files/files/2018-08/UNIDO_QI_CASE_FINAL_ONLINE_2.pdf, (Accessed: 23 November 2020)

Rab, S., Yadav, S., Jaiswal, S.K., Haleem, A. & Aswal, D.K. 2021. Quality infrastructure of national metrology institutes: A comparative study. *Indian Journal of Pure & Applied Physics*, 59: 285–303.

Racine, J.L. ed., 2011. Harnessing quality for global competitiveness in Eastern Europe. Washington DC: World Bank.

Ramon-Jeronimo, J.M., Florez-Lopez, R. & Araujo-Pinzon, P. 2019. Resource-based view and SMEs performance exporting through foreign intermediaries: The mediating effect of management controls. *Sustainability*, 11(12): 3241.

Ramos Justen, C., Ludovico De Almeida, M.F. & Souza, R.C. 2016. Innovation a quality infrastructure in the Brazilian electricity sector, in International Association for Management of Technology IAMOT 2016 Conference Proceedings.

Reichertz, J. 2013. Induction, deduction, abduction. In U. Flick (Ed.), *The SAGE handbook of qualitative data analysis.* Newbury Park: SAGE, 123-136.

Robertson, K. & Swanepoel, J.A. 2015. The economics of metrology. *Research Paper6*

Rubin, H.J. & Rubin, I.S. 2012. *Qualitative Interviewing: The Art of Hearing Data*. 3rd Edition. Thousand Oaks: Sage Publications.

Russo, Giuseppe Maria, Patricia Amelia Tomei, Bernardo Serra, & Sylvia Mello. 2021. Differences in the Use of 5- or 7-point Likert Scale: An Application in Food Safety Culture. *Organizational Cultures: An International Journal*, 21(2): 1-17.

Safari, A. & Saleh, A.S. 2020. Key determinants of SMEs' export performance: a resource-based view and contingency theory approach using potential mediators. *Journal of Business & Industrial Marketing*, 35: 635-654.

Saldana, J. (2009). The Coding Manual for Qualitative Researchers. Los Angeles, CA: Sage Publications.

Sanetra, C. & Marbán. R.M. 2007. *The answer to the global quality challenge: A national quality infrastructure*. Berlin: Physikalisch-Technische Bundesanstalt.

Santos, J.B & L.A. Brito. 2012. Toward a Subjective Measurement Model for Firm Performance. *Brazilian Administration Review*, 9: 95–117.https://doi.org/10.1590/S1807-76922012000500007

Sarmento, R. & Costa, V. eds. 2017. *Comparative approaches to using R and Python for statistical data analysis*. IGI Global. Hershey PA: Information Science Reference.

Saunders, M., Lewis, P. & Thornhill, A. 2009. *Research methods for business students*. New York: Pearson education.

Savio, E., De Chiffre, L., Carmignato, S. & Meinertz, J. 2016. Economic benefits of metrology in manufacturing. *CIRP Annals*, 65(1): 495-498.

Sfakianaki, E. & Kakouris, A.P. 2020. Obstacles to ISO 9001 certification in SMEs. *Total Quality Management & Business Excellence*, 31(13-14): 1544-1564.

Sharma, A. 2000. Discovering statistics using SPSS for Windows (2000). *The Turkish Online Journal of Distance Education*, 3(3).

Shunashu, I.L. & Pastory, D. 2020. Improved metrology infrastructures for the development of energy industry in Tanzania: Perspectives from the discovery of natural gas. *Business Education Journal*, 9(1)

Sibanda, N., McKenna, A., Richmond, A., Ricke, S.C., Callaway, T., Stratakos, A.C., Gundogdu, O. and Corcionivoschi, N., 2018. A review of the effect of management practices on Campylobacter prevalence in poultry farms. *Frontiers in microbiology*, *9:* 2002. doi: 10.3389/fmicb.2018.02002. PMID: 30197638; PMCID: PMC6117471.

Siltori, P.F., Simon Rampasso, I., Martins, V.W., Anholon, R., Silva, D. and Souza Pinto, J. 2021. Analysis of ISO 9001 certification benefits in Brazilian companies. Total Quality Management & Business Excellence, 32(13-14):1614-1632.

Siougle, E. & Dimelis, S. 2020. Linking ISO 9000 certification to firm performance and financial crisis: a matched sample longitudinal analysis. *International Journal of Quality and Reliability Management*, 38(3): 751-779.

Smith, E.M & Thomasson, A. 2018. The Use of the Partnering Concept for Public–Private Collaboration: How Well Does it Really Work? *Public Organization Review*, 18(2): 191-206.

Sternad, D., Krenn, M. & Schmid, S. 2019. Business excellence for SMEs: motives, obstacles, and size-related adaptations. *Total Quality Management & Business Excellence*, *30*(1-2): 151-168.

Strang, K. ed. 2015. The Palgrave handbook of research design in business and management. New York: Springer.

Sudman, S., & Blair, E. 1998. *Marketing Research*. Boston: McGraw Hill.

Sun, R., Xiao, H.F., Niu, C.H., Cao, Q.W. & Yao, Z.Y. 2022. National Quality Infrastructure System and Its Application Progress in Photovoltaic Industry. *Electronics*, 11(3): 426.

Surmeier, A. 2020. Dynamic capability building and social upgrading in tourism-Potentials and limits of sustainability standards. *Journal of Sustainable Tourism*, 28(10): 1498-1518.

Susanto, D.A., Isharyadi, F. and Ritonga, M. 2018. Manfaat ekonomi penerapan standar pada usaha kecil menengah menggunakan ISO methodology. *Jurnal* Standardisasi, 19 (1): 25-38.

Taber, K. S. 2018. The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48(6): 1273–1296.

Taouab, O. & Issor, Z. 2019. Firm performance: Definition and measurement models. *European Scientific Journal*, 15(1): 93-106.

Tassey, G. 2017. The Roles and Impacts of Technical Standards on Economic Growth and Implications for Innovation Policy. *Annals of Science and Technology Policy*, 1: 215–316.

Termeer, G.M. 2019. Is There A Future For Manufacturing-Led Development? *Икономика и*, 16(2): 11-24.

Thomas, A., Dorrington, P., Costa, F., Loudon, G., Francis, M. & Fisher, R. 2017. Organisational learning capability in SMEs: An empirical development of innovation in the supply chain. *Cogent Business & Management*, 4(1): 1-20.

Tippmann, C. 2013. The National Quality Infrastructure, World Bank.

Trade and industrial policy strategies. 2021. Available at: https://www.tips.org.za/projects/current-projects/itemlist/filter?fitem_all=Quality+Infrastructure+in+South+Africa&moduleId=285&Itemid=265&bbe541b2fb249cd7146a915e6431408e=1, (Accessed: 01 December 2022)

UNECE, 2011a. Strengthening Water Management and Transboundary Water Cooperation in Central Asia. The Role of UNECE Environmental Conventions. Working paper 3, 1-81.

United Nations Industrial Development Organisations. 2018. Quality Infrastructure: building trust, UNIDO, Available at: https//www.unido.org, (Accessed: 05 July 2020)

Varpio L, Ajjawi R, Monrouxe LV, O'Brien BC, Rees CE. 2017. Shedding the cobra effect: problematising thematic emergence, triangulation, saturation and member checking. Med Educ. 51(1):40–50

Warner, R.M. 2008. *Applied statistics: From bivariate through multivariate techniques*. California: Sage Publications.

Wellalage, N.H. & Fernandez, V. 2019. Innovation and SME finance: Evidence from developing countries. *International Review of Financial Analysis*, 66.

Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal*, 5(2): 171-180.

Wilcock, A.E. & Boys, K.A. 2017. Improving quality management: ISO 9001 benefits for agrifood firms. *Journal of Agribusiness in Developing and Emerging Economies*, 7(1): 2-20.

World Bank. 2003. *Across the globe: a new database*. Working Paper 3127, World Bank.

International Finance Corporation, 2008. Financing micro, small, and medium enterprises: An independent evaluation of IFC's experience with financial intermediaries in frontier countries. World Bank Publications.

Yin, R. K. 2018. *Case study research and applications: Design and methods*, 6th edition. Thousand Oaks, CA: Sage.

Yoo, H. 2019. A case study on the establishment of a national quality infrastructure in Korea. In *19th International Congress of Metrology (CIM2019)* (p. 04002). EDP Sciences.

Zwick, W.R. & Velicer, W.F. 1986. Comparison of five rules for determining the number of components to retain. *Psychological Bulletin*, 99(3): 432.

APPENDIX A: ETHICS APPROVAL LETTER

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SCHOOL OF BUSINESS LEADERSHIP

RESEARCH ETHICS REVIEW COMMITTEE (GSBL CRERC)

06 December 2019

Ref #: 2019_SBL_DBL_021_FA
Name of applicant: Mr SM Thema
Student #: 79177972

Dear Mr Thema

Decision: Ethics Approval

Student: Mr SM Thema, St55054@gmail.com, 071 8879 752

Supervisor: Prof R Ramphal, ramphrr@unisa.ac.za, 011 652 0363

Project Title: A framework for application of the National Quality infrastructure by small and medium-sized enterprises in developing countries- The Case of South Africa

Qualification: Doctorate in Business Leadership (DBL)

Expiry Date: October 2023

Thank you for applying for research ethics clearance, SBL Research Ethics Review Committee reviewed your application in compliance with the Unisa Policy on Research Ethics.

Outcome of the SBL Research Committee:
Approval is granted for the duration of the Project

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the SBL Research Ethics Review Committee on the 28/11/2019.

The proposed research may now commence with the proviso that:

1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2) Any adverse circumstance arising in the undertaking of the research project that is

45 Building leaders who go beyond

SBL GRADUATE SCHOOL OF BUSINESS LEADERSHIP UNISA

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SCHOOL OF BUSINESS LEADERSHIP
RESEARCH ETHICS REVIEW COMMITTEE (GSBL CRERC)

23 November 2021

Ref #: 2019_SBL_DBL_021_FA (second phase)
Name of applicant: Mr SM Thema
Student #: 79177972

Dear Mr Thema

Decision: Ethics Approval

Student: Mr SM Thema, St55054@gmail.com, 071 8879 752

Supervisor: Prof R Ramphal, ramphrn@unisa.ac.za, 011 652 0363

Project Title: A framework for application of the National Quality infrastructure by small and medium-sized enterprises in developing countries- The Case of South Africa. **(Second phase)**

Qualification: Doctorate in Business Leadership (DBL)

Expiry Date: October 2023

Thank you for applying for research ethics clearance, SBL Research Ethics Review Committee reviewed your application in compliance with the Unisa Policy on Research Ethics.

Outcome of the SBL Research Committee: Approval is granted for the duration of the Project

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the SBL Research Ethics Review Committee on the 18/11/2021.

The proposed research may now commence with the proviso that:

1) The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2) Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the SBL Research Ethics Review Committee.
3) An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.
4) The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines, and scientific standards relevant to the specific field of study.

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Graduate School of Business Leadership, University of South Africa, PO Box 392, Unisa, 0003, South Africa
Cnr Janadel and Alexandra Avenues, Midrand, 1685. Tel: +27 11 652 0000, Fax: +27 11 652 0299
E-mail: sbl@unisa.ac.za Website: www.unisa.ac.za/sbl

Kind regards,

NBW Mtiwa

Prof N Mtiwa

Chairperson: SBL Research Ethics Committee

011 - 652 0000/ wiltonb@unisa.ac.za

Prof P Msweli

Executive Dean: Graduate School of Business Leadership

011- 652 0256/mswelp@unisa.ac.za

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APPENDIX B: INFORMED CONSENT

Informed consent for participation in an academic research project

A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – the case of South Africa

Dear Respondent,

You are herewith invited to participate in an academic research study conducted by **Mr Samuel Molelekwa Thema,** a Doctoral student in the Business Leadership at UNISA's Graduate School of Business Leadership (SBL).

A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – the case of South Africa

The purpose of the study is to develop a framework that can be used for the application of the Quality Infrastructure services by SMEs in South Africa to optimise their business performance. The results of the study will be used by policy makers to provide policy direction for SMEs. Other interested parties such as the Small Enterprise Development Agency (SEDA) can use the framework for policy direction for SMEs

All your answers will be treated as confidential, and you will not be identified in any of the research reports emanating from this research.

Your participation in this study is very important to us. You may however choose not to participate and you may also withdraw from the study at any time without any negative consequences.

The results of the study will be used for academic purposes only and may be published in an academic journal. We will provide you with a summary of our findings on request.

The date and venue will be communicated to the participants in advance closer to the time.Please contact my supervisor, Professor RR Ramphal at (Tel: 011 652 0255; Email: ramphrr@unisa.ac.za) if you have any questions or comments regarding the study. Please sign below to indicate your willingness to participate in the study.

Yours sincerely

I, _____, herewith give my consent to participate in the study. I have read the letter and understand my rights with regard to participating in the research.

_____ _____

Respondent’s signature Date

APPENDIX C: INTERVIEW GUIDE

A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – the case of South Africa

Participant code:……...

Date of interview……. Time of interview…….

Venue……...

INTRODUCTION

Firstly, I would like to thank you for your time in allowing this interview. As explained during our previous communication, I am conducting a research the title of my research:

“A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – the case of South Africa”

I am cognisant of your busy schedule. The interview should not take no longer than 45 minutes. However, the interview will depend on our engagement.

I would like to re-affirm confidentiality and confirm that the information gathered from this interview will only be used for the purpose of this research. The information will not be disclosed to any other party except for the purpose of the research objectives.

AIM OF THE DISCUSSION

There is one aim of the discussion based on the first research objective, namely.

- To identify potential factors that can encourage Small and Medium-Sized Enterprises (SMEs) to use the services provided by the Quality Infrastructure (QI), based on the inputs from QI experts.

“I intend to record this interview to allow easy transcription at a later stage. Do you give permission for this interview to be recorded?”

QUESTIONS TO BE DISCUSSED

Before we start, kindly assist with the following general information:

1. What is your highest academic qualification?

2. What is your current position and responsibility and how long have you been involved in this position?
3. How do you define the National Quality Infrastructure from a South African context and what is your experience with respect to the South African National Quality Infrastructure?
4. Could you kindly explain your experience with regards to the impact of the South African National Quality Infrastructure towards the performance of small business in general?
5. Have you been involved, previously, or are you currently involved in SME initiatives? If not, why not?
6. If you have been involved in SME initiatives, kindly explain the initiatives you have been involved in or currently involved in?
7. What is your point of view with regard to the application of the South African National Quality Infrastructure by SMEs, specifically focusing on the following key QI components (Accreditation, Metrology, Standardization, and conformity assessment)?
8. What do you think are the most critical factors or drivers that can assist SMEs to apply services provided by the QI services in South Africa in order to optimise their business performance?
9. What do you think are the most critical limitations that can limit SMEs to apply services provided by the National Quality Infrastructure in South Africa?

GENERAL QUESTIONS

1. Is there anything else that you think should be improved with regard to how the Quality Infrastructure services are being applied by small businesses in South Africa?

2. If you could change something about services provided by quality infrastructure in South Africa, what would you change for the QI to effectively improve SME performance?

“Thank for your time and willingness to contribute to this study”

APPENDIX D: FOCUS GROUP DISCUSSION GUIDE

1. The Researcher welcome all, introduce himself and the research title as well as the purpose of the focus group discussion. (1 min)

Firstly, I would like to welcome you all and thank you for your time for volunteering to take part in this group discussion.

My Name is **Samuel Molelekwa Thema**, and I am the researcher who is involve in the current study.

The title of my research study is as follows:

“A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – the case of South Africa”

The purpose of this group discussion is to assess your current thoughts and feelings with regard to the application of the services from the Quality Infrastructure system by SMEs in South Africa.

I am cognisant of your busy schedule. Therefore, this group discussion is not expected to take more than 60 minutes of your time.

2. The moderator introduce herself and participants (3 min)

Firstly, I’d like everyone to introduce themselves. During the introduction, kindly be as brief as possible by telling us your (1) Name (2) the Institution/ organisation you represent and (3) your expectation from this group discussion.

- The moderator introduces herself and explain her role…
- 1st Participants introduce him/herself followed by the 2nd Participants… etc

3. Re-affirm confidentiality (1 min)

The researcher would like to re-affirm confidentiality and confirm that the information drawn from this discussion will only be used for the purpose of his research.

The information will not be disclosed to any other party except for the purpose of the research objectives.

Despite the discussion being recorded, the researcher would like to assure you that your identity in the transcripts will be anonymous.

The transcribed notes of the focus group will contain no information that would allow individual subjects to be linked to specific statements.

- The recording will be kept safely until they are transcribed verbatim, then they will be destroyed.

4. Instructions to participants (2 min)

- I request that you all switch on your videos throughout the discussion in order to allow for “thick” description of content as part of a qualitative study.
- You should all try to answer and comment as accurately and truthfully as possible.
- The researcher and other group participants would appreciate if you would refrain from discussing the comments of other group members outside this focus group.
- If there are any questions or discussions that you do not wish to answer or participate in, you do not have to do so; however please try to answer and be as involved as much as possible.
- The most important rule is that only one person speaks at a time. There may be a temptation to jump in when someone is talking but please wait until the other participant is finished.
- There are no right or wrong answers and you do not have to speak in any particular order. When you do have something to say, please do so by raising you hand using the tab button. It is important that we obtain the views of each one of you as far as possible.
- You do not have to agree with the views of other people in the group.
- Does anyone have any questions so far? (Answers).
- OK, let’s begin.

5. Introductory question (8 min)

- Firstly, I am just going to give each one of you few minutes to share your experience and current thoughts about the use of the services from the Quality Infrastructure system by SMEs in South Africa.
- Anyone ready to share his or her thoughts?

5. Guiding questions (16 min)

Now let us look at the next question

- What do you think are the most **critical factors or drivers** that can assist SME managers/owners when they want to use services from the QI in order to optimise their business performance?

Thank you all for your contribution so far … let us look at the next question…

- What do you think are the **limitations** that can limit SME managers/owners to use QI services?

6. Concluding question (10 min)

Thank you all for your contribution so far…let us look at the last two questions…

- Is there anything else that you think should be improved with regard to how the Quality Infrastructure services are being applied by small businesses in South Africa?
- If you could change something about services provided by quality infrastructure in South Africa, what would you change in order for the QI to effectively improve SME performance?

7. Conclusion and summary (2 min)

- Thank you for participating. This has been a very successful discussion.
- Your opinions will be a valuable asset to the study.
- We hope you have found the discussion interesting.
- If there is anything you are unhappy with or wish to complain about, please speak to me at a later stage.

APPENDIX E: QUESTIONNAIRE - PARTICIPANT INFORMATION SHEET

Title: A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – the case of South Africa

Dear SME Representative,

My name is **Samuel Molelekwa Thema**, a doctoral student at the University ofSouth Africa School of Business Leadership (SBL). I am currently pursuing a doctoral thesis

on the topic titled; “A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – the case of South Africa”

THE FOLLOWING ARE ANSWERS TO SOME OF THE QUESTIONS YOU MAY HAVE:

WHAT IS THE AIM / PURPOSE OF THE STUDY AND WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

The purpose of this study is to develop a framework that can be used for the application of the Quality Infrastructure services by SMEs in South Africa to optimise their business performance.

Completing the questionnaire will enable the researcher to develop a framework that will identify, select and ranking key drivers to be integrated into this framework. This will subsequently contribute to helping SMEs to optimise its business performance from compliance and quality perspective.

WHY AM I INVITED TO PARTICIPATE?

You have been invited to participate in this survey in your personal capacity as a representative on behalf of SMEs within your organisation in South Africa.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY / WHAT DOES THE RESEARCH INVOLVE?

The study involves electronic questionnaires with closed-ended, multiple-choice and Likert scale type questions that participants are requested to complete.It will take 30 to 45 minutes to complete the questionnaire.

CAN I WITHDRAW FROM THIS STUDY?

Being in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

ARE THERE ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

The research will not have a direct human interaction since the survey will be sent via email. Therefore, no foreseeable risks of harm are expected to the participants.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

The questionnaire does not collect personal information such as names, email, phone number etc. and no one will be able to connect you to the answers you give. Your answers will be given a fictitious code number and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

Your answers may be reviewed by people responsible for making sure that research is done properly, including a statistical analyst, external coder, and members of the Research Ethics Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

All information gathered will be treated in the strictest confidence and reserved for academic use only. For example, a report of the study may be submitted for publication, but individual participants will not be identifiable in such a report.

HOW WILL INFORMATION BE STORED AND ULTIMATELY DESTROYED?

Hard copies of your answers will not be collected. However electronic copies of your answers will be stored by the researcher for a period of 5 years in a password protected computer, thereafter, deleted from the hard drive of the computer through the use of a relevant software programme. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

Participation in the research is purely voluntary and there is no reward offered, financial or otherwise. There is no cost involved since the questionnaire will be electronic.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

Participation in the research is purely voluntary and there is no reward offered, financial or otherwise. There is no cost involved since the questionnaire will be electronic.

HAS THE STUDY RECEIVED ETHICS APPROVAL?

This study has received written approval from the, UNISA. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS / RESULTS AND HOW LONG IS THE QUESTION TO COMPLETE?

If you would like to be informed of the final research findings, please contact Mr Samuel Thema on + 27 71 88 79752 or 79177972@mylife.unisa.ac.za. The Questionnaire should not take more than 30 minutes to complete.

THE FOLLOWING ARE SOME OF THE KEY DEFINITIONS TO ASSIST YOU ANSWERING THE QUESTIONS:

WHAT ARE SMALL MEDIUM-SIZED ENTERPRISES?

A separate and distinct business entity, including co-operative enterprises andnon-governmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in any sector or sub sector of the economy in South Africa.

WHAT IS MEANT BY THE QUALITY INFRASTRACTURE?

The Quality Infrastructure (QI) relates to all the key institutions that ensures public confidence in South African goods and services locally, regionally and globally (These institutions include the South African Bureau of Standards **(SABS)**, National Metrology Institution of South Africa **(NMISA)**, South African National AccreditationSystem **(SANAS)** and The National Regulator for Compulsory Specification **(NRCS)**, from South African context).

WHAT AM I EXPECTED TO DO?

Please complete both Part A and Part B below and do not leave any question blank.

Please select one alternative only.

Rate your level of agreement from:

Low agreement High agreement

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

PART A: BIOGRAPHICAL INFORMATION

A1. What is the total number of years you have been employed in the SME sector?

☐☐ Years

A2. Which SME sector are you representing?

☐ Manufacturing
☐ Agriculture
☐ Construction
☐ Cosmetic
☐ Mining
☐ Automotive
☐ Other,

If other, please specify_____

PART B: RESEARCH QUESTIONNAIRE

		1	2	3	4	5	6	7
Awareness: In this case awareness relates to arrangements that can be established by the QI key institutions to ensure that SME representatives are aware of the existence of the services provided by the QI								
B1	A "one-stop shop" should be established to provide awareness with regard to the services provided by the QI key institutions	☐	☐	☐	☐	☐	☐	☐
B2	Quality campaigns, implemented through a national quality council and/or through industry associations should be established to provide awareness with regard to the services provided by the QI key institutions.	☐	☐	☐	☐	☐	☐	☐
B3	Awareness about the services provided by the QI key institutions can be enhanced if the QI key institutions speak in one voice.	☐	☐	☐	☐	☐	☐	☐
B4	Awareness about the services provided by the QI key institutions can be enhanced if the QI are promoting the development of a culture of consumer responsibility, through individual and/or group education and advocacy on behalf of SMEs.	☐	☐	☐	☐	☐	☐	☐
B5	Awareness about the services provided by QI key institutions can be enhanced if the QI are promoting, on behalf of SMEs, a culture of responsible and informed consumer choice.	☐	☐	☐	☐	☐	☐	☐
Collaboration: In this case collaboration refers to the mutual engagement amongst QI key institutions as well as between SMEs representatives and the QI key institutions to ensure that the collaborating partners achieve a common goal.		1	2	3	4	5	6	7
B6	Collaborating partners, namely QI key institutions and SMEs, should provide information accurately in order to make quick common decisions	☐	☐	☐	☐	☐	☐	☐
B7	Collaborating partners, namely QI key institutions and SMEs, should always have information readily available in order to enhance the level of trust amongst the partners	☐	☐	☐	☐	☐	☐	☐
B8	Collaborating partners, namely QI key institutions and SMEs, should take decisions as a collective instead of individuals	☐	☐	☐	☐	☐	☐	☐
B9	Collaborating partners, namely QI key institutions and SMEs, should share risks in order to minimize individual QI key institution vulnerability and weakness.	☐	☐	☐	☐	☐	☐	☐
D10	Collaborating partners, namely QI key institutions and SMEs, should create an enabling environment in order to achieve a common goal	☐	☐	☐	☐	☐	☐	☐

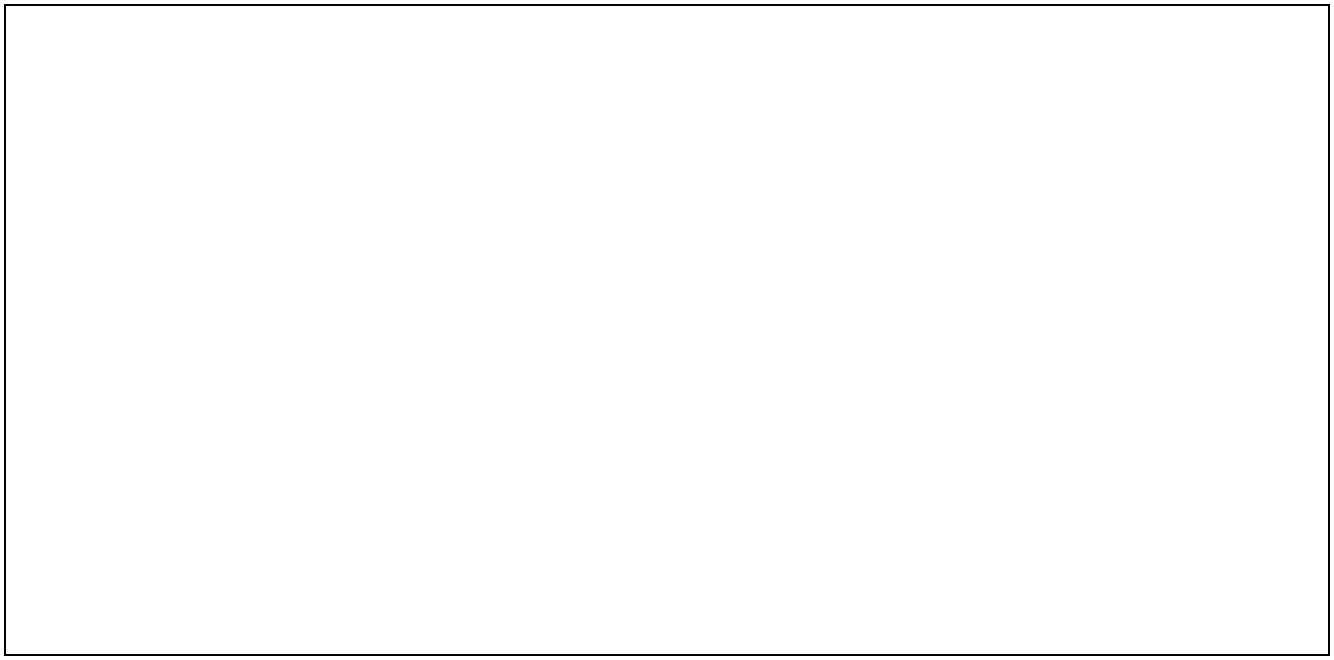
Education: In this case it is the steps that are taken by the QI key institutions (SABS, NMISA, SANAS and NRCS) to ensure that SMEs acquire and assimilate knowledge with regard to the services provided by the QI		1	2	3	4	5	6	7
B11	The QI key institutions should ensure that the QI topics are included in the curricula of universities through on-site or distance learning programs for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	☐	☐	☐	☐	☐	☐	☐
B12	The QI key institutions should organise seminars for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	☐	☐	☐	☐	☐	☐	☐
B13	The QI key institutions should organise training and targeted workshops for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	☐	☐	☐	☐	☐	☐	☐
B14	The QI key institutions should organise webinars for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	☐	☐	☐	☐	☐	☐	☐
B15	The QI key institutions should organise a platform such as *"frequently asked questions"* for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	☐	☐	☐	☐	☐	☐	☐

Affordability: In this case affordability relates to arrangements that can be established by various stakeholders including the Quality Infrastructure (QI) key institutions, to ensure that SMEs are able to afford the services provided by the QI key institutions (SABS, NMISA, SANAS and NRCS)		1	2	3	4	5	6	7
B16	The QI key institutions should subsidise SMEs certification and accreditation programs in order to ensure that SMEs are able to afford its services.	☐	☐	☐	☐	☐	☐	☐
B17	The QI key institutions should subsidise consultancy fee on behalf of the SMEs in order to ensure that SMEs are able to afford the services provided by the QI key institutions.	☐	☐	☐	☐	☐	☐	☐
B18	The QI key institutions should subsidise training programs on behalf of SMEs in order to ensure that they	☐	☐	☐	☐	☐	☐	☐

	are able to afford the services provided by the QI key institutions.	
B19	The QI key institutions should subsidise internal audits programs on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions	☐ ☐ ☐ ☐ ☐ ☐ ☐
B20	The QI key institutions should subsidise the measurement activities (testing and/or calibration of equipment) on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions.	☐ ☐ ☐ ☐ ☐ ☐ ☐

Meet specified Requirement In this case it is about the arrangements that are put in place by the Infrastructure (QI) key institutions to assist SMEs to comply to specified requirements		1	2	3	4	5	6	7
B21	The QI key institutions should be able to develop and publish guidance notes to assist SMEs to understand how to comply to specified requirements	☐	☐	☐	☐	☐	☐	☐
B22	The QI key institutions should be able to develop help desks facilities to assist SMEs to understand how to comply to specified requirements	☐	☐	☐	☐	☐	☐	☐
B23	The QI key institutions should be able to develop single web portals facilities to assist SMEs to understand how to comply with specified requirements.	☐	☐	☐	☐	☐	☐	☐
B24	The QI key institutions should be able to develop toolkits to assist SMEs to understand how to comply with specified requirements.	☐	☐	☐	☐	☐	☐	☐
B25	The QI key institutions should be able to develop self service facilities to assist SMEs to understand how to comply to specified requirements	☐	☐	☐	☐	☐	☐	☐

The Impact of the QI: In this case it is about how the Quality Infrastructure (QI) key institutions are able to measure the impact resulting from its services		1	2	3	4	5	6	7
B26	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing how SMEs benefit from management practices (example; better quality, better service delivery).	☐	☐	☐	☐	☐	☐	☐
B27	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which SMEs are able to access markets	☐	☐	☐	☐	☐	☐	☐
B28	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which products produced by SMEs are safe for public usage	☐	☐	☐	☐	☐	☐	☐
B29	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which the products that are produced by SMEs are compatible with one another.	☐	☐	☐	☐	☐	☐	☐
B30	The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which SMEs benefit from economies of scale (the economies of scale in this context mean cost of reduction associated with a larger scale of production)	☐	☐	☐	☐	☐	☐	☐
Provide any other input that will promote the use of the Quality Infrastructure (QI) by Small and Medium-Sized Enterprises (SMEs)								



The End.

Thank you for participating in this research study.

APPENDIX F: INTERVIEW TRANSCRIPTS

Interview 1

Length of interview: 43 Minutes

Interviewer: Firstly, [1st participant], thank you very much. I would like to thank you for your time in allowing this interview. As I explained before during our previous communication, I'm completing a thesis and the title of my research project is as follows: it's a framework. I have to develop a framework for the application of the National Quality Infrastructure services by small and medium enterprises in developing countries, and I have decided to look at the South Africa context. I am cognizant of your busy schedule, thank you very much for that and commit to keep this interview to not longer than thirty minutes. We will see with the recording. I hope we will be within that timeframe.

Respondent: Good.

Interviewer: Very important, I'd like to reaffirm confidentiality and confirm that the information that will be drawn from this interview will only be used for the purpose of my research. The information will not be disclosed to any other party except for the research objectives. The first part that I want us to talk about is kind of a general information that I want to get from you. I classify it as demographic information and the first question that I'd like to ask, [1st participant], is what your highest academic qualification is?

Respondent: I've got a PhD in physics. So, my Master's subjects were chemistry and physics. But I then carried on. I've got four years chemistry and physics and after that I specialised in physics, so I got my PhD eventually.

Interviewer: Okay, so [1st participant] is a physicist.

Respondent: I'm a physicist, yes. I don't think many people know it these days because I work more in the quality infrastructure, but yes, I'm a physicist.

Interviewer: It's good to know that, [1st participant]. I couldn't actually reach that level, I did physics up to third year and it was indeed challenging. Thank you for that information. The second part to assist our demographic information, is: what is your current position and responsibility and how long have you been involved in this position, [1st participant]?

Respondent: So, actually I've got two positions, and I've got two offices. So the one here and the one in France. So let me start with the one here. I was the Director of Research and International Regional and Infrastructure. We've just restructured a bit, so my position is now called Director of International Liaison. It also includes the regional – like Africa. So, anything to do with regional quality infrastructure. My other position the President of the International Committee of Weights and Measures now, so I've got an office in Paris, so I spend about a quarter to a third of my time, basically in Paris. So, there I deal mostly with the international organisations like ILAC, ISO, OIML.

Interviewer: Okay, great. It's good to hear. So, the one part, your responsibility from a regional point of view, does it also cover Africa as a whole? The continent?

Respondent: Yes. What we mean by international liaison is anything outside the borders of South Africa. So, the sub-regional SADC will report to me, and then Africa, what we do in Africa, and then the rest of the world.

Interviewer: Is that linked to AFRIMETS?

Respondent: Yes, part of that is then that any activity is that the NMISA is involved in AFRIMET basically reports to my office. So, it's coordinated from my office, the same goes for SADCMET then.

Interviewer: Okay, good to know. Thank you very much for that. The first part is intended to explore your experience, and the first question is: How do you define the National Quality Infrastructure from a South Africa context, and what is your experience with respect to the South African National Quality Infrastructure?

Respondent: Ja, so of course we learn it the way that our department of Trade and Industry calls it, and that is the technical infrastructure in South Africa, and that is the equivalent of the quality infrastructure. I became involved in that in about 1999 when my group in another part of CSIR was actually moved and became DTI CSIR NML [? 37:58]. So, my group then became part of the National Quality Laboratory of South Africa and the CSIR. So of course, then we have got the other pillars – the written standards, South African Bureau of Standards, and of course the South African National Accreditation System, and the National Regulator for Compulsory Specifications. I was basically involved with the drafting of three of those Acts, and by the time that I came here, of course the South African Bureau of Standards had the

Standards Act. By that time then we did not have an act, it was just the Measurement Act, the Measuring Units and Measuring Standards Act.

Interviewer: When was it, [1st participant]?

Respondent: That Act was a 1973 act. That first Act. We call it a Trade Metrology, basically. It was also a Trade Metrology Act of basically the same time. I can't remember if that was also '73 or '76, but it was a measuring unit and measuring standards act. It basically said that from that point the DTI are really responsible for the technical infrastructure read for the quality infrastructure in South Africa. Now before that, for example, the measurement standards, or as they called it in those days, Measuring Standards. That was basically the National Measurement Standards, called the Measuring Standards was in the CSIR [? 36:31]. It was part of the Science Council Act. The first one was 1946. The Science Council Act, that is the CSIR, and then basically what the clauses said that the CSIR must give physical standards measurement for South Africa. So it's as old as that. The Act was renewed a few times. The last time was basically the big one in 1986. So before '73 the CSIR was basically responsible for the measuring side, SABS was of course for the standards side…

Interviewer: The paper standards?

Respondent: The paper standards, and of course at that time as you know, what is today, SANAS, was part of and basically NML. It started within the CSIR as part of the CSIR-NML called the NCS, but I'm quite sure I'm not going to – other people know that history better than me, it was before my time.

Interviewer: So, the NMISA as it's called today was called NML, which was part of CSIR, is that what..?

Respondent: I'll give you the [unclear 35:26] quickly, it started off as the NPL of South Africa – the National Physical Laboratory. Because at that time we were very closely aligned with the UK. So, it was the CSIR National Physical Laboratory. It was the second laboratory of the CSIR – 1947. Then later it became the National Physical Research Laboratory. The NPRL. And this whole section building 45 was still called the NPRL when I started working in 1986. So it was still NPRL but then it was bigger than just the measuring standards already. So shortly after that it was a big restructuring at the end of the 80s and then it became the CSIR National Metrology Laboratory. It was still part of one of the divisions, Aeronautical Sciences at that time.

It later moved to Material Science. And then by the time I came here I was part of Material Science. And when it was amalgamated basically within Material Science, it became MSM. What was that – Material Science and Manufacturing. Then at that time when they asked my group "What are you doing?" We said, "We are measuring", we were Surface and Structure Analytical Services and we were moved to the CSIR-NML. So we were then under that division – MSM for a few years, and then finally the DTI was getting a bit upset about the visibility of the NML because they then, since about 1993, they started to give money directly to the NML for National Measurement Standards. But we reported to the CSIR and the CSIR then shortly after that the DST was formed – Department of Science and Technology. The CSIR then really started to report to DST, and then DTI said but they are giving us our funding – CSIR-NML. And we have low visibility. To try and give us a higher visibility, the CSIR then moved us to a centre of CSIR and we reported directly to the president, not anymore to a director or a position [? 33:13]. So, CSIR-NML is a centre of CSIR. We were that for about four years. Then finally 2005 the DTI said we must go out, and then we developed a measurement unit and a Measurement Standards Act, No 18 of 2006, and we were also involved then in the Act that basically establish SANAS. I can never remember the full name of that Act – I think it's no 19 of 2008.

Interviewer: Yes, it's no 19. They call it Accreditation Act in short.

Respondent: In short. So, I was involved in the drafting as were some of your colleagues at that time were involved in the drafting of the Act. And then later we were involved with the NRCS as well. So, I think that's a bit of history and that is how I define the National Quality Infrastructure of course in terms of those four institutes form the four pillar basically, although legal metrology within the NRCS and the NMISA scientific metrology actually together forms one leg. And I'll say something about that later, what's happening at the international level now in scientific and legal metrology. So, what my experience is – I don't know if that's enough for you, or if you want to know how I think it's operating, and is it operating well? Do you also want to know that?

31:43

Interviewer: I think that will also be important, [1st participant]. But in terms of the quality infrastructures you did, I defined it in your last explanation. Things such as the mandate of these four pillars that you have mentioned, has it been achieved in your

view? And is it achieving the intended purpose of the quality infrastructure in South Africa, from a South African perspective.

Respondent: If you look at the African context, I do think that our system is one of the best ones in Africa, if not the best. In that sense, yes, the answer to that is yes, especially in the beginning, yes. I'll be very careful, but let's say that in that period 2006, for the next ten years, I think we really started to achieve what we set out to achieve. Of course, you'll never in a system like that you'll never be able to say it's 100%. I think we did but if I look at the whole context, the African context and even many of the other countries in the world, I do think we went at it in a very pragmatic way, and we established the institute, we had good support from the DTI and the director at technical infrastructure. In those days, from 2006 onwards for the next 5,6,7,8 years, we really did an excellent job also to coordinate the system. So, we've got four institutions, but the DTI did a lot to basically coordinate the system. So I think we had the basic ingredients, the basic building blocks, and I think we then with the coordination from the DTI, we really started to achieve what we wanted to achieve. If I think about when we really started to talk about SMEs, and at that time I think it worked well. Okay, just excuse me for one second…

Interviewer: No problem.

[Interruption 29:32]

Interviewer: Thanks very much [1st participant], I've kept a recording of that not to distract my recording device, I didn't want to stop it, you know I'm not good in technology, I might have disrupted the recording, so I've kept it's recorded unfortunately.

