Exploring the Relationship between Cost of Quality and Quality Management in the South African Manufacturing Industry

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by

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DECLARATION

I, Bheki B.S. Makhanya, hereby declare that the dissertation “Exploring the Relationship between Cost of Quality and Quality Management in the South African Manufacturing Industry” is my own work and it has not been submitted for any degree at another tertiary institution.

ABSTRACT

In the highly demanding business environment of today, companies are looking for affordable and sustainable methods of meeting customer demands, while improving business performance. The South African manufacturing industry is not excluded from the challenging business environment of today. Over the past years the South African manufacturing sectors have experienced the challenges relating to economic trends, globalisation and political influences. The government has tried to save the industry through the implementation of trade laws and policies. However, despite the support from Government the success of the manufacturing company in the 21st century is dependent on the quality management systems and partnerships.

This research derived the concept of quality management and cost of quality from the literature. The study further explores the relationship between quality management factors and cost of quality categories. Over and above identification of the relationship between quality management factors and cost of quality categories; the research investigated the ability of quality management factors to predict the cost of quality categories. The research also aimed at investigating the quality management maturity of the South African manufacturing industry and benchmark the result with international companies. The quality management factors used in the current research include customer focus, leadership, process management, employee focus and business result focus. The cost of quality categories included conformance cost, failure cost and hidden cost.

This research was driven by the literature which includes the development of quality management from 1900 to 2010. The literature focused on the concept of quality management maturity; models used in the assessment of quality management maturity and common factors used during quality management maturity assessment. The research also covered a comprehensive literature on the subject of cost of quality and benchmarking. The literature review led to the development of a conceptual framework of quality management and cost of quality.

The research methodology of this research was informed by the literature review. This research is based on the positivism research philosophy. The research used survey research method as the research strategy. The research collected primary data using the online survey platform (Survey Monkey). Based on the snowball sampling approach the research collected 119 responses from South African manufacturing industries and 19 from the international manufacturing companies.

The research used exploratory factor analysis, confirmatory factor analysis and Cronbach Alpha to assess and improve the validity and the reliability of the study. The Pearson correlation was used to explore the relationship between quality management factors and cost of quality categories. The cost of conformance was found to be correlated with all quality management factors. The findings confirmed that the cost of conformance is a total cost of ensuring the successful implementation of the quality management system. The research finds failure cost to be related to process management, business result focus and employee focus. This means that the companies can use the failure cost to assess the usefulness of the three quality management factors. The research finds hidden cost to be related to business result focus and employee focus. Hence, it was recommended that the companies use hidden cost to measure business result focus and employee focus.

The multiple linear regression analysis provided the ability to assess the capability of quality management factors to predict the cost of quality categories. The result shows that the quality management factors (process management, customer focus, business result focus, employee focus and leadership) were best predictors of cost of quality categories. The

research finds business result focus and employee focus as two quality management factors associated with cost of conformance in the multiple linear regression model. This means that the two factors should take priority if the company wants to benefit from the cost of conformance. The research finds process management and business result focus as the main generators of failure cost. Hence, it was recommended that companies pay more attention to process management and business result focus to improve failure cost. The multiple linear regression analysis confirms that business result focus and employee focus were the main factors responsible for hidden costs. Hence, it was recommended that the companies pay more attention to business result focus and employee focus to reduce the hidden costs.

The study uses the descriptive statistics (means and standard deviation) to assess the quality management maturity of the South African manufacturing industry and relative important index (RII) to benchmark the result with the international responses. The research finds the quality management maturity of the South African manufacturing sector to be at level three in the quality management maturity grid. The South African responses had the lower RII score if compared to the international responses except in business result focus. The study identified leadership and hidden costs as two factors which need urgent improvement to advance the quality management maturity of the South African manufacturing sectors. The research findings could be used by the South African manufacturing companies to focus their quality management effort and improve the competitive advantage.

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LIST OF ABBREVIATIONS

ABC	Activity Based Costing
AMOS	Analysis of a Moment Structures
ANOVA	Analysis of Variance
AVE	Average variance extracted
BPR	Business Process Re-engineering
CFI	Comparative fit index
CMIN/DF	Reletive chi-square
CMMI	Capability Maturity Model Integration
CoC	Cost of Conformance
CoNC	Cost of Non-Conformance
CoQ	Cost of Quality
CQA	Canadian Quality Award
DF	Degree of freedom
ECSA	Engineering Council of South Africa
EFA	Exploratory Factor Analysis
EFQM	European Foundation for Quality Management
EM	Expected Maximisation
GFI	Goodness of fit
GMs	General managers
ISO	International Organisation for Standardisation
JPC-SED	Japan Productivity Centre for Socio-Economic Development
JQA	Japan Quality Award