Respondent: You know the quality work at these places – I don't know if she's phoning again by mistake, let me just look. No, but you know, if they don't know from me now what's happening then they can't continue. She phones back now again, she's trying to phone back.

Interviewer: Thank you very much, I will continue with the interview.

Respondent: I think we can finish that. It went well and what started to happen later a bit is then we got the SEDA – the Small Enterprise Development Agency - and at that time actually with SANAS, especially with SANAS, the NMISA was gearing up with SANAS to do a lot for small enterprises. Then came SEDA and in that process let me

say to much about it then – but basically it stopped most of our plans then, it was waiting for SEDA and it never got going again. So it's a big pity, so let me stop there. Otherwise the rest of the infrastructure worked really well. It's still working well.

Interviewer: Okay, so to continue on what you have just mentioned now regarding the small enterprise development agency, what will be your experience regarding the impact of the quality infrastructure on the performance of small business in general?

Respondent: Sam, we saw at that time when NMISA and SANAS started to together go to SMEs, we had the programme, we had the toolkit, we went, we worked it through with the SMEs, and it really made them very aware of quality, and especially good measurement also accreditation quality systems. And we partnered them and said, SANAS, if you go to SMEs then let us go with and if we go to SMEs, we take SANAS with so we do both together and it really worked well, but it was basically then stopped by SEDA unfortunately, so we later carried on, but then it was less organised, and we carried on only as NMISA alone. I know SANAS also carried on with certain things alone. So I think it is a great pity that SEDA at that time were not able to really pull this together, coordinate it, get the program going with all the pillars and they really could have run out a big quality infrastructure program for SMEs. So my assessment at the moment is fragmented, we are still trying to do what we must do, but it is fragmented. But I saw with the ones we really did it together, the value that it had for them, and we had extremely good feedback later – 4,5,6 years later from those SMEs.

Interviewer: So in other words, this basically leads to my third question under this category: You have been involved previously with some SME initiatives, is that correct?

Respondent: Yes. That is definitely correct, Sam.

Interviewer: So, are you also saying you are involved currently as we speak?

Respondent: Yes. Like I said, we were involved in that way, of course now my colleagues took that over from me, but our group was still involved in that, yes. So, we still go to all the manufacturing indabas, we give a training course there, so yes, we are definitely still involved. I think it just probably could have been much bigger.

Interviewer: Okay, good. Thank you. I'll move to the next question. That is the last question under this section. [1st participant], what is your point of view with regard to the application of the South African National Quality Infrastructure by small medium enterprises, specifically focusing on the key components of the quality infrastructure,

namely, accreditation, metrology, standardisation and conformity assessment? Conformity assessment, I am referring to the conformity assessment bodies, such as testing laboratories that has to conform to certain specifications, calibration laboratories, inspection bodies and certification bodies. So what is your view regarding the application of this infrastructure that I've mentioned, specifically focusing on these components?

Respondent: Sam I can mostly answer for the first ones, on the last one I can give a bit of an answer, but that's not my speciality field. So basically accreditation, I do think that it's been taken up quite well by SMEs, but of course the more technologically advanced SMEs. We are probably now focusing on them, so we've got very specific programs to assist them now with advanced measurement, basically the SMEs with the potential to export and that are component manufactures for the motor industry and the aeronautical industry, for example, that make small satellites. So it's more the technologically advanced ones and I think that if I can say that in that group, they know everything about the quality infrastructure and the uptake is good and they know that to be able to participate in the international economy to export and so on, to get contracts, they need to implement the QI to get standards perfectly, written standards. They now understand measurement standards after we've been through them, and they know where to get their traceability, we help them to get traceability. If we can't provide it – some of it is so specialised that if we can't provide it - and like I say, they're very well aware of standardisation in their part of the world. But then if you go to the lower levels, of course it changes. The intermediate group, I think they are quite well aware and they are applying it quite well and I think SANAS deals with a lot of them. Like intermediate. They're already formal, they participate in the formal economy. They perhaps don't have the potential to export, but they play a very important role at the national level – component manufacture and so on. And then of course you have the bottom level, more the micro ones, I'm not going to say too much about them because there we just do basic awareness training. So what is a measurement? Why is it important? And when we do that, we always include like standards – written standards, they understand that and we tell them about accreditation, but it's not necessary for them at that stage.

Interviewer: It's very interesting that you're also extending your awareness to that cluster of the micro enterprises, although my study is only confined in accordance to

the definition of small medium enterprises as per the National Small Business Act, which exclude the micros and so on. But it's interesting to hear that the National Metrology Institute and SANAS and so on and so forth are also beginning to extend the knowledge and the awareness to the micro. Very interesting.

Respondent: I think what we also say to them is you probably need to form cooperatives and push yourself out of the micro because of things like the Q[? 19:57] because it's very difficult for micro who really want to move into the higher levels to actually [unclear 19:49] is one of the entry values. But the moment you form a cooperative, then you can together collectively, then you have money together and you can basically overcome that entry barrier.

Interviewer: Thank you very much [1st participant], that completes our questions under Section D. I will move to the next section which is Section E. In this case I would like to solicit information from your experience regarding the possible drivers that enable SMEs managers or owners to apply optimally. Yes, you have indicated to me that they are somehow somewhat aware of the quality infrastructure services, but to optimise that, I would like to find out if we can identify possible drivers that can be able to achieve that goal. The first question is, what do you think are the most critical drivers that can assist SME's managers or owners when they want to apply the quality infrastructure services, particularly looking at the South African context in order to optimise their business performance?

18:25

Respondent: Ja, so if you look at why they need to do it, I can start with that. Of course the quality, they can't participate in a real formal economy without the quality, and that should be for them the biggest driver [unclear 18:08] that way. But of course the next thing that the drivers, the practical drivers they need to get in place if you mean that as well.

Interviewer: Yes, of course.

Respondent: So, of course from our view, they will first need to know of course about the standards in their specific field that they are playing in and sometimes it's not that easy for them to get hold of the right ISO standards and the SUN [? 17:33] standards and everything. So that's probably the first driver of course, make sure that you get those standards. And I think we are also not doing enough as a country to make sure

that they have very quick access there's enough assistance to them, I want to do this, which standards do I need? Here it is. You know they can buy, but we find when we go into the field, especially in the rural areas, even if it's not micro, but it's not that easy for them. But okay, that's the first big one. The second one, as far as we are concerned, because probably you can do business without the other one, is measurement standards and it's access to fir the purpose and measurement standards.

Interviewer: [1st participant], knowledge of the standards that you were referring to previously, is it the paper standards?

Respondent: It's the paper standards. So I want to manufacture this, what number standard do I need to adhere to, to be able to access the formal market?

Interviewer: So, and then the measurement standard is different to the paper standard?

Respondent: Exactly. Because in the first place, you need to know, if I want to manufacture this, or if I want to produce this, to what standard must it comply before I will be able to deliver my product or someone will buy my product?

Interviewer: ISO standards?

Respondent: ISO standards. Even with bananas. If I want to push my bananas into the market, there's an ISO standard, and what standard is that and get that standard, get it on the door and this is my starting point. I need to have all these things in place, there's a measurement part of that, so the next very important thing is the measurement part. And that is where we work mostly in, and not so much to assist them, we just make them aware of what do you need? What accuracy do you need? Sometimes they get totally confused and they think they need the metrological accuracy that we are talking about, so we make very sure that we assess what accuracy do they need and that they don't go overboard and we assist them to say, this is what you need. It may be that even a bucket is enough to measure the amount of water that you need for the process, but otherwise we show them, if you need this accuracy, this is the type of measurement equipment or measuring equipment that you would then need, and then where do you get this? Where do you get this calibrated? Of course now at a point where you want to get accredited as well. And fortunately there's still the misconception that you only calibrate your measuring equipment if you want to get accredited. Because then they go and they say, "What must we do to get

accredited to 17025 [? 14:43]? It has traceability for our whatever, and then they think, okay, now we must calibrate. So we teach them that to measure accurately for your process, you need calibration. You don't need it to get accredited, that's just oh, by the time you want to get accredited you should have this in place long ago. So we really teach them that, and I think that's one of the very important drivers.

Interviewer: It's very important of course.

Respondent: Is the measurement side, the practical measurement side. The moment they start to go into like legal metrology, then we also make sure they understand that, then what regulations are in place so that they don't get on the wrong side of the law. So I think that's also very important.

Interviewer: So [1st participant] has mentioned four factors: knowledge of the paper standards, knowledge of the measurement standards, awareness of the paper standard as well as the measurement standard – am I right?

Respondent: Yes.

Interviewer: And how to use them, and how to apply them, essentially. And also the regulatory requirement if you look at the legal metrology perspective.

Respondent: [unclear 13:23] for conformity assessment because many of them would then need a test, a routine test. So we also make them very aware of the role of the QI in testing. So for example, one of the big problems that they have is that they go for the cheapest and then most of the time it's not accredited testing for service providers, that's a huge problem in the market. And there's a huge problem to educate them as to the value of an accredited service provider in the sense of an accredited laboratory. It is even a big problem in our universities and SMEs in universities. They don't understand this, and basically what they then do is they think, oh, we're smart and they just have a few students that run the equipment, the equipment is not calibrated, they don't use referenced materials and they use student operators and there's a new one every year and there's no, no reusability of data. So those are the things we explain to them. If you want to monitor and follow your process and improvement in your processes and in the quality of your product, the use of accredited service providers for [?] the assessment.

12:04

Interviewer: It makes sense. Are there other drivers that you may think of apart from the ones you have mentioned?

Respondent: You know, Sam, I'm always, as a metrologist, like the two sets of drivers: the drivers that make you do something, and when you want to do something, the drivers that you need to get it going. So, I think I basically talked to you now about the drivers that you need - the first drivers are the ones that you really need to understand the quality should be the driver. If you don't understand that, you're in trouble. So that I see as drivers. If there's another driver that you want me to think about, you just need to tell me what type of drivers are you thinking about.

Interviewer: [1st participant], things such as the affordability of the calibration of the instruments, of the equipment…

Respondent: I see what you mean, we would call them limitations.

Interviewer: Oh, those you perceive them as limitations, okay, yes. Do you want to tell me more about those? The costs?

Respondent: Exactly. As I just said, for the conformity assessment services cost is a big problem for them, and for the SMEs and if it's not technologically advanced SMEs with good funding behind them, and so on, then it's really a problem. The mid - I'm not even going to talk about the bottom level – the mid-level finds it very difficult and that is where they then start to search and they find non-accredited services. So that is in that sense you called that a driver. It is a big problem. It is an entry barrier for SMEs into markets. And that is actually what we wanted to address at that time with the QI working together, assisting the SMEs. I remember at that time when SANAS was talking about reduced fees, NMISA was talking about subsidised categorisations. And the funding came from DPI and then the funding went to SEDA. And then we thought now we're going to get it going because the subsidisation for that will then be from SEDA. Perhaps that is happening somewhere, but not in the whole SME group that we are working with in the manufacturing, even in food production. So somewhere there's a big gap here in LQI [? 09:19]. It's that assistance tool then to overcome those barriers to be able to afford those accredited services. To get proper traceability to accredited calibration laboratories or even in certain cases to the [unclear 09:06]. Huge problem. So probably if you call that a driver, I call it a big entry barrier.

Interviewer: Limitations as you said.

Respondent: Ja. It is the biggest one. I think they get a lot of information, they get a lot of brochures, they know how to go and find information, because of the awareness that NMISA and SANAS did years ago already and still do it. But I do think that is where they then struggle. It's [unclear 08:38] the costs, it's finding the right people, using the right people in the QI at the low level, the conformity and [unclear].

Interviewer: What about the participation of small businesses into the technical committees? Will understand that the likes of SABS, SANAS, and maybe to some extent the National Regulatory for Compulsory Specification – NRSCS – has some technical committees. Are they participating as expected?

Respondent: No, not really, simply because they are small. That's why they are called SMEs, but they are small, and time is money, and many of them – the ones that I know that we are working very closely with – they work ten hours a day and it's just simply not possible for them to send someone to go and participate for a few hours in the standards committees or the NRCS committees for legal metrology. It's really simply not possible, that I can tell you from the ones that we are working with. By the time that they get like really, the ones with potential to export and so, yes, here and there they then start to participate. But we also find it's many times it's ones where there's a connection previously. So, somebody that came from the SADS laboratories and that started an SME, they understand that they need to be [unclear 07:07]. I don't think there's enough awareness for the rest of the [unclear 07:01] to be there. So, I think it's still basically the bigger manufacturing companies, the bigger businesses that have got the resources to send someone and go and participate in the standard.

Interviewer: The drivers and limitations that you have identified, [1st participant], thank you very much for that. Is it possible for you to rate them in terms of importance? The rating guideline could be the first one, very important – if you perceive it as very important, could be rated as very important. The next one important, and maybe we go to the last one and as less important. Is it possible to rate them?

Respondent: Okay, in the first place: access to information. And by that I mean [unclear 06:08] methods, standards, to get access to that. That's number one. After that, if you know what you must do, now you know you need to get your equipment calibrated and everything, it's really of course funding. Access to funding to overcome those entry barriers is probably the second most important one, or even just on a scale.

The first one is one, the second one is one as well. Both very important, but you probably need the first one first: access to information, then you know basically what you must do, then you need access to funding to of course overcome that entry barrier by the standards. Have the equipment, of course for anything you manufacture or calibrate or fix, equipment is then the biggest problem. Bigger even than a building. You can rent a building, and it's a small initial capital outlay, if you rent, but then your equipment. So probably that is a big problem for the application of the QI, instrument based [? 04:56]. We don't have very good support systems for SMEs to get equipment. The DTI has started a few programs, our assessment of that, [unclear 04:44] but they know, I told them as well, is that then they make the admin so difficult that the uptake was not so good. Tell you now, it was basically a failure because they had money, but it was not taken up. The problem is, they made it so difficult, to do the admin to get that, that the SMEs again just gave up.

Interviewer: Thank you very much, [1st participant]. The last section that I want to cover is from a general point of view. First question is, is there anything else that you think should be improved with regard to how the Quality Infrastructure Services has been applied by the small businesses?

Respondent: The first big thing is we need to get rid of all bureaucracy. If you deal with SMEs, an SME is a small company. They do not necessarily have people that can deal with the bureaucracy. It's many times the owner, or one of the four people who works in the laboratory that then need to go and do the paperwork and get through the bureaucracy. And that's probably also – I forgot to mention it in the previous one, but there, we all together, with the DTI all of us as well to make sure, we keep the paperwork and bureaucracy to the absolute minimum. We are very good as the QI to have processes in place that's elaborate, metrologists will always strive to have zero uncertainty, I always fight with them because you can only have zero uncertainty if you have no movement forward and we are prone to as QIs, put systems in place that we stop the progress, simply because we put processes in place that's foolproof QIYs and no-one can use them and no-one can move forward. So, the big thing for SMEs, let's make sure it's streamlined, access to all the things I've mentioned, quick, hassle free and not to expensive or subsidised then, especially for SMEs.

Interviewer: Alright. Thank you for that information. The last question under this section – general is: if you could be afforded the opportunity to change something

about the services provided by the Quality Infrastructure, what will you change in order for the Quality Infrastructure to improve the performance of small medium enterprises optimally or effectively?

Respondent: Okay, don't tell the President, or he'll privatise them immediately, simply because in the SME system, the bureaucracy I've just spoken about, are basically difficult not to implement. What I mean by that is we're under the treasury rules, and we're under PFMA and everything that basically introduces bureaucracy into the system. It's fine when you serve the big companies, even the Eskom, Telkoms, the big manufacturing, it's fine. It works for them; it does not work for the SMEs. We need to find a way to serve the SMEs and it may actually be to privatise. The other way that we are exploring now, to set up a different arm of the institute that will really streamline their processes within the system – there is a system, to serve SMEs. But you will have a much quicker turnaround time there, you'll have the absolute minimum bureaucracy just not to land in jail. So you'll just have to pay to keep you out of jail, but you'll have the minimum bureaucracy, the minimum paperwork, the minimum admin and the quickest, fastest service possible within an SOE system. So that's what I'd change.

Interviewer: Okay, thank you very much for that. In conclusion [1st participant], thank you very much for your time and willingness to contribute to this study. I hope the information that you have provided will be able to enable me to move forward to the next step, which will be the quantitative stance. It is actually intended to ensure that I construct an intelligent instrument, which is a questionnaire from this interview, that it can be rolled out to SMEs managers to solicit information further. But I would like to thank you for your time and thank you very much.

Respondent: Pleasure Sam, when you do the quantitative one, then we can talk about scientific and legal metrology.

Interview 2

Length of interview: 51 mins

Interviewer: So [2nd participant], thank you very much. Firstly, I'd like to thank you for your time in allowing this interview. As explained during our previous communication, I'm completing a thesis, and the title of my research project is as follows: A Framework for the Application of the National Quality Infrastructure. I'm looking at the National Quality Infrastructure from a South African perspective. The services that are provided

by the National Quality Infrastructure to small and medium enterprises in developing countries.

[2nd participant]**,** I am cognisant of your busy schedule, the interview should not take longer than 30 minutes, that's the expectation. I would like to reaffirm confidentiality before we proceed and I'd like to confirm that the information that I will gather from this interview, will only be used for the purpose of my research. It's not necessary to disclose the information to any other party, except for the research objectives.

Respondent: It's fine.

Interviewer: Thank you for that. The first part in my interview is to get some information, and I have classified this information as demographic information. There are two questions basically under this section before we kick-start the actual interview. The first question under the demographic information, [2nd participant], is what is your highest academic qualification?

Respondent: National Diploma. National Technical Diploma.

Interviewer: Thank you for that, [2nd participant], and secondly, what is your current position and responsibility and how long have you been involved in this position?

Respondent: I am the director of the National Laboratory Association of South Africa, which is a stakeholder body representing the interests of laboratories, both testing and calibration, we have about 330 members, who are members of the association, and we started the association in about 1998-1999, and I've been in the role since 2000 formally. So, I'm a board member and I've been involved in the… I don't know… I guess the accreditation and metrology field, for I suppose the last 30 odd years or so.

Interviewer: So, you have mentioned that you have been involved in accreditation and metrology. Are you referring to the National Metrology Institute? NMISA, or..?

Respondent: No, I'm referring to it from my experience when I was at Altec(h) [?] and I was responsible for running two calibration laboratories indirectly. So, I was the CEO of a small company within Altec(h) and we had two calibration laboratories that we merged into one at a point in time. I was involved with helping to set that up, getting it accredited. So been a board member of SANAS and the predecessor to SANAS. I was the treasurer of SANAS, so I guess I've been around the block quite a lot.

Interviewer: And I understand [2nd participant] that you are the chairperson of the board of SADCAS?

Respondent: Yes, indeed I am. SADCAS is a multi-economy accreditation body which service the needs of eleven of the SADC regional members. So, it doesn't service South Africa, it doesn't service Mauritius, who have their own accreditation bodies, but the rest it does, and we're set up to service them from an accreditation point of view.

Interviewer: Certainly. So, they should, I suppose there is, based on what you have just said, ample experience in terms of the operations of the quality infrastructure in general?

Respondent: Well, I had a lot to do one way or another with what is now termed the quality infrastructure.

Interviewer: And from a global point of view, is there any role that you are playing here, [2nd participant]?

Respondent: Well, I've recently given up being the chair of the International [unclear 46:10] Accreditations Lab committee. I was the chair for eight years. ILAC's laboratory committee and due to rotation I'm now a member of the committee, but I'm no longer the chair, and I was part of the executive of ILAC as well during that time.

Interviewer: Are you not still part of ILAC?

Respondent: Yes I am, but we as the Laboratory Association are an ILAC stakeholder member, and I play a role in a couple of the committees, one of them being the laboratory committee, the other is the accreditations committee, but I'm no longer the chair of the laboratory committee. There is a new chair has been for a year and a half.

Interviewer: And if I may ask quickly before we proceed, did your role, are you part of QASCO [unclear 45:16] or committee?

Respondent: So in the time, the more recent time I was involved in the review and the development of the new ISO 17025 standard for laboratories. I was a convenor and as a result of that, I'm on the chairman's policy committee.

Interviewer: Okay, good. Thank you for that information, [2nd participant], in terms of your experience, your position, your responsibility from a national and a global view. And I really appreciate that. Okay, so [2nd participant], let's proceed to the next section. And this section is intended to solicit information and your experience with regard to

the quality infrastructure, but we will focus on the South Africa context. The first question under this section please: How do you define the national quality infrastructure from a South African context, and what is your experience with respect to the very same national – South African national quality infrastructure?

Respondent: Well, I think that we know that there are a number of, I guess you would call them categories, or areas of quality. We can't paint one brush and say quality is just one thing, because it has different connotations depending on where you're coming from. So, a simple example, if I'm a manufacturer of window frames, then the quality that I need to put into that is very different to perhaps a laboratory sitting in, I don't know, the national health scheme testing, you know, blood samples for some virus. So, both have a quality implication, both you can consider to require or need a quality infrastructure within which to operate, but they operate under very different conditions and different, if you like, criteria, and different priorities etc. So, I think one has to be very careful that we don't paint the brush over everything and say everything is the same. So, my experience is that generally speaking, a large part of the quality infrastructure in South Africa, is focused on, if you like, higher level stuff. It's focused on the kinds of things the guy manufacturing window frames is not concerned about and they don't see the connection between that and the quality infrastructure. Probably in my view, the biggest problem is the fact that most small manufacturers don't necessarily equate quality and the quality infrastructure with what they do. If you go and speak to somebody in a lab doing medical testing, water testing, somehow or another there is a better understanding – if that's the right word – of quality and the need for quality and the need for good results. I'm not sure of the guy who takes a tape measure and measures the window frame, sees, understands quality. However, if you take a motor car, take a motor vehicle, the manufactures will tell you that one of their things that they have is a problem, is getting adequate quality out of their supplier chain. Out of people that manufacture only the bonnets or only the bumpers. For them once again, the connection between a quality measurement or the quality is not seen in necessarily the same way as those operating in other environments, and I think that's probably one of our biggest challenges. Interestingly enough, I don't think it's only a South African problem. I think we see that in large parts of the world, including quite sophisticated economies, don't necessarily equate quality with what they do. Yes, when you interrogate them and you say, "but isn't that..?" "Oh ja, you're right, that's

what we mean." But they don't initially understand that there's a connection, a relationship between the services provided by the quality infrastructure and what they do. They don't see the connection.

49:20

Interviewer: So, having said that, [2nd participant], are you saying if we define quality infrastructure, or maybe technical infrastructure.

Respondent: Yeah, that may be a better word. I think Sam, what DTI have in fact done. They haven't called it the quality infrastructure; they've called it the technical infrastructure. I stand to be corrected, but I think that is exactly what they've done. And now they're talking about a national quality framework and a national quality policy, and you know, if you're familiar and I'm sure you are, in large parts of the world, Africa included governments there have spent quite a lot of resources, mainly donor resources on establishing quality policies. I'm not sure if it's money well-spent or not and I'm not sure if we should be doing the same, but if ultimately we can feed that down, then it will be successful, but problem is, these things tend to be, as you know, things that consultants do and everyone gets very excited to produce these pieces of paper, but do they get to the end-user? In this case your end-user is in an even more unique part of the market because they're small, they don't usually have the resources and so it's a challenge. How do we feed that information down into them? How do we get that through to them? And I guess there's actually, you know, there's a common thread through this for South Africa, and that is quite frankly, education. So, the same way we're talking about educating our children and educating people, there's probably equally a case to be made for educating the man in the street about quality and taking that further. Taking it to the SMME and taking it to bigger organisations.

Interviewer: So [2nd participant] you have mentioned the National Quality Policy. Typically, as an example, do you know of any country that has started establishing their technical infrastructure, or if you may allow me to call it a national quality infrastructure by starting with the establishment of the national quality policy? Any countries that you know of?

Respondent: No, I think that what we've found is what I'd call back fitting. Most countries have got elements of the technical or quality infrastructure and then afterwards they're looking to find a way to harmonise or integrate the stuff together.

And so I think in general, the quality policy or the national quality policy is to be developed to provide a means for these organisations to talk to one another, to be, you know, in tune with what has to be done and not to be islands. So, in other words, to work together. And I think that in some parts of the world I think it's probably more applicable than others. I think in maybe more sophisticated economies there's no need, but I think in many parts of the world the organisations which are typically government organisations which represent these quality infrastructure organisations. They don't talk to one another well; they don't integrate well. So, you get decisions that are made in isolation, and you get decisions that are often duplicated. So people think it's, you know, they should be in this part of the market and there's not general agreement that you do this and I do that. You know, there's no integrated thing from the outside. How many times have I had a phone-call and I'm sure in your job you've had a phone-call where the user doesn't know where to go because the institutions themselves don't know who's really responsible for what. How often have I had a call here to say, "I've got that kind of problem? I spoke to SANAS, and they told me one thing. I spoke to NMISA, and they told me one thing. I spoke to NRCS, and they told me… what do I do?"

Interviewer: Or SABS.

Respondent: Or SABS or whatever. Ja, exactly. So, this is not a criticism, but it is a fact. And I have had it, and I had a debate, I remember having a conversation many years ago to say that you need a call centre somewhere to resolve these problems. You need something that is where people can go. And the problem with it is that we know that call centres are typically staffed by people who don't have enough experience, don't have enough knowledge themselves, and so in a sense you need a highly experienced – I don't want to say qualified – but you need somebody who has got the exposure who actually knows not only what's going on, but when what's changed where you go now, because things have changed. You know, all of those things. Those people don't come cheap.

Interviewer: Of course.

Respondent: I can remember at one stage, I think NMISA had a concept that they were going to start some kind of a call centre. But the reality is, you can't have somebody at the end of a phone waiting for a phone call who's highly qualified, highly

paid, but that's the kind of person you need to try and provide, at least in my view, a kind of interface between the user – whether it's a laboratory or a CAB – the ultimate user, and these institutions.

Interviewer: These institutions – SANAS, National Metrology, SABS, NRCS.

Respondent: Exactly. You know what I'm saying. So that's a key weakness that we have and it's a weakness that you see all over. It's not just in South Africa that we have this weakness, this is a common thread. I've heard this many times and from big economies in America, UK, you speak to users, they say, "I don't know what we're supposed to do. I phoned UKAS, they can't tell me. I phoned NPL, they can't tell me". So, it's a very difficult thing, it really is. You know, it's not like I've got my PC and it won't boot. So, you phone the call centre and they say, "Is it plugged in? Is the power on? Have you got power?" You know, it's not a simple checklist that can be developed. But perhaps that is one area that maybe there is something that needs to be considered as a resource or as an outcome of what you're doing, to see how we can better integrate the knowledge about what to do or where to go, what forms? How do you apply? You know, what's the process?

32:52

Interviewer: Alright, thank you very much [2nd participant] with regard to your definition clarifying the definition of the national quality infrastructure from South African context. So, as you have said that the DTI prefers technical infrastructure, which is comprised of the National Metrology Institute, the South African Bureau of Standards, South African National Accreditation, and NRCS, the National Regulator for Compulsory Specification. Perhaps can we include into this key component the conformity assessment bodies – testing laboratories, inspection bodies, and certification bodies?

Respondent: I think you have to be careful how you define the role of the technical infrastructure of the quality institutions. The organisations you've met are funded by your taxes and my taxes and everybody else's taxes. So they're a common resource. There's an expectation that they won't make a profit that they will fund themselves to some degree, but we will fund them for our benefit. So everybody below that, if I can say, or feed into that, or feeds into that should be outside of the quality infrastructures in my view. In my view we don't want somebody doing accreditation as an independent accreditor competing with SANAS. We don't want an independent bureau of standards

developing standards because we would like to see that centralised because we can't afford to have you to go one way, and I go another way. The economy, I don't think can tolerate it, and I don't think it's quick enough. Maybe in other economies it's possible, but I don't think in ours. And the same goes for those more involved practically. So, in other words you could say, like NMISA. You know, should NMISA – it's a long debate – should NMISA be competing with laboratories? Should NRCS be competing with..? There's… So, I think you need to… Should we include them? Yes of course we've got to include them, because they are the ones that are the drivers of the infrastructure policy. So, in a sense, if you think about it, you're drinking some water which came out of a bottle, but the bottle was filled by the tap, okay? But you want to be assured and I want to be assured that when I drink the water and when you drink the water, that we can rely on the water – where it was tested, how it was provided to you, etc. So that's the goal. Now in between that there's a range of services and things that need to happen to guarantee that, to make it a reality. And so, I think it's clear that in the same way as a builder wants to rely on the window frame to be the right size when he asks for a 1 metre by 1 metre window, you want to rely on the water being good and healthy or whatever. So, the people who test, or the people who manufacture, they are a contributor to the quality infrastructure, but they're not in the same category as the technical infrastructure institutions.

Interviewer: Oh, I see.

Respondent: You follow what I'm trying to say? There's a separation there, I think we've got to be clear about that. So, we don't expect all the services to be provided by those four institutions that you mentioned. So, I think it's how you define the roles as to how you… But sure, of course you've got to say that within the system, and we would expect when I buy a tape measure, I don't need to check the tape measure, I should have something that assures me that 1 metre is 1 metre. I buy the water, I like to know that there is something on that water that says, this is healthy to drink.

28:22

Interviewer: Ok, so it makes me think that the two concepts, services, and role.

Respondent: Well, I think that's it. That's exactly it. I think you're right. You're right.

Interviewer: Alright. Thank you [2nd participant], for articulating the definition of the technical infrastructure from a South African context, and your experiences in respect

to that technical infrastructure. My next question [2nd participant], is as follows: Could you kindly explain your experience with regard to the impact of this technical infrastructure - or let's call it South African National Quality Infrastructure for now – towards the performance of small businesses? Just in general.

Respondent: Ja, look, I think if we go back one step and we say that everybody involved, whether it's the quality infrastructure institutions or whether it's the conformity assessment bodies, I think without them we wouldn't have what we have today. So, we can't say it's all bad. I mean that would clearly be the wrong impression to give. You and I know that's not the case. What I do think, is the case is that sometimes things are taken for granted by the end-users and they're not aware of a) the importance of it; and b) the ramifications if they get it wrong. So, they only find out afterwards. So, if you talk to a car manufacturer, tells me, "Listen, we are trying to get these bumpers made, and every time X, Y, Z small company makes them, they don't fit." So, you know, that's a quality issue. How do we make that right? How do we make it right that people know where to get food tested? How do we make it right to know where to get your tape measure calibrated, or whatever it is? Those are the difficulties. But I think if we have to be honest, we have a system that works. I think there are parts that don't work. That doesn't mean to say that it applies across the board. This isn't a generalisation. Generally, I think we know that it works. There are problems, sure there are problems, but we live in a society that has got problems, development problems unfortunately. So, you know, to go back to your question, ja, I think that my experience is that if the end-user knows enough to know that they need quality, then they can find resources to help them. I think the gap is their education. There, if you like, lack of understanding if you like, about what drives quality in their environment. So that could be a number of things. In some cases, it could be measurement issues, in some cases it could be legal compliance issues, in some cases it could be conformity to a standard. There are various things that make them not produce a quality product. But if they know that, then getting the resources is less of a problem. Notwithstanding what I said earlier, but often they just don't know where to go, who to start with, and the lower down the chain you go, which is where you've gone with your research, or going with your research, the harder it is for those organisations I think to get the information, because they don't know where to start.

Interviewer: Okay, [2nd participant], let's move to the third question under this section. Having said that, having considered what you have explained to me, have you been involved previously, or are you currently involved in any small medium enterprises' initiatives? If not, why not?

Respondent: I like everything except the why not. Look, as an association we are involved to the extent that we provide services to small and medium enterprises. I mean, we've got small labs which people come for training, we've got small labs we provide proficiency testing schemes to, so we are involved. We've got small labs who come to our conference and listen to the likes of you and I trying to help them understand. But I'm not personally directly involved in organisations. You must remember we are a stakeholder body, so we typically we have not seen a big drive by our members for things that are initiatives that they require. So, in other words, we haven't seen the need to say, okay, we've got 50 small medium enterprises, and they're all crying out for this, that and the other. We've got a membership and we provide a range of services whether you're big or small that affect you the same way. They're not directly related to your size. If you need to be trained to understand uncertainty of measurement as an example, you need to be trained, whether you're in a small conformity assessment, or whether you're in a large one, it's the same thing. So, I think to some extent we are involved, but I'm not personally involved in an initiative to start or support SMMEs particularly, you know, as a specific category.

Interviewer: But kind of indirectly.

Respondent: Indirectly. Exactly, that's a good one. More by the way, ja, they happen to be from that area.

Interviewer: I think that essentially answers the next question, which is if you've been involved in any SMMEs initiatives, and then explain the initiatives that you are involved in, or currently that you are involved in, or that you have been involved in. I just want to focus a bit on the next question. It has been indirectly to some extent answered, but the next question under this section is – which is the last question, is, what is your point of view with regard to the, I will say the application, you can understand that as the rule of the national quality infrastructure, specifically focusing on the key ones: accreditation, metrology, standardisation and conformity, assessment. I mean, your point of view is there entrenched coordination in terms of the rule? Are they perhaps

operating relatively independently, or what is your view regarding their application? **Respondent:** I personally think that they are in some areas reasonably strong in what they do. So, to answer your question about independence, yes, I think independently they do quite well. I think we had a similar conversation just a week ago with somebody who was in this office about the fact that in my view – I called it integration – and then I was misunderstood, so I don't want to use that word again, but I do think that we have not captured properly a uniform policy approach. So, what I mean by that is that I think it's quite clear to me that whilst all these organisations have their own roles and functions to be involved in, I think we are lacking a little bit in an integrated way that could be better. The decision making could be better if the parties, I think are more talking to one another, really kind of saying, okay, if we take a decision in this area, how does it affect other areas? In other words, Sam, I mean, you take a decision like, should we have a national standard for, I don't know, talk measurements as an example? Well, do we really understand the needs in the regulatory area? In the standards area? In the accreditation area? You know, how does it all fit together? we somehow in my view don't always talk to one another. We don't see that being harmonised, integrated. I don't know what the words are, but you know, properly, in my view – not properly – that's not the right word. But I think effectively, that's the better word. I think efficiency in that is something that is lacking. I think we are lacking, because I think each one of these organisations, as you well know, because you come out of them, are focused on what they have to do, and so it's very difficult for them to really kind of pay much attention and spend much time trying to understand what the other things and other parties and how does that all fit together for the common good.

Interviewer: So, in your view, that lack of efficiency in terms of collaboration…

Respondent: Coordination…

Interviewer: Ja, that is a better word, is actually not, or has an impact in terms of how SMMEs could optimise their services of these quality infrastructures.

Respondent: I think so. I think there is, because, I mean, I've been in meetings and perhaps you have too where people say, you know, this should be done, but it's not our job to do it. I've heard that so many times. People say, "Well this or that should be done! But you know, it's not our job. We're only involved in measurements." or "we're only involved in accreditation." So, whose job is it then? You hear what I'm trying to

say? Sometimes there are things which need people to say, well maybe it's not our job, but we have to come together for the common good. And I think that's the part that somehow, sometimes allows things to fall between the cracks. You know, it's not always efficient, I think. And I think that's why to some degree people outside don't know what's going on. Let's just take a simple example and you'll understand what I'm saying. You recall the days when the Bureau of Standards did all the testing for everything related to the so-called legal regulatory area that they were involved in. You know, you couldn't get a product tested somewhere else. Was it considered okay? Do you remember those times?

Interviewer: Ja, so it was considered okay if it was tested by SABS.

Respondent: Correct. Now, the SABS for whatever reasons decided that wasn't – or the regulator decided, no, we'll allow other people to test for various reasons. That decision was taken years ago. It's not a decision taken last year. We still have people who don't actually understand what the role of the NRCS is, what's the role of the bureau, what's the role of SANAS, what's the role of NMI. So, whose job is that? See, there's a typical thing. Whose job is it? You talk to each one of them, they'll say, well I'm only interested in telling you about this part of the quality infrastructure. I'm only interested in that part of the quality infrastructure.

Interviewer: How do you think that can be improved, [2nd participant]? I know you've mentioned something like a call centre in terms of [unclear 15:05] of what is the rule of NRCS, SABS, NMISA or SANAS, but how do you think other...?

Respondent: I don't know, I think it's a good question. I don't have a simple answer. I do think that perhaps the guiding role played by the DTI needs to be reviewed. I wouldn't like to say more than that. In the sense that I do think that somehow or another the independent heads of those organisations are not really brought together in a cohesive way, in a way that encourages what I'm suggesting is missing. So, I think that's something, they wouldn't like me to say that, but I think I can because I'm not in one of those institutions. So, I can sit outside, and I'm saying that's something that needs to be considered. What I do think won't work to be honest with you, is to produce another piece of paper that explains what happens. We've got lots of piece of paper that explains…

Interviewer: White paper.

Respondent: White paper. Let's just say, you know, there's this very famous approach to say, we need a tool. We need something. And then another… it's a website or it's a piece of paper that explains how the connections work and where you go and whatever, but the average user hasn't the time to read it, they become very complicated, they become extremely difficult to follow, even if you know what's supposed to happen and they don't always reflect the reality because often the reality, nobody wants to reflect the reality because reality is something that you don't want to really… because you know it's not really so. So, who actually… What I'm trying to say is the gap is really to find some way to find individuals who can actually guide you in the right place or can make a phone call to find out what's going on. So, it requires a personal touch and we live in an age where the personal touch is… You speak to our kids. How do they communicate? If you ask your son or daughter, "Have you spoken to so and so recently?" they'll say, "Ja, sure." You say, "Did you actually speak to them?" "No, Dad or Mom, I sent them a WhatsApp message." Everything is based on WhatsApp and email and so on, so I think, how do we overcome that? Because this requires more than that. I know it's old fashioned, so excuse my lack of hair or whatever, but it's saying, we don't have enough communication.

Interviewer: Okay [2nd participant], I hear you. I think this basically even leads to my next question, which is…

Respondent: I thought that was your last question.

Interviewer: Which is the last question in Section D.

Respondent: Oh goodness

Interviewer: But you have actually answered some of the questions that are coming basically, but just to confirm that under Section E, just in summary, maybe one or two, what do you think that the most critical drivers that can assist these SMEs managers when they want to apply these services provided by the national quality infrastructure, you know, that to optimise their performance?

Respondent: I think I've said it, but I think if they had a single point of contact. I think that would be useful if there was some single point of contact who could guide them to where they need to go, and not send them on a wild goose chase. Not, "Oh, you need to go to the Department of Interior" and you land up there and actually, you needed to

be at the police force. You know what I'm saying? There's too much of that. You need somebody who actually knows where to send you with the questions that you've got. So I think a single point of contact would be useful. It comes back to my suggestion about a call centre and the communication and so on. It's all kind of wrapped in the same thing.

Interviewer: Sure, and what will be the opposite of it in terms of the limitation that critical most limitation that can limit SME's managers or owners when they want to apply the services of… I think you have mentioned the drivers, you know, but the limitations…

Respondent: Well, I think the limitations are their own education. If they have a better understanding of what was required, they would be better off. So, their limitation is that they don't know.

Interviewer: Knowledge.

Respondent: Knowledge. That's my view. In other words, somehow we need to have a way to communicate what the intentions are and who does what so there is better understanding of what's required.

Interviewer: Do you think in general they are not aware, or there is not much..?

Respondent: I think Sam, it's like everything else in life. You know, there are guys who are aware and choose not to be. There are guys who are aware and choose to ignore, and then there are people who literally don't know.

Interviewer: So, the guy who, I see a lot of guys now are starting in the township to manufacture bricks.

Respondent: Excellent.

Interviewer: Ja, so in Mamelodi I've seen that in Soshanguve they've got kind of brick making machines, which is a good business concept, but are they aware that they can..?

Respondent: Well, let's look at… There's a very good example. Are they aware of the composition of the brick? Are they aware of the safety requirements? Are they aware of the size requirements? Just three little things, I don't know. I would say knowledge.

They may not be. And they may not know there's a regulation that says a brick has got to have a certain compressibility, must have a certain size. So, they're going to be… So fine, you can supply the informal sector, perhaps. You can supply the informal sector, but if you want to build a house that meets building code regulations…

Interviewer: And to make the business sustainable.

Respondent: Then you need to know a little bit more than you… you know. The next question is, where do I go? But the first question is, how do I know what I need to know?

Interviewer: Thank you [2nd participant], the last but one question before we conclude this interview. Is there anything else which you think needs to be improved with regard to how the quality infrastructure services are being applied by small medium..? You might have answered this one here, and I think I will integrate this with the other question, which says: If you could be given a chance to change something about the service provided by the technical infrastructure in South Africa, what will you change in order for the quality infrastructure to work effectively?

Respondent: Look, I think we've said a little bit of what my single point of contact for information. I think it would also be quite good to introduce some principles of quality requirements at school level. Because I do think that most kids coming out of school have got no idea of the sort of things we've been talking about and maybe some idea about this would be good. I don't mean in a detailed fashion, but in a general fashion. I've no doubt that there's nobody coming out of school… It's not something that's on the curriculum because it's considered extra and it's much more important, and there's no doubt that it is important to have maths and science and language skills. There's no question, but I do think that perhaps some attention could be paid to have this, introduce this life skills or life sciences education which they continued with, introduced it twenty years ago or whatever, and they talk about finance and various other things, but I don't think they talk about quality, and maybe that's something that should be considered. Think about that, that's a thought for the Department of Education as an output. Maybe that's something you haven't thought about. And then the other thing that I think is probably a strong recommendation, if I had a magic wand and I could change it, I would like to see how we could really more clearly define what a considered national priority versus what's expected from industry, what's expected from the

outsider so we don't have competition for the same piece of turf. The same… competition's fine, but I do think the institutions have been placed under huge financial constraints, and so I don't think it's a secret, but talk to SANAS, talk to NMISA, talk to whoever, they all tell you the same story. They had parts of their budgets cut. Okay, we live in tough economic times, we know that, but I do think what has happened now is that these organisations – not all of them – but are starting to look at ways of competing with other institutions who don't have the benefit of government funding. So, it's a very difficult area, and for this I blame the cabinet. I make no bones about it. I blame the cabinet. I blame the way in which they have started to tighten the screws, but they haven't thought about what's down the road.

Interviewer: Do you think in terms of structurally, the quality infrastructure [unclear 04:00] metrology, standardisation, SABS, NMISA, SANAS, are reporting to the Department of Trade and Industry. They could independently be on their own, will that solve the problem?

Respondent: No, I don't think so. I've also been asked this question recently about do I think there's something to be made of integrating it all into one, and I don't think that's a good idea either. But I do think that somehow or another there are… You know, we can't keep on demanding things from these organisations that are going to turn into competitors for organisations who are independent. Got to really think hard about that because it's going to… if you know that you're going to set up a laboratory and the National Metrology Institute is also going to set up a laboratory to compete with you, you're going to be very reluctant to be innovative and to, you know… I know that it's not a polite thing to say, and I know it's probably not something that's easy to reflect, but I do think that there's something to be said for, we haven't quite got our national priority sorted out. We want people to spend their money, and then we also want to compete with them because we need revenue. You know, it's a very confused message we're sending.

Interviewer: Is there any bureaucracy that's emanating from the arrangement of…

Respondent: Well, there's always bureaucracy. I think we've got to accept that the government breeds bureaucracy. I say that gently, I don't say that being critical. I'm just saying there is… but I do think there's room for better coordination. We've said it before, and I do think that might have an impact on it. I do think so, and I think also we

do need to look very critically perhaps, at some of these organisations about the kinds of people that they're employing as to whether they actually… you know, the ratio of support staff to workers – when I say workers, I mean those making a contribution directly in the area that the institution seems a bit out of kilter when I look at it. I mean I understand the need for governance, and I understand the need for some of these additional staff members, but I have got a question in my own head to say, the ratio is wrong. Maybe it was too little before, but now in my view it's bloated. It's so huge, it's crazy. It's crazy to have 20 or 25% of the organisation doing things which are non-productive.

Interviewer: Kind of, ja. Okay, [2nd participant], thank you very much for your time and willingness to contribute to this study project. I think our discussion was even more than I expected. Our interview.

Respondent: You always get more value here than you came for. We don't charge much either.

Interviewer: Yes, indeed and I do apologize to take it overboard. It went a little bit overboard due to the interest and the passion that comes from yourself and even me. But I'd like to say thank you very much for your time, and I'm looking forward to your contribution to the study as well.

Respondent: No problem, I just wonder whether I'll get the PhD as well as you.

Interview 3

Length of interview: 56mins

Interviewer: Thank you [3rd participant], firstly I would like to thank you very much for your time in allowing this interview, as explained during our discussion, previous discussion regarding the overview of the, of my study, I'm completing a thesis and the title of my research project is as follows, A Framework for the Application of the Quality Infrastructure Services by Small and Medium Sized Enterprises in Developing Countries Focussing within the South African Context, so that is essentially my topic [3rd participant]. Of course I'm very much cognisant and I appreciate your time and your busy schedule, I mean busy making a contribution regionally and also globally, I think that is very, very much appreciated, I would also like to reaffirm confidentiality, and

confirm that the information that will be gathered during this interview will only be used for the purpose of my study, the information will not be used for, disclosed rather to any other party except for the purpose of my research objectives. I've got about five sections, so we can quickly go into that, that will guide us in terms of our interview, the first one is just to get some general information, or rather demographic information, in that the first question I would like to ask you [3rd participant], what is your highest academic qualification?

Respondent: I've got a PhD in Biochemistry, so I guess that's my highest.

Interviewer: Thank you very much for that [3rd participant], biochemistry, it's different to chemistry?

Respondent: The chemistry of living things.

Interviewer: The chemistry of living things, interesting, I did a bit of chemistry, but I couldn't go beyond third level, kind of challenging. Thank you for that information [3rd participant], my second question [3rd participant] is what is your current position and responsibility, and how long have you been involved in this position?

Respondent: I am the sole proprietor of a consulting company, basically the owner of a company, and I consult in the field of quality infrastructure to developing organisations, so I'm usually on a short-term basis, I contract my services to various developing organisations, development organisations around the world, so currently I'm working on a project with BSI in China.

Interviewer: BSI, what is BSI?

Respondent: British Standards Institute.

Interviewer: British Standards Institute, I came across that acronym.

Respondent: I'm working in China on a prosperity fund which is their fund dealing with the poverty alleviation in China, and basically I'm contracted as a national, as a key expert in standardisation.

Interviewer: In standardisation, I guess this is a kind of a responsibility that you held when you were part of the South African Bureau of Standards.

Respondent: I was in all sorts in SABS, in SABS I was divisional director in charge of standards for about five years, I was also divisional director, well managing director of

the commercial arm for about a year and a half or two years, and I was also in operations for a couple of months as well, so I've been all over the organisation at SABS.

Interviewer: Interesting [3rd participant], and probably that's the reason why I've identified you as one of the experts in this community or this system, thank you very much, let's continue to the next section, I've got one or two questions that I'd like to ask under that section, the first one is, how do you define National Quality Infrastructure from South African context, and what is your experience with regard to this system, quality infrastructure?

Respondent: I suppose the definition of the quality infrastructure is all those, is the institutions and the mechanisms in place in the country to deal with quality and standardisation, quality measurement and standardisation in such a way that it supports trade in the country, so I think you've outlined the different agencies that are established by government to support that, so we've got the measurement institute, or metrology institute (NMISA) that deals with measurement, measurement traceability and the traceability of measurement internationally, we've got the South African Bureau of Standards which deals with documentary or standards in the country, also has under its mandate a couple of other things, but certainly standards in general are provided for under the standards act, and we also have the SANAS which deals with the accreditation and competencies, recognition of competencies in the field of the quality infrastructure in the country, my experience is as I said to you before, I was involved for about twenty years with the South African Bureau of Standards and...

Interviewer: That's quite an experience.

Respondent: Back in the olden days nearly everything in the quality infrastructure, almost everything fell under the SABS, things broke off over time, the first one to break off was the Metrology Institute, that broke off many years ago and you had the National Metrology Laboratory which eventually became the National Laboratory Institute, they were the body set up to derive and to maintain measurement in the country, we also had various services under that, things that have evolved over time, my experiences with the SABS, we were part of that process, we also then modernised the South African quality infrastructure in line with the establishment of the World Trade Organisation, that happened in the mid-nineties, around about the same time SABS

also recognised that SABS as well as the Department of Trade and Industry in South Africa also recognised that they needed to modernise the South African quality infrastructure, and I was also involved with the team from DTI in drafting the model regulations, or the draft regulations and putting them through parliament in terms of changing the Standards Act of, the then existing Standards Act to the new Standards Act, and at the same time we published acts related to accreditation and metrology and the regulations of NRCS in the country as well.

47:37

Interviewer: Are you referring to the acts that were updated around 2006, 2005?

Respondent: Ja those ones.

Interviewer: The definition that you have now unpacked for me [3rd participant], is that kind of an arrangement that is approached by the global community as well, is that the same approach as well from, if we look at quality infrastructure from global perspective is that a..[unclear 46:59].

Respondent: Yes I would say, I think, I mean certainly South Africa and the Department of Trade and Industry in South Africa, as the lead agent for quality infrastructure is taking great care to benchmark against, and to model what we've got in South Africa against international best practise, and also looked at the guidelines for quality infrastructure particularly when we looking at things like World Trade Organisation, and access to international markets so we don't create unfair barriers to trade etcetera, through what we're doing in the quality space, especially when it comes to what we would want to call something like the standards receptive model for regulations, technical regulations in the country, that we don't create unfair barriers to trade, so South Africa being a very open market certainly has been very cognisant of the fact that we need to be very careful in terms of our obligations internationally, regionally in terms of trade and our obligations under trade.

Interviewer: [3rd participant], let me get your experiences regarding the influence and the impact of this quality infrastructure from South African context, towards the performance of small businesses in general, what is your experience with that in this regard?

Respondent: I think in many cases, there are a couple of things, I think small business in general, well my experience with small business and almost being an operator of a

small business myself, I think many small business operators don't necessarily take advantage of the services offered by the quality infrastructure, in many cases I think small business tends to do, tends to operate and do what they have to do, so in other words carry on doing things until they're caught for example, and only necessarily do something if they have to, generally I think the services of the quality infrastructure have been exploited or used predominantly by larger organisations, organisations that have I suppose have a bit more time and a bit more recourse to actually use them, so they tend to do things like applying standards, developing standards to their own advantage, participating in the development of standards, using conformity assessment services once they have a critical mass, so your start-ups, your survivalist organisations and small businesses tent to only use standards as a last resort, or if they're forced to, so if it becomes for example something like a condition of a sale, large organisations will only buy from them if they conform to a particular standard, of if they can demonstrate they conform to a particular standard, then they will use that standard, but they don't do so necessarily voluntarily.

43:22

Interviewer: Do you think it is necessarily for them to actually be more aware [unclear 43:15] the usage or the services as provided by the quality infrastructure without being pushed, from a push kind of a perspective to rather maybe look at a pull?

Respondent: I think it would be ideal, but I think there's two aspects to that, I think you're right, it's a pull strategy that we've got to look at very carefully, but how do we pull that strategy? I think yes we need to make it clear and make the message clear to organisations that it's in their interest to make use of these services, that ultimately the payback is going to be on the short term, and they got to realise they not going to be in that for a long payback period when it comes to using the services, I mean that investment that they make in quality infrastructure has got to show almost immediately [unclear 42:01], sometimes that will be a bit difficult so sometimes it becomes something like...

Interviewer: It can be difficult for small businesses [unclear 41:54].

Respondent: I think the other thing to bear in mind is that when we look at how we develop small businesses, I think one of the problems that we tend to face is that the ultimate goal of developing small businesses is to make sure that they're no longer a

small business, and I think that kind of get in the way of policy, the fact is if you have a business development strategy that says we don't want you in here after five years, we want you to be a big business, then ultimately we going to do away with our market, it becomes a contradictory thing.

Interviewer: I think it's kind of making them more sustainable.

Respondent: You don't want to sustain them as a small business, you want to make them sustained as a big business, and you want to convert. I mean this idea of sustainability of small business is a contradiction in terms, we want to have a conversion of small business, and I think that's where government falls flat, is that we don't focus on converting small business to large business, to grow the economy, to grow them because ultimately a small business is a very inefficient animal, and what we want to do is to have a sustainable business that employs lots of people, that can be a large business [unclear 40:40] your time as a small business must be reduced, and standards can certainly help in that conversion, the problem is we tend to focus on how to keep them small [unclear 40:31].

Interviewer: For the conversion from small to medium to large businesses [unclear 40:27].

Respondent: Government's objective should be, I mean look at China, China are looking at things, they call them unicorns, a unicorn is a business that turns over more than a billion dollars a year, small business, started as small, turns over more than a billion dollars a year, how do we make small business into unicorns, how do we do that, so we need to be measuring unicorns, not small businesses, the success of things like SEDA, of all the small business development agencies, it's not about how many small businesses they're supporting, but how many small businesses they're converting [unclear 39:44].

Interviewer: That's a premium point indeed, alright, quickly [3rd participant] [unclear 39:39] before, previously you have been involved in initiatives with regard to small business projects and so on and so forth, would you be able to relate in terms of what initiatives you've been involved in previously, or even currently.

Respondent: All my work currently has been outside the country, so I don't think it really helps too much, I think really if we just look at the previous work that we've been doing, I think in SABS we tried a number of initiatives to try and get small business

involved, from a certification point of view, we were looking at how do we make small business implementation guidelines for common standards, how do we make it easier for small businesses to achieve conformity to particular standards, particularly those standards that would enable them to get business contracts, for example implementation of ISO9001 quality management systems, how do we put that in place and how do we give small business guidance, so we were working on a program to try and get that, that was early on in my days at SABS we were trying to look at that, trying to publish even something like a partial recognition agreement, so in other words you got the first phase, [unclear 38:10] so that you could say, you could recognise you for having partially met the requirements, and that you were still on the pathway so that you didn't have to do the whole thing and invest such a lot of money, but you could at least have your foot in the door.

Interviewer: [unclear 37:55] those initiatives also [unclear 37:54] in conjunction with the other components like metrology, National Metrology Institute, SANAS and so on and so forth.

37:46

Respondent: Certainly with SANAS because it was partly certification accreditation, and there were issues associated with how do you advise people without conflicting with your accreditation requirements as a certification body, how do you advise people on how to get certified without necessarily consulting, because that then becomes a conflict of interests under the 17021 requirements, we were dealing with SANAS in that respect, with the standards body and SABS as a conformity assessment body, so all three of those components were involved as well as some of the other DTI agencies like SEDA and those agencies in terms of small enterprise development and things like that, so we were working with them at that stage.

Interviewer: Ok [3rd participant], I think the next question, it might have been partially answered.

Respondent: Sure, sure don't worry.

Interviewer: If it has been answered that will be...

Respondent: Ok, let's work through it.

Interviewer: Just to make sure, the next question is, what is your point of view regarding the application of the quality infrastructure from South African context by small medium enterprises, specifically focussing on these four key components of the quality infrastructure, accreditation, metrology, standardisation and conformity assessment?

Respondent: I think you're right, I think we have looked at that, by small business I think especially formal certification, accredited certification is seen largely as a very expensive barrier in some cases, I think we need to be very, very careful how we deal with that, for a small business to succeed we need to sell the importance of quality, and I think we are doing that to some degree, maybe not as well as we should be doing in South Africa, and I think people are looking at the sale of quality in inverted commas as an opportunity to get business, commercial business for conformity assessment bodies, commercial test laboratories, and they're not necessarily seeing it as an enabler, they seeing it more as an exploitation or that kind of thing, so small business is seeing, or business in general is seeing when SABS comes to them, or when any conformity assessment body comes to them it's in your interest to conform to the standard, be certified, to have our certificate of conformity, they just see dollar signs, you know [unclear 34:13] is the benefit in those kind of things like that, those issues are seen as big, so while we do supply those services I think the fact that nearly all of the agencies under the DTI in the national quality infrastructure, the ones you've mentioned, SABS and SANAS in particular have a kind of a mandate, a mixed mandate in that they're there to supply services, but they're also there to make money, well there to be a commercial service, and these services that they offer are often seen as quite expensive, so I don't know how we deal with that, but anyway let's have a look what your other questions are.

33:20

Interviewer: The next question is under section E and it might have been touched based in your previous sections, but let me ask it in any case, what do you think are the most critical drivers that can assist this small medium enterprises, their managers and owners when they want to apply the services provided by the quality infrastructure with an aim of optimising their business performance, the drivers that can be probably from your experience can lead to that benefit?

Respondent: I think the most important driver of any small business will be can I get my product sold? Bought, sold however you want to define it, will this generate more sales? That's the most important driver from a small business point of view, probably a secondary one is, can I improve my efficiency? A: can I generate sales, because without sales I'm dead. B: can I improve my margin, in other words if the selling price is fixed I need to reduce my cost of production, I think the quality infrastructure can to some degree contribute to both those questions, in other words can they convince the buyer that they are selling a good product by conformity to a given standard, do I meet minimum standards for my product, and will people trust my product? Trust is the underlying thing, quality and trust are the underlying messages that come into these, you know, can I trust this product? Yes you can trust this product because it meets the national standards, national standards define a level of acceptability for that product, so therefore the buyer is willing to buy this product because they know they are buying a good product, they are buying a product that is safe, fit for purpose and that kind of thing, everything else above that is advertising and differentiation, so that's another important thing is, can I sell my product ahead of my competitor? That's a different side of the market, but ultimately, can you trust my product is where standards come in. Therefore underlying measurement is important, because I've measured this product, I've tested this product, it can be done, so this product can perform, standards are important because we have the right standards to convince the buyer that my product is correct, conformity assessment is important because there's a trusted third party that can issue a statement that says this product is a good statement, and ultimately SANAS is like the bottom feeder there that actually fits in and says you can trust the guys that say you can trust them, the people who are issuing the report, there's a back up to say it's not just a case of I've got my friend to say this is a good product, it's underlying in terms of key good practise in terms of backing up that kind of assertion.

Interviewer: Maybe just for a fraction of a second if you put it in perspective, as I drive along the townships, my Mom is staying in one of the townships Soshanguve, so as I drive along I see the guys are starting to fabricate bricks, and they tend to, kind of, I see that as a kind of upcoming business, which is very important, now if you conceptualise what you have just explained to me with regard to a trust of your product, let's say that very same brick that is fabricated there alongside the street, is it critical or if [unclear 28:52] depend on what will be the brick used for, of course for building,

will it be of more value if the owner of that little company of brick manufacturing knows about standards and so on and so forth, and the strength of material that is being used there and so on and so forth, a kind of a example.

28:21

Respondent: I think absolutely, I think those are the kind of things that are important in terms of, let's put it, components and why we need standards, I mean when we looking at building materials in particular, i mean it's important that you look at it from a couple of perspectives, I think when you look at bricks, everything in the building industry revolves around the dimensions of a brick, we just talking purely about the dimensions, a brick is 220mm long by 110mm wide by 55mm high, that's the dimensions of a brick, it's that kind of a brick, and every door post is so many bricks high and so many bricks wide, if a guy is manufacturing bricks, or fabricating bricks that are not according to those dimensions, then he's going to build a house that doesn't fit with door frames, that doesn't fit with window frames, that doesn't do all of those things, so A: the interoperability is not going to be assured if it doesn't meet the right kind of sizes, secondly when we talk about the safety, because it's a safety critical component, if the brick is made of the wrong materials, the wrong performance, the house could fall down, I mean we sitting here in Brooklyn, fifteen years ago right where we sitting now a roof collapsed in this very building because of the use of poor construction material, the rebar that was used in the construction of this collapsed, failed because of poor use of materials, right in this very building, didn't even have to be in Soshanguve, it happened here in this building.

Interviewer: In the suburbs, in the town, in the cities where you would expect things to be done properly.

Respondent: Corners were cut even by large institutions, I think while you don’t want to create unnecessary barriers to entry for the market, you also need to be able to give the purchaser a certain amount of trust that, that product meets basic requirements, in many cases you can't necessarily assess a brick by looking at it as to whether or not it meets the required standard, sure you can measure the dimensions, that's quite easy to do, but the inherent safety critical performance criteria might need to be tested on a batch basis, on a materials basis and those kind of things would need to be put in place to provide assurances to the guy that's buying that brick, you need to be able to provide

that in those kind of areas, just the other thing is, when we look at things like that sometimes the established organisations and the established operators instil fear in the consumer unnecessarily.

24:57

Interviewer: What do you mean by that?

Respondent: For example, and it's always been a bugbear of mine because I don't like, as long as it's between you and me and whoever is listening to this, it doesn't have to go into the report, but there's a certain industry in South Africa that thrives on instilling fear into the buying public, that's the motor industry and the after trade, when you look at it, you go to any OEM kind of organisation, Toyota for example, and I don't mean to single them out because every other manufacturer does exactly the same, they would go and say unless you have your car serviced by Toyota you're in danger, they make X amount of money on selling you the car, and they make probably as much money on servicing the car after you bought it from them because they've instilled so much fear, there's so many perfectly competent people out there who could service your car just as well as Toyota can, in fact even better than Toyota can, but everyone goes to Toyota because they've instilled so much fear, and I believe that one of the areas where the national quality infrastructure can get involved but don't because they're scared of the motor industry, is to say for example if that person is competent he's just as good as Toyota, and your guys can do that as long as they've got the competencies backing them up [unclear 23:11], we could start having a whole lot more people.

Interviewer: [unclear 23:03] the market.

Respondent: [unclear 23:00] the market, so we've protected it due to fear, not due to regulations, we've created fear in the marketplace.

Interviewer: I mean [3rd participant] I'm seeing this things also happening especially in the townships where I'm coming from, my parents are still living there, you find this small service providers who services cars, mainly they position themselves around this motor spare sales and outside there they service the cars and such, but that is very, very informal, that is very, very informal, how do you justify your fear there, because it might be question of they not aware probably of the importance of quality, and you can't blame Toyota for example for Toyota to say don't take your car to those guys

because I mean it will be worse off, is it a question of unaware, or is it because of this element of...

Respondent: I think it's, we can have a long discussion about this, because I think it's something that radically needs to be changed in this country just in that industry, I do believe that we are being taken for a ride as a consumer, and I believe our consumer associations are not necessarily looking at that, no other country in the world, well when you look at the other established countries in the world sells as many for example motor plans as we do in South Africa, so in other words you buy the car and not only you buying the car but you buying a contract to have the car serviced by these people after you've bought it, and that's servicing that whole infrastructure, it's anti-competitive, a lot of these things are anti-competitive and we need to open up that market to allow for better competition, one of the things we looking at, the DTI has now become the DTIC, competition is a very important part of what we do in the market, we've got to allow for competition and that kind of stuff, I believe one of the things that would allow us to do that fairly is to say how can we build trust, by all means the guy who services your car on the pavement and in the back yard where there's chickens running around should not necessarily be afforded the same level of trust as somebody, but you know what, there's people out there that have got it very well established infrastructure a lot of competent mechanics to be able to service those vehicles, and they should be afforded the same level of opportunity as the guys that are associated with the, let's call it the OEM's and the sellers, the guy should be able to go and buy the same part, he's got the same competent mechanics, he's got the same systems, he should be afforded the same level of trust as having your car serviced by Toyota for example, and by all means we don't want to go on there and say the guy who's stolen a vehicle, taken it through a chop shop, taken the brake callipers off a running taxi and put it on to a new taxi, you shouldn't be supporting that market but we should be supporting that chain of custody and things like that, but I mean sorry we're digressing quite a bit here, but what I'm trying to say is, I think what our question was is, how can the quality infrastructure support small business, and I believe the underlying thing there is to allow them easy access to be able to sell trust to the market place, to allow the consumer to choose between equals, based on competence, and based on systems, not necessarily based on brand, building a brand is incredibly important, is incredibly expensive, and where we want to give small

business support is to say, you're building the brand to say that you trust this brand, what we're saying is the quality infrastructure must be there to allow the small guy to have the same level of trust based on like for like, and the likes there are measurement, trust, ability, all of those kind of things should be there, the quality infrastructure should not necessarily be protecting the big guy, but should be assisting the little guy through trust, so that we can compare like to like.

Interviewer: On the other hand, maybe we have touched base on it, but what do you think are the most critical limitations, is it that you have mentioned, are they the drivers, those ones that you have just mentioned, trust and so on and so forth.

Respondent: The critical limitation for small business to get access to the quality infrastructure is, they don't know what they don't know, accessibility of the quality infrastructure is a little bit of a dark secret, people don't know about standards until it bites them in the bum, sorry to use a bad phrase, they may be rejected when they submit a tender, because they don't know about it, or they may find they can't get their product exported because all of a sudden they can't provide a certificate of conformity that they never knew about, these things are not obvious, the biggest, one of the first limitations is the awareness of the services, they're not front and centre for everybody entering into business, the first thing you do when you enter into business is you go and register your company, you do all of these good things, you get into this [unclear 15:46], and then you say and now I'm going to go out marketing myself, and then people say oh but demonstrate this, demonstrate that then all of a sudden these things become a crucial [unclear 15:37], I think the second limitation is the cost, the cost, people are saying the next thing os oh I need a test report, so then all of a sudden we need this thing urgently and we haven't got those options, we can't shop around, where do I get this thing tested, boom, boom, boom, all of a sudden it is expensive, I never realised how expensive it was to get my product tested, to get a certificate of conformity, to get a test report, and they don't know enough about or shop around enough, so there's coupled with the accessibility and awareness is the thing of advice from the most appropriate, sometimes it's self-serving advice, I must admit, people go in there and say yes, but, if you were to get certified and this, this and this so they go for the whole hog when they only need a little bit, so they are often advised from a self serving point of view, I wouldn't say it's only by the formal quality infrastructure SABS and those kind of people, but also the likes of BVQ, SGS all of those guys are out

there, they out there as conformity assessment bodies offering services, offering services ultimately to get themselves some business as well, they survive based on those kind of things, I think that's another limitation because the fact is in order for you to get this [unclear 13:50] you got to get this test report, you got to get this certification and that's just going to cost you money, and it's up front expenditure.

Interviewer: I guess my next question basically relates to kind of recommendations from yourself, but let’s see what are the questions, the first one is, is there anything else that you think should be improved with regard to how the quality infrastructure services is being applied by the small businesses? and this can be linked to my next question which is my kind of last question, but maybe lets try and answer this one first.

Respondent: I don't know, I think first of all is awareness, I think awareness is crucial, awareness is crucial from two perspectives, I think one is the overall message of quality in the country needs to be there, why it's important, why we need a kind of quality...

Interviewer: Awareness.

Respondent: Well, a quality culture in the country, and we need it from a demand and a supply point of view as well, good enough is not good enough, that kind of message we need to [unclear 12:33] from a perspective of are you supplying a service that's good enough, or are you supplying a[unclear 12:25] service, people need to be able to say how can I differentiate in quality, how can you understand that my quality is good, how can you trust my quality and how can I build that, and then from a demand side people need to demand good quality services from small businesses [unclear 12:07] services as well, that kind of thing, the message of quality needs to be there, the message of the quality infrastructure needs to be there, and it needs to be a very strong message that supports business in the country, again it's a very well-kept secret, I still, after all these years I still believe that the quality infrastructure in South Africa is still not well enough known to the consumer and to everybody else, the age old thing has always been out there people know thimgs like, we know quality, we know SABS, we know the NRCS, we know about SANAS and all those things, we know they're good for you, but we don't know why, and people will see these brands SANAS has come up, you see little things on the side of the road, you see adverts every now and then, you see them in magazines, you see SABS on the side of the road, you see it in magazines and you say it's important, still people don't know why it's important, they

don't know why it's there and business doesn't know why it's important for them to have these areas, and the wrong people are getting the wrong certification, people are getting management system certification when they need a test report, they're getting product certification when they need system certification, so awareness is not necessarily there, and I think an important part, and it's an important creator of jobs, but it's an important thing that we need to get right early on because, the consultancy services are crucial, we saw them as vultures, and we saw them as something that's not necessarily a good thing, but I believe that it's a good consultant, more and more I realise that the more Iv'e been involved with [unclear 09:48] I think the value of a good consultant is incredible in terms of that, and that's where it's important to get the likes of quality societies and those kind of things involved, where you can start saying how do we differentiate, how do people know what is a good consultant versus what is a bad consultant, so we need things like to build up that industry as well, to try and support small business, that interface between being a small business, being a successful business, how do we consult in terms of getting your trust, and then how do we take that thing, what I was saying right in the beginning, how do we get that conversion of small business to large business to what the Chinese call unicorns, market leaders, how do we create the next [unclear 08:53], how do we create the next? You know, all of those kind of things from the small businesses we've got at the moment, not how do we sustain those small businesses, but how do we convert them to be a market leader, to go from successful operation to being the next Shoprite, to being the next that kind of thing, to being a listed company, to being a market capitalisation of a billion plus, conversion to me is a major important thing, and how do we, how does the quality infrastructure allow us to get there?

Interviewer: Do you think [3rd participant] the establishment of the National Quality Policy can achieve that? I see other countries are starting from that framework.

Respondent: I think it should be and it should be cognisant of that, to some degree I think business succeeds, and again that's my little phrase, business succeeds sometimes despite the quality infrastructure rather than because of it, and I think we've got to be careful that as a quality infrastructure we've actually got to see how do we allow, how do we stand in, not necessarily, it's almost a case of how do we stand back to allow business to evolve rather than getting in their way, because I think we tend to be interfering more than enabling, and again back to what we were saying right in the

beginning, are we creating constraints rather than enabling business to develop, and if we're creating a constraint, we should rather step back and not do it rather than do the wrong thing, because a business will succeed.

06:59

Interviewer: So, we should be more enablers.

Respondent: We should be looking at enabling rather than looking for business opportunities at the wrong time, we trying to milk a cow too early, we milking the cow dead before we've actually, we killing the golden goose before it's laid the first golden egg, we've got to be very, very careful how we do that.

Interviewer: Thank you very much [3rd participant] for that, I've got a last question, a very important question, it's a kind of a general question, if you could be afforded the opportunity to change something about the services provided by the quality infrastructure from South African context, what would you change in order for the QI to effectively improve SME's performance, what is that, that you might change, if it is working why do you change it?

Respondent: The problem is, is it really working?

Interviewer: That's the million-dollar question.

Respondent: I think to some degree we tend to use that argument incorrectly, we tend to be doing the old Einstein [unclear 05:28], the fact is we tend to be doing the same thing over and over again expecting different results, and I think we got to be very careful that we don't get sucked into saying it's working, I think the most important thing that we got to look at is we've got to always be cognisant of what does the market want, market relevance is incredibly important as to what we doing, rather than trying to create a market for the products that we already have, and I think we tend to be looking at it from that perspective to say we've done all of these things, we've got ten thousand odd standards published, they must be good, therefore we must get more people to use the standards we published rather than to continuously look at, are we being market relevant in terms of standards that we published and what we doing, we tend to be looking at our test facilities and saying we offering these tests, we've got this equipment, can we find new customers for this equipment rather than saying what do our customers really want, are we really going out and finding what our customer really wants, and I think that's an important part of where we looking at, so market relevance

ultimately, and I don't think it really means changing the infrastructure radically, but it's changing the approach of the [unclear 03:57].

03:57

Interviewer: The approach, to be more relevant.

Respondent: I think that's possibly what we need to be looking at, we tend to be looking at the same people, asking the same people the same questions over and over and not necessarily looking at asking new people new questions as it relates to that, the business landscape has changed drastically over the last few years, but has our standards landscape changed drastically in South Africa, we've got to look at that.

Interviewer: But [3rd participant], how do you think that can be done, just as a sideline question?

Respondent: I don't know, I think it's the million dollar question, but I mean we've got to keep going back to things like, let's go back to things like standards development, standards committees that are developing standards, are they as relevant now as they were ten years ago when they were formed, are we still representing the stakeholders that represent that industry, the manufacturing industry, the automotive industry? Those kinds of things.

Interviewer: Were they involving small business, kind of represented in those committees, or predominantly large organisations?

Respondent: You've got to be careful when you look at that, but they've got to certainly involve the interests of small business, are they cognisant of the interests of small business, are they cognisant if the interests of all business, are they cognisant of the interests of the market, sometimes focussing on small business at the expense of large business is also not good, so you've got to understand does it reflect all players in the market, oops you getting a incoming call while we, I don't know how to do that.

Interviewer: I hear what you're saying, that's brilliant [3rd participant] and I would really like to thank you very much for your time, in conclusion I would like to thank you very much for your time, I think it was a very interesting discussion and interview, a little bit of background voice, but I think the most important information, I hope it has been captured, thank you very much, is there something that you want to say before we [unclear 00:43].

Respondent: No, I must apologise I do like to ramble on with these things, I get very excited about these issues, so a half an hour interview becomes an hour interview very, very quickly.

Interviewer: I think in all the interviews I have done so far; the thirty minutes allocated time has not been achieved, I realise now it has gone to an average of fourthy minutes, it's not your fault, it's the nature of the experts, they'll give you less, or they'll give you more.

Respondent: I understand.

Interviewer: I'll like to thank you for your time [3rd participant], thanks very much.

Interview 4

Length of interview: 43:09

Interviewer: [4th participant], thank you very much for your time, I'm intending to record this interview to allow easy transcription at a later stage, do you give me permission to record this interview?

Respondent: Absolutely.

Interviewer: Alright, thank you very much for that. There are about five sections that I would like us to, like you from that side to assist me with regard to information, to allow, you know to guide this interview, there are about five sections that we will go through. The first one is the one that we have spoken about regarding an overview of my research objectives, I've already touched base on that. The second section basically I would like to thank you very much for your time in allowing this interview, and as I explained before during our previous communication, I am completing a thesis, and the title of my research project is as follows: A Framework for the Application of the National Quality Infrastructure Services by Small and Medium Enterprises in Developing Countries. I'm looking at the case of South Africa. That is a title that has been approved by the University Ethical Committee. [4th participant], I am very cognisant of your busy schedule, as an expert who works

regionally and globally I take cognisance of your busy schedule and commitment, and I will try to keep this interview to not longer than thirty minutes, but you know, because experts like you can go on and on, it can end up going a little bit beyond thirty minutes.

Respondent: Well Sam you must manage my answers, I'm available for as long as you need me, you don't have to worry about my busy schedule, but I think [unclear 40:57] you should guide me if we get off track as far as your focus is concerned, so don't worry about the thirty minutes from my side.

Interviewer: Thank you very much [4th participant], for that, firstly I would like to affirm confidentiality during this interview and confirm that the information that I will be gathering will only be used for the purpose of this research. I can confirm that the information will not be disclosed to any other party except for the purpose of my research objectives.

Respondent: No problem with that.

Interviewer: Thank you for that [4th participant], the first question, the first section, and in that section there are just two questions I think is intended for the generic information, the so-called demographic information. The first question [4th participant], is what is your highest academic qualification?

40:00

Respondent: I have a PhD

Interviewer: Alright thank you for that [4th participant], and the second question is, what is your current position and responsibility, and how long have you been in that position? Maybe you can briefly also touch base on your previous positions as well, in a brief manner, no problem.

Respondent: Well very briefly Sam, I was involved in South Africa in the National Quality Infrastructure for fifteen odd years, my final position being the Chief Executive Officer of SANAS, I was also during that same period a board member of the National Regulator for Compulsory Specifications, and also a board member for the National Metrology Institute of South Africa, so I got a wide insight into the activity at that stage. From there I was in the United Nations, and I've spent just under eight years with the Framework Convention on Climate Change, looking particularly at quality management and accreditation issues at the international level. At the moment I'm working basically for two organisations, the one is the United Nations Industrial Development Organisation, and the other is the British Standards Institute, and for both of those organisations I work as an international expert on quality policy and quality infrastructure.

Interviewer: I presume you are referring to BSI and UNIDO.

Respondent: Those are the two organisations I work for at the moment. I'm an independent contractor [unclear 38:07] expert in some projects for UNIDO which are very, very relevant for this research and I can talk about that later in the interview, and similarly British Standards Institute, I'm working with them now in five different countries that also are looking at quality infrastructure, particularly SMME's, so that is an African, as well as another region perspective that maybe your research will want to look at as part of focussing on the South African context.

Interviewer: Oh yes, okay, absolutely awesome. I think it was indeed very good choice to identify you as one of my participants with this vast experience [4th participant].

Respondent: I trust it helps.

Interviewer: It will indeed, let me move onto the next section [4th participant], which is intended to solicit your experiences with regard to the quality

infrastructure. The first question is, how do you define the National Quality Infrastructure from a South African context, and what is your experiences with respect to the South African National Quality Infrastructure? I think it is called the Technical Infrastructure, or TI. However, named, I just want to get your understanding with the different levels of the South African National Quality Infrastructure, and your experiences thereof as well.

36:21

Respondent: You're right, I wouldn't define it myself, there is a lot of international work going on, on not PI but NQI and that's kind of become the international acronym for the National Quality Infrastructure and UNIDO are doing a lot of work and I helped them with that, particularly linking the role of the quality infrastructure with the United Nations sustainable development goals, and also more particularly on how do we focus the National Quality Infrastructure in future because donors are getting very fatigued with these kind of bilateral organisational requests for money. So the definition that has kind of come in to the international fore in the last, maybe the last two years, it's been a fairly recent process, has been obviously metrology, standards and accreditation. They then also as an equivalent also talk about conformity assessments, and there we're talking about calibration and testing laboratories, inspection bodies and certification bodies, we also talk about technical regulations, and interestingly in a global meeting that we had in Vienna under the auspices of UNIDO. About two and a half years ago the World Bank were very keen on including market surveillance as part of the NQI infrastructure as well, so that gives a very, very wide, it's over and above the historic kind of Metrology Standards Accreditation, and they looking at linking that to Technical Regulations and now to market surveillance as well, as far as my experience with the South African National Quality Infrastructure. I think as I've mentioned, I was involved with SANAS, the accreditation body and in that role I not only helped with the national accreditation capacity building, but also with regional SADC accreditation capacity building, and with that a lot of interaction with the

national peers and the regional peery organisations for metrology and standards, and as I started to leave the work in 2009 to go across to the United Nations there was starting to be an understanding of the role, also getting technical regulations involved in this, not just standards but also technical regulations. The reason for that being in the region and maybe also in South Africa as well a lot of the technical regulations historically have been based on standards, and so there is this kind of linkage now between defining standards and making them technical regulations. That is a whole discussion in it's own right which I won't bore you with under this particular question Sam.

Interviewer: Sure. Alright [4th participant], thank you very much for that overview and information regarding your experiences, and your view regarding the National Quality Infrastructure. You have mentioned something that the banks suggested that they should probably include the, what was actually suggested to be included into the National Quality Infrastructure definition or you know...

Respondent: Technical regulations Sam and also market surveillance.

Interviewer: The value chain of market surveillance, alright, interesting. Alright [4th participant], let me move to the next question which is, with regard to understanding your experience with regard to the impact of the South African National Quality Infrastructure predominantly towards the performance of small businesses in general, what is your experience regarding that?