KMO	Kaiser-Meyer-Olkin
KPI	Key Performance Indicator
Ln	Natural Logarithm
MAR	Missing at Random
MBNQA	Malcolm Baldrige National Quality Award
MCAR	Missing Completely at Random
MI	Multiple imputations
MSV	Maximum Shared Squared Variance
NMAR	Not Missing at Random
NVA	Non-Value Added
PAF	Principal Axis Factoring
P-A-F	Prevention, Appraisal, and Failure
PMSA	Project Management South Africa
QCC	Quality Control Cycle
QMM	Quality Management Maturity
RII	Relative Importance Index
RMR	Root mean square residual
RMSEA	Root mean square error of approximation
SAIMechE	South African Institution of Mechanical Engineering
SCQM	Supply Chain Quality Management
SD	Supplier development
Sig.	Significant
SPC	Statistical Process Control
SQA	Singapore Quality Award
Sqrt	Square root

SS	Six Sigma
TQM	Total Quality Management
UK	United Kingdom
USA	The United States of America
VA	Value Added
VIF	Variance Inflation Factor

1. CHAPTER ONE

1.1 Introduction

In the highly demanding business environment of today, companies are looking for affordable and sustainable methods of meeting customer demands, while improving business performance. According to Edwin and Paul (1995) during difficult times, companies normally opt for downsizing, closing shops and cashing in the long term investment to finance the situations. The traditional approach of unlocking the business potential is not sustainable because it does not provide for the root cause of the factors affecting the companies (MijoĀ & MijoĀ, 2015). The authors in the field of quality management, associated business improvement with leadership, technology advancement, quality focus, customer focus, knowledge management, and employee focus (Ittent, 1999; Freiesleben, 2004; Raut & Raut, 2014). The authors also agreed that quality management is an answer to most of the corporate challenges (Al-Basteki, 1994; Al-Saket, 2003; Kedem, 2004; Khataie & Bulgak, 2013). According to Xiaofen (2013), there are different levels of quality management practice and the ability of the organisation to benefit from quality management is dependent on its maturity.

Crosby developed the concept of quality management maturity during the 1970s (Baškarada, 2008; Moschidis, et al., 2018). The concept is divided into five phases with phase one characterised by a lack of understanding of quality principles. Phase five or world class level is characterised by full understanding and application of quality management principles, processes and setting the standard for the field. This confirms the claims by Patti, et al., (2001) suggesting that quality improvement is an ongoing process which requires resources, leadership support, and understanding customer requirements. The means and the effort to quality improvement requires money, which is the scarce resource in companies.

The quality management practitioners realised the need for linking quality administration to cost analysis as early as the 1930s (Chiu, 2002; Schiffauerova & Thomson, 2006; Kaur, 2009). The practices (linking quality and cost) were formalised in the 1950s; today there are many different ways of assessing the cost associated with quality improvement (Goulden & Rawlins, 1995; Abdelsalam & Gad, 2009; Kaur, 2009). The approach includes the activity-based approach, process-oriented method, and grouping of cost based on their characteristics. The process of assessing and summing up the value related to quality activities is termed as the cost of quality (CoQ) (Weinstein, et al., 2009; Khataie & Bulgak, 2013; Nel, 2013). The authors in the field of quality management maintain that the cost of quality is a tool to assess quality improvement (Schiffauerova & Thomson, 2006; Kaur, 2009; Nel & Pretorius, 2016). Other authors maintain that the regularly used financial reports and financial statements are unable to disclose all the cost associated with the quality and related losses (Sower, et al., 2007; Cheah, et al., 2011; Nel, 2013; Iren & Bilgen, 2014). This means that it is important for the organisation to have a system which discloses the cost associated with quality activities and inefficiencies.

There is also agreement among scholars suggesting that companies who ignore the importance of quality face the risk of disappearing (Chiu, 2002; Palikhe, 2013; MijoĀ & MijoĀ, 2015). However, the current research did not identify the study, which explains the relationship between quality management factors and cost of quality categories in the South African manufacturing industries. The research also identified the need to assess the ability of quality management factors to predict the cost of quality elements. The result of the assessment helps to detemine which cost of quality category can be used to measure each quality management factor in the South African manufacturing sector.

The literature in the field of quality management is silent on the relationship between the two concepts factors, especially in the South African manufacturing sector. Sower et al., (2007) conducted a study in the United States of America (USA) to assess the relationship between quality management maturity and cost of quality. The study found the positive relationship between quality management maturity and cost of quality. Moschidis et al. (2016) conducted a similar study in Greece to check the relationship between the quality management maturity of the organisation and the cost of quality practice. The study focused on the food and beverage companies; once again the study found the positive relationship between quality management and cost of quality. This research did not find a similar study in the South African manufacturing industry. Sukdeo (2016) recommended the need for further investigation of CoQ and quality management maturity in the South African context.