31:55

Respondent: Sam I think that we could split that into two, because there are small businesses that undertake metrology and testing and inspection and certification, so they are SMME's as well, and then of course there are the SMME's that need the services of those service providers that conform [unclear 31:32] assessment service providers then to fulfil a market need. So, my experience with the conformity assessment SMME's I mean as

SANAS. When we started SANAS our major group of laboratories in those days was 125 small calibration laboratories. That's how SANAS started, and so you're looking at one or two person businesses that are there trying to distribute the traceability from the National Metrology Institute into the rest of industry, and that was a very interesting time and I think there's been some rationalisation there because at the end of the day people were starting to drive the business of calibration, for instance, down to the lowest common denominator, and there was a lot of anxiety by a lot of the professionals in the laboratories that other laboratories were short cutting them, doing a very inferior service because the customers would only pay a certain amount for their calibration or their test. This is where SANAS started to play a major role to give that independent transparent decision on their competence to do this work, it wasn't then left to market perception, the [unclear 30:02] small businesses themselves. In those days it was still all very, very generic and a lot of it was driven by suppliers, small businesses supplying big businesses. So if we think of the motor industry for instance, they have a lot of small suppliers, and they were looking for each of those to having some sort of recognition before they would then start to actively involve themselves with them. So [unclear 29:28] in my experience it was very much from a, you know a provisional competent conformity assessment service provision through SMME's, and less so with the actual market facing SMME's. That said, the work that I'm doing at the moment, and I'm doing in the Tanzanian and I'm working also in the Caribbean, in St Lucia, in Dominica, in St Vincent and the Grenadines, there is a huge desire on their part now for their small businesses to be focussed on national strategic sectors and warrants a conformity assessment then that needs to assist them, and that's where the framework that you are looking to provide, I think starts to assist everyone to know what such an infrastructure can do, and how it should be focussed.

Interviewer: I see, sure. [4th participant], I think this information that you have provided touched base on my next question, I think my next three questions under these sections, it was basically to get some information regarding the initiatives, or SME's initiatives that you might be involved in. I think you

have answered that one, but maybe let me get this information clear, it's linked to my last question under this section, however if you have answered it maybe you can just say so, or maybe clarify going forward. What is your point of view with regard to the application of the South African National Quality Infrastructure by small medium enterprises, specifically focussing on the key components of the quality infrastructure, I'm referring to accreditation, metrology standardisation and conformity..?

27:16

Respondent: Conformity assessment.

Interviewer: Assessment, yes.

Respondent: This question Sam is basically..? Sorry ...

Interviewer: In other words what I want to gather basically is to find out if they're optimally applying the services as provided by the National Quality Infrastructure looking at these key components. What is your view regarding the application of the services as provided by this infrastructure?

Respondent: I would be hesitant to give you an opinion on the South African view, but what I would like to do is give you an international view.

Interviewer: Sure, that will also help as well [4th participant], [unclear 26:22].

Respondent: What we finding internationally is the reason we all got together in Vienna under the chairmanship of UNIDO three years ago, is that people are, countries are starting to adopt what we call a National Quality Policy, and the National Quality Policy aimed to focus the attention of these different components and make sure they're fit for purpose for a particular country, recognising it's economic position and also its development trajectory, where it is on that development trajectory at the moment. And what that work has found is that historically there has been a lot of donor funding to help strengthen accreditation, strengthen metrology, strengthen standardisation, and it is so broad that the impact of it is very, very difficult to determine. So, what is happening now is that - and this is what's

happened in Tanzania for the last three years - we've identified ten key sectors, and we've identified them according to three criteria. The first criteria is those sectors that are successfully exporting and meeting the requirements of their target markets. The second is those sectors that with a little bit of strengthening of accreditation metrology standards conformity assessment could seize more opportunities as far as export markets and meeting the requirements of foreign target markets. And the third sector is those sectors that the government has identified as a key sector, but at the moment it's a new sector and so there is no infrastructure focus on that at the moment. And so with those three filters, for instance in Tanzania, in the first criteria they identified their fishery industry, and they identified that the target market for their fishery industry was the European Union, and from there they determined what are the technical regulations. In Europe they have these regulations, although they don't call them technical regulations. What are the testing requirements? What do the customers require etcetera? And then to look and see what at the moment are the accreditation activities, the metrology, the standards conformity assessment, what is available, and what is required and what is the gap? And that's taken nearly three years. Now I am not sure that that activity has taken place in South Africa yet. I think at the moment it's very much distributed and every small medium enterprise basically is out there on their own, trying to fight that battle on their own, and some of them are successful, and some of them will just give up. You'll never ever know because they will just say this is too difficult, and what the international opinion or view on this at the moment is then countries, developing countries are really serious this has to be a government driven initiative, it has to be targeted on particular sectors, and normally led by trade and industry. But what we're finding at the absolute technical level when you get down to laboratory equipment and the tests that are required and the accreditation schedules that are required, particularly in a country like Tanzania, the majority of their exports are in the agricultural area and agro processing, so immediately you start to hit sanitary [unclear 22:22] sanitary issues, so you can no longer have the luxury of having a TBT focussed

infrastructure and a SPS focussed infrastructure. And in my opinion I think South Africa is still in that mind-set. I think there are certain organisations that deal with the TBT area, and certain activities agriculture and health that deal with the SPS type issues, and I'm not sure that the technical infrastructure actually talks to each other. I think the agricultural laboratories, the health laboratories and others, especially in the public domain, they basically look after themselves and they deal with the three International Standards organisations for those issues on their own, and then on the TBT side then we have the bureau and they look after the TBT focal points and other things, and we focused on TBT, so this makes it very, very difficult for an SMME that's involved in exporting agricultural products or services to really access the South African NQI infrastructure in a coordinated holistic way. I might be wrong, but I've seen that happen in Tanzania and every other country that I've been involved in, and I don't think South Africa is different. I did do some interviews about three years ago with the Department of Agriculture and Health, and they seemed to be fairly confident that they were in charge of those areas and they didn't need to talk to anybody, and they certainly didn't understand the SPS components of technical barriers to trade, and I think if you've still got that disconnect at the national level then the impact lower down on the SMME's is fairly significant.

Interviewer: [4th participant], you have mentioned the other developing country to be starting to establish a national quality policy.

Respondent: Correct.

Interviewer: Is that clarifying the coordination of different sectors to enhance clear coordination in terms of what different components might be doing, or what is the intended purpose of the National Quality Policy [unclear 19:57]?

Respondent: The policy is a national instrument that gives direct policy guidance for metrology, for accreditation, for standardisation, for conformity assessment, market surveillance and technical regulation, and it's the policy level guiding the

National Quality Infrastructure, or in South Africa the PI, and I know in South Africa they don't have such an initiative, so in a South African context this is where your framework would probably fill that gap that in other countries are being addressed by what they call a National Quality Policy.

Interviewer: Tanzania is one of those countries, and Namibia they have established also a National Quality...

Respondent: Namibia is in their second version of the NQP, Botswana have one, Uganda have one, Rwanda has one, Nigeria has one, if you go in Google you'll find, and the reason for that Sam basically is a lot of them are approaching donors to get donor funding for their capacity building in QI or PI and so the donors are then saying they want this done in a coordinated way. They do not want the Department of Agriculture laboratory approaching a donor saying they want this particular piece of equipment $250 000 and then the next week they have one of the Bureau of Standards laboratory approaching the donor for exactly the same piece of equipment, when basically the country could probably only use one of them to address TBT and SPS issues. So, it's really coming from the technical level and the donor funding component.

Interviewer: Alright, I see. I see what the intended purpose of this NQP is. Alright [4th participant], let me move to the next section, which is about five questions, but I think we can integrate all these questions into one. The first question is basically to get your thinking with regard to drivers that can assist small medium enterprises, particularly the managers and owners of those enterprises when they want to apply the services provided by the quality infrastructure, mainly with a view to optimise the business performance. What do you think are the critical drivers? And perhaps you can also after this, perhaps you can also touch base on the opposite of this which might

be the limitations of… yes, which might limit the SMEs from applying these services.

Respondent: Right. The critical drivers I would think is what are the customary requirements they are trying to satisfy, and where are they coming from? If it is a national standard that they're wanting to comply to, and if they're wanting test results to satisfy a customer, that their product or service are meeting those requirements, then that would be the driver. The problem of course, is that many of the overseas countries – again coming into the agri-processing side, if you are dealing with agricultural produce and you are trying to export that to a supermarket, a big supermarket chain, for instance in the United Kingdom, they have their own criteria. So, they will say, this is what we want of your particular product, and then they would have to say, well what is the most cost-effective way to me to prove, by test or inspection, or certification that this product will meet their requirements and would the foreign purchaser accept those results without question. So, to me those are the critical drivers. It's got to be the services of accreditation metrology standardisation are to achieve something. And it's to achieve that trust of measurement or conformance to a standard etc. So now would be the most critical driver, then the next one is, once they know this is what test or inspection certification I require to meet this customer's requirements, be a local one like Woolworths or an international one like Tesco or whatever, and I'm just using supermarkets at the moment, if they then satisfy that, the next critical driver is cost and time. Because if they are looking to have some fresh produce tested, they want it tested quickly, they can't wait three or four weeks, if it's fish they can't wait three or four weeks to have the fish tested and inspected and certified. And of course, there's the cost element as well because every part of the cost of that thing comes onto their bottom line and reduces the profit they are making on this. So, I think those will be the three criteria – the critical drivers: the requirements, the cost and the time it takes to have these things tested or inspected or certified.

Interviewer: [4th participant], if we look at those three drivers, what will be the most in terms of importance amongst the requirement, the time and the cost element if you could rate them in terms of importance, how will you rate them?

Respondent: I think the most important is that they know what they are delivering meet the requirements, because without that they will just not succeed at all. I mean that's the most important thing. That's the thing that I'm producing as a necessary to meet the requirements of my customer and are these test results, inspection results, certification results proving to the customer that he can trust what I'm supplying to him. So that's the critical thing. The second then would be – I think the other two are equal. It's got to be the time it takes to get results – especially if it's fresh produce, fish or something that's going to perish. And also, the cost of doing so as well if it's going to be very, very time consuming and costly to have it done at the bureau's laboratory in Cape Town, they might be tempted then to go to another laboratory somewhere else. And again, this would be a discussion with the customer that they're dealing with. They would tell them; these are the requirements, and this is how we expect you to prove to us that you meet these requirements.

Interviewer: Sure, and what in your view and in your thinking are the most critical limitations?

Respondent: [unclear 12:20] and again Sam, I can't speak with any authority on the South African situation, but what I've found in other countries is normally the lack of normal testing capabilities for specific things and in particular for instance we'll be looking at fish etc., there are certain toxicology tests that are critical for overseas customers. They will not accept that product unless they know that heavy metal levels are below a certain level or toxicology tests are below a certain level and so if they're not available locally, it comes as a huge constraint that they can't actually provide that confidence in those tests. So really, it's a lack of capacity. The other thing is, if there is a lack of capacity, is it sufficient for the market demands, because if it's not,

then we end up with these long queues and waiting times, and by the time they've actually got their product tested it's too late.

Interviewer: Well, I can see that there is some kind of linkages to the drivers and limitations one way or other.

Respondent: Exactly. As you say, it's the same thing but from a different perspective.

Interviewer: From a different perspective. Alright, thank you very much.

Respondent: The other thing of course is if it's costing a lot of money to product test it, which is more than they can actually sell the product for, then they'll just stop doing it.

Interviewer: Ja, now cost coming into play now as well.

Respondent: Exactly, that then becomes the big factor that it's not time anymore, it's the cost. So, the three are really that triangle, the quality triangle – the right thing at the right time at the right cost. You can't really prioritise them in a sequential thing, it's more interactive.

Interviewer: Very much so as I understand you. [4th participant], I have the last questions to ask under the last section. Is there anything else that you think should be improved with regard to how the quality infrastructure is being applied by small businesses in general? Maybe you can answer from a global perspective or maybe more importantly from a South African context.

Respondent: Ja, let me move this. It looks like the power has gone off here. So one thing that has concerned me for a long, long time is the way that the international standards are getting more and more complicated and very difficult for SMEs to comply to in the first place. And a classic example of that for instance, is the new version of 17025 for laboratories. If you really look at that document, it is aimed at large laboratories, large organisations, it's not looking at two person laboratories now. They've got so many clauses about the management system that it becomes almost impossible for the SMEs

to do this in any cost-effective way and of course all that adds to the cost of the service they're trying to provide.

So in trying to simplify, unfortunately the law has made things more complicated. What's interesting is if you look at that new standard and you split up the technical areas from the management system areas, you find that the technical side hasn't really changed since the first versions of Guide 25 and 17025, and there's still about nine or ten clauses on the technical side, but the management side has just multiplied, and I really don't know that that's making laboratories more competent. So that's looking at an SME that's trying to provide conformity, I think it's getting more and more difficult for them to do so. If we look at the limitations of the SMMEs that are providing services and products to the marketplace, be it agricultural or others, I think the problem they have is the changing requirements of markets and the problem that you have there is that large customers that are in the private sector, they can stop their business tomorrow. And so, you've put all the work in to meeting their requirements, show them you meet requirements, and they suddenly say, "we don't want that product anymore, we're going to another product". So if you want a more stable source, then you start to look at the regulatory area and the problems in the regulatory area then are the technical regulations are also getting very, very difficult to prove, and there's almost a suspicion in some developed countries as the technology testing inspection improves, then so do the requirements get tighter as the technology gets more and more improved, which makes it very difficult in developing countries to meet these requirements because they can't always just upgrade their equipment by next year. They have to use equipment for five - ten years. They can't just upgrade it because of these requirements. I think those are the critical limitations, is these limitations being driven by the market, or are they kind of being used like a trade weapon – that's probably too strong a word, but I think you'd understand what I'm trying to say.

Interviewer: So, in other words, where these requirements or standards should be more accommodative in being streamlined – maybe not streamlined,

but more accommodative to accommodate bigger organisations as well as small enterprises if we want to see the benefit of these standards, for example being applied effectively by small medium enterprises.

Respondent: A classic example in South Africa is a company called Circuit Breaker Industries, I don't know if you've heard of them, I don't know if they're still in business. But they are making circuit breakers for the South African market. The IEC standard for circuit breakers basically is favouring those circuit breakers made by big foreign companies like Siemens and others and so if South Africa were to adopt that standard, then basically they'll put their local industry out of business. And immediately the market is going to be flooded by these other circuit breakers that basically because those industries have managed to lobby the committees where those standards are basically developed and approved. And then in that case, the standards become almost like a point of warfare, and the limitations are then on the SMEs themselves. And I know there's a huge issue as well with the chicken industry at the moment as well with standards, compliance to standards, and what they will accept from other parts of the world vis a vis the local capability and capacity to good use. So it really, really is something that government has to have a very, very clear understanding about and to focus this, it can't just be left to SMMEs because they're very, very way down the food chain as far as these things are concerned.

Interviewer: The issue if participation and technical committee which may lead to the development of standards, small medium enterprises participating in those committees or is it because of challenges or time and cost wise or is it also necessary that they can one way or the other participate?

Respondent: Sam, that will be a very interesting question to ask your colleagues in the bureau. To me the question that might not need to be there as particular companies, but they must have a representative voice, and the question is,

how do you get such a representative voice that would bring all of the views of the SMMEs in the sector to the table and maybe there are associations in South Africa that can do that. So maybe you'd want to focus on a couple of sectors and approach the bureau and look at the composition of the standards committees. Of course, the other question then is, are we taking those views to the international level and getting the international standards changed or do we just adopt what comes from Geneva? That would be the other question, are we standard makers or are we standard takers?

Interviewer: I see. Alright [4th participant], thank you very much for that information. My last but one question is: if you could change something about the services provided by the quality infrastructure, particularly from a South African context, what would you change in order for the QI or NQI to effectively improve SMMEs performance?

Respondent: I think South Africa needs to adopt a sector driven value chain approach. They need to decide which strategic sectors are important, and where SMMEs can play a role, and then instead of the [unclear 02:16] deciding they are now going to try and recover as much money from the marketplace as possible and SANAS being forced to make users pay for their services, etc. at the moment, you know it's kind of almost like the markets were looked after quality institutions, which is rubbish, they won't. And so government has to decide what sectors are they going to drive and I know the DTI for instance have lots of policies and strategies. The question then is how does that translate down into implementation and funding and how do we encourage the SMMEs, if they need for instance to invest in infrastructure, in training, in equipment, how can we encourage them to do that? The only way to do that is to guarantee that they would have some sort of income generation when they've done all of this. Again, that seems to come back to policy issues and government policy particularly.

Interviewer: Ah, I see. Thank you very much, [4th participant], for that information. In conclusion, I would like to thank you very much for your time, [4th participant], and willingness to contribute to my study, and this comes to

the end of our interview, and I am hoping that I will be in touch with you to get more advice as I continue outside this interview as I continue with my project as well, and also keep you abreast in terms of what will be the spin off benefit from my project that I'm doing. I think it will be very interesting to integrate the work that you are doing with what I'm trying to research on. I think that will be very beneficial and interesting indeed. But thank you very much for your time, [4th participant], I will talk to you at a later stage outside this interview. Thank you.

Respondent: Perfect. Thank you Sam, I look forward to that.

Interviewer: Thank you [4th participant], goodnight.

Interview 5

Length of interview: 49 minutes

Respondent: I'm happy for you to record it.

Interviewer: Thank you [5th participant] for allowing me to record the interview, this will allow me to do easy transcription at a later stage, Firstly [5th participant] as I've explained, but before I begin with the actual interview, I'd like to thank you for your time, and allowing me to conduct this interview, and honouring this meeting, as I have explained previously when I was explaining an overview of my research project, I'm completing a thesis and the title of my research project is " A Framework for the Application of the National Quality Infrastructure services by SMEs in South Africa. In other words, I have to ultimately come up with a Framework for the Application of the National Quality Infrastructure, I think in South Africa it's called TI and it has other definitions globally, this framework is intended to be used by small and medium sized enterprises in developing countries, but I'm focussing within the South African context. [5th participant] I am cognisant of your busy schedule, and as I've explained I expect this interview not to take longer than thirty minutes, it might go beyond that, as I've realised in the previous interviews with other experts, but I will try and keep it within thirty minutes. I would like to first of all to reaffirm confidentiality and confirm that the information gathered from this interview will only be used for the purpose of my

research project, I can affirm that the information will not be disclosed to any other party except for the purpose of my research objectives.

Respondent: That's fine.

Interviewer: As I've explained [5th participant] there are seven sections, I've designed this research guide to guide or streamline the interview. There are seven sections and we have already touched base on the first two sections, and the third one is intended just to get your general information, the so-called demographic information. There are two questions that I would like to ask under that section C. The first one is What is your highest qualification [5th participant]?

Respondent: I did a Higher National Diploma in Electronic Engineering and registered with the Institute of Electrical Engineers as a senior member and I after that have done a UNISA Advanced Executive Programme which is a mini-MBA.

Interviewer: Thank you very much for that information [5th participant], and secondly what is your current position and responsibility? And if you can also touch base on how long you have been involved in your current position, and maybe you can briefly explain your previous positions, just briefly if you don't mind.

45:11

Respondent: Sure, currently I'm the managing director and the owner of a company called Accreditation and Metrology Services, it's a PTY(ltd) company, I've been in that position for the last sixteen years when I established the company, the role of the company is to do consulting and training in the fields of accreditation and metrology, and I travel all over the world doing that work, these days predominantly training, my previous career path, previous position was as a Managing Director of Spescom Measuregraph, a large electronics corporation in the public sector listed on the stock exchange, prior to that, two or three other companies right through to the beginning of my career generally associated in the test and measurement business, military development work, but the bulk of it has been in the test and measurement business throughout the whole career which is now very many years.

Interviewer: That's very interesting [5th participant], and are you involved in ISO some way or another, or have you been previously involved in ISO in terms of...

Respondent: Yes I've been involved on several of the SABS committees and some of the ISO committees I was very involved with the 17025 revision and involved with some of the other ISO standards all related to the technical infrastructure, I'm currently on several of the ILAC which is the International Laboratory Accreditation Cooperation committees, several of those committees and still run some of the SANAS technical specialist committees, I'm the chair of the electrical one and I'm on the temperature one and assist from time to time on the time and frequency one.

Interviewer: I see, so that basically confirms the reason why I've included you as one of my participants, so it's actually a very good choice because *of your vast experience in this field.*

Respondent: *Well it goes a long way back because I was involved back in the late seventies, early eighties with the establishment of what was then known as the National Calibration Service, it was an approach from industry to the government to try and establish an accreditation body, that stage the government wasn't interested so we established it independently through industry largely to create an accreditation body, we needed it at the time of building the Koeberg Power Station because it was a requirement d from them to have accredited calibration work done for all of the instrumentation being used on the project, so we worked together then with what is now NMISA, it was the National Physics Laboratory, physics research laboratory at the CSIR, and with Dr Turner we created the organisation called the National Calibration Service, which was our first accreditation body in the country.*

Interviewer: Thank you [5th participant], I remember the first time I saw you, I think you were involved in terms of a committee that approves NMISA's project, then I was working at the National Metrology Institute, and I saw [5th participant] there as part of the committee, and that was the first time I saw you and met you many years ago.

41:28

Respondent: I was and still am used by the National Metrology Institute as an advisory, there was a formal advisory committee to direct the spending of capital equipment to make sure it met the requirements that NMISA had to do to meet the industry requirements, and I'm still involved from time to time when NMISA needs some assistance.

Interviewer: Thank you for that information [5th participant], thanks very much, let's move to the next section, this section is intended to solicit information with regard to experiences of experts, and in this case I'm engaging yourself. The first question is,

how do you define the National Quality Infrastructure from South African context, and what is your experience with respect to this quality infrastructure? You can touch base and confine yourself within the South African context, or if you don't mind you can extend to the definition as per the global context as well, I don't mind about that.

Respondent: I was very excited when we finally started making some headway with the establishment of the National Quality Infrastructure, We're now talking a long way back, it took a lot of effort to get the various bodies independently, independent and working together to create the National Infrastructure, I always have seen it as critical to the development of business in South Africa and development of world trade, and I was very, very pleased even though it was a lot of heartache at the beginning to get it established, and to extract out of the CSIR what we have today as NMISA, that was a big political battle because of money then to extract out of the SABS their approval, so that the accreditation functions that were currently being run by the then National Calibration Service, which remember was an industry organisation to merge those two together and then get that out of the SABS, they weren't keen to let that go, but in the end they could see the need to do that, and out of that then came the establishment and the creation of SANAS which was a project that was then funded by the DTI through the National Calibration Service to establish SANAS, and it was for me very, very rewarding to see the original establishment of SANAS and thus those three key pillars on the technical infrastructure, we did deal a lot at the time also with some of the other international bodies, we looked at the European model, we looked at the Australian model and worked together to make sure that we were looking at our own infrastructure, and that it served the needs that we wanted it to.

Interviewer: So [5th participant], from a global perspective the defined National Quality Infrastructure, or the country's technical quality infrastructure differently, what I'm saying is that they may include the conformity assessment body as part of the quality infrastructure in addition to the three components, mainly the National Metrology Institute, the standard body, the accreditation body, and in South Africa we've got the National Regulator for Compulsory Specifications as one of the four key components, the conformity assessment body or conformity assessment body testing, certification and inspection and so on and so forth, are they considered to be part of the quality infrastructure, or in South Africa only say technical quality infrastructure is mainly this four key components.

37:05

Respondent: Yes, I think certainly in South Africa that's the way I see it those four components with the compulsory regulation being not affecting world trade, but affecting local trade immensely, the other three pillars are very much facilitate world trade and reduction of technical barriers to trade, which was critical in the process of setting it up and there were many, many examples in the early days where having a combined effort between SANAS, NMISA and the SABS we were able to take on technical barriers to trade and get them resolved, and so as far as the actual conformity assessment bodies or the laboratories, they are in my opinion, they are the customers, the users of the technical infrastructure, and not as we would typically define the technical infrastructure certainly the way that I see it, yes very necessary part and we're there for their purpose, but not as part of the definition of them.

Interviewer: [5th participant] let me move to the next question under this section D, and the question is as follows, could you kindly explain your experience with regard to the impact of the South African National Quality Infrastructure towards the performance of small businesses in general, is there any significant impact to, we expect the small businesses will derive some positive spin off from the services provided by the quality infrastructure, in general, small businesses, are they achieving?

Respondent: Absolutely, if you take it from the point of view of a small laboratory doing calibration work or testing work for their clients, they are absolutely reliant on having an accredited facility for local business, and for any international business, and for the accredited facility to be able to work properly they need the resources of the NMI's and the resources of the SABS so that you've got the three pillars all working together, in my opinion the National Regulator serves a slightly different role, perhaps we can touch on that later, but those three organisations are critical to small businesses to enable them to do their work properly in South Africa, in SADAC region and overseas.

Interviewer: A small business that quite frankly we can say has to attend to some conformance, conformity assessment, like a testing laboratory, but if you look at a small business that fabricates bricks in the townships and so on and so forth, you know starting a business and so on, ready start business, falling within the ambits of small business, but when coming to the knowledge of, and the usage and application of the quality infrastructure services, is there a need for that particular business sector

fabricating bricks in the township, we're talking about township economy now, is there an impact, is it penetrating effectively, what is your experience regarding that?

33:14

Respondent: I would say right at the moment, at a level like manufacturing bricks in the township, they would not even know who the organisations and the technical infrastructure are and do not see a need for them, they probably see them more as providing barriers than assisting them with stuff, but that's because their work is generally extremely local, they will be manufacturing bricks and selling them to people all around them rather than now starting to try and move them around the country, start to compete with other people and start to meet with rigorous building requirements, if you look at the building inspectors, they would be looking to see are the bricks good enough to do the job, then the township applications very rarely does that kind of thing happen, when you start building big buildings in the business districts, then it starts to matter whether the bricks are fired properly and whether they will be able to withstand the pressures they're required to do.

Interviewer: Similarly, will happen to a manufacturing company that manufacture window frames, as a Metrologist I will understand that the size of the window frame should fit well into, it's typically a certain typical standard size.

Respondent: Yes if you look at a door or a window frame, they are supposed to be of a certain size so that when you go and buy the door it fits in the door frame, when you go and buy the window frame it fits into the cut out in the wall, that the right lintels are in place and that those things take cognisance, but the tolerances are pretty large at that level, it's not to say thay they're not important, the tolerances are just quite large.

Interviewer: Alright [5^{t} participant] thank you for...

Respondent: I think in answer to some of your question, if you took it just a little bit higher, the technical level just a little bit higher and you start saying what rulers do they use, or measuring tapes do they use now all of a sudden a whole lot of other things come into play, if the rulers aren't properly checked when they come into the country then you land up with rulers that people are measuring stuff with that's wrong, and I've shown that often and we used to have a very strict board of control and if you take a simple 300mm ruler in the 1960's, the inches one was banned and we had only millimetres, today it's hard to buy a ruler with just millimetres on it, even though the law

is still the same, so that is not being applied properly and now you confusing students at school with inches and millimetres, you confusing the building industry or anybody else using a ruler anywhere else, we need to get back and focus on getting those things that we had put in place that have good reason, even at the low level.

30:05

Interviewer: Or typically even a spirit level.

Respondent: Absolutely, sure, and spanners and torque wrenches and all of that sort of thing can have impact at a relatively low level.

Interviewer: Thank you [5th participant] for that information, [5th participant] the next two questions can be integrated together and they are as follows, have you been involved, or are you currently involved in any small and medium enterprises initiatives? Kindly explain the initiatives that you have been previously involved in, or you are currently involved in, it can be directly or indirectly.

Respondent: Right at the moment the company accreditation metrology services is a very small operation and consists largely of myself, but the work that I do spans many, many different organisations, and I am involved with training in metrology, teaching the science of measurement to operators and this goes through from the tyre shops where they looking at tyre pressures and torque wrenches and stuff like that, through to the medical field, blood services field where they're needing to do accurate temperature measurements and blood pressure measurements and understand why their centrifuges have to spin at the right level, speeds and then all the way up and like if you take the last two weeks I have been in ESCOM in East London training them on how to do insulation testing, then I was in Sishen on the mine at Sishen showing them how to calibrate their electrical equipment, their multi-meters and again the insulation testers and equipment like that, and then this week earlier I was at Koeberg Power Station, the nuclear power station where we were going through in detail some of their temperature measurement work that they do and how to best do that work properly, so yes I'm involved in all sorts of activities from very small operations to large operations, I'm still a signatory in several of the SANAS accredited labs just to keep my hand in and to keep my registration as a certified metrologist up to speed.

Interviewer: What I'm hearing [5th participant] is that you disseminate the knowledge of metrology to businesses through training and that is a very, very important

contribution, if you can share with me if some of your candidates, previous candidates are predominantly coming from larger organisation or small businesses, or is a combination of both?

Respondent: It's a combination of both, the week before I started this run off was the new, brand new laboratory consists at the moment of three people, brand new premises trying to establish a laboratory to do electrical, temperature, pressure, calibration and to build up to become a SANAS accredited lab, so I've been helping them with selection of equipment, understanding the 17025, why they need to know 17025, and how they then apply the 17025 to their own lab quality systems and the steps they have to take to get accredited, and then in turn the training that's got to be done both on the metrology side and understanding how the accreditation systems work, so yes, involved with all sorts from tiny operations through to large corporates.

26:03

Interviewer: Brilliant, thank you very much [5th participant], last question I think it is the last question under this section, what is your point of view with regard to the application of the National Quality Infrastructure, or South African National Quality Infrastructure by small, medium enterprises specifically focussing on the four key components of the quality infrastructure, what is your point of view regarding the application of their services by small, medium enterprises in particular?

Respondent: If we take them one at a time, on the accreditation side I believe things are running well, it is difficult for people to get accredited, but well let me rephrase, it's not difficult, it's a time consuming and laborious process, it's actually quite easy to do but people are lazy to do the work that they have to do to meet the requirements of the standard, they don't study the standard properly and then the accreditation part gets quite difficult to do, but I believe the accreditation side is working well, we are well regarded on the international scene and things there are working well, as far as the standardisation side is concerned, there things are not going very well, it's become very difficult for the small operator to find the right standards, you log into the SABS site, you think you downloading a standard that's going to cover what you need, and then you find after three or four or five different standards or sub standards that you've downloaded that you still haven’t got to where you need to get the critical information, and those costs are running relatively high and the update of the standards is taking a

very, very long time, for example when the new 17025 came out it was released in November internationally, and then South Africa if I remember correctly we only released it in May, whereas SANAS was already going ahead to do the accreditation towards the new standards, but It wasn't yet rubber stamped by the SABS, so I think that there are some issues, there are issues regarding building industries and air quality industries that are very seriously looking at withdrawing their standards out of the bureau and managing it as an industry standard because they can't wait three years to have a standard published or updated, they need to find quicker methods of doing it, so I think there is work to do at the SABS, and by the way I didn't give the compliments to SANAS because you sitting here, it is just the way that I feel about it, you know me well enough for that.

Interviewer: I'm coming from an impartial point of view.

Respondent: Yes I understand but you know me well enough for that anyway, as far as metrology is concerned we have a very good national metrology institute, it has great capability, it's got lots of the right equipment, but they're battling with people, they're battling with people that are dedicated to the work, they have got a lot of very highly qualified people, but they are missing people to do the actual day to day work, and I think there, there is room for improvement and more focus on what they should be doing which is maintaining the national standard and disseminating it into the industry, and assisting other laboratories to maintain traceability rather than competing with them which is recently started.

22:16

Interviewer: The National Regulator for Compulsory Specification.

Respondent: I think that with the NRCS, they are still finding their feet, and right now there are not clear boundaries as to what their role is, their purpose is and their work is doing, there being several cases where they are saying well they will do their own calibration which means they're going to define their own traceability, and this is really not in the spirit of the whole technical infrastructure, they should be using the resources of NMISA, they should be looking to use the 17025 type of standard to make sure they are plying their work correctly to the organisations, to the conformity assessment bodies, but as well all the way down to the trading store that's selling sugar, and when the verification officer goes in that he knows that his standards are traceable, that he

is competent to do the test, if he condemns a fridge in a hypermarket and writes off a million Rands worth of stock, he better be sure that he knows what he is doing, and at the moment I think they are not quite clear as to what their role is and where the boundaries are, and that should be something there where I think there is room for improvement.

Interviewer: So [5th participant] what I'm hearing from you is two things amongst others perhaps, if I'm correct that the coordination or collaboration of this key quality infrastructure components is paramount, is that correct?

Respondent: Absolutely and if I think it's a question that comes later in your query is that what would be for me the biggest thing is to get the technical infrastructure parties to talk to each other.

Interviewer: We'll talk about that later, so that is paramount, and the second thing is the, there are witnesses, of course there are strengths and weaknesses and their opportunities, but the witnesses would then affect the application or the entire quality infrastructure from the business perspective, is that what you are saying?

Respondent: Absolutely yes, if those organisations don't work together and make sure that the boundaries are clear between them, and who's doing what and maximise the working together it will have a negative impact on the industry, there's no question about that.

Interviewer: Ok thank you very much [5th participant], I am moving now to the fifth section, and this section is intended to solicit your experiences regarding possible drivers and limitation similarly, and my first question is as follows, what do you think are the most critical drivers that can assist small, medium enterprises managers and owners in particular, when they want to apply this services as provided by the quality infrastructure in South Africa, with a view of optimising their business performance, what could be the key critical drivers that you may think of, you know I mean you can throw as many as you can, but if you have one or two is OK, and perhaps maybe just to jump the gun to my next question, if you can be able to rate them in terms of importance, if you have thrown three of them, which one might be very important, important and less important, that's my question [5th participant] .

18:14

Respondent: As I have eluded already for me probably the most important thing is to have the key drivers of the technical infrastructure to work together, to talk to each other to work together, and to make sure they know who's role is what, secondly there has been a move away from actually talking to the conformity assessment bodies and industry in general, the move is kind of isolating themselves saying, these are the rules, tough luck, and I believe that if you look at the various levels of advisory forums, and interaction with the conformity assessment bodies as well as industry in general, they not operating properly the TAF that was there for accreditation I don't think has met in years, the NMISA advisory board hasn't met in years, the information to a point is not really sought after, SABS I can't comment at the moment, but to the best of my knowledge they not looking carefully, people that used to volunteer to work on the committees, on the technical committees and the sub committees are pulling out because they end up going to the SABS and wasting a day or half a day, the meeting's not prepared, people aren't driving it properly, so those are the first part, the most priority is they must talk to each other, define who's responsible for what, make sure that's done properly, secondly they must talk to the industries that they service, and make sure that they are providing the services that the industry needs, you will remember when you first met me that part of that group at NMISA was to try and extract where did industry see it's requirements five years in the future, which is also not easy because they often don't know, but to try and get some idea to say well we going to need to measure to a thousandth of a degree in about five years' time, and then to make sure that NMISA was coming in line to be able to provide traceability at that level, and that they were buying the right equipment to do that type of function, at the same time to look to see that the standards met that requirement, as you know it was South Africa that drove the update of 17025, and it came from this office that we're sitting in right now here at the NLA, we raised that issue and we pushed that issue till the 17025 revision was done because we saw the standard, 17025 standard being very difficult to implement for SANAS and for the laboratories, because there were so many notes, so many side regulations from the various accreditation bodies and around the world we are not seeing a uniformity of accreditation for the same kind of reasons, those are the two driving factors, and then the third one is maybe a little bit more sensitive issue, in the strive that the bodies of the technical infrastructure have at the moment with lack of funding to do the work that they're required to do and pressure to meet other criteria

and the PPI stuff they are starting to lose focus of who the customer is and not to compete with the customer.

14:31

Interviewer: What is PPI [5th participant]?

Respondent: The Public Priority... I can't think of it right now, you will have them at SANAS, the government PPI's the [unclear 14:18], so to meet those and in those PPI's were some very commendable activities like making sure that you employ people to build people, and now you sitting like at NMISA where you've got a huge amount of PHD's, but practically they can't do the job, they need to get more hands on, they spend time with their studies, but now the staff bill is very high, and it's not I don't think conducive, it's to the point where it's out of balance with what needs to be done, the drive then that the state identifies is have in this case is they are now sitting with lots of people, and shortages of money to do their job properly.

Interviewer: Funding, funding you know the bottom line.

Respondent: The bottom line is funding, I believe the bottom line is funding is there, it's just not being allocated correctly and being used efficiently, and emphasis being put on the wrong things and it's time for that to come back to make sure that the entity can service the customers that it has with the functions that they require, and if they work that together between the other pillars of the technical infrastructure, you going to get less infighting between those organisations, and more focus on how do we get the job done instead of how do we not get the job done.

Interviewer: Thank you [5th participant] for that information, if I summarise and single out one of the drivers that you have mentioned, maybe if I can, if you can allow me to convey to you as dissemination of knowledge, or dissemination of information, put it that way, from the quality infrastructure components like metrology, accreditation, standard body to industry, in your view that needs to be improved, the dissemination of information, is it important to focus on the existing clients of this agencies like metrology, or even non existing for when you disseminate this information, in other words a small, medium enterprise sitting there well established, a formal one looking to grow, but is not invited into the technical advisory forum like the [unclear 11:38] of NMISA and so on and so forth, is it important?

Respondent: It is a very good question, and yes both parts are important, we need to maintain the current infrastructure that we have, we are seeing each year laboratories closing because they can't make sufficient money to survive, you see it in the SANAS accreditation numbers, you see labs that are closing down twofold, one is that it is too complicated and too expensive for them to do the job, the economy is rough at the moment and that's a reality, and I'm not looking at all for any corners to be cut in the process, that's the very last thing, but where things can be improved is to make it easier to access information, easier to access advice, and certainly the second part of your question relates to outside of the laboratories, the testing, calibration laboratories, the whole technical infrastructure needs to be able to do a concerted uniform marketing program to make sure that people can understand, that the customers can understand, the industry can understand that this is not what I said earlier, how we are going to block you from doing what you need to do, to turn it around to say this is how you do things properly and this is how we will empower you to do it, yes they need to do some work in the process, but they need to be able to set off in the right foot to do the work constructively step by step, and build their businesses so that they can produce a quality service at the end of the day.

09:48

Interviewer: In other words, we should not forget the triple R, in my own terms, to retain them, those that we have in terms of ensuring that they've got sufficient information, and also to recruit the ones that we don't have as well in terms of dissemination of information, thank you for that.

Respondent: Absolutely, to retain people costs much, much less, it's the same in any standard business model, to retain a customer doesn't cost you a lot, to find a new customer and build you a new customer costs you a lot of time and money so if you can retain them and see why people are not following, why they pulling out when a laboratory shuts down to make an appointment to go and see them to say just why? It is because your people are gone, is it because of money because the industry is not working? To try and understand why the laboratory is pulling out because we need this stuff, we don't need less labs, we need more.

Interviewer: [5th participant] my next or last question under this section is the limitations, now we have spoken about the drivers, I'm not so sure if you can assist me

to maybe streamline in terms of these constructs, drivers, and limitations, or maybe in your view there is a subtle difference between the two, but if you...

Respondent: I think it's fine, I think the drivers I said very clearly, the limitations to getting those drivers to be done is a communication issue, first of all I believe the DTI needs to take a much stronger stance than it currently does, it needs to make it very clear which organisation is responsible for what, if there's a problem with the acts that needs to be fixed, first of all around the table where people can say right, the intention of the act was that, maybe the words of the act are wrong, let's work on the intention of the act and make sure that the various pillars of the technical structure understand, and agree between each other who's going to do what, secondly that they are allowed to focus on their primary functions and don't have to go scrambling to find a few cents to survive because they are trying to keep other programs alive that quite frankly shouldn't be running, we can't afford to run some of the other programs at the cost of the primary function, so they need to make sure that the funding is sufficient to do their primary functions to make sure that they have the right people in the organisations, and the right market in the organisations to achieve those activities.

Interviewer: You have mentioned about DTI, the Department of Trade and Industry taking a very leading role in terms of making sure that the quality technical infrastructure agencies are more working in terms, in a collaborative manner, do you see that other countries are approaching a different approach in terms of establishing from the core a national quality policy, is that important? Because I'm not sure if we do have a national quality policy in South Africa, and other countries, perhaps they start at a core there with a national quality policy to make sure who's doing what, what should be done and what is the rule?