The research derives from the literature the concepts of cost of quality and quality management and explored the relationship between quality management factors and the cost of quality categories. The study further investigated the quality management factors which were highly associated with the cost of quality categories in the statistical model. The findings of the relationship between the factors of the two concepts informed the recommendations on which cost of quality categories can be used to measure which quality management factors. The research also assesses the quality management maturity level of the South African manufacturing sector and also benchmark the result with the international companies. The purpose of quality management maturity assessment and benchmarking was to identify and recommend the areas of improvement.

1.2 Background of the study

The South African manufacturing sector is the backbone of the country's economy (Bhorat & Rooney, 2017; Mc Camel, 2018). The removal of economic sanctions during the 1990s, allowed the South African manufacturing industry to participate in the global scale (Hefti &

Staehelin-Witt, 2002; Bhorat & Rooney, 2017). This also permitted the international companies to spread out their businesses in South Africa. The influx of international manufacturing companies boosted the country's economy, but it left the local manufacturers vulnerable (Kinyondo, 2007; Mc Camel, 2018). There has been substantial support from the government in the form of policies and laws to support the local manufacturers to remain in business (Chapeyama, 2015; Ettmayr & Lloyd, 2017). The most notable policy in the manufacturing industry is the South African local content policies (Nyakabawo, 2017). The policies force the international companies operating in South Africa and local companies to use a certain percentage of the local resources in their production processes.

According to Green (2009) during the early 1990s, the sector faced the challenges associated with globalisation and the politics of the time. Ishaq (2003) maintains that the car manufacturing sector was one of the industries which were impacted by globalisation. The study by Bhorat and Rooney (2017) indicated that the South African manufacturing sector has experienced job losses over the past years. This confirms the claims by Edwin and Paul (1995) suggesting that the companies normally opt for retrenchment during difficult times. Kinyondo (2007) maintains that the globalisation did not only affect the manufacturing sector but the economy at large. Foster (2013, p. 76) defined globalisation as the process where companies establish their business in foreign countries or international scale. Globalisation affects the pricing of the services as well as product and customer expectations (Bhorat & Rooney, 2017). The concept of globalisation does not form part of the current research, but it is important to establish the background of the study.

Globalisation is not the only challenge facing the sector; the availability of skilled employees is another challenge to meet the demanding business environment of today in the South African manufacturing sector (The world bank, 2018). Mc Camel (2018) found a poor electricity supply, the cost associated with the management of manufacturing companies, technology, skills and currency exchange rates as major challenges facing the South African manufacturing sector. The author further maintains that South African manufacturing mirrors the country's economy. As indicated in section 1.1 quality management and cost of quality can be the answer to some of the challenges facing the South African manufacturing sector.

Assensoh-Kodua and Imrith (2016), conducted a study in Kwazulu Natal (Durban area) to assess the effect of total quality management in the manufacturing industry. The authors found leadership, work environment, culture, and customer focus to be some of the important factors in the success of the manufacturing business. There is also evidence in (Dondofema, et al., 2017), suggesting that some of the challenges facing the South African industries is the lack of full utilisation of quality management tools. This means there is some quality management practice in the South African manufacturing sector, but the current research did not find the study which assesses quality management maturity of the South African manufacturing industry.

1.3 Problem statement

Despite the support from the government, the success of a manufacturing company in the 21st century depends on its quality management system and partnership with other companies (Rodrik, 2004; Hallward-Driemeier & Nayyar, 2017). This means that the poor quality from one partner has the potential to affect other partners in the network, hence quality management and cost of quality are important topics in the manufacturing industry.

Yet, the level of quality management maturity of the South African manufacturing sector and how it compares to the international companies remains invisible in the literature. Baškarada (2008) suggested that companies with a mature quality management system have a precise understanding of the cost of quality implications on business performance. The companies with an infant quality system rely on ad hoc assessment and quality inspections, and they do not have the system in place to accurately collect and report on the cost of quality (Patti, et al., 2001; Baškarada, 2008) . Table 1 indicates some of the examples relating to quality management failures and associated cost of quality in the global domain. The first column is the affected organisation, the second column is the year of events, the third column is the description of the events, and the last column contains impact of the events.

Table 1: Examples of Cost of Quality from Global Enterprises

Company	Year	CoQ description	Estimated Cost	Fatality
Samsung	2016	Samsung recalled over 2.5 million cell phones and stopped the production of Note 7 due to the poor quality of the battery systems	• $ 5.3 billion (Phys.org, 2016)	None
Ford	2016	4556 Ford Kuga 1.6 models manufactured at Valencia (Spain) from 2012 to 2013, were reported to have overheating problems in the engine (National consumer commission, 2017). Moreover, 47 cars already caught fire in the hands of customers.	• Not published yet	• 1
Volkswagen	2015	Volkswagen faults readings of the emission test (Mansouri, 2016; Cue, 2015).	• Cost of recall $ 7.3 billion (Cue, 2015) • Penalties $18billion (*Ibid.*)	• Not estimated
Toyota	2009-2010	About 8 million cars were recalled to fix the automatic acceleration problem (Mahmood & Kureshi, 2014; Nel, 2013).	• $ 5.5 billion	• ±93
Sampoong Department Store	1995	Poor quality management decisions led to the building collapse (Park, 2012).	• The owner was arrested • $ 216 direct cost of property damages	502 people died 930 injured
Jack D. Gillum and Associates	1981	Unprofessional engineering practice led to the collapse of the Hyatt Regency Hotel walkways in Kansas City (Foster, 2002; Martin, 2004)	• Engineers lost their licenses to practice as engineers • The Jack D. Gillum and Associates lost the license to practice as an engineering firm • $14 million toward victims	• 114 people died • 200 Injured

Company	Year	CoQ description	Estimated Cost	Fatality
Turkish Airline	1974	The quality management processes did not force the crew to check and notice that the doors were correctly closed which led to the plane crash	• Not published	• 346

The quality management maturity grids by Crosby confirmed the positive relationship between the maturity of the company and the cost of quality (Patti, et al., 2001; Baškarada, 2008; Xiaofen, 2013; Moschidis, et al., 2016). The scholars also indicate that companies, who couple their quality management system to the cost of quality are reporting positive results on their investments (Sower, et al., 2007; Kaur, 2009). In support Sower, et al. (2007), cited some studies that shows managers without CoQ information struggle to make decisions which support long-term business growth. But the authors in the current research did not find the academic research which explains the relationship between quality management factors and cost of quality categories, especially in the South African manufacturing industry. Hence, there is a need for the empirical evidence on the relationship between quality management factors and the cost of quality category to support the South African manufacturing companies in their efforts to improve quality management.

1.4 Purpose of the research

The main purpose of the research was to investigate the quality management maturity of the South African manufacturing sector and explore the relationship between quality management factors and cost of quality categories to support the industry.

1.5 Objectives of the research

The study was focused to achieve the following specific objectives:

a) To derive from the literature the concepts of cost of quality and quality management;

b) To explore the relationship between quality management elements and the cost of quality categories in the South African manufacturing sector;

c) To explore the ability of the quality management factors to predict the cost of quality categories in the statistical model in the South African manufacturing sector;

d) To identify the quality management factors which are highly associated with the cost of quality categories in the statistical model in the South African manufacturing sector;

e) To identify the level of quality management maturity in the South African manufacturing industry;

f) To benchmark quality management practice between the South African manufacturing industry and international manufacturing sector.

1.6 Research Questions

The questions below are designed to meet the objectives of this study.

a) What is the relationship between quality management elements and the cost of quality categories in the South African manufacturing sector?

b) Can the quality management factors predict the cost of quality categories in the statistical model in the South African manufacturing sector?

c) Which quality management factors are highly associated with the cost of quality categories in the statistical model in the South African manufacturing sector?

d) What is the level of quality management maturity of the South African manufacturing industry?

e) How does the quality management practice of the South African manufacturing industry compare to the international manufacturing sector?

1.7 Study Justification

The literature is packed with dissertations, conference papers, journal articles and other secondary sources of information on the subject of quality management and cost of quality.

The majority of the publications focus on assessing the relationship between quality management maturity and cost of quality (Patti, et al., 2001; Sower, et al., 2007; Moschidis, et al., 2016). The other group assessed the adoption of the cost of quality as the tool to measure the effectiveness of the quality management system (Sower & Quarles, 2003; Schiffauerova & Thomson, 2006; Kaur, 2009). The development of cost of quality model and the applications is also one of the areas which receive high levels of attention from the scholars (Moolman, et al., 2010; Nel, 2013; Özkan & Karaibrahimoğlu, 2013; Palikhe, 2013; Aniza, 2014; Iren & Bilgen, 2014). In the South African context, the focus has been on the total quality management and the application of quality management tools (Bhero & Dlamini, 2015; Assensoh-Kodua & Imrith, 2016). The literature did not provide the work which explains the quality management maturity of the South African manufacturing industry. This research provides the level of quality management maturity of the South African manufacturing sector and benchmarks the result with the international companies. The result further provides the areas of improvement which are much needed to support the South African manufacturing industry.

Despite the growing call from the authors in the field of quality management to use the cost of quality as the tool to measure the effectiveness of the quality management systems (Schiffauerova & Thomson, 2006; Kaur, 2009; Nel & Pretorius, 2016), it is not clear which quality management factors are associated with each cost of quality categories specifically in the South African manufacturing industry. Therefore, the current research endeavours to disclose the relationship between quality management factors and cost of quality categories. This information can be used by companies to focus their quality management effort. The results of the research also indicate which quality management factors should be used to improve each cost of quality category or verse-visa.