Respondent: I believe we probably have something, I'm not aware of something, of a specific document, in the early days of establishing the National Quality Infrastructure there were documents, whether they still valid, still around or not I'm not sure, and certainly the intention of drawing up the whole quality infrastructure in the three and a half pyramids, being the metrology, the standards and the accreditation, and the half pyramid being the NRCS national regulatory side of it, it was clear who was supposed to do what, but that I believe has got a little bit diluted and needs to get some refocus again, and I think the DTI needs to have regular meetings with those organisations, to say we getting feedback from industry, to say NMISA you are now competing with your

laboratories, you are doing lower level industrial work, why are you doing that? NMISA's answer's going to be because we have to get extra funds, and then the industry example is why do we have to wait three months to have an item calibrated when that's their primary task, and NMISA will say we don't have the manpower to do all the stuff we have to do, and there is a case of where they are neglecting their primary function and doing secondary functions to try and get money to survive, and I'm not picking on NMISA specifically, it's just using that as an example because I think the other organisations are sitting with a similar problem.

Interviewer: Botswana, Namibia have established an NQP, National Quality Policy, they have approached it through that road, maybe something that we might consider, if there are different policy frameworks, and they can be integrated into national quality policy that can streamline the current needs.

Respondent: Absolutely, I believe there are documents that lay that out the original intention and need to be pulled out dusted off and updated, and if they don't exist or can't be found anymore, yes we should create a new one that says very clearly who is responsible for what and why, so that at the end of the day people don't lose focus of the fact that they are there to serve the industry, to serve the tax paying industry, to make sure that at the end of the day South Africa can trade.

03:04

Interviewer: Good point [5th participant], thank you very much for that, [5th participant] my last but one question is. Is there anything else that you think should be improved with regard to how the quality infrastructure? I think that this question has somehow been addressed, but let me go to the second question under section F, if you could be given the opportunity to change something about the services provided by the quality infrastructure, from a personal perspective, what will you change in order for the QA to effectively improve the small, medium enterprise, their performance and so on and so forth, if this question has been answered it's ok, but you know it's a...

Respondent: I believe I have answered it, it comes back to as with most issues where there are problems, lack of communication, the right communication, so get the right people in the room, clearly define who's got to do what and why, and make sure that remains their key focus.

Interviewer: Thank you for that [5th participant] , in conclusion [5th participant] I'd like to thank you very much for your time and willingness to contribute to this study, I am hoping that outside this formal interview I will be engaging you and also keeping you abreast in terms of how this project is developing, my intention basically is to first of course acquire my and satisfy my requirements of my thesis, but most importantly and foremost is to make a contribution through this process and much knowledge from experts will be very, very vital to, that is my key objective to make a somewhat contribution through a little research project to my study, thank you but anyway thank you very much for your time.

Respondent: Can I comment on that? I do believe that the project that you have chosen is in fact an extremely valuable one, there hasn't been a stand back and have a look at what we've got that I'm aware of, and I think this is what you are doing, and this is a very good opportunity, instead of being inside the machine and trying to find out what's going on, is to step back and look at the whole infrastructure and say well where is it working where isn't it working, how can we improve it, and I think that's very valuable and I certainly hope that at the end of the day that this thesis of yours will be read by people at the DTI, because unless it starts at that level it'll never work below, we've got to get it working from the top, and I certainly hope it gets there and the people read it and take note of your findings.

Interviewer: Thank you very much [5th participant] and I think the contribution from the experts will certainly achieve that objective, thank you.

Respondent: It's my pleasure.

Interviewer: And have a lovely day further.

Respondent: Thank you.

Interview 6

Length of interview: 63mins

Interviewer: Thank you very much [6th participant]. I just want to get your consent. I am intending to record this interview for easy transcription at a later stage. Do you provide permission for the interview to be recorded?

Respondent: I agree.

Interviewer: Thank you [6th participant] for that consent. As I've mentioned, the interview guide is intended to give us, or streamline the interview to make it more formal, and secondly to guide us so we can focus on the intended objectives. So, it has about six sections that has sub-sections that I would like to ask you to solicit some information and experience going forward. Now we have touched base on the first section, which was an introduction to our objectives, or rather, the objectives of the project itself, the research project. And okay, the second section basically is just an introductory remark. As I've said, I thank you very much for your time in allowing this interview. As explained during our previous communications, I'm completing rather, a thesis, and the title of my research project is as follows: it's a framework. I have to, at the end of the day, develop a framework for the application of the national quality infrastructure services – the services that are provided by the national quality infrastructure by small and medium sized enterprises. I'm focusing, [6th participant], within the South African context.

I'm cognisant of your busy schedule; you have just informed me that there is a meeting that is required. Thank you for giving me the attention to finalise this interview. So we have consciously realised how busy you are. So, thank you for allowing me to engage you for this interview. I'm expecting this interview not to take longer than thirty minutes, but with the previous interviews, I've just realized that on average, it takes 40 minutes or so. But nonetheless, we will see how it goes. First and foremost, I'd like to reaffirm confidentiality. Very important and confirm that the information that I will gather from this discussion will not be disclosed to any other parties except for the purpose of my research project. The information will not be… it's not necessary to disclose it to any other party but only will be used for the research objectives as I've explained and I [unclear 1:00] on my objectives. The next section let's get into the next section right away. The next section, Section C, just to get some general information. The so-called demographic information, there are two questions that I would like to ask [6th participant] here, and the first one is, [6th participant], what is your highest academic qualification?

Respondent: Okay, Sam. Ja, my name is [6th participant]. And to answer your question, my highest academic qualification is a Master's degree in Engineering, and also, I've done a number of post graduate management courses, such as your management advancement program at Wits University and a number of other

peripheral certificates such as project management at Damelin, and I've done a lot of post degree qualifications in the field that I was at, at that time within the engineering sphere, and that was inspector of pressurised equipment. Because I used to work within the pressure vessels industry. So ja, in short, those are my qualifications.

Interviewer: So, I say that is in the human nature that human beings do not stop learning and I think that is the greatest weapon. Thank you for that information. The second question [6th participant], is, what is your current position and responsibility and how long have you been in this position? And [6th participant], if you don't mind, you can briefly touch base on the early years that you have been involved in that might also be vital for my project, briefly.

Respondent: Okay. Currently I am the executive director to SANAS and I'm executive for accreditation, which is the core of SANAS' business. That's my position at SANAS and my responsibility is to ensure that the accreditation managers have got the necessarily tools and resources to carry on their respective functions whereby they are running accreditation programs. So, I make sure they've got the resources and I make sure they do the things that they set out to do insofar as the SANAS mandate is concerned. So basically, you could say I drive the operational part of the company, SANAS, yes.

Interviewer: You have mentioned the programs within SANAS that you are spearheading, [6th participant]. Could you kindly give me the typical example of those programs?

Respondent: Ja. We have like your testing program, and we divided that into two. We've got the analytical testing and also the mechanical and physical testing. We have the medical testing program for medical laboratories. We have the blood transfusion program. We have also the certification program, the inspection program, and the calibration program. So, all of these are different technical fields within the areas that we [unclear 55:56].

Interviewer: And that is basically the sector or the area that you are responsible and managing and spearheading. Okay. Thank you for that [6th participant].

Respondent: How long?

Interviewer: Well, you can basically throw something in that perspective…

Respondent: I started in SANAS way back in 2003, so as it stands it's about 17 years now that I've been with SANAS. I started off as a program manager for the legal metrology verification laboratories program. From there I migrated to the inspection program, and then eventually, from about 2007 I was promoted to senior manager. The position which I currently hold, although now, it is now being titled executive so it's the same thing. In the past it was senior manager, but now it's executive. So, all in all I've been at SANAS now for 17 years.

Interviewer: You started here in 2003?

Respondent: Yes.

Interviewer: You remind me now the time when I was getting married.

Respondent: In 2003?

Interviewer: Yes, but let's not get… Thank you [6th participant]. Maybe to get your experiences from a global-regional perspective? Your responsibility if you want to touch base on that?

Respondent: Sorry..?

Interviewer: The regional and the global perspective, any responsibilities that you might be directly or indirectly involved in?

Respondent: Starting from the regional, we have an accreditation cooperation in Africa called AFRAC and within AFRAC we play the role of technical committee chairperson. Now within this technical committee we have our, we've got about four technical areas: one being the testing, the other being the medical, the other being the certification, the other being the inspection. So, all of these have working groups within the technical committee.

Interviewer: And you are the chair of the committees.

Respondent: Yes.

Interviewer: I see. Right.

53:11

Respondent: And then on the international level, we as accreditation bodies are expected to participate in the international forum, such as ILAC / IAF forums, and as

the chair of the technical committee for AFRAC, I report to ILAC on the activities of AFRAC.

Interviewer: And what is ILAC, [6th participant]?

Respondent: ILAC is the International Laboratory Accreditation Cooperation. It is where all the regional accreditation bodies globally affiliate to for laboratories and inspections.

Interviewer: So AFRAC, from a regional point of view is an affiliate of ILAC?

Respondent: Yes. AFRAC being the African Regional Cooperation is an affiliate to the International Laboratory Accreditation Cooperation, ILAC. IAF is the International Accreditation Forum, and that one, it's where all the certification body issues are being managed and run.

Interviewer: So, I presume that you do participate in those forums?

Respondent: Yes.

Interviewer: Time and again.

Respondent: Yes we do. There are a number of meetings and there are a number of working groups, where we come together, sometimes physically, sometimes electronically where we give input to accreditation requirements that all of us will have to use in the end of the day.

Interviewer: Sure. I guess [6th participant] that is the reason you were identified by myself as one of the experts – so-called experts with that vast experience. I have argued that the people I have been interviewing are experts. Indeed, with this affirmation of the experience that you have just alluded to me, reaffirms the vast experience that you have. That is something [unclear 50:46]. So let me go quickly into the next section, D, and this section is intended to solicit your experience in particular. It has five questions, but [6th participant], I think the last three questions can be integrated together. But let's see. Let me start with the first question. The first question is, how do you define the National Quality Infrastructure from a South African context? And what is your experience with respect to this quality infrastructure?

50:06

Respondent: From a South African perspective, we have what we call the South African Technical Infrastructure…

Interviewer: TI?

Respondent: Yes. The South African Technical Infrastructure is the vehicle through which the South African Department of Trade and Industry seeks to use, to make South African products and services internationally competitive.

49:27

Interviewer: Oh, I see.

Respondent: So, the technical infrastructure is designed to take care of primarily four things, or rather, four concepts: one being the concept of accreditation, as part of the technical infrastructure, or quality infrastructure, whichever way you may look at it. The other is the standardisation part, whereby we have the South African Bureau of Standards, who are mandated to take care of standardisation in South Africa.

Interviewer: SABS.

Respondent: SABS, yes. And then we also have metrology as part of the quality infrastructure or technical infrastructure. And metrology is mandated, or rather, there is an entity mandated to look at the metrology part for South Africa and that is the National Metrology Institute of South Africa – NMISA. And then also we have the National Regulator for Compulsory Specification – NRCS – which primarily takes care of technical regulations. So those four are the pillars of the South African technical infrastructure and each and every one of those structures are mandated through an act of parliament. So for instance, in terms of the accreditation, there is in short we call it the Accreditation Act, but the full name is the Accreditation for Conformity Assessment Calibration and Good Laboratory Practise Act 19 of 2006. And each and everyone of these bodies have got their own act which mandates them to do what they need to do. Now, what is the importance of this infrastructure and the manner in which South Africa decided to make separate, but working in synergy, is because in the past, functions of the quality infrastructure used to reside in one body, and that was the standards body. And that's how it was throughout the world. But as industry evolved, it then came to pass that perhaps these functions need to be separated because it came to pass that the standards body was becoming the super quality infrastructure

all in one and there were grey areas in-between whereby the entity became the referee and the player and the linesman and the fan, all at the same time.

45:58

Interviewer: Okay, so in other words, there were identified possible conflict of interests?

Respondent: Yes, absolutely.

Interviewer: Within its mandate?

Respondent: Within its mandate, hence the separation and all the acts made each entity independent of each other, so although the mandates are well defined severally, we are all working under the umbrella of the DTI, we all have our synergies. I'll give you an example, people would ask – if you ask somebody about this question…

Interviewer: So, the DTI being the Department of Trade and Industry?

Respondent: The Department of Trade and Industry, yes. So, for instance, in the past, when you talk quality, people jump and think about SABS – South African Bureau of Standards, and rightly so because that's where things started, but the world has moved from that. You know, Europe has moved all away from that one super body to separate bodies working together.

Interviewer: So, in essence you're saying this quality infrastructure is also an arrangement that is being done…

Respondent: Internationally.

Interviewer: Internationally? Oh, I see. Thank you for that information [6th participant]. Let me go straight into the second question under this section. Could you kindly explain your experience with regard to the impact, and just to emphasise the concept impact of this quality infrastructure that you have defined from a South African context towards the performances of small businesses in general?

Respondent: Okay. I'm going to try and answer this in a very simplistic manner.

Interviewer: Ja, that will be helpful.

Respondent: An SMME seeking to compete with a large multinational that run into several hurdles, one of them being that there would be demands made on the quality of their product or their service or whatever. And for them to be able to compete on an

equal footing with larger competitors, the product or the service is expected to meet the minimum requirements and these minimum requirements need to have been tested against a certain specification and so on and so forth. So, for the small guys that do not know this offhand, they will just come up with a product and then boom, they want to put it to the shelves, and then if it is something – for instance, food – there are stringent quality tests that need to be passed before you can put something on the shelves. They find themselves that already they have produced this wonderful product and then there are these tests that need to be done retrospectively, and then they find the cost of doing these tests is very, very high, and in their mind all of these so-called quality requirements, for them it becomes a hurdle. It becomes something that is trying to stop them from doing what they do best. But if they had been told beforehand that, remember, you are going to need to do A, B, C, and E, then it would have been better for the small guys. So most small companies, they then fail because they do not understand all that is required at the end of the day. And they need to be, in my view, somebody needs to guide them to say, “Guys, you’re going to be putting your product in the market, let us tick those boxes.” So, when it comes to conformity assessment itself, they don’t have to do it themselves, it is not necessary. They need to be able to send it to a third-party testing laboratory.

Interviewer: Okay, I see. So if we put it from this context, from the perspective that you have this small business that is aspiring to grow, and the concept they have is manufacturing or fabrication of bricks, knowingly or unknowingly there will be an impact or expected impact from the quality infrastructure perspective, towards that project, even though their SME itself, or the manufacturer of that brick might not know of the application of the services provided, but the product that he’s fabricating from a quality infrastructure perspective, it has covertly or overtly impact on that product, or it’s expected to play a role.

40:07

Respondent: You know, the unfortunate part is that the infrastructure.

Interviewer: Sorry to interject, so there might be certain small medium enterprises that may have knowledge about the quality infrastructure so they may experience different impacts or effects, might be those that probably do not even know, like the one that

I've just mentioned, but either way the quality infrastructure has an impact on those products that they providing, is that what you are saying?

Respondent: Yes, we absolutely do. Now remember one thing that also becomes a problem afterwards is that quality in a manufacturing plant, quality is built into the production, so for you to have a quality product at the end of the day you need to have done certain things towards building quality in that product, so when it goes out and it gets tested it passes. Now what is happening with the SMME's? They push a product through the production line and expect quality to be inspected into the product, you see now where the disjuncture is?

Interviewer: Ja, so actually it is built throughout the process.

Respondent: It is built throughout the process, so if it is within the processes chances of that product failing are very small because it is built in, not inspected in retrospectively, so that's where the problem is. The question you ask is "what is the impact of the quality infrastructure"? It's involvement, we need to get involved, there needs to be some, I believe, some incubation projects for small to medium enterprises where they will know that how do we use this infrastructure for us to have a good product at the end of the day, they need guidance, you cannot inspect quality into a product, so now the difference is as you know Sam, our involvement is with our clients, our direct clients are the conformity assessment bodies which are the guys who do the testing, inspection and the whatnot, so that is our direct link, there is a missing link between us and the clients of our clients which is where these people need to go to, to have their quality, to have their product tested, that is where we fall short because we do not know, the people who know are these guys that we service, so if we have closer ties with these guys they would know which products are coming from SMME's, and then we will say to those SMME's "hey guys look, hang on, before you continue with this here is something that you need to think about while you're doing A, B, C and D" Teach them how to build quality into a product, teach them on the system that needs to be in place to have a good quality product at the end of the day, and these guys at the end of the day, they don't have the recourses and the time, they need to be assisted.

36:11

Interviewer: Oh, I see, so that missing link could be the users of the services of the conformity assessment bodies.

Respondent: Yes.

Interviewer: Oh, I see, thank you very much [6th participant] for that one information and very critical indeed. Let me go to the third, and I think the third and the fourth questions might be integrated accordingly. Have you been involved, or are you previously or currently rather, involved in any SME's, small medium enterprise initiatives directly or indirectly?

Respondent: I have been involved in a pilot project whereby SMME's in the energy efficiency measurement and verification bodies, which was done in conjunction with the Department of Energy, now let me give you background to this energy efficiency measurement and verification bodies. Earlier on, about ten years ago the Department of Energy decided to investigate ways and means of encouraging South Africans to be more energy efficient.

Interviewer: Oh, I see.

Respondent: A study was made about the energy profile of South Africa and the way it is being used, and it was found back then, and there was a white paper on energy, I can't remember the exact name but I can check for you later, in this white paper it was discovered that if we were to use the current energy resources more efficiently we would not have to build one power station more, ok, then the government said "we will then incentivise industry to be more energy efficient" think about this, do you know how much energy a smelting plant uses? Aluminium smelting plant, they using, their electricity bill per month runs into tens of millions, why? It is energy intensive processes; however, they are using old machinery, old technology, old this old that, but if they were to change into new technologies they would halve their energy consumption, the same goes for any other industry.

Interviewer: So that is what the study predicted at the time.

Respondent: Yes, so basically then the government said to incentivise industry at that time, to incentivise industry to use less energy we will give them a tax rebate if they can prove that they have improved on their efficiency, and whatever that they have saved we will change it into monetary terms and give it back to them as a tax reprieve, how wonderful is that? But the trick was to make sure that the energy savings due to

energy efficiency interventions need to have been verified, measured and verified by an accredited measurement and verification body, which in short we call M&V body, so at the end of the day there were a number of M&V's which applied for accreditation and they were accredited, however there were SMME's within this, who could not enter this space because they felt that, you know, accreditation fees were too high and what not and what not and the Department of Energy then spoke to us to say what can we do in this regard, so there we had a pilot project where we said we will charge these people zero on their application for accreditation, ok, we will charge them zero cent but to substitute that we will use only SANAS staff to do their doc reviews you know and so on and so forth, so that way we not losing any money and they not being charged, so that is a project that we were involved in. Now if you ask me where that project is right now, unfortunately it didn't go very far because the energy efficiency industry is in flux and everybody is suffering, however that is the one that I was involved in, and it was a great project and I think from there we managed to accredit one or two of those SMME's.

Interviewer: Are they still accredited as we speak?

30:42

Respondent: I'll have to check for you on that one because of the current economic conditions most small companies are dying, it is a very sad state of affairs.

Interviewer: That was a very great initiative [6th participant], it's a pity that the greatest concept that was pre-empted or rather established and has not bear the expected but be it as it may it remains a very good initiative.

Respondent: On a positive side Sam, this concept of that pilot project we learned a few lessons, the concept itself was successful, it's just the industry that became...

Interviewer: There were challenges.

Respondent: There were challenges within the industry, but the concept we are trying it in other areas, and it is very [unclear 29:35].

Interviewer: So, there were learning points [unclear 29:33] from that.

Respondent: Yes indeed.

Interviewer: That's great, let me move to my last question under this section a little bit quicker, it might have been answered but you will advise me if this has been answered,

The question is, what is your point of view with regard to the application of the South African National Quality Infrastructure, specifically if we zoom and focus on the key components of the quality infrastructure, in other words the application from the key, four key components of the quality infrastructure effectively and optimally being utilised, and if it is being utilised are there any improvement that can be enhanced or entrenched to, I mean improved, considered to entrench the efficiency of the usage or the services as provided by the quality infrastructure conformance by small medium enterprises?

28:17

Respondent: To answer you in a very short and succinct manner Sam that unfortunately we are not winning in terms of working together, there has been a number of initiatives that were initiated by the DTI you know through the IPAP sectors alright, Industrial Policy Action Plan.

Interviewer: Ok that's IPAP.

Respondent: IPAP yes, within the IPAP there were a number of sectors that were identified where each individual pillar of the quality infrastructure had a stake to play, you know had a role to play, so my observation is that we worked in [unclear 27:11] as technical infrastructure institutions in carrying out our mandate in as far as the IPAP was concerned, so there was no synergy and as a result each one was trying to solve their own problems within accreditation, within the standards, within, so the synergy of all working together was a little bit lacking in my belief yes.

Interviewer: So that basically leads to my next section, what you have just said [6th participant] is to which is under section E, is to solicit your experiences regarding the drivers in particular that can assist small and medium enterprises when they want to or intending to apply the services as provided by the quality infrastructure, what could be the key drivers?

Respondent: I'm going to be blunt and say, government. Government knows, the Department of Trade and Industry knows, the Department of Energy knows that there are SMME's all over the show, there have been number of incentives that have been introduced to assist SMME's, some of them have been successful, some of them maybe not, ok, so I believe that the government needs to intensify the concept of, what do you call them? Incubation of SMME's to assist them through this process of them

getting to know about the quality infrastructure and what it entails and what it can give them, and also where to go when they need what, I think it is being done but it is not coordinated because the government has so many departments and so many regulators and what not, and there is no synergy there so we are spending money on little pockets of excellence which together do not make a whole, you understand? There need to be a more coordination, and there needs to be a driver and this driver has to be government, it has to be government.

24:13

Interviewer: The small and medium enterprise development agency within it has not considered the impact that can be derived from the services of the quality infrastructure and conformity assessment.

Respondent: In my view the SEDA, Small Enterprise Development Agency has been inundated with requests for funding, that is the main thing I think they have been busy with, here what we're talking about is the infrastructure, what is needed, so with this funding what are you going to do? If you want funding to buy stock and I give you that funding to buy stock you going to buy that stock and when you get your profit you come back to me and you still want some more funding, so funding sometimes is not the only way, you need partnerships whereby there are targets that needs to be met, and there is somebody who is holding you, your hand as an SMME to make sure you do not fail, so I think from the SEDA part they were looking more into the financial part rather than the technical part itself as to do this, this is what needs to be done and I think that's where us as the quality infrastructure can work together and identify our roles in small specific things that we dealing with individually, because I would know that this guys going to need accreditation, I'll concentrate on giving him knowledge on accreditation, and then there is metrology, there is standards that he needs to be using, there are technical regulations, if you going to build a cell phone sir before it can be used in this country we need to make sure that it's not going to explode into your ear once it starts ringing or when you answer it, so it needs to pass all of those things, so SMME's needs to know what is going to impact them once that product is out there, it's not like now I can sell it, does it pass the minimum specifications?

Interviewer: So, if I bring now larger organisation and I side put smaller organisations or SME's, who in your view are more privy to the services and the application thereof of the quality infrastructure, will it be larger organisation or smaller organisation?

Respondent: I think larger organisations will be more privy because A, they've got the knowledge, they have been there before, they probably belong to a multinational who is exposed to international standards on these things, so they are more knowledgeable than the small guy, the small guys mostly are survival mode all the time you know, all this little testing and what for them is eating into their profit, that's what they think of course but yet if they could understand that a quality product will give you a competitive advantage.

Interviewer: And they would become sustainable, but the challenge they are experiencing is not being sustainable.

Respondent: Yes absolutely.

Interviewer: So, the larger organisation they have the knowledge.

20:00

Respondent: Yes.

Interviewer: And there seems to be a limited knowledge in terms of smaller organisations.

Respondent: Indeed.

Interviewer: If I can prompt these aspects further [6th participant] the committee, technical committees in your experiences are smaller organisation participating in committees, either whether it is for the establishment of the standard itself or the technics, your committees within your accreditation body if you have got any committees and they do participate optimally, or if they are not participating, what could be the drivers for them to participate? And maybe we can also even touch base into my next question, which is putting this one at the back of your mind, what, which is the critical limitation that can limit SMME's to apply services of the National Quality Infrastructure? We can tackle these questions you know at the same time.

Respondent: SMME's like I said earlier on they are mostly and mainly concerned about sustainability survival, now picture this, you are a small medium enterprise, you are, let's say you produce a certain product that you selling to the market, you are

concerned about the success of the business right, and making money to survive for the next month, and then I call you to a technical meeting to discuss some obscure standard that you know you think might affect me, what am I going to do first?

Interviewer: You look for your survival, that is optimal and absolutely normal.

Respondent: In most cases they don't have the time to think about the niceties and what not, other than to make the business...

Interviewer: Resources, necessary resources.

Respondent: Yes necessary resources.

Interviewer: Either it's funding, time, and money because it's money to attend those...

Respondent: It is money.

Interviewer: STC committee, and is there a need for them to be represented one way or the other?

Respondent: There is a huge need for them to be represented because remember this is where criteria is drawn up, and if there is no balance of interest you would find that the bigger guys would come with unnecessarily high criteria so that they can keep...

16:35

Interviewer: That can ultimately exclude small...

Respondent: Yes, so that will exclude them but if these small guys are there they will be able to realise, but hang on if you saying the requirement for this and that, what about A, B, C and D? And I usually make an analogy that when it comes to requirements and criteria you do not want to use a bazooka to kill an ant, ok, so that's why they'll be saying "no guys you don't need a PHD to inspect an air receiver, no you don't, you need A, B,C and D." "Oh really?" "Yes." "Oh yes ok." They need to be there so that they, a balance of interest.

Interviewer: You have mentioned interestingly something called incubators.

Respondent: Yes.

Interviewer: Incubator is to probably if I understand to cluster them together, to bring them together because as individual they cannot survive to do certain things, now will

it be beneficial if those incubators, I understand there is an association of incubators in South Africa, will it be beneficial to be represented through incubators, or one way or the other?

Respondent: It will be absolutely crucial for the small guys to be represented, it will be absolutely crucial and the concept of incubation, I believe has worked very well with our counterparts like in Brazil and in India, you know our BRICS counterparts, so there has been a study made in that regard and the value of these incubators, because remember, imagine in the leather cluster industry, others are making shoes, others are making bags, others are making car seats and whatever, and they are all under one umbrella, in comes the input which is the leather itself, then out there it goes out as different products, so if they all in the same say business park it is very, very good for them, they would share ideas and you would be managing them better unlike if one is in Benoni the other one is, but if they are all in the same place, this leader or whoever is taking care of these guys has got them all in one area, and that is brilliant.

Interviewer: So, if we revert back to that link, or let me call it for the better word missing link of the quality infrastructure, the conformity assessment bodies and the services that are provided to the users, so if you are saying, if you can bring the users or those small businesses...

Respondent: In an incubator.

Interviewer: Into the value chain and also be represented through the value chain, through the committees and so on, that would be also helpful.

Respondent: It will be beneficial for them and beneficial for, you know...

12:57

Interviewer: So, it will bridge that link, that missing link.

Respondent: Missing link.

Interviewer: Missing link, yes that is a good word, So, if we summarise [6th participant], the drivers and the limitations, if we summarise.

Respondent: Starting with the limitations, unfortunately in a country like ours we have lots of regulations, and these regulations tend to become very restricting for the small medium enterprises, and for them it becomes a barrier to trade, ok. The driver in my view is that we have got experts in this country, we've got experts within SANAS, we've

got experts within the DTI technical infrastructure, we need to coordinate our efforts by identifying what are the priority sectors within the SMME which would benefit from our collective expertise.

Interviewer: Sure, that makes sense.

Respondent: So, we need to come together and say "guys what is the in thing now, what is happening now?' I mean right now we talking 4IR, 4IR this, 4IR that, where is the SMME's within this 4IR that the government is talking about? There are pockets, there are small companies building cell phones as we speak, you know, what are they doing?

Interviewer: They are not brought into the value chain.

Respondent: Into the value chain.

Interviewer: So [6th participant] just a quick one, if you talk about working in a more collaborative manner, especially focussing on this key component of the quality infrastructure, will it be value adding if one considers what you call the National Quality Policy? I understand in other countries and other economies they start you know by, at the centre, at the core by establishing a National Quality Policy which seeks to ensure that it gives direction and streamline starting with the first layer at the centre is the National Quality Policy, then the key components of the national quality infrastructure, then to the conformity assessment, then to the enterprises, then to the users or end users, now that core quality, NQP, National Quality Policy, like the Namibians, I understand they have established one, Botswana, Do we, let me ask this question, do we have a National Quality Policy, and if we don't, do we need one?

Respondent: I believe we do have a National Quality Policy, hence we have a very well established technical infrastructure in Africa, all of this emanated from a policy about quality in this country, hence today South Africa has been taken as a model for a perfect technical infrastructure with all the governing laws, we are a very well established country in terms of the quality infrastructure, very, very well, even some of our international counterparts look at us and say "wow, I wish I had that act to protect accreditation in my country, and to safegaurd independence and what not." So yes I believe that in South Africa we do have a quality policy.

Interviewer: Ok, so if we do have one, now this leads to my last but question, next but last question, is there anything else that you think should be improved with regard to

how the quality infrastructure is applied by small businesses? And I can include my next question to this one as well and say that if you could be given the opportunity to change something about services provided by the quality infrastructure, considering small medium enterprises, what would you change in order for the QI to effectively improve the SMME's performance? Those two questions you know you can answer them at the same time.

Respondent: Sam, I believe everything starts from when you are learning, when you are a child you are still learning things. Number one I believe that the education system in this country is outdated, our children are learning things that are not going to be relevant when they finish school ok. Something like quality infrastructure and how it feeds into your everyday life should be taught at elementary school, so that as you grow you understand why there are things in place, why is there a National Credit Regulator, why is there a legal metrology act, what is it doing? We need to educate from the ground up, right now there's very little quality education at tertiary institution, why? Because there's nothing at the bottom, so if we can start from scratch, and I'll give you an example of what I saw in Germany when I paid a visit with the German agency GIZ, they showed us that in terms of water efficiency, energy efficiency, these things are being taught at grass roots level, so when a child grows up they know that to leave a room with bright lights on while I'm not using the room.

Interviewer: Doesn't make sense.

Respondent: Doesn't make sense, so it becomes second nature when you leave a room you switch it off, and you don't have all of the house switched off and that you all sitting in one room watching TV, everybody will be watching, how could you leave that room without switching off? Come on you're wasting energy, so it becomes a culture, so this quality thing needs to be a culture within the country. You know the unfortunate part is that when you go to Europe you see these things are like second nature, why because the education starts from the grass roots. Here today Sam you see a grown man, a grown man driving a big Mercedes Benz or whatever, he was having Nandos in the car while he was driving and he just simply takes out his hand and throw the rubbish on the road, drives off as if nothing has happened, what is wrong there? Littering.

Interviewer: Because it's normal to...

04:01

Respondent: It's normal to, so you need to start from the bottom so that as we grow, remember what I said earlier on that in a product quality is not inspected in, it is built in, so even our small SMME's would know that ok if I am producing this, what are the requirements, what is this, what is that, then they start building quality into the product, processes, whatever.

Interviewer: Ok so [6th participant] you mentioning something interesting here, this push or pull demand, who should be responsible for that? The government or the quality infrastructure stakeholders, those who are responsible for the quality infrastructure.

Respondent: It's a bit of both Sam, I'll tell you why, government needs to be doing it because if they don't there's going to be a market failure, and even if there is a market failure then regulation kicks into place alright, so that will be the push from government. Now the pull is when people see the value of the quality infrastructure, when they see the value of the quality infrastructure it becomes almost second nature for them to follow suit, I'll give you an example, at SANAS we accredit by and large, it's in the voluntary domain and yet people they still want to be accredited, who's pushing that? It is industry, industry says no,no,no I will not take this product until it has been tested by an accredited service provider, conformity assessment body, so it is being driven by [unclear 01:50] because now they know the value of accreditation, so in the regulatory domain there are lives of people at stake, there is environment condition at stake, there is health and safety issues at stake, those are the mandate of the government, the government must protect people from those three things.

Interviewer: Health and safety.

Respondent: Health and safety, they must protect people from unfair labour practises, unfair sorry trading practises, hence you've got your legal metrology act, and so on so people do not know these things at the back of their minds, at the back of these regulations they are being protected, so it is a little bit of both.

Interviewer: Thank you very much [6th participant], I think there is a lot of questions that I can prompt from this, but I have to unfortunately or fortunately have to stop somewhere, but I would like to thank you very much for your time and your knowledge and the input that you have provided with regard to your experiences and with regard

to the drivers that you think possibly are the key drivers that may consciously and intuitively enable SMME's to start to optimally use the services as provided by the quality infrastructure, so yeah I really appreciate your time and willingness to contribute to this study, and thank you very much.

Respondent: Thank you Sam it was my pleasure participating in this study of yours.

Interview 7

Length of interview: 11+33+25= 69mins

Interviewer: Thank you very much Chief for your opportunity, first of all as I've explained but before we continue I'm intending to record this interview to allow for easy transcription at a later stage, do you provide permission for this interview to be recorded?

Respondent: Yes.

Interviewer: Thank you very much for that, as I've explained and given you an overview of my interview research guide as well as my overview of my research project, but the research guide is comprised of about seven sections to allow and streamline the flow of information, that is the purpose of the research guide, in the first section I've explained to you Chief the aim of the, or rather the objectives of my research project.

Respondent: It's true.

Interviewer: So the second section basically is to break the ice and firstly to thank you very much for your time, I've already taken much of your time because of the recording device, I think there are lessons to be learned because of the recording device disappointing me, but first of all I would like to thank you very much for your patience to allow me, disappointed by my recording device and providing me with an alternative device, I thank you very much for that, as I explained during my previous communication, I'm completing a thesis and the title of my research project is to develop a framework for the application of the National Quality Infrastructure Services by small and medium sized enterprises in developing countries, but I'm focussing on the South African context.

I'm cognisant of your time, and I have already I apologise, as it has already taken more than what I've planned, the average interviews previously that I've conducted, six of

them already have taken an average of fourthy minutes, I think I've taken much of your time I don't want to waste more time Chief , what is important before we start I would like to reaffirm confidentiality and confirm that the information that will be drawn, or rather gathered from this interview will only be used for the purpose of my research project, the information will not be disclosed to any other party except for the purpose of my research objectives, I've already sent you a consent letter I think before to alert you that I would like to engage you as one of my participants , as part of the quality infrastructure experts, and Chief have signed that consent.

Respondent: It's only a pleasure for me.

06:53

Interviewer: Ok, so the next section Chief quickly, it's just to solicit information, from a general perspective, it has two questions, and I will just go straight into the first question which is as follows, Chief what is your highest academic qualification?

Respondent: It's an [unclear 06:28]

Interviewer: Thank you very much for that information Chief, the next question is, what is your current position and responsibility and how long have you been in this position Chief? If you don't mind you can briefly also touch base on the previous position, on your previous experience that might also be relevant to my research project if you don't mind.

Respondent: Currently I am the Chief Executive Officer of the National Metrology Institute of South Africa, I have been in this position since 2013, you can work out the numbers then, previously I have served in a science park as a General Manager responsible for enterprise development, so SME development has been key to my role in addition to roles that were related to supporting enterprises with non-financial services as well as supporting skills development at universities with a focus on developing those students that will come and develop their own enterprises, or work in small enterprises, before that I was part of the quality infrastructure in a testing diagnostic environment within the veterinary health and food safety environment.

Interviewer: Thank you very much chief for that information, I think that is one of the reason I have selected you as one of my participants, I think it fits well into my inclusion criteria of the ten participants that I have selected, we will move, then move to the next section which is intended to solicit information regarding your experience as an expert,

and the first question is, how do you define the National Quality Infrastructure? Allow me to call it the National Quality Infrastructure, I know in South Africa we call it TI, Technical Infrastructure. How do you define the National Quality Infrastructure from South African context, and what is your experience with respect to this Technical Infrastructure in South Africa?

Respondent: I think I agree with you that it is a National Quality Infrastructure, the reference, and I want to define it, I'm starting from there, the reference to the Technical Infrastructure only relates to the government entities that are involved in the National Quality Infrastructure, those that are dedicated specifically to SQAM, standards, metrology, quality and accreditation, that is what we refer to as the TI entities, the technical entities in South Africa, National Quality Infrastructures is much broader than that and in the South African context it's got a very strong privately owned calibration and testing laboratories that form part of that National Quality Infrastructure, and obviously it is developed to service business.

02:00

Interviewer: Sure.

Respondent: But it also has a role to play in regulation, and I think as we talk I'll explain to an extent the importance of separating the two roles of driving competitiveness for business on the one end, and enabling regulation for government on the other end, because that has got a very huge impact on small enterprises, and as we go ahead with the interview, I'll try and explain clearly what from my experience both in enterprise development, and serving as a head of a quality infrastructure institution within the metrology space has been.

Interviewer: I think Chief you kind of have pre-empted my next three questions, perhaps we can integrate them together, or rather we can decide to take them sequentially as they come, but when you respond you are welcome to integrate them together in your response, but let me just state the questions sequentially as they are reflected on my document guide, the next question in this section is...

[Audio file 2 begins]

Interviewer: Thank you Chief for that, I'm aware that as we progress because of your, I take cognisance of your busy schedule, there will be interruption to my recording, but that is part of the research anyway, as I said in my second section there are three more

questions underpinning my second section, you can respond to them from an integral point of view, or sequentially, but I will read them accordingly according to my research guide, the next question on this one, on the section D is that if you could kindly explain your experience with regard to the impact as you have now so well-articulated the definition of the quality infrastructure from South African context, if you could kindly explain your experiences with regard to the impact of this quality infrastructure towards the performance of small business in general, and then I have another question which is as follows, I want to understand if you have been, I think you have, whether you have been involved in certain initiatives pertaining to small medium enterprises, or small businesses in general, and the other question basically is, what will be your view with regard to the application of this, the quality infrastructure by small medium enterprises when you focus then on the key components of the quality infrastructure, namely accreditation, metrology, standardisation and conformity assessment? Chief as I said you are welcome to throw it on the table just broadly to accommodate these three questions, thank you very much.

Respondent: I think if I understand your question very well, it's more on my experience with regard to the impact that the National Quality Infrastructure has on small and medium enterprises.

Interviewer: Absolutely that is the context of my question.

30:29

Respondent: In my experience I've found the quality infrastructure broadly and not only talking about the Technical Infrastructure which is the government entities, but including the whole of the quality infrastructure set up in the country, and I want to believe this is the case for not only South Africa but a number of developing countries as well, but specifically for South Africa, I found it to be very limiting to the development of small enterprises for quite a number of reasons, one the government TI has been set up to support regulation as I indicated in my definition of the quality infrastructure, to an extent that it is geared to support government regulations, it is not structured to support product development, and taking that competitive product not developed to enhance competitiveness for the enterprises in such a way that in my experience as an enterprise development practitioner of quite a good number of years actually I have found that those enterprises that try to go through a quality infrastructure process

actually get negatively affected that the, eventually the percentage of enterprises that fail because they couldn't take product to market is higher than those that succeed because they went through the quality infrastructure route, and my analysis and conclusion is that the enterprises are geared for regulation, so they are prepared and structured to assess conformity to already set quality standards that at the end of the day, more especially those enterprises that come up with innovative products into the market, they found themselves getting frustrated, not knowing where to go, who to talk to and they get thrown from pillar to post simply because the quality infrastructure is not prepared...

Interviewer: For them.

Respondent: For them, it is not developed to support product development and enhance competitiveness of their products and eventually their company as a whole, if you look at it from the perspective of standardisation, the standards get developed through the SABS and the machinery in the SABS which includes, you would know very well, your committees and these committees get set including what I want to call now, already entrenched monopolies of companies that are already in the market, they bring their experts, and then there is government experts that also gets involved, then there's academia and so on, but there is no representation in the setting of those standards for either enterprise development practitioners or your small enterprise experts in those committees, such that when those standards are set they are set with a consideration only of products that are already in market, and they are set with a consideration mainly of import products that come into the country, that becomes a very important aspect for the small enterprise, and I hope as I put it the way I'm trying to summarise it, it is clear that already you can see that their standard setting already puts the small enterprises out, now when a small enterprise comes with product into market they get given a hoop to go over.

Interviewer: Yes, sure.

24:55

Respondent: And it becomes in such a way that their testing is a conformity testing that most of the time, and this is a very important aspect in my experience actually negates the attributes of the innovative product that comes in to the market, because you saying that is what you should be doing, so before I can check on what your

competitive advantage is, I first want to see can you meet this hoop, and that conformity assessment approach makes it impossible for small enterprises to go through the development process, and that's why most of the small enterprise, it's a higher percentage of small enterprises in South Africa that doesn't even make it through the second year of their existence, the majority don't even go through the product development and taking product to market because of a way that we apply the quality infrastructure, not to support the development, but to support the conformity assessment process, I will be frank and say the moment a small enterprise comes with a product it is in everybody's lips that supports those enterprises to say go test at the SABS, not even checking.

Interviewer: Oh, it must be certified.

Respondent: It must be certified, not even checking what are you testing, what are you certifying, what is the product trying to meet, what need has been identified in the market and now how do we make sure that we use our quality infrastructure from a supporting perspective as opposed to what I saw as a gatekeeping approach.

Interviewer: I think Chief you have touched base on an important part in terms of the, first of all in terms of clearly explaining the context from where you see the small medium enterprises are coming from, one you have mentioned the ones that are more privy to the regulatory and standards and quality and their knowledge regarding quality is more enhanced, and on the other side you have mentioned the ones that are more from an industry point of view, from an innovative point of view and certainly not having the opportunity because of the way the quality infrastructure is designed to be able to be incorporated into their mainstream, so I like that separation of the small medium enterprises, and then you also indicated the reason or the rationale of why they are being limited, I'm tempted to ask you a follow up question on that.

Respondent: That's ok.

Interviewer: Is there a National Quality Policy that has been established as far as you know from South African perspective that could bring, that could direct the, provide the clear directive in terms of what the quality infrastructure should do, as well as perhaps even disseminating its mandate to the small medium enterprises that are more on the industrial competitive side, is there a National Quality Policy that is available as far as you know, and secondly if not, do we need one?

20:17

Respondent: I'll start with the answer to the latter part of the question, definitely we need one.

Interviewer: So, in other words there is no, if there is...

Respondent: We need a National Quality Policy, but to the earlier part of your question, is there a National Quality Policy in the country? The answer is unfortunately no, and most of the issues that we are finding, and the narrative that I gave you is only but a small portion of what makes it difficult for SMME's to get into the market, I was just giving it to you in the context of using quality infrastructure services, there is more but the issue is the policy coherence in the SMME development space is very weak, it's a very fragmented set up, to the extent that even what is called the Technical Infrastructure in the country does not have a proper guide from a quality policy to an extent that you see the NMI say drives metrology, traceability, competitiveness and all of those things, then when you go to what the SABS does, it drives conformity assessment on the other end, then you go to what SANAS does, they drive accreditation with an intent to very actively compete internationally and the coherence thereof, and now when you bring the legal metrology aspect of things there is not even a golden thread from the scientific metrology that we develop to the legal metrology that we apply, because of that lack of the National Quality Policy, and there has been a lot of initiatives to say let us streamline this quality infrastructure, and let's put a policy together, but typical South Africans I don't know how we going to get to a point where we say we cannot have entities, the private sector quality bodies like your calibration laboratories, your testing laboratories, your conformity assessment, your certification bodies and so on with the government regulatory programs that are in the different government departments, like your department of environmental affairs, health, the whole spectrum together with the TI entities needs to be streamlined, and one of the biggest failures that leads to this limitation that I refer to, to the growth of enterprises which by extension would mean to economic growth is the lack of that National Quality Policy that pulls things together, so that each of the parts of the National Quality Infrastructure contributes their bit understanding that what they contribute will be taken up by the next level in the chain, once they are done the next level in the chain has got well processed inputs that they can use in their process that the value chain gets properly completed at the end of the day we have one intention, which is to have

competitiveness of our enterprises in the market, understanding that there is no way that we can have large enterprises before we have small and medium enterprises, so if we talk economic development at that level we've got to be focussing at the small enterprise level, because they are the large enterprises of tomorrow, they start here.

15:17

Interviewer: Absolutely, that is well articulated Chief, I think it actually touched base and accommodate the three questions that I was intending to ask here, namely the impact of the, with regard to your experiences from the quality infrastructure perspective, the impact thereof, of its services to the small medium enterprises, your current or previous involvement in SMME's initiatives as well as your views with regard to the application of the National Quality Infrastructure, specifically focussing on the three components, key components, as well as the conformity assessment bodies as well. Thank you for that information Chief, I will then move to the next section, in this case I want to draw some information from you with regard to the possible drivers and limitations, I know in the previous, or I can attest that in the previous answers to my questions perhaps you have touched base on that, maybe you can maybe quantify them now, and the first question under section C, E rather is, what do you think are the most critical drivers that can assist SMME's if they want to apply? You know the quality infrastructure services from South African context, in order to optimise their business performance, and also you can touch base on the limitation on the other side and perhaps you can even advise me in terms of which of the critical drivers, in your view is the most critical one. If you can name one or two, or three what do you think is the one that is underpinning the driving force for SMME's to be able to use the services of the TI, with the intent of optimising their business performance Chief?

Respondent: It's a very broad question

Interviewer: Yes indeed.

Respondent: Not an easy one that, it's a difficult question but I'll make an effort to answer it in short, and maybe just mention one key driver, a quality culture, this is very key, if we use the quality infrastructure like we are using it now because somebody else says you must do this things, we are not going to be able to extract the most benefit from the quality infrastructure, but if we drive a quality culture from a consumer

perspective, then we are able to have the inputs that goes into this consumer market to be quality considering, let me use a typical example, let me use a basic one, in the small and medium enterprise space those that make a huge effort to educate themselves, investigate what they need to do and so on are the ones that one would need to export, because in the export markets the quality requirements are set very clearly, and they are enforced. Recently and this is an unfortunate situation in our country, where the buyers of retail enterprises are using quality to exclude inclusivity into the supply chains by developing enterprises in essence to entrench monopolies within the specific sectors that they are operating in, those enterprises that want to enter those supply chains, before they even put on the table what they are bringing into the market, the buyers will be telling them "is it SABS certified", only then they start investigating what is this SABS certification, what is this quality infrastructure and so on, and for that reason Mr Thema if we drive a quality culture in our consumer space, which I mean consideration for quality as you would know would include consideration for safety, health, environmental impact and all those things that encompassed in a proper quality consideration of what as consumers we consume, then we would be able to have this critical driver, that quality culture ensuring that our SMME's are not just trying to bring conformity assessed products into the market, but they want to bring competitive products that goes into a quality aware market segment.

08:21

Interviewer: If I understand you correctly you are saying that the drivers beyond the customer requirement is underpinned by certain aspects such as the quality of the product itself, the competitiveness of the product itself, the safety of the product itself, without removing or adding what you have said, if we take for example just a simple manufacture there on the township fabricating bricks with an intent to grow the business in the next five years, ten years to export those bricks to Botswana, neighbouring Lesotho and so on and so forth, what is your link to what you have just said as the drivers to that example Chief?

Respondent: The quality culture is a key driver, it's a good example the bricks you use, if the consumers who buy the bricks have got no consideration of the quality of the brick that lands on their construction site, then the manufacturer doesn't have any reason why they should be concerned about a quality infrastructure that will ensure that their bricks are able to make it and compete in that market, now if we drive that

quality culture and this is where, remember when I said the quality infrastructure goes beyond the Technical Infrastructure?

Interviewer: Yes, absolutely.

Respondent: They are entities that need to be training people on quality, what does quality mean and so on and so on, and drive that culture within the consumer space then you are able to ensure that your enterprises are not so concerned about going through hoops, they are more concerned about taking into the market product that competes on it's own on quality which will encompass the safety considerations and all the other things, so the key driver needs to be a quality culture. Let me use similar to the bricks context an automotive product, because of the quality culture within the German environment any automotive company that wants to manufacture cars in Germany will first go through the quality infrastructure to ensure that the consideration of all quality aspects is taken into account before they take product into market, and the policy itself, the quality policy will then consider that it needs to support this enterprises on their quest to take quality by implication competitive product into the market, like I said I want to mention only one critical driver which is a quality culture in that account, if we do that and this is something that from my consideration, and I started considering it from enterprise development but even in technical barriers for trade and locking out unsafe goods, if we just do that you will see our customers not procuring substandard goods that get into the market, because they are quality aware they have a quality culture, this issues that we see, let's talk bricks with RDP houses that get built and then they start collapsing within the first six months of their being built because of substandard cement that goes into the bricks and so on, they will go away because the moment you put those bricks that are not of right quality, a quality aware community will say this bricks are not going into our houses, right there and then you've dealt with the problem.

Interviewer: I get a picture now of what Chief is talking about, so in other words this NQP National Quality Policy will be, has to be underpinned by this driver, key driver that you've profoundly articulated to, and those two has to be clearly entrenched from your perspective.

Respondent: And I must say it's unfortunate, and how you interpret this in your research might be key to coming up with a framework for ensuring that SME's small

medium enterprises utilise this quality infrastructure services to their benefit, and this is considering that in the past when the quality infrastructure was just SABS we knew that the moment you say "has it got a SABS mark" what you meant was very clear, you meant it's the right quality and we insisted on it, if it didn't have it we were not buying it, and the fact that even the inspectors from a legal metrology perspective that went out inspecting and so on, they were inspecting for that mark to a greater [unclear 01:15], it was a culture that we used, we knew, I mean in my own family we had a shop where we knew that every quarter there's going to be a SABS inspector that comes in and checks those products, that meant whoever, a small enterprise supplies us, even bricks, we had a general dealer where we even sold bricks, even bricks had to have that SABS approved mark, and that was a cultural thing, it was not something we think about and we sit around tables and we discuss, it was something that was culturally...

Interviewer: It was non-negotiable.

Respondent: It's non-negotiable, it's a culture if you don't do it that way, sorry we not going to buy your product, and that's why songs like Fong Kong and those songs will come in because in our culture we know this is Fong Kong because it doesn't SABS mark, and it is that culture and that for me is key. (Allow me to take this, this is from parliament)

[Audio file 3 begins]

Interviewer: So you have mentioned basically there is in your view, if I understand you, you will correct me if I've missed that one, so there is a subtle difference between the limitation and the drivers, there is a grey line there and in your view the critical driver and subsequently the limiting factor is the lack of quality culture, did I understand you correctly?

Respondent: I think you've summarised it very well and understood what I'm trying to say, the fact that to have enterprises playing in a certain space, they are meeting a certain need, now if it's a quality issue you need that quality culture, then the enterprises will meet, will go and use that National Quality Infrastructure, now the limitation then becomes the lack of that quality culture which is clearly articulated and demonstrated in the lack of urgency in drafting a National quality Policy, because like I sometimes say the people get the leader they deserve, if we don't have a quality culture we will not insist on a quality policy when we are supposed to be holding our

politicians and technocrats to account to say “where is our quality policy?" We are holding them to the things that are more closer to our heart and it takes education to educate people on that culture, that there are certain aspects, I'm trying to imagine a situation where you sell sub-standard goods, let's say automotive products in the German market, the market will deal with you, they will not buy your product, and we need the same scenario in South Africa yes considering affordability and all the other things, but when we grew up you would know that you would wait until you have enough money to buy that quality Tempest product than just go and buy any radio, FM radio set, because you knew if I bought that Tempest product with the SABS mark that radio is going to last me longer, we even have phrases like "goedkoop is duurkoop"to show that's the culture we had, we knew that if I buy expensive and it's a good product, I've actually saved myself money [unclear 22:20].

Interviewer: If I conclude Chief, from a policy framework we need to entrench this National Quality Policy in order to ensure that there is a, it talks to the culture of quality and measurement and bringing conformity assessment into the play. Are there any other considerations that can be considered whilst this important point that you have mentioned from a policy perspective, to what we want to achieve which is the quality culture, are there any other consideration that needs to be considered? I don't want to pre-empt what you would be saying, but also you have touched base on coordination of the quality infrastructure key components, so are you saying that will be, if the quality, National Quality Infrastructure is well articulated, well defined, and well implemented it will address the other things such as coordination and so on and so forth, is that???

Respondent: Because policy will then lead to regulation obviously, so then coordination and what I foresee and what I've seen in economies like the Chinese economy, the moment they put their national quality policy together then they established a quality coordinating directorate in the ministry whose role was to ensure, and they resourced it. In the South African context we do have an administrative part of that, and I put it in, and I put it in quotes because it exists when you look at it, but it's only three of four people in the unit to coordinate the quality infrastructure for a country as big as ours, while supporting the rest of the SADC region, so it is inadequate and it does not have a policy guiding position that guides it so that coordination will be able to be done, secondly the coordination between the technical infrastructure within the

Department of Agriculture and the regulatory entities in other departments, an example SAHPRA in the medical devices and medical sector being properly coordinated with the quality infrastructure is very important, remember in the beginning I said the limitation is that the quality infrastructure is not geared to support the small enterprises, so let's say there's somebody whose, you might ask yourself this question, it's a very difficult question for me to answer, if we using so many condoms in the country, why don't we manufacture them in the country?

18:15

Interviewer: It's a good question

Respondent: If we using so many syringes in the country, why are we not manufacturing them in the country? And it's because of those hoops that get created, our quality view is that of, you need to have certain conformity requirements instead of saying this are the quality standards that you need to meet, let's help you go through them and go to the end, it is very critical to have those regulators, because let's take the SAHPRA example I started where for the condoms to eventually end up within that system they have to go through the quality infrastructure entities, but there's a regulator there which is SAHPRA, who also need to be streamlined and it is that coordination that makes it difficult. Big companies navigate that very well, and they know all they need to do to be competitive, is to be able to navigate that misalignment and they use political arm twisting to go through the system, because once they've done that they've got a monopoly, because nobody else can go through it because small enterprises doesn't have enough muscles to do the political arm twisting to get product in to markets, and that is for somebody who works in a technical infrastructure entity, it is a sad scenario where you find what is a limit for the small enterprise to get into the market, it's exactly the same limit for a big enterprise but the big enterprise is selling in that market and they conyinue going, when you check par to par you might find that the product for the small enterprise is even better than the product fot the large enterprise, but the large enterprise just knows how to navigate the streamlined process that we have created, that's why I emphasise specifically it is in the people, in the quality culture, but it is in the government to set the quality policy and then we can focus our entities to be there, just as an example in Korea they've got an NMI, which is the Korean Research Institute for Standard and Science, that NMI has got a unit, big unit whose focus is to help small enterprise become export ready.

Interviewer: Wow it's amazing.

14:47

Respondent: It is one of those things I would recommend because you can't go to a conformity assessment body and say help this enterprise become export ready, which is, which takes me back to what I said that you can't just say go get certification from SABS, SABS will take your product, they have to be impartial, they have to be independent, they take your product, they test it against the standard that was set, if it doesn't meet it they tell you it doesn't meet it and you don't get the certification, you're not in the market, whereas if you go to another part of the quality infrastructure, metrology, they help you because they know what the National Measurement Standard is, and they say "yes we understand in terms of that documentary standard you don't meet that, but in terms of the National Measurement Standard you meet this and that and that and that", then you bring legal metrology and say “in terms of safety and health considerations you actually meet these things so you can actually trade this product even without the certification", and that is support for the small enterprise, and that is what the Koreans do where in the NMI they've got a unit and they use retired metrologists, retired conformity assessment experts to come in and sit with the enterprise and say “now let's talk your product".

Interviewer: Before I continue Chief, the small medium, sorry the Small Enterprise Development Agency SEDA which is, broadly its mandate is to support enterprises, should be brought into the fore when this National Quality Infrastructure is being considered, if ever it's going to be considered to entrench on it, because we already have the supporting entity SEDA, and probably with the spin off effect of what we are seeing in terms of the sustainability of small enterprises dying off within two to three years, probably the goal or the objectives is not well achieved, so if I get you correctly they have to be brought into the whole system, SEDA.

Respondent: It's a no brainer, you need the agency that supports the development of small enterprises to be brought in. SEDA is very well positioned to champion this, because they've established what they call the SEDA Technology Program, STP which is an incubation program for technology-based businesses which by definition means businesses that requires this quality infrastructure are supported through them, but

there is no streamlining of what they do and the services of the quality infrastructure as we know it in South Africa.

Interviewer: I see, is it obviously because of this lack of clear National Quality Policy?

Respondent: I think that and the lack of coordination in the process beyond just quality consideration, just clearly saying "we've got one market", I think it was President Mbeki that for me, and at that time I was still in an incubator supported by the SEDA Technology Program as CEO where he clearly defined that we've got two economies so despite the fact that, that was clearly defined well documented, what if we've got one market?

10:12

Interviewer: Absolutely

Respondent: And we've got to take that market and that is where I talk of the quality culture in the market as a whole, that we consider that whether it's small enterprise, whether it's Woolworths or a spaza shop the corner of a street in a township.

Interviewer: The township economy.

Respondent: It's one market, the person wakes up next door to the spaza shop, wake up get into a taxi go to a supermarket to buy milk from Woolworth and come back home, whereas they could have sourced milk right next door, so it is one market.

Interviewer: Thank you Chief, the last question under section C, F rather, you may have answered that, but let me bring it to the fore, let me bring it to the table, is there anything else that you think should be improved with regard to how the Quality Infrastructure is being applied by small businesses? I think you have answered that one, and the next question is, if you could change something about the services provided by the Quality Infrastructure, what would you change in order to ensure that there is effective improvement to the performance of small businesses? You may have also answered that one as well.

Respondent: I'll summarise it, refocus our approach in supporting enterprises, not ignore our regulatory imperative, but enhance our developmental drive, because I said in the beginning in answering it as you rightfully say, I said it's because we are looking at it from a gatekeeping perspective as opposed to a support and developmental perspective.

Interviewer: So, in other words this push, and pull should be balanced.

Respondent: Should be balanced and not only for the small enterprises by the way, but for all businesses in the country, it's got to be properly balanced such that if, I'll give an example of standards, if there's a international standard for a specific aspect, let's take garments for instance, shirts, when we come into the country we should look at the culture, the quality culture, the requirements in the environment that when we go set a standard for garments we've got to be considering that we are now making garments for this market, and tailor our support to be properly located in our market, in our environment that is very key in my view so what I would change is the way we service enterprises from the Quality Infrastructure perspective, there was a drive which I thought was going somewhere which was the SABS Design Institute, if you look at the way that the SABS Design Institute was tailoring their services, it was still Quality Infrastructure services in a conformity assessment body which the SABS, I didn't see them as a standard setting body, even today I don't see them as a standard setting body I see them as a conformity assessment body, if you look at eighty percent of their business is conformity assessment, you judge a person by what they do most, but even with that they developed a SABS Design Institute, which in my sector that I'm interested in, the essential oils and medicinal plants sector, we were coming with an approach of saying "what is it that our clients want, how do we develop a standard that meets the requirement of our client, what are the quality requirements of our clients"? And then we say"what are the health and safety requirements that we need to build" then you are able to develop products in that perspective, they were using the design thinking in that concept, but it is what we need to do in the country, that's the way we will get products into the market, there's a lot that we can take out there into the world but if we judge it against what the world has already set as the standard we ignore, I use the example of baobab oil as an example, the standard for moisturiser in the world is palm oil, now baobab is like ten times better at moisturising than palm oil, avocado oil is also coming closer, five, six times better than palm oil, but if you take baobab oil and you go test it against the standard which is palm oil it will not pass the certification requirements, does it make it a bad moisturiser?

Interviewer: Good example, so in other words are we standard takers or standard makers?

Respondent: That is the point I've been trying to make the whole time, based on the culture of quality within our system let's support our enterprises that they can go into the market, I think you summarised it very well, because what we do is we become gatekeepers, restrictive because we say there's the standard, and we know what palm oil had to go with, then we ended up having a document that is standard that is based on palm oil, but something better comes through, we've got to be able to use our quality infrastructure to tell the world that hey here we've got something that is that and that and that and then go to the international system and rewrite the standard because something better has come through.

Interviewer: We should be more of standard makers than standard takers. Chief I would like to conclude by saying thank you very much for your time and willingness to contribute to this piece of study, and more importantly my apology for the mishap that happened due to technology earlier on, but I think it was an interesting discussion, and at the same time an interview but I think it was more of a discussion to the interview, and I would like to thank you very much for your time, I will be coming from an informal engagement to gauge the analysis that I will be doing, it's one of the requirement that you should go back to the expert and the participant to say “is that the things that I've identified, is that the correct one"? So, at a later stage I might take a phone or maybe through an e mail and so on and so forth, or even send the analysis report, because from here now I'll be doing what is called content thematic analysis and extracting relevant themes, I'm starting to see, can I show you common themes from the past...

Respondent: Interviews.

Interviewer: Interviews here there are common themes, but I will have to validate them through your assurance to say yes this is what we've been talking about but thank you very much for your time and thanks and have a good day further and thank you very much.

Respondent: You're very much welcome, from my side it's only a pleasure, I'm looking forward to what type of framework you will come up with, I must say when I looked at the topic I thought you've nailed it at the head of the problem, how do we structure ourselves so that we are able to support our enterprises, I do believe in international trade and fairness and all the other things, but I can't be fair when I'm hungry.

Interviewer: Absolutely, thank you.

Interview 8

Length of interview: 41 mins

Interviewer: Thank you very much [8th participant] for your time, and my apology to pitch up a little bit late, I think the security here at your company is a little bit tight, so they had to screen me and when I was saying I'm here to see [8th participant], he say do you have an appointment with him, and I said yes I've made an appointment, I've even confirmed it yesterday and they have to check the laptop and so on and so forth, but nonetheless, perhaps I should have come here an hour before the actual meeting, but I would like to thank you for your time, as I have explained I have indicated an overview, in the form of an overview the objectives of my study, so I would like to go straight into the interview research guide questions, in the research guide questions we've got about seven sections that will guide us to carry on or conduct this interview, in the first section I have as I've previously indicated to you [8th participant] it was just intended to provide the intended purpose of my study, but first of all I would like to get your consent to record this interview for easy transcription at a later stage, do you give me permission to record the interview [8th participant]?

Respondent: Yes you can go ahead and record.

Interviewer: Thank you very much, first of all as I've explained before I am completing a study and a thesis and the title of my research project is as follows, I am actually developing a framework for the application of the National Quality Infrastructure, in other words this National Quality Infrastructure has to be applied by small medium enterprises in order to optimise their performance, I am looking at the case of South Africa, that is essentially the title of my study, [8th participant] I'm cognisant of your busy schedule the previous interviews on average have taken about an average of fourty five minutes or so, I'm hoping to keep this one a little bit shorter, but you know experts like yourself can go on and on and on so I will try to use this guide to shorten the interview as much as possible.

Respondent: I don't have a lot to say so it's going to have to be short, you have already talked to the real experts in this space, mine will be just adding a point here and there.

Interviewer: Alright, but thank you very much I think as I said my supervisor really was really hoping and pushing that I have to engage the likes of you from the Department of Trade and Industry as the custodian of the National Quality Infrastructure in South

Africa, so I had to indeed arrange such an interview, before we begin I would like to reaffirm confidentiality and confirm that the information that will be drawn from this interview [8th participant] will only be used for the purpose of my research study, I can assure you that the information will not be disclosed to any other party except for the purpose of my research objectives.

36:39

Respondent: Okay.

Interviewer: let's go into the first section which is intended to solicit information from a general perspective, the first question under section C is, [8th participant] what is your highest academic qualification?

Respondent: My highest academic qualification is a degree in chemistry, PHD in chemistry.

Interviewer: Thank you [8th participant] for that information, and what is your current position and responsibility, and how long have you been involved in this position [8th participant]?

Respondent: I am currently the liaison person between the quality infrastructure entities, that's the agencies of government and so as a liaison between them and the government, I am responsible for coordinating their work from the department side and ensuring that their strategy impetus from the minister is implemented by them.

Interviewer: Just to get clarity [8th participant], so you work very closely with the National Quality Infrastructure institutes such as the SABS South African Bureau of Standards, National Metrology Institute.

Respondent: Yes I work closely with all of them, the National Metrology Institute, the Bureau of Standards, the [unclear 35:00] System of South Africa as well as one regulator which we call the National Regulator for Compulsory Specifications NRCS, I coordinate overall the work that they do coming back to government as reports, and going from government to them I give the strategic direction that the minister wants them to implement.

Interviewer: I understand [8th participant] is coordinating and liaising with this institute from a Chief Director level.

Respondent: Yes my formal position is a Chief Director in the Department of Trade and Industry.

Interviewer: Thank you [8th participant], I will just straight move into the next section, section D which is intended to solicit your experiences regarding the Quality infrastructure, the first question [8th participant] is as follows, how do you define the National Quality Infrastructure from South African context, and what is your experience with regard to our National Quality Infrastructure?

Respondent: I think from the South African context we define the National Quality Infrastructure as the system, it's a framework system that sets standards and ensure that the standards that are set are actually implemented, and there's proof of that implementation, that proof we call conformity assessment, so it will be testing, inspection and certification in addition so that people who would give you the proof that standards are being complied with will be the accreditation system, they will be accredited, so those people who have to be accredited so that we know that they are competent to do what they claim to be doing.

32:35

Interviewer: Sure, so the acronym SQAM, I think [8th participant] is very familiar with it, Standard, Quality and...

Respondent: Standards, Quality Assurance, Metrology.

Interviewer: Was it also including quality in other words, or where is this concept or construct or quality coming from into this acronym SQAM, was it the Quality Association that was also included at the time, or is it because of this bodies, the standard body are more working within the quality sphere?

Respondent: You see the acronym SQAM stands for Standards, and then the Q, S is for Standards, Q stands for Quality Assurance, whereas the A stands for Accreditation and the M stands for Metrology, so the whole system as a whole is the one that talks to giving quality to products and services.

Interviewer: I see, that's where the quality assurance is drawn from?

Respondent: Yes, so the issue of quality assurance actually talks to what is not being mentioned which is this conformity assessment, which is the proof that what you do as

a company actually complies with the regulations, if those regulations are based on standards [unclear 30:45] standards.

Interviewer: I see, ok [8th participant] thank you for that information, do you want to touch base on your experience regarding our quality structure in South Africa probably?

Respondent: Yes I think we have a very good quality infrastructure system in South Africa, it's comparable with the best in the world in terms of the setup, the direction, the level technical knowhow in the system is very high, however where we have gaps it's in terms of uptake by upcoming especially entrepreneurial small businesses, they really have not played as much a role in the system as they should, the way that we develop standards has not been as inclusive as it should have been, in my view it's a problem.

Interviewer: You remind me of an article that I I've just recently read which was basically ranking the quality infrastructure from a global perspective, and out of seventy maybe I will at some stage share with you [8th participant] that article, out of seventy South Africa was rated as number thirty four, I don't know how relevant and appropriate that article is, but they use certain measures and so on and so forth, the key comparison data base that is being, the CMC that are included by our National Metrology Institute Infrastructure at BIPM take into consideration those factors, the use of I think information from the use of ISO documents and those data certified by ISO, they factor them in to certain formula and ultimately they get, but it was interesting just to, but indeed it attest to what [8th participant] is saying that it's one of the best, and in Africa I think one of the...

27:44

Respondent: We are the premier.

Interviewer: The premier in Africa yes.

Respondent: When it comes to international participation we do a sterling job there, we do a very excellent job, we are in as you say in the BIPM there a number of areas we participate in, we have some of the, even the current, to just show how good we are even the current president of the BIPM is a South African.

Interviewer: [8th participant]

Respondent: Yes and the same holds for ISO, that we host a number of ISO committees, we participate in a number of ISO committees, it shows that we have very good depth in technical abilities where it comes to the area of quality, we lead in Africa in accreditation, we lead in standard setting, we lead in metrology and we are the host secretariat the Africa Corporation Systems.

Interviewer: [8th participant] has mentioned the gap in terms of the impact of the South African Quality Infrastructure towards small medium enterprises, what do you think would be probably the limitation in terms of not optimally ensuring that the small medium enterprises are realising the important benefit of the quality infrastructure optimally, what could be the limitation, is it how the quality infrastructure is structured or perhaps maybe if you could touch base on that [8th participant]?

Respondent: I think the biggest challenge is to get quality understood by the majority of the population, so as customers in our buying decisions we don't put quality at the forefront, and what is lacking there is the fact that the culture of quality, it's not as advanced in the country, what you need is to have the majority of people being aware of quality when they buy products on the market, if that is not there then quality becomes a sort of an elite system, and that is why you see that most small businesses are not really taking up the opportunities that the quality infrastructure gives to their products and services, because the buyers, the clients are not really taking that into account in their procurement decisions.

24:09

Interviewer: [8th participant] is referring to the end user, so in other words the culture that you are talking about which has been emphasised by one of the experts that I've interviewed, very strongly is really not entrenched.

Respondent: Yes it's not entrenched, so until we get a grip on the culture of quality, we will still struggle in getting small businesses to really take advantage of the opportunities, that the system that government has paid for actually offers, which is a pity.

Interviewer: [8th participant], having said that, are there any formal initiatives that have been established from the DTI, Department of Trade, and Industry point of view, specifically looking at the Quality Infrastructure Institute, initiatives that they should be involved in, in order to link the services that they provide to be connected to the small

medium enterprises, were there any formal initiatives? Or they are there but from an informal point of view.

Respondent: The Department of Trade and Industry supports businesses with incentive schemes, there is grants, government grants for expansion, buying new equipment and so forth, they also help exporters by taking them to foreign countries so that they can market their products there, market research is another big area that we support, but when it comes to supporting you to get your product to be more competitive based on the quality aspect of the product, I think that's where business is, especially small businesses don't seem to take that up, they don't seem to ask for that kind of support from government, because it's, the fact that we have a very good system, it means that government has already invested a lot to make this happen, so it's up to the businesses themselves actually to go to the entities and ask for this kind of support, and you find that wherever companies can get away with supporting low quality not fit for purpose goods they will do it, and unfortunately in our market most of the consumers when they buy products they compare prices only, and that makes it very difficult.

Interviewer: So the culture is basically not correct, that essentially leads me to my next question in section E, the possible driver and limitations, what do you think could be, perhaps let's start with the drivers, as you have mentioned that the small medium enterprises are not as expected, grabbing the opportunity and a system that has already been provided from a quality infrastructure point of view, but from your perspective what do you think are the most critical drivers that can assist the small medium enterprises, so that they can optimally apply and fully apply the services as provided by our National Quality Infrastructure eco system?

Respondent: I think the first one is to have some kind of supply development, where small businesses are selling of bigger businesses, there is an opportunity to develop the suppliers, to make sure they have quality management system in their enterprises that their products have some kind of certification, they've been tested or inspected whatever is necessary before it's bought by the bigger company that's going to make the final product, so there the lever is rather clear that with supplier development you can do a lot, but you don't have enough problems of supplier development that are being run in the country, and those do not have to be just done by government, companies themselves should be able to do that, so there there's I think there's quite

a good room to do so, the next driver that it can work is the one of ensuring that there is actually awareness, general awareness about quality and that is the quality culture so that requires a whole lot of awareness programs throughout various communities, this are difficult in that sense that they have to be so widespread, and they are probably costly, but they cannot only be run by government, they should be run by government and this NGO's, not governmental organisations that raise funds for various activities from different donors, they too need to have the focus of this, if it means that there is room to set up non-government organisations that only focus on quality, maybe this is the time to do it because the fact that we're not quality conscious in our buying decisions in general means that it makes it very difficult for South African companies to compete in this market or to compete in foreign markets, especially small companies because we are not supporting them in the sense that anybody can buy a product from somewhere else, it comes to South Africa, it doesn't really meet the specifications but because the price is lower we just buy it, then the guy down the road who is making a product that is a little bit better doesn't have support, that's the way I see it.

Interviewer: You have mentioned two critical drivers, the supply development as well as more importantly, awareness, when coming to awareness, can it be coordinated relatively independently by the quality infrastructure agencies, or in your view there need to be a centralised system that will disseminate the services that are provided by the quality infrastructure from a central point of view, because I understand these agencies they have to work in a coordinated manner if the national metrology, only by themselves try to make their own arrangement in terms of awareness of metrology, and then the standard body does the same relatively independent, do you think that can work, or we need probably a centralised system?

Respondent: For producers it makes sense for their various agencies to promote their services to them directly, for general awareness you need an entirely different model, the model that I think can work is a model where you have a structure, some sort of forum, and that forum should not be, it should encompass everybody, the producers, the consumer organisations, the government, big business as part of that system where they can talk about every year having a clear program promoting quality throughout, but that too has to be supplemented by other non-government organisations that raised donor funding from everywhere to focus on that, to actually talk to quality, I think the forum can give basically, they can be the third leader in terms

of what can be done in various committees and then those strategies once developed, they can be given or licenced to NGO's to actually run them on their own time with their own structures of governance.

13:17

Interviewer: I hear you [8th participant], perhaps maybe to conclude on the questions under section E, perhaps the drivers that you have mentioned might not be separated from the limitations, is that your view? Because there is a subtle difference between the drivers and the limitations, or maybe you want to touch base on the limitations, I'm referring to the factors such as determinants, such as cost, is it cost effective for the small enterprises to be able to afford, for example to be able to participate in, if it is important, to be able to participate in standard development, is it cost effective to use, to be certified, or rather accredited for example and use proper measurement as provided by the National Metrology Institute to conformity assessment bodies such as testing, the cost is it not a limitation in your view?

Respondent: No the cost, yes it's a limitation for a small business to even participate and to take up a lot of their standards that are required, cost it's of concern, but however if the customer demands that the product be made right [unclear 11:37] for purpose then the supplier will find that that's not, because you won't be able to play in that space without meeting that requirements, the supplier will not find that to be a real, a major cost for them, I think the limitation for all this in my view is the fact that we, one, we are not able to enforce the requirements to incoming products from foreign markets as well as we could, that is really one of the drivers why we don't have good quality in our market, is the fact that products coming in from other markets are able to get in, and we don't have a good system to actually keep them out, we should be able to keep products that don't meet requirements out of our market, if we can do that then it will mean that the products that meet our requirements are the only ones that come in, and by so doing it will also uplift the products that we make because we won't be able to put them on the market unless we meet the requirements, I think that's one of the biggest limitation is that we are not able to do that, and the second limitation is the fact that the business buyers, the big business, is not too interested in developing the supplier, so in their supply chains, if they were keen to develop the supply chain it will make a big difference, and I don't think they are too keen, they are not doing enough to develop the supply chain, you find that if I'm a big business and I need to buy a

widget from down the road and they don't meet my requirements, I just change and import the widget, that is also a problem.

Interviewer: That talks to what you have indicated and touched based earlier on in the supply development is not well entrenched.

Respondent: Yes it's not well entrenched.

09:06

Interviewer: [8th participant] thank you for that information, I am going to my last but one question, that is section F, which is the last but one. Is there anything else that you think should be improved in regard to how the quality infrastructure is being applied by small, medium enterprises taking to account what you have mentioned to me, if we have answered this question you can also advise me Doc, but if there is something that could still be improved from the quality infrastructure perspective from South African context, let me give you an example, I see globally that when they arrange, like countries such as Namibia they are doing it, they start by establishing a National Quality Policy, which is at the core of the quality infrastructure, and the next layer they start to establish this key component of the quality infrastructure, the standard body, so this National Quality Policy is the embodiment of the whole layer and value chain of the quality infrastructure, and then it end up to the user, are we in a position where we can say from South African perspective that our National Quality Policy, if it exists is fundamentally entrenched to do what it's supposed to do?

Respondent: In the case of South Africa we have the key institutions, the standards, the metrology, this testing houses, certification houses that are very well developed, then we have the accreditation system, what we don't have is actually a forum to bring these together with their clients, which will be industry and the ordinary man on the street which I am calling a forum, if we have that structure, that structure will be what you are calling quality policy or quality philosophy, and that structure is to, all it has to do is to drive awareness throughout about quality, what does quality mean to you as a buyer, that's really what we need to be looking at, my view is to raise awareness, it shouldn't be just a government thing, government can set some structure, it's a structure where everybody comes, we develop strategies thereto say, in order to raise quality for this community this is what you need to have as a minimum, but the people who need to drive it is the community themselves, that's where I talk about the NGO's

and so forth, because you don't want to be having another heavy structure heavily funded by government with heavily paid executives doing heavily nothing, so you need actually to have this things being done somewhere else.

Interviewer: So, in short the National Quality Policy is there, it just needs to be streamlined or entrenched.

Respondent: Yes, it's there. It's fragmented, it's not housed in one specific forum or one specific entity that you can point to it, it's fragmented, it's not obvious [unclear 04:46] that sense.

Interviewer: And then lastly [8th participant] if you could change something about services provided but the quality infrastructure, what would you change? Perhaps this is a flip of the question that I've just [unclear 04:28].

Respondent: If I can change something I would actually ensure that all the regulators ask for proof that products comply, but they don't do the proof themselves, so they don't test themselves, because I find that they slow themselves down with doing all the testing and inspection on their own, they should just let somebody else do it, they just see the proof when it's there, and let the products go or block the products from getting on to the market, I think that change it will be quite useful.

Interviewer: Absolutely, I know in an inspection the DOL, Department Of labour partnered with SANAS or the South African National Accreditation System that before you could test or work or inspect rather the lift for example, you need to be accredited by SANAS, so that push is coming from the regulator point of view.

Respondent: So, the regulator pushes that away, instead of saying come to my office I'll check if you qualify, so the regulators must give it to the quality infrastructure, the quality entities to do that work, they must just get proof that this thing is fine so you can approve this [unclear 02:43].

Interviewer: In other words what you are saying is that other regulators such as the Department of Health for example, with this medical devices that are now coming into the economy has to be, the push has to come from that Department Of Labour to ensure that they conscientize these users, or even suppliers of medical devices to ensure that those devices meet the relevant spec, quality assurance and conformity as well, is that what you are saying?

Respondent: Yes, what I am saying, especially in the medical space, I'm saying the Department of Health buys a whole lot of equipment, medical devices, some of the equipment is so sophisticated that it's not possible for the department to do, to actually prove that the system is working as well as it should, like X-Ray machines, there's no way they can do anything about it, so what they do they rely on the supplier, so if the supplier says this product is safe, it's fine they put it in the hospital, whereas you have actually the National Metrology Institute, they have the equipment and the people and the technology to actually check those things, so this equipment it should have been coming through, and they should have been verifying that indeed it's within spec, but that is not happening because the regulator also feels this is my space.

Interviewer: I hear what you are saying [8th participant], absolutely, lastly thank you very much for your time and willingness to make I think it is a, I must call it a profound contribution to my project, as I said earlier on it was very important for me to also engage you from your office, from the Department of Trade and Industry perspective, I hope that the information that I have gathered from your side will be able to assist me to achieve my projects objectives, and lastly I would like to thank you for your time and I hope that I may outside this formal interview maybe engage you for further advice in future, thank you very much.

Respondent: You're welcome, thanks.

APPENDIX G: TRANSCRIPTS - FOCUS GROUP

FOCUS GROUP 1

Researcher Firstly I would like to welcome you all and thank you for your time, for volunteering to take part in this group discussion, it's really a pleasure from my side. My name researcher and I am the researcher who is involved in the current study. The title of my research study is as follows, I am developing a framework for the application of the National Quality Infrastructure by Small Medium Enterprises in developing countries, I am looking in the case of South Africa. Colleagues the purpose of this group discussion is to assess your current thoughts and feeling with regard to the application of the services from the quality infrastructure system by small medium enterprises in South Africa. I am really cognisant of your busy schedule; we are already a little bit late I apologise for that; therefore, this focus group is not expected to take more than 60 minutes of your time. I am now going to hand over to the moderator so that she can take the discussion forward, thank you moderator.