1.8 Scope and limitation of the research

The research investigates the quality management and cost of quality practice in the South African manufacturing industry and compares the result with international companies. The study further used the feedback from South African manufacturing companies to explore the relationship between quality management factors and cost of quality categories.

The first limitation on the scope of the study relates to the literature review. The research did not review all the available literature due to language barriers and security in some of the databases. The second limitation of the scope related to the generalisability of the study result; the result of the research cannot be generalised to the service sector. The service sector was not included in the current research.

1.9 Research methodology

The literature provided two core reasons for conducting research; these include filling the knowledge gap or solving the problem (Moyo, 2016). The two primary types of research practice, which include positivism and phenomenological or interpretivism approach (Saunders, et al., 2000; Katebire, 2015). The research questions and objectives of the study detect which method will best fit the nature of the study.

The phenomenological research uses qualitative data to understand business and solve problems. The interpretivist believes there is more than one reality and the truth is developed from people's experiences, people's interaction with the environment, researcher and participants' interaction (Heuschele, 2014).

In contrast, the positivism research approach uses quantitative data to create knowledge. The positivism considers only one reality, which involves an extensive literature review and formulation of the hypothesis (Katebire, 2015; Moyo, 2016). In the positivist research, the researcher does not have control over variables under scrutiny. The current research opted for the positivist approach to study the literature and answer the research questions.

1.10 Research approach

The literature provides two types of research approaches, namely deductive and inductive research. The deductive research method used the available knowledge and information to develop assumptions about the phenomenon, and the hypotheses are tested through statistical methods (Saunders, et al., 2000; Uma & Roger, 2009; Saunders, et al., 2009).

The inductive study develops theories from people's experiences and people's interactions with their environment (Saunders, et al., 2000; Rajasekar, et al., 2006; Walliman, 2011). Soiferman (2010) defines inductive research as a bottom-up approach associated with qualitative research data analysis. The current research is adopted for deductive research which links to the positivism philosophical stance.

1.11 Research strategy

The research strategy is a plan of action, which defines how the researcher will answer the research question and reach a conclusion (Saunders, et al., 2009; Farquhar, 2013). According to Saunders et al., (2009) the research strategy should take into consideration the research question, the duration of the study and the available literature on the subject. The literature provides a number of different types of research strategies which include experiment, survey, case study, action research and archival research (Kothari, 2004; Rajasekar, et al., 2006; Uma & Roger, 2009; Saunders, et al., 2009). The highlighted research strategies have different features, and the application depends on the researcher's experience, research question and philosophical stance adopted by the researcher (Uma & Roger, 2009; Saunders, et al., 2009; Farquhar, 2013). The current research opted for the survey research strategy because of the spread of the population of interest.

1.12 Research design

The research design is a systematic approach of selecting the unit of analysis, data collection method, sampling method, and data analysis to answer the research questions (Greener, 2008; Uma & Roger, 2009; Saunders, et al., 2009; Kumar, 2011). The authors further suggest that there is a direct link to the purpose of the inquiry and the research questions (*Ibid.)*.

According to Uma and Roger (2009, pp. 101-113), the research design can fall into three categories which are exploratory, explanatory, descriptive or hypothesis testing. Saunders *et al.,* (2009) maintain that the descriptive and exploratory attempt to explain what is going on, while explanatory research design explains the reason why a particular phenomenon is occurring. Uma and Roger (2009), agrees with the claim further suggesting that exploratory study applies where there is not much known about the subject. The current research opted for descriptive and exploratory research.

1.13 Data collections

The section explains how facts and information were obtained to answer the research questions (Saunders, et al., 2009; Uma & Roger, 2009). Greener (2008) suggests that there is a link between the type of research methods and data collections strategies. Uma and Roger (2009) detailed different kinds of data collection methods and applications, which include interviews, observations, Delphi Techniques, and questionnaires. The current research selected questionnaires as a possible choice.

1.14 Document layout

The document consists of six chapters with each serving its own purpose. Chapter one - this section provides the introduction to the study, the background and the problem statement. This section is important in this document because it provides the justification of the study.

Chapter two - this section provides the foundation of what has been done in the field of study. The section also provides the variables used in the literature to measure each concept of interest. The definition of key terms and the development in the field of quality management and cost of quality is presented in this section.

Chapter three provides the overall approach adopted to meet the set objectives and answers the research questions. The choices of data collection methods are justified in this section and the application through the data collection process. Chapter four presents the data analysis result. The section includes the presentation of observations, missing data analysis, reliability and validity result. Chapter five provides the meaning of the result, while Chapter six provides a summary of the findings and draws the conclusions.