Moderator: Good evening all my name is moderator and my role here is to be the moderator for this focus group meeting. I myself is currently studying at UNISA, and we are very grateful that you've made time available for this very important research project. I would like to ask the participants to introduce themselves. Participant you're the only one that I can remember, whose name that I can remember so you have to start.

Participant: Thank you very much moderator, apologies once again for the delay, it had completely slipped my mind. My name is Participant, I'm currently the accreditation manager at the South African National Accreditation System. So, I have been working there for almost 14 years now in the accreditation space and I'm responsible for mechanical and physical testing laboratories, and also responsible for the accreditation of the [unclear] laboratories which are governed by the legal metrology [unclear].

Moderator: And what would your expectation for this group be?

Participant: Well, my expectations will actually cover the role of SMME's and how they use the available quality infrastructure.

Moderator: Excellent. Ayanda can I ask you to introduce yourself.

Participant: Yes, good afternoon everybody and thank you for the invite. I'm Ayanda [unclear] from Sasolburg. Currently I have my own company that I'm looking at producing sanitisers [unclear]. And I think one of the things that made me come to this through Sam is because I'm looking at the package of my product, and then I also worked in the quality space within Sasol, so having that background and knowledge that's what I want to take it through my company. So, my expectation definitely to be in this and to be involved in Sam's research is that you know as an SME, I want to use the quality you know as much as, to the best of my ability. So, I'm actually, I don't know what he expects from me, but for me [unclear] learn to take my company to the better space through quality. Yes mam.

Moderator: Okay.

Participant: Did I leave something out?

Moderator: Your expectation for this meeting.

Participant: The expectation for this meeting is I hope I will contribute, but mostly I don't want to sound unfair, definitely I want to get more ideas even for the small medium enterprise where I am right now to boost my company in a quality direction.

Moderator: Okay. And then Participant, sorry, it's very small. Participant. Researcher what is the person's name?

Researcher: It's Participant.

Moderator: Participant sorry.

Researcher: There might be some connection problem.

Moderator: Participant.

Participant: [unclear].

Sam: I think Participant, sorry to interfere there is a connection from our side, we can't hear you.

Moderator: Participant can I please ask you to switch your video off for the moment so that you can speak.

Participant: [unclear].

Moderator: Participant may I please ask you to switch your video off and just repeat what you said. Participant can you hear me? Participant may I ask you to introduce yourself please?

Participant: Sure, thanks Moderator. My name is Participant I currently am employed at NAMISA the National Metrology Institute of South Africa as a metrology specialist, as you can see I'm old and grey and I'm actually due to retire at the end of this year which I'm looking forward to greatly. I have 38 years of general metrology experience, both in industry and then for the last twenty years at the National Metrology Institute where I have been involved in both electrical and mechanical disciplines of metrology. I'm also a technical assessor for SANAS, and have been involved with the quality, technical quality structure institutes over the past 38 years. So, I'm hoping to contribute in this discussion based on my years of experience. And I'm also passionate about quality, and perhaps the fact that often quality is confused with documented systems that require more time to maintain [unclear] of paperwork and add very little value to the people that require the quality product. So hopefully this will come out in our discussion this evening, and I'm certainly hoping that as a group we can identify some of the things that can be improved to help the SME businesses access the Quality Infrastructure Institute's to their benifit.

Moderator: Excellent. Participant can I ask that you introduce yourself?

Participant: Okay I think that you can hear me now.

Moderator: Brilliant, excellent.

Participant: Am I clear?

Moderator: You are very clear.

Participant: Okay my name is Participant [unclear]. I'm in this group representing National [unclear] Metrology Institute of South Africa and then before I [unclear] environmental quality, include the quality of [unclear] laboratories for the mining industry and for hospitals, and then I've been with NMISA now for 10 years. And then my expectations, I'm starting [unclear], and then my expectation in this meeting looking at the [unclear] for environment in my organisation I've realised that the SME are not that much [unclear]. And even when we go out [unclear] ask them, some they don't even know about the quality infrastructure, so I was asking myself like how can we

make them know us that we do exist and then how can we reach out [unclear] to them, that's maybe something that can come out of this focus group.

Moderator: Thank you so much Participant. I would like to ask Sam to go further up in the document, and I wanted to reaffirm the confidentiality. It means that the information and discussion here will only be used for the purpose of research, and none of the information will be disclosed to any other party except for the research objectives. And then even though the discussion is recorded we would like to assure you that your identity in the transcripts will be anonymous, and the transcribe notes will contain no information that will allow individual subjects to be linked to a specific statement, so the recording will be kept safe and once transcribed verbatim it will be destroyed. Then in terms of instructions we request that you switch on your videos. Participant please don't switch on your video otherwise we can't hear you. So that we can have thick descriptions. But Participant I need to ask you that if you want to say something please put up your hand so that I can see that you want to say something. And then we would like to, we would appreciate it if you refrained from interrupting other people while they talk, and even though this is a voluntary situation we request that you participate because your engagement is what will make this a valuable exercise. Then you can raise your hand by using the Tab button so that I can see that you would like to speak. And you don't have to agree with any of the views in the group, you're welcome to disagree, in fact we are looking for your opinion and your discussion, and if you have any other questions then we will look at those specific questions, if you have questions specifically to me you are welcome to raise them. And I would like us to start now with the questions, with the introductory questions. So, the purpose of this is to hear your experience and thoughts about the use of services from the quality infrastructure system by SMME's in South Africa. Are there any thoughts that you would like to share, Sam can I ask that you stop sharing the document? Is there anybody that has thoughts on the use of services of the quality infrastructure by SMME's? Yes participant, participant is your mike on?

Participant: Sorry I was speaking to myself. So, what I've experienced SME, in my experience in accreditation is that most SMME's, they struggle a lot for example to get accredited, and some if they do get accredited they fall by the wayside along the way, and this is because of that lack of support mechanism that exists to help them to keep going once accredited. And if I can just break this down is that for example the issue

of financial backup, most of them due to lack of financial recourses are unable to maintain their accreditation status. The second thing that I have noticed is opportunities. Because they are small no one wants to take chances with them and give them a contract or something and so on. Everybody is a little bit sceptical, about who are these guys? They are too small; we can't take chances with them. They will go to more established [unclear] notwithstanding the fact that even SMME's are accredited against the same standard just like that big well-established laboratory. From a point of accreditation point of view is that we understand those who accrediting them that there two labs, whether the other one is the SMME or it's a well-established organisation the results are the same because they are being evaluated against the same standards. But the perception out there is that, no we're not going to go for a small guy who's in a small one room and then he's got only [unclear] and so on. So there's the second point, the opportunities and then, so for now there's only two points that I want to highlight that I have seen with the small SMME's. We have tried at SANAS as well to try and come up with mechanism of how we can assist them financially so that they can in the first place get accredited. Many times, I get people asking me, "hey participant we want to apply for accreditation, but how can SANAS assist us in getting accredited?" Some of them don't even know what accreditation is, they just tell you "we want to go into the space of construction material testing but we're looking for guidance." [unclear] that will become a third point, lack of awareness and if that lack of awareness is not there, due to lack of awareness they will not be able to use the available quality infrastructure opportunities that are there in the country.

Moderator: That's very valuable, thank you participant. Anybody else have a comment on their experience and thoughts regarding the services of the quality infrastructure? Participant?

Participant: Hi, hi mam.

Moderator: Participant?

Participant: Can you hear me?

Moderator: Now that's better yes.

Participant: Can you hear?

Moderator: We can hear you.

Participant: When I started the production side of my journey I wanted to be accredited, be certified. But upon consulting, because I think for us small medium enterprise the information is not out there, and when we grasp on the information now the steps that that we take because one of the turn off that I received was when I had to pop up thirty thousand just to have one sample tested. To me as a small company, I cannot afford that, and again the fact that I need to be in a factory space. Renting a factory space for me is very expensive. That is one of the keys whereby the accreditation board says, "We are not going to look at you until you are in a factory space" I cannot be there as a small company that is starting. For me that was a turn off that you know what? Okay I will have my product and then black market is out there I will continue there but because my ambition is that I want to go big, for me to go big I need to have that so it's something. So if information can flow, easily to ask and the support is the one thing that we need as small companies, and many of them are just turning at that first door that you knock and you are required to have so much for you to be considered. I could have turned back, yes I'm not there yet. I'm pushing because I'm ambitious, I want to get there, but that kind of reception that you get, that we are not going to look at you because you are not in a factory space. We close that door that you operate at your back house, I understand the safety and everything that you know, it's surrounded that office, I'm not saying those must be overlooked, no those are the key things in quality. But I cannot afford the factory space right now. I don't have thirty thousand for one sample to be tested. So, for me those are the things that I believe that after this I will have clear view and clear understanding. What the gentleman said, it's the truth I support, and I agree with him.

Moderator: Thank you. Participant and then Participant. Participant let's hear.

Participant: Okay thank you. What I've realised from what Participant just said about the quality, yes it's something that most SME's they complain about the cost of getting these services, and then secondly I will talk to calibration. Most SME's labs they don't understand why they get calibrated, what they get their stuff calibrated and other things. I'm quoting one who once said to me "we are doing this for SANAS sake." It's a small lab that was calibrated, but because SANAS when they come they want to see the equipment calibrated, having stickers and all those things, and I ask that's the only reason why you are bringing your stuff here, they said yes. And another thing that I've realised, some they don't even check the calibration certificate once they received

them because that only serves for SANAS purposes, and even for SANAS purposes those who can look at the technical [unclear] of the certificate. If their errors some end up picking them up and showing the labs because to the lab doesn't mean anything. And then thirdly we once went in one laboratory, used one calibration certificate that let me say they got certificate from us in 2013 [unclear] that they have to calibrate after every two years. From that 2013 after every two years, they will scan that certificate and change the date and [unclear] information and when SANAS comes they just present that, until one day the person who was responsible for that I think left the company, and the one who joined brought the certificate to us. Like okay fine this is what you calibrated in 2019, in 2018, I want it to be calibrated. When we look at that, the person who calibrated is the person who left the organisation six years ago, and so we have to start now and look like okay fine it was calibrated by this person, he's no longer here. And when we try to register a complaint, and try to investigate ourselves, we find that they've been forging that certificate, meaning that they don't understand the meaning of the equipment to be calibrated. And some people even take [unclear] thank you.

End of first recording

Moderator: Participant.

Participant: Thanks, so much Moderator. First of all, can I just request Sam to stop sharing his, the screen, because what it's doing, is it's taking up a big portion of the screen which is preventing us being able to see each other nicely. So, Sam, if you could just go to the right top of the screen and there where the little arrow goes into the box, just click on it, which will stop sharing.

Moderator: There we are, excellent.

Participant: Now that's much better, thank you.

Sam: Thank you Participant.

Participant : Okay, So I think I would like to take one big step back and I would like to say that the biggest problem **Participant** has is the fact that it's not clear to her as a SME what the requirements are, what the goal posts are and that is important because; If she knows what the goal posts are and for example if there is now a specification, a regulated specification for the manufacture of sanitiser then everybody that's manufacturing sanitiser is playing by the same rules. But I hear Participant is trying to

do it the right way and she is trying to have her sanitiser tested to make sure that it is a quality product. The reality is, she is competing with a whole lot of people that is selling sanitisers that is made with paraffin and some other stuff that you can buy on the shop floor. And so, I think that's where we need to start as a country, is first establish a regulated environment for these things. Then if Ayanda then has to have her product tested to make sure that it meets certain technical specifications and the process to do that is too expensive. What we then effectively do is, we starting to say to industry certain things can be manufactured by SME's, other things cannot be manufactured by SME's because it is too costly. Then the third point that I'd like to make is that the quality infrastructure or the technical infrastructure institutes are charging prices for their services which are totally out of reach of SME's. So, if they want SMEs for example to get instruments calibrated at NMISA or they want them to be accredited by SANAS those institutions are going to have to either have their services subsidised. My proposal would be that instead of taking the money that they are throwing after SME's in all wrong directions, they could take government money and invest it in subsidising Ayanda's test cost to have her sample tested, so that she's got a test certificate which would then enable her to compete against other companies because she would be able to demonstrate that her product is of the required quality. What's currently happening is; she's got to find R30,000 whilst they're throwing money after SME's to do all sorts of other things and it's not adding any value to their business proposition. So, I think first of all we need to have the clearly defined regulations so that we all know what game we're playing to start with, what the rules are. And then second of all we need to want to make sure that if it is something that Participant wants to get involved in it must be affordable, because if it is not affordable it doesn't matter what you are going to do she will never be able to participate in the game.

Moderator: Participant, I see your hand, can I just request that we move on, I am a little bit concerned about the questions. I would like to start with more questions. Is that okay participant?

Participant: That's okay thanks.

Moderator: Okay. I'm going to come back to this point later so if you can make a note so that you don't forget what you wanted to say then we can record that. Is that okay?

Participant: That's okay; I've just made a note.

Moderator: Right, in terms of the questions, let's look, thank you so much for all your participation, it's very valuable. Sam, can you just stop sharing please? Thank you. Right. Participant, something has happened to you now. Okay, okay. Right. The next question we're going to look at is; what do you think are the most critical drivers that can assist SMME managers and owners when they want to use services from the quality infrastructure in order to optimize performance. I am going to repeat; what do you think are the critical drivers that can assist managers or owners if they want to use the services from quality infrastructure to optimize business performance. Anybody that wants to offer a viewpoint?

Moderator: Moderator, can I maybe kick off this one and that is to say that I think the drivers are, and it comes back to what I said earlier about the target, in other words the specifications that the product needed to meet. Because if I'm manufacturing carpets, the technical specifications are going to be a lot less onerous than if I am manufacturing drugs. So, the drivers are largely dependent on what the product is that I want to sell into the marketplace. And I think that that is something that is not well understood by the SME's. You will find SME's that are trying to play in a technologically advanced space with no technical specifications and very little in the way of accreditation calibration and all the things that are necessary to play in that space versus others that are playing in an essentially non-technical space, but then are running after all these very costly aspects to try and improve the quality of their product. And I think it comes back to the fact that as technical infrastructure institutes we are not doing enough to educate the SME's about where it is appropriate to have all these technologies, accreditation, traceability, all of those things versus where it is not appropriate, and it probably won't make any difference to your business proposition. So, I think there's a lot of work that we need to do there but then the SME's I think somehow need to be able to carefully consider that. Their managers need to consider, are we producing a technologically advanced product that requires all of this or are we not and therefore it probably doesn't. And I think that's the main driver, is how technically sophisticated is the product we are trying to sell.

Moderator: Participant.

Participant Thank you Moderator. [Unclear] what Participant had said? So, one of the key things as well that would assist in optimizing a business performance is the monitoring of the performance, of the operations, sorry. So, operations are very key,

so there should be in place some form of continuous improvement which will have an impact on the business performance. So, for example if we think about the transformation model we can say accreditation, for example, is one of the inputs if you have systems in place you are able to monitor the performance of your activities and then the output will be then quality operations. So, that's very important, it goes hand in hand. [Unclear]

Moderator: Participant do you want to venture anything?

Participant: Okay [unclear] which I think there is [unclear] I would say I noted down here, quality products [unclear] Looking at like something that participant [unclear] the criteria of getting that in place [unclear] laboratories even if it's not like for accreditation. When you develop things like the CRM's you need to look and compare what you are producing if really that makes sense. And the [unclear] is one of the criteria of what the SME's can look at [unclear] if we have like accreditation, yes I've had the issues and then we know that what the instrument that we used they need to be calibrated so that whatever you be measuring when you produce or manufacture your products it is really in [unclear] and then the CRM's and then [unclear] if you don't get [unclear] at least the process throughout from the beginning to the end you get that system at least [unclear] and then also looking at the regulatory requirements like what are the technical specifications of what you are producing if you get to know that and then be comfortable, be aware of those that can offer you those [unclear] and in brackets there are also [unclear] grants and subsidies where a certain level of SME's which can assist them to achieve all these things that I have listed because of the cost implications. Thank you.

Moderator: **Participant**, now you are a business owner, so let's hear from you. What do you think are the critical factors that could assist you in terms of use of quality infrastructure in your business? What drivers do you think would assist you?

Participant: Short question, I mean short answer for me is education. But fortunately, enough I have a quality background because I have a BTech in quality and in from my previous work, I worked a lot in the quality space, I worked in the laboratory, so I understand the imperative of having your quality service in your quality product. One thing that people need to understand is that when you engage or reembark in your quality training you are not doing it for SANAS, that when they come and they valuate

you they find everything is for your business, is for your product, is for the service you are offering and quality is not something, that you know, it involves planning it involve, involving your stuff. Because is not quality for you, is the quality for your organisation but if you have that information as a manager and you are not passing that manager to your employees that they are in the same, you know, ballpark with you then you will have hiccups in the quality because if, you know quality is something I like very much and I always say that you know every employee in the company, be it a cleaner, be it that person who is cleaning the dustbins, empty the dustbin, quality is important. They need to understand the quality. So, it's important that managers or the owners of the company if they don't understand quality themselves, it is difficult for them to transfer that education to their employees, employers so they all work towards the same goal. Because what Participant just said now that sometimes people they take it for granted if you have machinery that you need to calibrate. Some people they will not take it seriously what you are do because they don't understand the aim of calibrating that instrument. Why are you calibrating that instrument, that is number 1? When you are using those CRM's, why are you using those CRM's? So, that education to me is a key in all the fears of chemistry. So, I mean not of chemistry, of quality, sorry. So, for me the key is education. SME's our there they need to be educated why quality is required. For me quality, you know is doing the right thing right the first time. For you to do that right the first time you must have information, you must have education, you must have planning in place, you must have resources that you are required. So, it's a long journey for me, but because I understand the background of quality, so for me it's easy that's why I'm pushing, that you know what, I will get there. It can be next year, but I will definitely get to the level I want to. So, for other people they don't have that education, so it requires you people out there to go and engage with them so that they understand exactly that is not about SANAS that is going to come and look and evaluate us but is for us, is for the business. So, I will end there.

Moderator: **Participant** , I'm going to get a quick comment and then we need to move to the next question.

Participant: Thanks very much. I just wanted to respond to the last thing Ayanda has just said. I think one of the problems we have is that we all know education is key in this space. The problem is how does one get to engage with the SME's? There is the lack of representative organisations of SME's for the technical infrastructure institutes

to go and engage with and that's impossible to go and engage with every single individual SME. I've personally had some very nice experiences with a one-on-one engagement with an SME. If only one could expand that to be talking to a group of fifty SMEs about the same subject. Fifty SMEs would potentially benefit but I've only had the opportunity to gain engagement with one. So, if she can point us in a direction of how can I engage with a representative collection of SME's and then educate them? I think the willingness to do the educating is there, it's just that trying to make the contact is difficult.

Moderator: And you've now hit the nail on the head because the next question is; what are the limitations? So, you've just highlighted a limitation that would limit SMME owners to use quality infrastructure services. Participant, can I hear from you? What would limit the quality infrastructure services?

Participant: Okay, I indicated costs and lack of awareness [unclear] and in my head was actually asking about do we have a body in the [unclear] the SME's. Thank you.

Moderator: Participant do you have an idea of limitations experience by SME's? Participant? Participant?

Participant: Thank you. While we wait for Participant. Just from my experience. So, for example, you'll find an SMME was interested in getting accredited and the first thing they will enquire is what does the process involve? The moment you outline the process you don't see them ever again. So there is a reason for that; one is hearing that for the first time it sounds very complicated, you know, because they may have thought that accreditation is a simple process and as you explain what is involved and then they find wow this sounds very difficult, you know. The second point revolves around this cost issue again. The moment you explain what it cost to get accredited you don't hear from the people again. You know, and I don't know if there is time just to give a positive testimony in one there was a partnership between SANAS and SIDA. So SIDA approached us and said we have identified this SMME we want you to assist them until they get accredited. So obviously we entered into a service level agreement, the issues of funding and so on whilst then a split between SANAS and that organisation. So, they were assisted from that point of view financially. Both SIDA and SANAS came to the party and then we started then doing application, document review, the actual initial assessment was then. So, until today as I speak they are still

accredited and they are on SANRAL's list so they do benefits from some of their nice contracts there, so they are doing very well. So that is one of the good stories over many years that we can at least, but then the problem is from their [unclear] we've helped more and more and more and more.

Moderator: Ayanda, what would you think is the limitations?

Participant: I think is just lack of knowledge because from what I'm hearing from Participant, there are good platforms out there that are working for SME's but we as SME's we, you know, I think exposure is our limitation, we don't know about this challenge.

Moderator: Participant.

End of second recording

Participant: Sorry, thanks, I think the automotive industry has quite an interesting model, and that is they actually try and develop their suppliers to the point where they are delivering acceptable quality, so what will typically happen is that they will identify a small supplier, SME supplier. They will get them to supply relatively non technically sophisticated components. And then as they embark on this journey of helping them to implement a quality system, eventually having their products tested by accredited facilities, etc. That will ultimately develop them into a supplier of, in some cases fairly technically sophisticated product. And I think a similar model needs to be followed in terms of the technically infrastructure institutes is that exactly the thing that participant has just described needs to be expanded. But I'll come back to the point I made earlier. We need to have a collective representative body to engage with and perhaps identify a small group of let's just say 10 SME's with a nice mix of those that are producing a highly technologically advanced product or trying to and others that are producing a relatively low non technologically sophisticated product and then one can actually use it as a group to embark upon a journey, a partnership if you like, where the technical infrastructure institutes can actually each contribute from their own specific area. So NMISA traceability, SANAS from accreditation, SABS from the technical specification side and then one can develop them along a certain journey until you can let them go and then say; "right now they can basically stand on their own two feet and develop quality products".

Moderator: I would like to throw a cautionary question in here, in terms of limitations. Oftentimes quality infrastructure is used to ensure that we get quality products in the marketplace. What about innovation? Because isn't that a limitation to innovation, because if there's innovation and it's a brand-new product how do you ensure quality if the standards don't exist?

Yes, Participant.

Participant: Can I respond please because, I think you wouldn't be developing a product if there wasn't a demand, so essentially a demand determines the specification. So, the very fact that you're involved on innovating a new product means that there's a jubilee there's a requirement out there somewhere. Somebody's actually going to buy your product because they think it's a good product and so therefore, I think that inherently is giving you the technical specification. And I've often said in a lot of quality presentations I've done over the years, that a quality product is one that meets the customers' expectations. So, a quality product does not have to be a sophisticated product if I'm buying something simple and I want a water drinking bottle as long as I can drink water from the water drinking bottle it's probably a quality product it doesn't have to be made of expensive glass with fancy seals and all sorts of fancy stuff. It must just meet the basic requirements.

So, I think my answer to Participant would be that innovation is driven by need or by expected need and therefore that need should determine more or less the specification we need to try and meet.

Moderator: Right in terms of, thank you so much for all your inputs Participant your hand is still up.

Participant: My apologies.

Moderator: Right, in conclusion let's quickly look at the… is there anything else that you think should be improved with regard to equality infrastructure services, **Participant**?

Participant: Yeah of course there's a lot that needs to be improved and in relation to SME's, I will still stand by that issue of awareness. They need to know what is in it, what is there, what system is in place in the country that can assist their businesses. We really need to start there and secondly the technical infrastructure institutions must put in place some form of a program that will be able to assist the SMME's and we

know that today whenever they were talking about this money issues into it you know, and that is where there is always the stumbling block. You know they may be good ideas but if there's no funding and it will not go anyway you know. I think we have a very good exercise previously and it worked. We had government coming in the form of Cedar, if we can have more of those and sensing peoples.

Moderator: Participant, you had your hand up. What do you think can be improved?

Participant: I wanted to say who the QI is because we are not… we used to use the term [unclear] people don't know the infrastructure; they don't know the purchaser of the nation. And again, as part of the awareness maybe just to educate the SME's that producing a [unclear] and producing something that is not off quality. And also, maybe if we do have the opportunities maybe just to identify how can we reach out like I said, Participant said something about like they do have their technical committees wherein you find but I don't know if it's only attended by those who are credited or by those who are in this interview or what. But I think the SME's also form part of those committees and then I don't know if possible, topics discussed there technically they are for those who know the QI, for those who understand why. So, I think they should also be considered into that and then just to get an opportunity because I can say to you that maybe Participant can back me up on this one this is not for the first-time people are talking about making awareness to the SME's out there. We talk about it; we cover it and go home. And then come again we talk about that I would be talking about this thing for quite some time now, thank you.

Moderator: Participant ?

Participant: If I can just say that I think this whole issue of cost is something where the quality in the technical infrastructure institutions need to come to the party whether, it be the cost of procuring a standard from SABS or going for accreditation through SANAS or having an instrument calibrated at NMISA. Those are largely very costly exercises currently and I think something needs to be done about that but also coming back to the awareness the SME's, you can produce a quality product with cheap instruments with instruments that have had inexpensive calibrations performed they just need to be fit for purpose and so what is lacking is the education of the SME's to make sure that they only develop quality system which is appropriate to the product they want to sell. Now come back to the point I made right in the beginning, if you're

trying to sell in a relatively technologically simple product you don't need a sophisticated quality system to back the quality of that product up. So, don't spend a fortune on buying the most expensive equipment and having it calibrated at the national metrology Institute when you could have that instrument calibrated via SANAS accredited laboratory at a 5th of the price and it would still be fit for purpose. So, I think we need to somehow do two things, reduce the costs but we also need to educate SMME's as to what is a fit for purpose quality system so that they don't unnecessarily spend money on something which is actually not going to add any extra value to their product proposition.

Moderator: Ayanda? What would you improve if you had it in your hands, what would you improve?

Participant: Thank you, Moderator. Just to comment on what Participant just said. You know, I went around, and I look for other laboratory that can test my samples and is never cheaper I got something around 1.5 but those labs they are not accredited. So now the question I had [unclear] ok I have this piece of paper from the lab that are not accredit, does it say much about this or do I still need to go through the 30,000-separate testing. OK coming to your question about the improvements, I think they said everything I wanted to say about awareness, and we are there we don't know where the channels are that we must follow the gentleman's and the lady they just covered you know what I wanted to say. Thank you.

Moderator: Participant ? Your hand is up Participant.

Participant: [unclear] something about a lab where in the cost is very cheap but when we look at things the system is not replaced. Remember as a customer you are also required to go and audit to suppliers and that if you get to do that exercise as the SME that one services you can be able to just go there and look at the [unclear]. You can find they look like [unclear] but what they do is like, wow! Thank you.

Moderator: And then the last question I would like to ask that's part of the concluding questions is if you could change something about services provided about the quality infrastructure in South Africa what would you change in order for the quality infrastructure to effectively improve the performance of SME's? So, what would you change in the quality infrastructure that would improve the performance of SME's? **Participant**?

Participant: To reach out to the SME's. Because it's like we operate [unclear]

Moderator: Participant ?

Participant: I would say that we must get out of our ivory tower syndrome and come down to earth and engage at an appropriate level, because the technical infrastructure institutes have a way of conducting their activities at a certain level in silos and I think that level is too expensive and too sophisticated for what most SMEs require. So, I think what is necessary for us, is to get out of this ivory tower at this high level and come down to earth and engage at an appropriate level a fit for purpose level at an appropriate cost of course.

Moderator: Participant?

Participant: Yes, one of the things that could definitely need to change is, you know DTI requirements. If you actually follow what the DTI does, they've got problems in place and so on the left but then the requirements are always so complicated you know, or sophisticated that if you read those documents you just give up, but I will never get this thing you know. So, they do have those funds that are being paid them, but they are hiding under very sophisticated documents that were written by consultants. And for you to get there, it can be very demoralizing, so they need to simplify things for SME to be able to access this file.

Moderator: That's very valuable. Participant?

Participant: Yes, amen to what participant is saying. Simple processes for us that are affordable then we will jump in the boat. Thank you.

Moderator: I would like to thank you all very much for a very successful discussions and your valuable opinions and I hope you found the discussions very interesting if there's anything that you disagree with…. Sorry Participant, your turn.

Participant: Sorry for the last time.

Moderator: OK, you also had a comment that you wanted to raise earlier.

Participant: Yes, so that comment had to do with that testimonial I gave in between. So, I managed to squeeze it in.

Moderator : Well done. participant?

Participant: No, I just wanted to ask like this type of discussion is it only discussed now because of this group or is this somewhere out there where they do sit and talk with their representatives hearing the real cries from the real people, do we have such platforms?

Moderator: I actually, do you want a real answer, or I know the moderator is not supposed to talk. Sam?

Sam: Thank you Moderator, thank you colleagues. I am just forced by a pressing need to make a comment or two. Although I was, you know planning to just observe and derive at critical information from the participants themselves. But just to answer Participant's question or comment basically, Participant this is one of the platforms that has been, you know established from a study perspective because the argument from my side from the researcher [unclear] was that there is a lack of the framework that will enable you know, a platform such as this one or a framework that will integrate in relationship between the quality infrastructure and SME's. So, indeed my problem statement on this study is that there is a lack of a framework, and it is being attested by what you are saying. You say; "are there any platform or frameworks that are available that integrates the relationships between services provided by the quality infrastructure and SMME's. So, in conclusion to answer your question is that this study is intending to develop that framework that will enable and enhance the relationship between the services provided by the quality infrastructure and the performance of small medium enterprises. So, I may say I'm glad Participant that I might not be one who came up with this framework maybe it has been established somewhere around the world but, I have presented my argument for the purpose of this study that this is a unique study and Moderator will attest to that. We have to contribute in terms of providing that framework. Yes, in my view this is one of their best studies that looks explicitly on a framework that integrates the relationship between the services provided by quality infrastructure and the performance of small medium enterprises in particular in South Africa and in particular in developing countries. Thank you.

Moderator : Researcher it looks like you hit the nail on the head here. Right, just to say if there's anything that you're unhappy with you welcome to reach out to me. Sam as included my email in the invitation so if there's anything that we've done that we could improve upon, kindly let us know so that we can improve on it and if there's anything else, I would request you to raise your hands. Sam, your hands up. Ok.

Sam: Moderator I think that was from the last time.

Moderator: Thank you. If there's anything else from anybody? Now is your time to speak or forever hold your peace. There we are, then I officially close this now. Thank you very much, this was a very fruitful discussion. Thank you for the opportunity to harvest some of your thoughts and it was excellent to find out more in terms of your contributions in recent. Participant I'm very sad that we couldn't see you properly but very grateful that you took part. Researcher

Researcher : Thank you. Yes, Moderator just in short, I like to appreciate your time and your valuable contribution. And I must just say in conclusion that apart from engaging into this focus group discussion for the purpose of my study, you are welcome to engage me or any of my colleagues beyond this study because the intention is not to realise the objectives of this study but to go into the practicality and the real contribution of what you want to achieve. Thank you very much.

Moderator: Thank you very much, Researcher I'm going to stop the recording and you can then close off.

FOCUS GROUP 2

Length of interview: 1:07:35

Reseacher: All right colleagues, firstly I would like to welcome you all and I would like to thank you for your time, amd vor taking the time and volunteering to take part in this focus group discussion. My name is Reseacher and I'm the researcher, who's involved in the current study, and the title of my research study is as follows colleagues, I am developing a framework for the application of the National Quality Infrastructure by small and medium size enterprises in developing countries, specifically I am looking at the case of South Africa. Colleagues the purpose of this group discussion is to assess your current thoughts and feelings with regard to the use of the services from the quality infrastructure system by small, medium enterprises in South Africa. I am cognisant of your busy schedule, we are already late by 8 minutes or so, however my apologies for that. Therefore, this group discussion guide was arranged in such a manner that it should not take more than 60 minutes of your time. At this point in time colleagues I would like to hand over to the moderator which is Moderator, to take the process forward. Thank you very much Moderator.

Moderator: Thank you Reseacher. Can I just ask, are we referring to the people by their surnames, or their names?

Reseacher: Moderator if you ask me I will say that I deliberately called Participant, participant because I thought his surname Mr Participant is easy pronounced, but if you can pronounce Participant that will be okay, I don't think he will mind if you call him Mr Participant. Similarly, to Mr Participant, his surname is a little bit nice and complex, but his name is quite simple, he's Participant. Thank you Moderator.

Moderator: Thank you very much Reseacher. My name is Moderator, and like Reseacher says, nice and complex, but my surname is worse, so we'll stick to my name. My name is Moderator. I'm currently a student at UNISA, and I will be moderating this session this evening. I would like to offer each participant the opportunity to introduce themselves, so in this regard will you kindly state your name, the institution or organisation that you represent, and what your expectation is from the group. So, if you see under number 2. 1, 2, and 3, those are the things that we are looking for from you. Participant.

Participant: My name is Participant, I come from the NRCS, I'm the manager in KZN province. I joined the group to... As I realised [unclear 01:03:46] is part of our sister entity, and I also intend to do my PHD. What do you call it, PHD?

Moderator: We are doing BBL's, but you're welcome to do your PHD.

Participant: Yes I mean I'm doing, next year I'm completing my MBA so I thought that I should learn how does this, I'm a scientist so I think MBA business administration is a bit different from our science, so it's an opportunity for me to see and get the feel of it and see if I can do it at a later stage.

01:03:07

Moderator: Participant. Participant!

Reseacher: Participant is muted. Participants unmute yourself. Participant. Participant will you kindly unmute yourself. I'm going to call Participant if you don't mind.

Moderator: Okay.

Reseacher: I don't know what the problem is.

Moderator: There we are, I think he's talking.

Reseacher: Participant.

Moderator: There we are.

Reseacher: Participant I would advise that you leave the meeting and then join again, probably if you can hear us.

Participant: Reseacher can you hear me now?

Reseacher: Yes I can hear you.

Participant: Sorry, you know there's something wrong with my button here, I unmute it does the opposite, but my humblest apologies for that. Colleagues my name is Participant, I work for SANAS as the accreditation manager for certification [unclear 01:01:41]. And really in short my expectation is of course my interest to be part of any discussion that has got something to do with the quality infrastructure. I am [unclear 01:01:28], learning as well, as a student. Thank you, I hope you can actually hear me properly.

Moderator: Excellent, you are so clear.

Participant: Thank you very much.

Moderator: welcome to this forum, and I would like to reaffirm confidentiality.

Reseacher: Apologies Moderator, we left one participant up now.

Moderator: Aah! Sorry Mr Participant, sorry, sorry, sorry.

01:00:57

Participant: Good evening colleagues my name is Participant, I currently work at the National Research Foundation as the executive director for corporate governance. I used to be at the South African Bureau of Standards for many years in the development of standards [unclear 01:00:36] standards and chaired committee's there and managed a department to develop national standards. I then obviously went all the way until I was the head of corporate strategy there, and now I obviously work in the National Research Foundation, but I have a keen love for the national infrastructure having been with it for many years and having seen much potential that it has to help develop our country. So, my interest here basically is always to contribute to anything to get better understanding of [unclear 59:47] so that then we can continue to flow to the economy of South Africa [unclear 59:40] from colleagues as to what they experiences is and their knowledge of the system is.

Moderator: Participant my humblest apologies, I'm very sorry because I know you I decided you know everybody, so very, very sorry about that. I would like to continue to number 3 on the agenda and reaffirm confidentiality. The research of this discussion will only be used for the purpose intended, and the information will not be disclosed to any other party except for the purpose of the research [unclear 58:52]. If you then go further I assure you that your [unclear 58:45] the transcripts will be anonymous and the [unclear 58:41] and the transcribed notes of the focus group will contain no information that will allow individual subjects to be linked to specific statements, the recording will be kept safe...

[unclear 58:26 - Reseacher busy with a call till 58:02]

Suddenly all the videos is off as I request for the videos to go on. Thank you very kindly Participant I really appreciate you. No now I've got the wrong person here. Is this Participant?

Participant: Yes. That's me.

Moderator: That's Participant, sorry I didn't know the face. And Participant can you switch on your video? Right so further to this please try and answer as accurately and truthfully as possible, and then comments can be discussed, but refrain from taking over the conversation. And answers are requested to be volunteered and participate as much as possible but refrain from interrupting each other so that we can transcribe the information. If at any point in time you would like to address the forum you're welcome to raise your hand, you can either press the Tab button, or if you click on participant or people then you will find the little button that shows that you can put up your hand. You do not have to agree with any of the views of other people in this group, and it is much easier to respond to people when I can see them all and we can see who's talking and who's not talking. So, if we look at the introductory question, I would like to ask what is your current thoughts about the use of the services of the quality infrastructure system by SMEs in South Africa? I'm repeating the question, what are your current thoughts about the use of services from the quality infrastructure system by SMEs in South Africa? At the bottom of page 2 as you can see it starts with [unclear 55:45]. So, what are your thoughts? Participant can I press you on your button to think what is your thoughts on the use of services of quality infrastructure by SME's?

55:31

Participant: Okay I see someone trying to come in there.

Reseacher: Sorry Participant, sorry Participant.

Participant: Do you hear me?

Reseacher: Yes, sorry Participant it's Reseacher here.

Participant: Yes Reseacher.

Reseacher: I would like to apologise to interject. I have just admitted Participant. Moderator is it advisable to just revert back and try to bring Participant on board? Participant! Participant!

Moderator: Participant can I ask you to kindly introduce yourself by stating your name, the institution you're from and what would be your expectation, nd may I please request that you put on your video?

Participant: I'm actually still on the road.

Moderator: Okay don't put on your video.

Participant: My name is Participant. Can you hear me?

Moderator: Sure, yes. You've now disappeared.

Participant: Can you hear me?

Moderator: We can hear you.

Participant: My name is Participant [unclear 53:53] I'm a director and owner of [unclear 53:47] training and projects. We are a precast concrete manufacturer of stormwater pipe and culverts and basically precast concrete products. And my expectation is to take in as much as I can, to be equipped at the end of the session [unclear 53:23] even more than what I already know of the services that are being provided.

Moderator: Thank you very much Participant.

Reseacher: Moderator! Moderator!

53:09

Moderator: Yes.

Reseacher: You can inform Participant to switch off his video its fine, because he's on the road.

Moderator: We appreciate your kindness, thank you very much Participant. When you're in a more convenient space you're welcome to switch on your video again. Right so we were interrupted so we're getting back to you.

Participant: Okay [unclear 52:35] I think most of them obviously seem to have been designed for, they are better suited for larger companies. They tend to be expensive, and a lot of SMEs seem to struggle with affording the services directly, and where I have seen them using them was when there have been some, either bridging finances or support from some of these enterprise development agencies across the country where SMME's were either assisted in accessing the services. And also, the one other thing I also noticed is that most of them tend to take the services without necessarily, it's like when you say something is, there's no intrinsic motivation to use them, rather that you get imposed by other people. So, I think there is still a lot of gap in the SMME's seeing the value of these things, most of the time it is other people who direct them to the services and they look like a grudge purchase. They usually don't seem to be willing

to invest their own money directly into those services, and because they designed mostly in technical committees that are a little bit more expensive to participate in. I think most times the needs of SME's don't really get reflected with those services.

Moderator: Very conscientious, thank you very much. Mr Participant.

Participant**:** Thank you chairperson. My honest view regarding these technical [unclear 49:57], they are not easily accessible, especially for a startup. [unclear 49:47] when you are probably applying for a job, or you hear them from somebody so that they are, their contribution to [unclear 49:34], you need to be established like Mr Participant has indicated, and it's very, very difficult to have access to this SMME as an entry to be familiar with their mandate. It's very easy to confuse what's between the SABS, between NRCS, between NMISA, but you are very possible to know about SANAS because they're the only body, but I think they're not existence to the SMME. They are only existent to people who started their businesses while they were, for example I was a previous employee, and I know [unclear 48:29] from a guy from a small town in KZN, I hardly know and understand their service. I think that's my short summary.

Moderator: Excellent. Participant what is your opinion?

48:15

Participant: Moderator thank you very much, I will just build on to the previous speakers, but I think to start off with we do have a very functional quality infrastructure in South Africa, a very well-established quality infrastructure in comparison to other African countries, and I'm looking at this from an independent point of view. [unclear 47:46] in certain countries you will find that the standards body is within an accreditation body, and they also share some regulatory activities there and it's just a mix up of things, and you really cannot approve the impartiality there, to some extent that also of the end users, or investor interest. Because you need that level of independence if you are to look at implementation of Q I services. Like what Participant said previously you find that the use as such is s bit too much driven by the end user request or requirement. You find that in certain cases they are imposed on the SMEs as a requirement down the line of the value chain of their businesses, because it's a regulatory requirement, and depending where you operate on. In certain cases, it's either voluntary or regulatory [unclear 46:43] if the leadership really sees some gain in

implementing quality infrastructures [unclear 46:34], but again the downfall there becomes the costs that comes with it because it doesn't really come cheap. I think as the main driver, my thoughts would be either if it's an end user requirement you find yourself having to comply with that, or else if the leadership draws some value in using the Q I services you will find SME's using that. [unclear 46:08] for now.

Moderator: Thank you very much Participant. Participant the question is your current thoughts on the use of the services of the quality infrastructure system by SMEs in South Africa.

Participant: Well just to also add on to what has already been said, I'll just speak from my personal experiences. SANAS only comes to light to a lot of SMME's when we start talking about you need to have a BEE that is accredited by SANAS, or you need this of SANAS, so that's the visibility of SANAS is not so. It's not touchable, it's not reachable to up and coming businesses. Which also brings a big limitation to, when it comes to product or service accreditation that you want provided in terms of business you are going into. Basically, it also limits the option. Hello!

Moderator: Hello, we're listening.

Participant: It also brings a limitation that we cannot cross borders of, because when you talk about products they are offering [unclear 44:32] can maybe make way for other laboratories or the other institutions that can compete against the existing one. That will also help with the quicker process of somebody getting their product accredited, tested, and so on and all of that. From my point of view that is the experience that we've had, a barrier of having to produce, of having to [unclear 43:49] the Research level as a well-established company, a corporate type of level of a company when we are only an SMME. I think that's my take on [unclear 43:33] as far as this is concerned.

43:28

Moderator: Thank you so much, we now moving on to the next question. I would like to hear from you, what do you consider is the most critical drivers that can assist SMME's, managers and owners if they want to use the services of the quality infrastructure in order to optimise their performance of the business? What would be the critical driver that can assist SMME managers if they want to use the services from the quality infrastructure to optimise the business performance? So, the [unclear 42:47] Participant I see you want to speak.

Participant: I'm thinking that the first word that is coming into my head is incubation. It is very difficult to get mentorship and be incubated by this technical infrastructure. It's almost like you get a service from them, but they will never mentor you until you are established. If I put it practically it is, I want to open a calibration lab, or a testing lab, or an assessment lab. It will be very, very difficult [unclear 14:51] institution at no cost to them. Their courses are expensive, they don't have that incubation mentality, you have to pay for your [unclear 41:32] they need to start having an incubation facility, identify them, incubate them for 2 years [unclear 41:24].

Moderator: [unclear 41:17].

Participant: I think what comes to mind as a critical factor really it's the SME [unclear 41:02].

Moderator: [unclear 39:44].

Reseacher: Hello Moderator.

Participant: [unclear 39:38].

Moderator: Yes Reseacher.

Reseacher: Sorry to interject participant, I am just suggesting that we can hide our videos when we are not speaking and we can allow the speaker, only the speaker to reflect his or her video, thank you. Just to enhance connectivity, thank you.

Participant: Okay thanks, if anything knowledge is important, the important thing is if you're an SMME you need to understand what value you get from using the services from the quality infrastructure so that you are able to do your own cost benefit analysis. And also the other thing is once you understand what value you add and you need to be modernising different kind of resources to invest in this because at the moment they are a little bit prohibitive, costs are an important part. It's not very easy to access the services as we say. And in the end I think also the problem with our infrastructure is the way that it's funded at the moment, obviously it is regarded as more or less commercial type services with a mixed source of income, and they have to most of the time raise their own revenue in order to be able to pay for their upkeep. I think that sort of complicates things, but again also the SMME needs to get itself parked maybe into the different government funding opportunities maybe, if they can specify maybe their need for the services there, like they pay for a lot of the SADA services maybe they

could also be asking for assistance in accessing their infrastructure services. I think both the networks that these companies keep and the knowledge about the value that they can get from this, and resources, I think those are important things.

36:21

Moderator: Thank you very much. Participant what is your opinion on the critical drivers that can assist SME managers or owners when they want to use the services of the quality infrastructure? Aha! It's so nice to see you. Your microphone is muted. Participant!

Participant: Okay basically we need more exposure, more exposure, more exposure and also when it comes to a funding model that the SMME's should maybe be affiliated to, funding models are not as pretty as it's painted, in the seminars, in the media or you know how it is said it is easy to get funding. Because when you're starting up a business it can take up to 12 months before you are funded for the business, and in the meantime you need to supply product to a market that is active. I think if maybe SANAS can also come with a starter package of some sort for the start-up business and the up-and-coming SMME's where they can have their own pricing package or pricing bracket. It's quite expensive for a start-up to provide an accredited product on their own. The costs are the Research, for example there's a standard pricing that is used across the board [unclear 34:31] for a new company to begin with because every [unclear 34:24] that you've got you want to put it into production. I would say exposure and a lot of options can be explored by the SMME's on the SANAS services.

Moderator: Thank you so much. Reseacher if I could ask you to click on the cross to leave, not on your mike, the one right next to it, just click on the little box with the cross, there we are that one, there we are, that's better. Okay if you put off your video then the person that speaks will, their video, there we are, Thank you so much Reseacher that will help us so much with the streaming of the information.

Reseacher: Thank you Moderator.

Moderator: Right so the next question I would like to ask is, what do you think are the limitations that limit SMEs to use the quality infrastructure services? What limits the SMEs to use the quality infrastructure services? Now you need to put up hands because now I can't see you. Participant.

Participant: I have to [unclear 32:46].

Moderator: Participant can I ask you next? Sorry are you finished?

Participant: Yes.

32:15

Moderator: Participant can I ask you next?

Participant: Yes sure. Basically, the cost and also the requirement, and I can make an example, because it's almost as if this meetings for me because I've been through all this. Basically, you get [unclear 31:51] company. I was using [unclear 31:45] mixer to make my concrete, and the [unclear 32:32] to get the quality manual [unclear 31:28] was required, and the infrastructure set up that was needed for me to [unclear 31:22] the pricing. And also, the infrastructure that was required to have in place so that you can be rendered accredited, regardless of the other processes that you are able to put down with a smaller budget.

Moderator: Thank you very much. Participant.

Participant: I will also tend to agree with what the other colleagues are saying, the costs are really something that is prohibitive. And also, the fact that a lot of the requirements are written mainly, if you see who participates in committees or groups that put together the requirements, they are often people who representing larger companies. Because they are the ones obviously who are able to [unclear 30:18] the cost of participation and also, obviously they are the ones who also afford people with maybe long years' experience and technical knowledge [unclear 30:01] time to really dedicate their time to writing the specifications and [unclear 29:49] the requirements of any kind. In a way the requirements themselves can be overloaded. So somehow something is required in order to find either bridging standards or write standards or requirements that are suitable for SMME's and the kind of markets that they serve. Because I think we tend to have a infrastructure that is geared towards larger, bigger type economy that is not very, at the moment the way that it is structured it is not very SMME sensitive.

Moderator: Participant can I ask, do you think that there's a barrier? That they can have barriers to entry.

Participant: To the extent that the infrastructure institutions themselves do not, they depend how strong the institutions themselves can gear the requirements, or whether

they're so dependent on this paying participants or participant that are already having vested interests, so they can easily create barriers, they can overload the requirements. If you are not present in the meeting or in the requirement-writing forum, you can imagine you know people make trade-offs. [unclear 28:03] able to engage because technical requirements and therefore they get [unclear 27:55] spaces.

Moderator: Thank you. Very, very [unclear 27:50]. Participant.

27:48

Participant: Moderator I think in addition to the cost, even before that I think the limitation to the business itself is the lack of awareness of which services the business would require from the quality infrastructure. And we find that most of the SME's only realise midstream that by the way I need to now have R20, 000.00 for the consultants [unclear 27:17] I have this system in place in order to be accredited. Relatively the cost, that's pretty much what the cost will be coming from, definitely lack of awareness [unclear 27:05] a startup stages. And then I think that secondly you find that [unclear 26:55] agencies, then the business will suffer if you have a disengaged leadership as an SME, then definitely that becomes a limitation to the successful implementation of [unclear 26:36].

Moderator: Can I ask, many of the participants stated that they consider knowledge, or the lack of knowledge, or the lack of awareness as a limitation, but what has not come out through this meeting is in terms of limitation, do we communicate the benefits or the value of quality infrastructure from various places?

Participant: If I may while I still have the stage. I think the communication will be reaching the right audience at any given point in time, if you look at the marketing strategies of many agencies within the technical infrastructure, it's basically you preaching to the converted. And then at some extent you've got to be proactive in looking for that information as it relates to your company as an SMME, somebody spoke about visibility earlier on. I think unless you are going to be proactively looking for information. What your business as SMEs will be needing from the quality infrastructure down the line it is very difficult to relate to. Definitely marketing strategies are being aimed primarily to the converted unfortunately. I think that is my take I will give the other colleagues a [unclear 24:49].

Moderator: Thank you very much. Participant what's your opinion?

Participant: Chairperson.

Moderator: Yes.

Participant: I didn't want to interject.

Moderator: Yes.

Participant: But there are two issues based on your previous question which I think I must bring up before we continue with [unclear 24:24] the follow up question.

Moderator: Okay Participant I'm listening.

24:17

Participant: The TI don't have a transformation mandate. So mainly they are serving advantaged, most of their companies are from the previously advantaged group, no disadvantaged groups, so they don't have that mandate to transform, also their own market, which makes it very, very difficult for an SMME to even have a SME from previously disadvantaged entering their own space because they don't have that transformation mandate. Second their turn around time is a big barrier because SMEs are intended to make money, but if you look you don't have 120 days waiting for example for a letter of authority from the TI. You don't have 50 days waiting for SANAS to come and [unclear 22:59] an assessment. You develop your own business plan with the projection that you start making money within six months, and on the fourth month you realise you need to have accreditation, you need a letter of authority. When you talk to this institution they will be talking [unclear 22:41] projection, so people tend to say, "I'm not going to follow these compliance issues".

Moderator: That's an excellent contribution, thank you so much. Participant [unclear 22:21] thank you Participant. Participant, sorry I interrupted you.

Participant: {unclear 22:13] no it's not a problem. Look there's so many dangers that SMME face in terms of whether they comply or whether they don't comply, but there's more disadvantages when we don't comply. Because number one as good as your product might be, you might have the best quality product on the market, but you will be forced to sell it at the lesser price than what are your competitors who are established companies are selling at. And also, the hoops that you have to jump in as one of our colleagues mentioned that the cost implications are so high that the time frames they don't match the turnaround time that you had from your order that you

received from a client to the delivery time and also compliance that you need to submit. So, I think if their processes for a company to comply, especially an SMME at start up because most of the time we are on a borrowed time and we also on borrowed funds. Banks are knocking at our door, a month later after you start borrowing [unclear 20:49] pay it back. If the accreditation time frame turnaround time can be taken into consideration, can be minimised from what it is, that will make getting accredited more acceptive to a lot of SMEs. Because we are facing a funding time frame which is way off, it doesn't even comply with the rules and laws of the business that we are changing from day to day. And then we also have to face an accreditation problem that after [unclear 20:11] only to be told that you need 1, 2, 3, 4, 5 which the guys will come back after another 60 days. If you look at that your 6 months is gone and there's nothing that you have to show up for, and on top of that in the 6 months you have to sell your product at the cost of almost like a black-market cost, because you can't price according to the market prices. And in between we also taken advantage of because our clients will probably ask you to provide it, even if you not complying, if you can provide a test from an accredited lab [unclear 19:27] that doesn't still, it doesn't mitigate for your price hike, for your price increase. They still want you to provide it at a cheaper price citing that you lack the accreditation, so it's a [unclear 19:11] for a SMME [unclear 19:06].

19:06

Moderator: Thank you very much, that was very valuable. I would like to move to the concluding question. Participant you want to say something. You are muted Participant.

Participant: I think the infrastructure institutions as well are not geared up as businesses in themselves who are supposed to always be looking at [unclear 18:28] coming up with different service offerings, it looks like their products are designed for them [unclear 18:19], they're not looking at expanding their services. That's why they only speaking to the converted and all that because it's like other people come and develop products on their behalf. They are packaging products appropriately to serve different sectors as they come, they seem to be not proactive. Rather they are very reactive to, in that way they tend to just rely on the [unclear 17:41] advantages, those groups that are there. And I think those groups, to be honest, the change in the marketplace is that they will start becoming smaller and smaller [unclear 17:6] the

infrastructure institutions themselves a little bit unviable themselves, that they are unable to maintain their own laboratories, and all that as the economy starts to restructure and change. So, I think something needs to happen in the technical infrastructure to be able to become relevant, and to be able to serve a changing economy with SMME's and all these various needs that are coming through.

Moderator: Thank you that was very valuable, thank you Participant. I would like to ask a few concluding questions. Is there anything that you think that could be improved with regard to how quality infrastructure services are currently applied to small businesses? There were a lot of suggestions that already made. Is there anything else that you would like [unclear 16:18] improve the quality? Participant.

Participant: I think the main thing is to have a very relevant quality infrastructure [unclear 16:00] the business or industry needs. So, when I [unclear 15:56] you can't like the previous speaker said [unclear 15:53] actually demanding something that is more modernised [unclear 15:30 - 14:46].

Moderator: Thank you. Participant.

Participant: I just came back [unclear 14:36].

Moderator: [unclear 14:9] would you improve in terms of the [unclear 14:7] quality infrastructure that [unclear 14:22].

Participant: [unclear 14:18].

Moderator: [unclear 14:17].

Participant: [unclear 14:16] for you to get something out of an accredited housing you can see that you really have to pour water out of the rock. But yet the standards that they set for you it seems as if it's a different standard to what they set for themselves when it comes to service providing. These are the only small things that can be polished up, but otherwise ja.

Moderator: Thank you very much. Participant.

Participant: I think maybe if the orientation of the [unclear 12:43] institution can change a little bit so that they can lead the institutions themselves and their mandate rather than remain as dependent on external users as it seems, rather than over reliance on technical committees or advisory committees and all these things. And they should be having a sort of developmental orientation. And thinking about how they can

expand their own reach and their market share and their coverage of the needs of the country. More than being so reliant on previous markets or previous companies that they have always serviced, so that will force them at least to come up with new service offerings, and new methods of doing things so they can build a bridge between the past and the future.

Moderator: Thank you very much Participant. Participant.

Participant: Thank you Moderator. My first contribution [unclear 11:14] we need to develop [unclear 11:11] solution that addresses the [unclear 11:08] challenges faced by this country. We seem to be [unclear 11:02] on our international reputation. We are highly regarded [unclear 10:54]. We tend to not address none of our challenges that we are facing locally. The second challenge that we face with this TI is that they all operate in silence, everybody is trying to achieve their individual target that they have [unclear 10:29] none of their performance indicators talk to each other [unclear 10:22], but everybody's trying to outshine everyone [unclear 10:15] 99%, and if you realise [unclear 10:11] talk to these TI, how are all this key performance indicator for this TI, are they talking to each other? [unclear 10:00]. My view is that you need to have one entity [unclear 09:48] with all your TI and departments, then they can be in proper [unclear 09:40] the oversight is at the department level [unclear 10:35], but their performance indicators are not talking to each other, everybody's doing their own thing [unclear 09:22] they are working in silence.

Moderator: Thank you very much. The last question I would like to raise is, what would you change about the services provided by the quality infrastructure in South Africa? So, what would you change in order for the quality infrastructure to effectively improve SME performance? So, the question is focussed on how would you make SME's better through changing the quality infrastructure? How do you improve their performance? Participant.

Participant: [unclear 08:29] just modernisation, you don't need to, most of their, the IT [unclear 08:20] through e-mails manually, if they can improve their [unclear 08:09] you can do everything online. I do know that [unclear 08:04] the whole process is online, and so far lots of them they [unclear 07:46] maybe through Covid [unclear 07:44] and modernisation.

Moderator: Thank you. Participant. [unclear 07:34].

Participant: Yes, I see Mr Thema are you about to share something?

Reseacher: Sorry Participant I was just showing you that I was laughing and excited to what Participant was saying, my apologies for that.

Participant: Okay that's noted. Look [unclear 07:08] Participant's comments there specifically on the fitness or purpose type of services, we really need to focus on more localising the services rather than focussing more on international recognition. It's good and well for our services to be on par at the global stage, but then are we responding to the needs of the man in the street as far as our economy setup is concerned, so modernisation [unclear 06:33] type of solutions and then of course localisation.

Moderator: Thank you very much. Participant.

Participant: In the end you know I think I agree with colleagues because it is very easy to adopt solutions from other people, but if those solutions don't necessarily solve your own problems, so what's the use, you can have very nice solutions that are on the shelf. I think we need to really do a soul searching and repurpose the technical infrastructure correctly for the needs of this country, so that we forget about the first world economy. That we shouldn't be so over supplying to that economy, we should be mindful that [unclear 05:31] South African [unclear 05:28], and I would then use what we learned from elsewhere to create solutions that works for our economy, I think I will concur with what other colleagues have contributed thus far.

Moderator: Thank you very much Participant. And Participant as a SME what would you change to be more effective in the quality infrastructure? Sorry Participant I can't hear you.

Participant: I think, okay can you hear me now?

Moderator: Ja that's better, thank you.

Participant: I think a partnership style of service delivery from the quality infrastructure is critical and the exposure about its service or you know maybe assist in helping the SMME's to look at the other options or the variety of ways to improve their services that they are providing, or the product that they are providing. Obviously cost reductions for SMME's, and the turnaround time for helping the SMME get onto their feet with their accreditation is key. So, it's price, turnaround time, these are the two factors that actually makes a SMME [unclear 03:38].

Moderator: Excellent! Thank you so much for the participation of all the colleagues, I really appreciate you time and effort, maybe we can all switch on the videos now because this is the last few moments just so that we can see each other and say, greet each other. And thank you for a very successful discussion, your opinions are highly valued, and it was very interesting. I know nothing about quality infrastructure, and I've learned a lot so thank you very much for the opportunity and thank you to learn from you. Reseacher is there anything you would like to say?

Reseacher: Yes Moderator and thank you for giving me the platform, as you know I was intentionally and deliberately keeping quiet so that I can solicit information from the experts as much as possible without any interference because of the purpose of the study, but I am grateful that things went well, and I really appreciate your time. Participant with repurposing the quality infrastructure, that was well taken, I was quite taken by that as well. Participant [unclear 02:08] for the quality infrastructure, your knowledge from a technical infrastructure perspective well taken as well. Participant, down to the ground, modernisation of quality infrastructure vices, fought industrial revolution, well taken as well. Participant, from the SMME perspective, turnaround time, resources and time, well taken as well. I think the contribution colleagues has achieved the intended purpose for the study. But I must say to add on that we can continue the discussion beyond this forum, this forum was intended for my study, but I'm looking beyond the purpose of the study itself. So if you want to engage myself or Moderator or Participant or Participant or even Participant, in the other groups we have iterated the very Research sentiments, that we can engage each other beyond this forum as well. But in conclusion I would like to say Moderator thank you very much for managing the process, and ensuring that we overcome the challenges regarding technology, it was against us, but we managed very, very much well thank you.

Moderator: Thank you very much, thank you very much for all your participation, I think your contribution is highly valued by Reseacher, and ai really do think that we building a better South Africa. Thank you very kindly.

Reseacher: Thank you colleagues have a good evening. I am going to stop the meeting and have a good evening and stay blessed and safe, thank you.

APPENDIX H: LANGUAGE EDITING CERTIFICATE

Marianne Kapp Language Services – marscard@gmail.com

Cape Town
6 August 2023

To whom it may concern,

This letter confirms that the manuscript detailed below was edited for proper English language grammar, punctuation, spelling, and overall style by a qualified and highly experienced native English-speaking editor. The manuscript was originally edited in December 2022. Subsequent to submission for examination purposes, and following corrections by the author, the manuscript was re-edited in July/August 2023.

Manuscript title: **A Framework for the application of the National Quality Infrastructure by Small and Medium-Sized Enterprises in developing countries – the case of South Africa**

Author: **Samuel Molelekwa Thema**

Neither the research content nor the author's intentions were altered in any way during the editing process. The editor makes no claim as to the accuracy of the research content or objectives of the author. The document above as edited is grammatically correct and ready for publication; however, the author has the ability to accept or reject the editor's suggestions and changes after the editing process is complete, and prior to submission to any journal or examining body.

Marianne Kapp
0824813300

APPENDIX I: CORRELATION MATRIX

Table 4.5: Correlations MATRIX

Variable	Awareness 1	Awareness 2	Awareness 3	Awareness 4	Awareness 5	Collaboration 1	Collaboration2
Awareness1	1						
Awareness2	0.7131*	1					
Awareness3	0.4834*	0.6400*	1				
Awareness4	0.4963*	0.5595*	0.6129*	1			
Awareness5	0.4076*	0.4581*	0.5409*	0.6966*	1		
Collaboration1	0.1577*	0.1632*	0.1221*	0.0628	0.0701	1	
Collaboration2	0.0791	0.1502*	0.1218*	0.0594	0.0195	0.8627*	1
Collaboration3	0.0998	0.1618*	0.1651*	0.1108*	0.0453	0.6952*	0.7728*
Collaboration4	0.1483*	0.2483*	0.1517*	0.1278*	0.1301*	0.6286*	0.6453*
Collaboration5	0.0869	0.1848*	0.1776*	0.1283*	0.1045	0.7281*	0.7745*
Education1	0.5386*	0.4423*	0.4060*	0.4268*	0.4039*	0.1822*	0.1053*
Education2	0.4155*	0.4603*	0.4103*	0.4171*	0.3694*	0.1081*	0.0770
Education3	0.3677*	0.3791*	0.5355*	0.3196*	0.2641*	0.0488	0.0267
Education4	0.4227*	0.4534*	0.3944*	0.4119*	0.3527*	0.1055*	0.0507
Education5	0.4605*	0.4840*	0.3951*	0.3585*	0.3329*	0.1029	0.0366
Affordability1	0.2524*	0.2646*	0.2787*	0.2212*	0.2491*	0.0573	0.0464

Variable	Awareness 1	Awareness 2	Awareness 3	Awareness 4	Awareness 5	Collaboration 1	Collaboration2
Affordability2	0.0518	0.0908	0.0376	0.0943	0.0170	0.3660*	0.3408*
Affordability3	0.0420	0.1080*	0.1702*	0.0419	-0.0056	0.3765*	0.3592*
Affordability4	0.0259	0.0622	0.0370	0.0396	-0.0025	0.3959*	0.3732*
Affordability5	0.1685*	0.1520*	0.2401*	0.0561	0.0869	0.1670*	0.1383*
Requirement1	0.2975*	0.3572*	0.3129*	0.2871*	0.2177*	0.1920*	0.1497*
Requirement2	0.2694*	0.3546*	0.2992*	0.2810*	0.2174*	0.1937*	0.1568*
Requirement3	0.3174*	0.3746*	0.3363*	0.3149*	0.2444*	0.1346*	0.1029
Requirement4	0.3140*	0.3270*	0.4558*	0.2705*	0.2655*	0.1418*	0.0932
Requirement5	0.3022*	0.3220*	0.4557*	0.2323*	0.1906*	0.1202*	0.0672
Impact1	0.2420*	0.2066*	0.1421*	0.2154*	0.1773*	0.0657	0.0636
Impact2	0.2499*	0.2371*	0.2040*	0.1753*	0.1766*	0.1269*	0.0905
Impact3	0.2663*	0.1996*	0.1815*	0.1853*	0.1678*	0.2429*	0.1962*
Impact4	0.2290*	0.1821*	0.3502*	0.1552*	0.1250*	0.0981	0.0531
Impact5	**0.3171***	**0.2746***	**0.2429***	**0.2516***	**0.1977***	**0.0823**	**0.0398**

Variable	Collaboration 3	Collaboration 4	Collaboration 5	Education 1	Education 2	Education 3	Education 4
Collaboration3	1						
Collaboration4	0.8102*	1					
Collaboration5	0.7243*	0.7012*	1				
Education1	0.1382*	0.1638*	0.1936*	1			
Education2	0.0926	0.1172*	0.1306*	0.7204*	1		
Education3	0.0508	0.0622	0.0784	0.6036*	0.7152*	1	
Education4	0.0753	0.1045	0.0849	0.6451*	0.7739*	0.7238*	1
Education5	0.1568*	0.1784*	0.0536	0.6129*	0.6919*	0.5871*	0.7890*
Affordability1	0.0481	0.0850	0.0830	0.3576*	0.2895*	0.2627*	0.2892*
Affordability2	0.2783*	0.2852*	0.3035*	0.0066	-0.0552	-0.0251	0.0079
Affordability3	0.2667*	0.2314*	0.2804*	0.0069	-0.0217	0.0954	0.0107
Affordability4	0.3123*	0.3170*	0.3210*	-0.0190	-0.0210	0.0028	0.0099
Affordability5	0.1318*	0.1812*	0.1310*	0.2359*	0.1495*	0.3090*	0.2504*
Requirement1	0.1896*	0.1556*	0.2023*	0.4386*	0.4146*	0.3650*	0.3894*
Requirement2	0.2541*	0.2374*	0.1903*	0.4269*	0.4268*	0.3281*	0.3604*
Requirement3	0.1720*	0.1616*	0.1496*	0.4940*	0.4625*	0.3703*	0.4286*
Requirement4	0.1221*	0.1482*	0.1074*	0.4692*	0.3985*	0.5057*	0.4117*
Requirement5	0.1363*	0.1429*	0.0813	0.4383*	0.3526*	0.5037*	0.3771*
Impact1	0.0808	0.1169*	0.0948	0.2979*	0.2134*	0.2177*	0.2414*
Impact2	0.2109*	0.2162*	0.0943	0.3491*	0.2548*	0.2191*	0.2958*
Impact3	0.2549*	0.2307*	0.1981*	0.3406*	0.2317*	0.1827*	0.2744*

Impact4	0.1826*	0.1562*	0.0575	0.3213*	0.2444*	0.3688*	0.2414*
Impact5	0.2000*	0.2288*	0.0902	0.3942*	0.3188*	0.2771*	0.3233*

Variable	Education 5	Affordability 1	Affordability 2	Affordability 3	Affordability 4	Affordability 5	Requirement 1
Education5	1						
Affordability1	0.2864*	1					
Affordability2	-0.0573	0.2155*	1				
Affordability3	-0.0121	0.1896*	0.8550*	1			
Affordability4	-0.0268	0.1546*	0.8586*	0.8334*	1		
Affordability5	0.1982*	0.3975*	0.1559*	0.2447*	0.2360*	1	
Requirement1	0.3093*	0.1916*	0.0537	0.0499	0.0190	0.1993*	1
Requirement2	0.3619*	0.2092*	0.0715	0.0645	0.0191	0.1489*	0.8501*
Requirement3	0.3414*	0.2464*	0.0065	-0.0132	-0.0357	0.2333*	0.8214*
Requirement4	0.3462*	0.1649*	-0.0334	0.0678	-0.0443	0.3026*	0.7080*
Requirement5	0.3358*	0.2001*	-0.0516	0.0662	-0.0570	0.3035*	0.6811*
Impact1	0.2066*	0.1813*	0.0608	0.0362	0.0378	0.1543*	0.2822*
Impact2	0.2768*	0.1127*	-0.0046	0.0073	-0.0158	0.1351*	0.2947*
Impact3	0.2737*	0.1302*	0.0798	0.0752	0.0779	0.1693*	0.2420*
Impact4	0.2865*	0.1105*	-0.0912	0.0216	-0.0822	0.2259*	0.2285*
Impact5	0.4066*	0.1582*	-0.0685	-0.0628	-0.0453	0.1972*	0.3167*

Variable	Requirement 2	Requirement 3	Requirement 4	Requirement 5	Impact 1	Impact 2	Impact 3
Requirement2	1						
Requirement3	0.7797*	1					
Requirement4	0.6852*	0.7752*	1				
Requirement5	0.6301*	0.7421*	0.8892*	1			
Impact1	0.2599*	0.2182*	0.1916*	0.2161*	1		
Impact2	0.3396*	0.2409*	0.2252*	0.2574*	0.7578*	1	
Impact3	0.2378*	0.2272*	0.1862*	0.2305*	0.7064*	0.7987*	1
Impact4	0.2734*	0.1968*	0.3517*	0.3927*	0.5338*	0.6919*	0.7295*
Impact5	0.3211*	0.3207*	0.2505*	0.3299*	0.5812*	0.7242*	0.7251*

Variable	Impact4	Impact5
Impact4	1	
Impact5	0.7211*	1

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

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

APPENDIX J: COMMUNALITY ESTIMATES

B1-1 A “one-stop shop” should be established to provide awareness with regard to the services provided by the QI key institutions	0.51714
B1-2 Quality campaigns, implemented through a national quality council and/or through industry associations should be established to provide awareness with regard to the services provided by the QI key institutions.]	0.64069
B1-3 Awareness about the services provided by the QI key institutions can be enhanced if the QI key institutions speak in one voice.	0.60681
B1-4 Awareness about the services provided by the QI key institutions can be enhanced if the QI are promoting the development of a culture of consumer responsibility, through individual and/or group education and advocacy on behalf of SMEs.	0.65635
B1-5 Awareness about the services provided by QI key institutions can be enhanced if the QI are promoting, on behalf of SMEs, a culture of responsible and informed consumer choice.	0.52940
B2-1 Collaborating partners, namely QI key institutions and SMEs, should provide information accurately in order to make quick common decisions	0.74977
B2-2 Collaborating partners, namely QI key institutions and SMEs, should always have information readily available in order to enhance the level of trust amongst the partners	0.81927
B2-3 Collaborating partners, namely QI key institutions and SMEs, should take decisions as a collective instead of individuals	0.78694
B2-4 Collaborating partners, namely QI key institutions and SMEs, should share risks in order to minimize individual QI key institution vulnerability and weakness.	0.67895
B2-5 Collaborating partners, namely QI key institutions and SMEs, should create an enabling environment in order to achieve a common goal	0.71655

B3-1 The QI key institutions should ensure that the QI topics are included in the curricula of universities through on-site or distance learning programs for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	0.63879
B3-2 The QI key institutions should organise seminars for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	0.74755
B3-3 The QI key institutions should organise training and targeted workshops for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	0.68778
B3-4 The QI key institutions should organise webinars for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions	0.79754
B3-5 The QI key institutions should organise a platform such as “frequently asked questions” for SMEs to acquire and assimilate knowledge with regard to the services provided by the QI key institutions.	0.68778
B4-1 The QI key institutions should subsidise SMEs certification and accreditation programs in order to ensure that SMEs are able to afford its services	0.21845
B4-2 The QI key institutions should subsidise consultancy fee on behalf of the SMEs in order to ensure that SMEs are able to afford the services provided by the QI key institutions	0.85035
B4-3 The QI key institutions should subsidise training programs on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions	0.84391
B4-4 The QI key institutions should subsidise internal audits programs on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions	0.81685

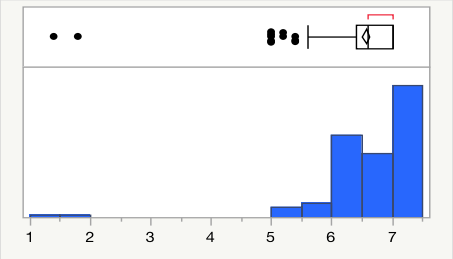
B4-5 The QI key institutions should subsidise the measurement activities (testing and/or calibration of equipment) on behalf of SMEs in order to ensure that they are able to afford the services provided by the QI key institutions	0.20857
B5-1 The QI key institutions should be able to develop and publish guidance notes to assist SMEs to understand how to comply to specified requirements	0.76889
B5-2 The QI key institutions should be able to develop help desks facilities to assist SMEs to understand how to comply to specified requirements	0.72083
B5-3 The QI key institutions should be able to develop single web portals facilities to assist SMEs to understand how to comply with specified requirements	0.79472
B5-4 The QI key institutions should be able to develop toolkits to assist SMEs to understand how to comply with specified requirements.	0.76491
B5-5 The QI key institutions should be able to develop self service facilities to assist SMEs to understand how to comply to specified requirements	0.76869
B6-1 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing how SMEs benefit from management practices (example; better quality, better service delivery)	0.60989
B6-2 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which SMEs are able to access markets	0.80420
B6-3 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which products produced by SMEs are safe for public usage	0.80972
B6-4 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which the products that are produced by SMEs are compatible with one another	0.67985

B6-5 The QI key institutions should be able to evaluate and measure the impact resulting from its services by assessing the extent to which SMEs benefit from economies of scale (the economies of scale in this context mean cost of reduction associated with a larger scale of production)	0.70368

APPENDIX K: SCORES, QUANTILES AND SUMMARY STATISTICS

(MEAN, STANDARD DEV., SKEWNESS AND KURTOSIS)

Awareness score



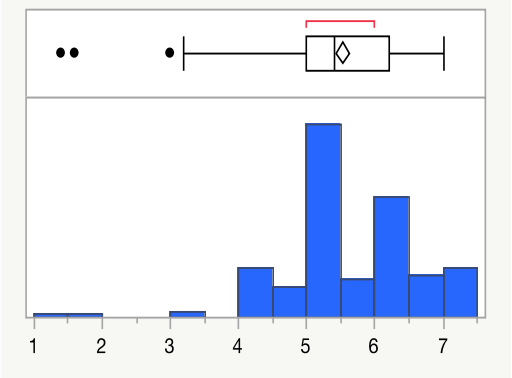
Quantiles

100.0%	maximum	7
99.5%		7
97.5%		7
90.0%		7
75.0%	quartile	7
50.0%	median	6.6
25.0%	quartile	6.4
10.0%		6
2.5%		5.155
0.5%		1.702
0.0%	minimum	1.4

Summary Statistics

Mean	6.5668571
Std Dev	0.6073465
Std Err Mean	0.032464
Upper 95% Mean	6.6307069
Lower 95% Mean	6.5030074
N	350
Skewness	-3.660023
Kurtosis	24.752825

Collaboration score



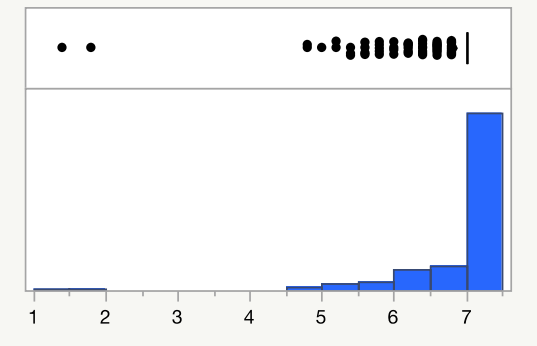
Quantiles

100.0%	maximum	7
99.5%		7
97.5%		7
90.0%		6.8
75.0%	quartile	6.2
50.0%	median	5.4
25.0%	quartile	5
10.0%		4.4
2.5%		4
0.5%		1.551
0.0%	minimum	1.4

Summary Statistics

Mean	5.516
Std Dev	0.9249958
Std Err Mean	0.0494431
Upper 95% Mean	5.6132439
Lower 95% Mean	5.4187561
N	350
Skewness	-0.417626
Kurtosis	0.9279128

Education score



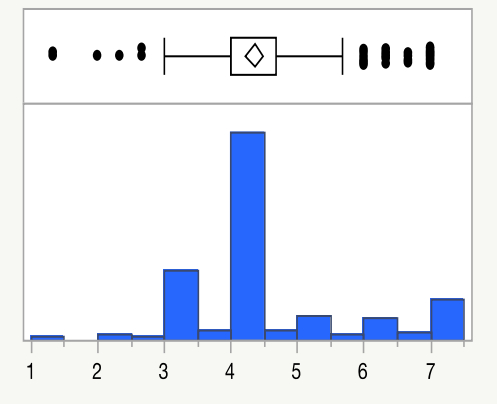
Quantiles

100.0%	maximum	7
99.5%		7
97.5%		7
90.0%		7
75.0%	quartile	7
50.0%	median	7
25.0%	quartile	7
10.0%		6.22
2.5%		5.355
0.5%		1.702
0.0%	minimum	1.4

Summary Statistics

Mean	6.7931429
Std Dev	0.5662513
Std Err Mean	0.0302674
Upper 95% Mean	6.8526723
Lower 95% Mean	6.7336134
N	350
Skewness	-5.411544
Kurtosis	41.26701

Affordability score



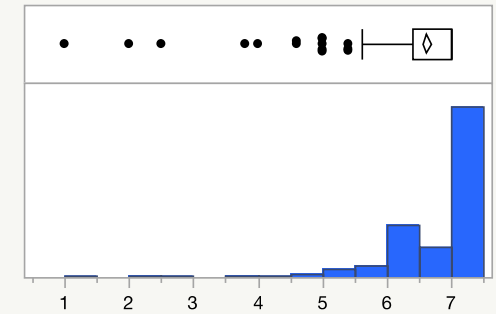
Quantiles

100.0%	maximum	7
99.5%		7
97.5%		7
90.0%		7
75.0%	quartile	4.6666667
50.0%	median	4
25.0%	quartile	4
10.0%		3
2.5%		3
0.5%		1.3333333
0.0%	minimum	1.3333333

Summary Statistics

Mean	4.3514804
Std Dev	1.2113719
Std Err Mean	0.0648433
Upper 95% Mean	4.4790144
Lower 95% Mean	4.2239464
N	349
Skewness	0.9950476
Kurtosis	0.3760985

Requirement score



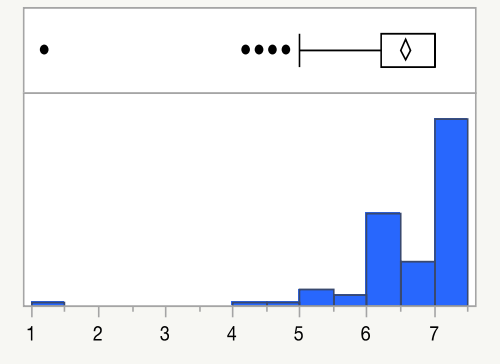
Quantiles

100.0%	maximum	7
99.5%		7
97.5%		7
90.0%		7
75.0%	quartile	7
50.0%	median	7
25.0%	quartile	6.4
10.0%		6
2.5%		4.9
0.5%		1.75
0.0%	minimum	1

Summary Statistics

Mean	6.6174785
Std Dev	0.7142703
Std Err Mean	0.038234
Upper 95% Mean	6.6926773
Lower 95% Mean	6.5422797
N	349
Skewness	-3.550815
Kurtosis	19.002235

Impact



Quantiles

100.0%	maximum	7
99.5%		7
97.5%		7
90.0%		7
75.0%	quartile	7
50.0%	median	7
25.0%	quartile	6.2
10.0%		6
2.5%		5
0.5%		3.465
0.0%	minimum	1.2

Summary Statistics

Mean	6.5708571
Std Dev	0.6329599
Std Err Mean	0.0338331
Upper 95% Mean	6.6373996
Lower 95% Mean	6.5043147
N	350
Skewness	-2.687368
Kurtosis	14.946145