1.15 Chapter summary

This chapter represents the introduction of the current research and lays the foundation for the research. The chapter further details the problem statement, justification, objectives and research questions for the research. The highlight of the research methodology and the layout of the study also form part of this chapter. Chapter two will look at the literature, arguments from other authors, and development in the field of quality management, Cost of Quality and benchmark practice.

2. CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In today's business environment, companies are compelled to adopt quality standards and best practice to remain in operation (Al-Saket, 2003; Sower, et al., 2007; Kaur, 2009; Foster, 2013; Trehan, et al., 2015). The importance of quality is not a new concept to humankind (Hellman & Liu., 2013). Bhero and Dlamini (2015) cited the Hammurabi, King of Babylon codes of law during the 1700s BC to indicate that quality has been part of human life for centuries. In agreement, Hellman and Liu (2013) maintain that quality innovations trace back to 2584 BC on the creation of the Great Pyramid of Giza. One of the highlights from the same authors would be the consequence of death if one's product resulted in fatality.

The Hammurabi's laws demonstrate that it is not new for low-quality performance or product to be atoned for with painful punishments. The results of poor quality are still valid even in today's business environment. Companies who ignore the importance of quality are facing the risk of disappearing, and they do not survive for too long unless the company runs the monopoly kind of business (Chiu, 2002; MijoĀ & MijoĀ, 2015).

This chapter presents the literature reviewed in the field of quality management and cost of quality. The chapter is divided into seven sections, with Section 2.1 providing the introduction of the chapter. Section 2.2 presents the review on the quality management development over the years. Section 2.3 present the review on the quality management maturity and the cost of quality reviews is presented in Section 2.4. Section 2.5 presents the review on the cost of quality models. Section 2.6 presents the concept of benchmarking and the chapter summary is presented in Section 2.7.

2.2 Quality Management Developments

The positive correlation between quality and customer satisfaction is the shared knowledge among scholars and quality practitioners (Sower & Quarles, 2003; Sower, et al., 2007; Van

Ho, 2011; Steyn, et al., 2013). However, the definition of quality differs from one person to another (Chiu, 2002; Van Ho, 2011; Palikhe, 2013; Steyn, et al., 2013). The common factor in most of the quality definitions is the need for meeting customer satisfaction. Jakpar *et al.*, (2012, pp. 223-225), unpacked product quality definitions from different perspectives "transcendent, product-based, user-based, manufacturing-based, and value-based." El Saghier and Nathan (2013, pp. 2-4), provide five service quality explanations: "tangibles, service reliability, responsiveness, assurance, and empathy."

Quality is the most dynamic construct; it is influenced by the perceptions, customer experience, and technology developments (Nyaoga, 2007). Most of the literature today in the field of quality management dates back to the 1900s. Figure 1 shows some of the key milestones in the theory of quality management, which forms the basis for the current study.

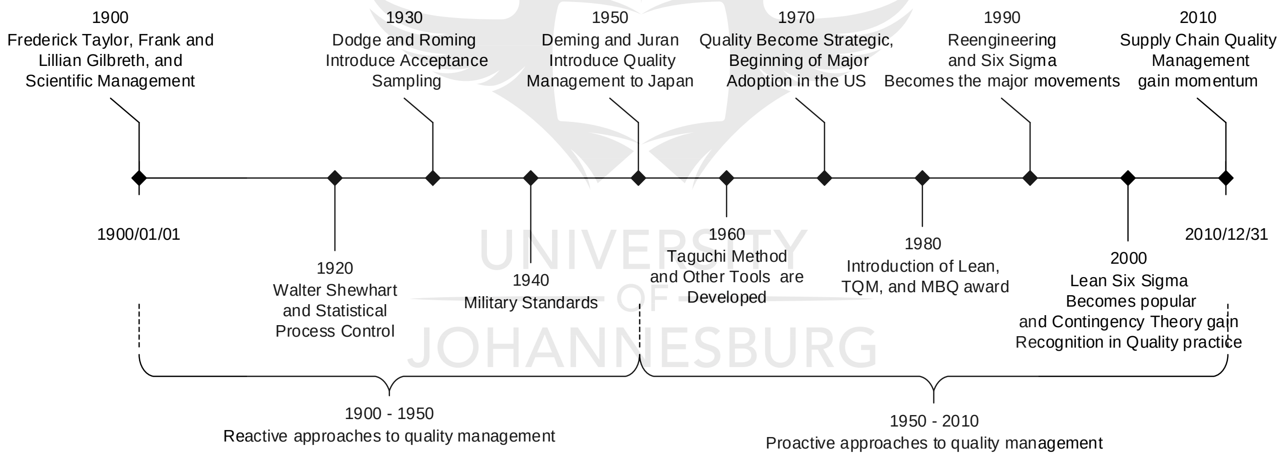

Figure 1: Key milestones in quality movement (Quinn, 2002; Foster, 2013, pp. 51-74; Hellman & Liu., 2013)

The next subsections present the detailed review for each quality management milestone. This section consists of eleven subsections. Subsection 2.2.1 present quality management development between 1900 and 1920s during Frederick Taylor's times. Subsection 2.2.2 presents the quality management review between 1920s and1930s. Subsection 2.2.3

presents the reviews of some quality management milestones during the 1930s to 1940s. Subsection 2.2.4 presents the reviews of quality management during the 1940 to 1950s. Subsection 2.2.5 presents the contributions by Deming, Juran and Feigenbaum during the 1950s to 1960s. Taguchi's contribution during the 1960s to 1970s are presented in Subsection 2.2.6 with other quality management developments during the same period.

Subsection 2.2.7 presents some of the key quality management milestones during the 1970s to 1980s. Subsection 2.2.8 presents developments like total quality management, quality award system and other developments which occurred between the 1980s and 1990s. The subsection 2.2.9 presents some of the quality management developments between 1990s and 2000s. The differences and similarities between quality management award systems is presented in subsection 2.2.10. The last subsection 2.2.11 presents the review quality management development between 2000 and 2010.

2.2.1 1900 -1920s: scientific management

Frederick Taylor invented scientific management practice during the 1900s (Quinn, 2002; Koumparoulis & Vlachopoulioti, 2012; Kolb & Hoover, 2012). Taylor is the godfather of today's management practice (Olum, 2004). During 1903 to 1911, Taylor was the first person to introduce the research-based management approach, which shapes the industry and resulted in the improvement in the business performance (Olum, 2004; Koumparoulis & Vlachopoulioti, 2012). Taylor's principles suggest the application of the scientific approach to work design and setting of business objectives. The beliefs also influenced the policies used in the structuring of rewards and recognition, training of employees and achievements of business goals (Quinn, 2002; Koumparoulis & Vlachopoulioti, 2012). Taylor emphasises the breakdown of the task into more manageable work packages (Olum, 2004). This practice is still very much applicable to today's everyday planning, scheduling of operations, and project activities.

Despite the improvements brought by the scientific management establishment, the working class was not content with some of the practices linked to the system, for example, the time studies, which saw Taylor defending his practice in the court of law (Koumparoulis & Vlachopoulioti, 2012). Moreover, the scientific management approach does not allow employees to participate in strategic planning and does not create the room for continuous improvement (Wheelwright, 1985; Koumparoulis & Vlachopoulioti, 2012). In general, people should be involved in strategic planning and contribute to business development. Taylor's education created separations and the sense of 'them' and 'us' among employees.

The Gilbreth family played an important role during Taylor's time and towards advancing some of the scientific management practices (Olum, 2004; Du, et al., 2014). According to Baumgart and Neuhauser (2009) the Gilbreth family integrated Taylor's time study with human factors. This integration included filming workers during their busy times with the aim of identifying the best ways of achieving the tasks and standardising some of the tasks. The recordings were further used for training purposes; identification of skills gap and engaging with employees. Taylor's teaching and the effort by the Gilbreth family still drive today's management practice, for example, the time studies still play a critical role in planning, estimation of resources and scheduling, process improvements, and contractual agreements.

2.2.2 1920 -1930s statistical process control

Walter Shewhart is cited as the originator of the statistical process control (Woodall, et al., 2000; Quinn, 2002; Raisinghani, 2005; Hellman & Liu., 2013). Shewhart developed the control chart with the aim of detecting defects and determined the stability of the processes (Woodall, et al., 2000; Kolb & Hoover, 2012). Although Shewhart's control chart started as an instrument to improve quality in manufacturing, the industries adopted the technique as an improvement tool worldwide (Woodall, et al., 2000). The control chart has also created the foundation for other quality innovations such as Six Sigma (Raisinghani, 2005). Shewhart also developed the Plan-Do-Study-Act Cycle (PDSA), which was later advanced by Deming (Foster, 2013). Shewhart's wisdom still plays a critical role towards improving daily operations, projects, and customer services.

2.2.3 1930-1940s introduction of acceptance sampling

Acceptance sampling is the first scientific quality control tool designed during the Second World War by Dodge and Roming during the 1930s (Dumičić & Živadinović, 2006). The acceptance sampling accelerates the process of inspecting the lots or the batch coming from the supplier or embarking to the customer (Dumičić & Živadinović, 2006; Ganguly, 2009; Arnold & Göb., 2009; Dumičić & Žmuk, 2012) . The initial purpose of the acceptance sampling technique was to support the military during the war and provide the most straightforward way of accepting or rejecting the bulk of goods from the suppliers without doing 100% inspection of the lots or batch of shipments (Arnold & Göb., 2009). Acceptance sampling is useful because in most cases 100% sampling is not feasible to the large population; it may result in a time-consuming and costly exercise.

There are two types of sampling methods: variable and attribute sampling (Dumičić & Žmuk, 2012). According to Dumičić and Žmuk (2012) variable sampling refers to the case where some form of measurements like the dimensions, viscosity or temperature rejects or accepts the units of the sample. Attributes sampling uses go or no-go, and the right or wrong approach in accepting or rejecting the groups of the sample. Also, there are three primary sampling plans defined in the literature, single sampling plan, double sampling plan and regular sampling plan (Dumičić & Živadinović, 2006; Ganguly, 2009; Arnold & Göb., 2009).

The significant risks associated with the tool involve the rejection of a good lot (supplier risk) or the acceptance of poor quality lots (consumer risk) (Dumičić & Žmuk, 2012). The other risk associated with acceptance sampling is that it does not mention anything about the production process of the product or material. Ganguly (2009) developed a decision model to deal with acceptance sampling risks. It was during the 1930s, when the quality management practitioners started to appreciate the cost of quality and the detrimental impact associated with poor quality (Schiffauerova & Thomson, 2006). The effort of integrating quality management with the cost elements plays the critical role in the current research.

2.2.4 1940-1950s military standard (MIL-STD)

During the Second World War, the US army adopted the statistical process control methods (detailed in section 2.2.2) to ensure the reliability of weapons and ammunition from their suppliers. Based on the Walter Shewhart line of thinking the US military developed the MIL-STD (military standard), which defines the requirements for vendors (Hellman & Liu., 2013). The MIL-STD did not only standardise the methods for acceptance of goods from suppliers; it also normalises all processes in the departments from the definition of terms and training to the testing of equipment (United States of America Department of Defense, 2014). Evans and Lindsay (2013), maintain that MIL-STD was the only standard applied worldwide.

Moreover, the standard played a critical role in the quality development in America and the rebuilding of Japan after the Second World War (*Ibid.*). The military rules tend to link to almost all previously discussed efforts of quality movement. The point of emphasis on MIL-STD is the reliability of the parts, material, and service coming into the organisation.

2.2.5 1950-1960s Deming, Juran and Feigenbaum

The harm brought on by the Second World War in Japan prompted the appointment of Deming and Juran to rebuild Japan (Hellman & Liu., 2013). Different research papers and books cite Deming and Juran as significant contributors to the quality movement (Al-Saket, 2003; PMI, 2013; Foster, 2013; Hellman & Liu., 2013; Evans & Lindsay, 2013; Jura, 2016). Deming and Juran attended the same school, and they both worked for the Western Electric Hawthorne plant. During Deming and Juran's employment at the Western Electric Hawthorne plant, they met Walter Shewhart who influenced their line of thinking about quality (Landesberg, 1999).

Deming promoted a proportion of Shewhart's teachings on quality and continuous improvements. Deming changed the focus of quality from inspection to a more integrated process, which put the leadership at the center of business success (Neave, 1987; Mândru, et al., 2011; Lunenburg, 2010). Deming's continuous quality improvement is based on the Plan-Do-Study-Act Cycle (PDSA), and Statistical Process control techniques (Mândru, et al., 2011). Figure 2 below indicates Deming's explanations of quality management benefits.

As a symbol of appreciation, the Union of Japanese Scientists and Engineers (JUSE) established the Deming Prize see Table 2 (Baškarada, 2008; Ganguly, 2009). Sukdeo (2016), maintains that the Deming Prize was based on his 14 points for quality management. The Deming contributions also led to the formation of the American Society of Quality Control (Kolb & Hoover, 2012). Deming did not only practise quality, but Deming also published books and delivered lectures to engineers, managers, and scientists in the field of quality management (*Ibid.*). Deming is recognised as a promoter of the quality control cycle (QCC) (Barlow & Dale, 1983; Salaheldin & Mohamed, 2007). The practice allows the voluntary team members to come together with the aim of improving the performance of the products within the organisations.

Figure 2: Deming Quality management benefits (Lunenburg, 2010; Foster, 2013)

Salaheldin and Mohamed (2007), demonstrated the role of QCC as the tool to enhance safety in the work environment. Jyoti and Murali (2011) find leadership involvement, training and skills development as some of the issues blocking the successful implementation of QCC. Table 2 shows Deming Prize factors - the first column presents the categories (factors) assessed and second column are elements used to assess each category.

Table 2: Catadapted of Deming Prize adopted from (Baškarada, 2008, p. 27)

Category	**Measure**
Management Policies and their deployment	• Strategic deployment of policies • Policy development
Innovations	• Passion • Outcomes
Preservation and improvement	• Monitoring and controlling • Continuous improvement
Organisational systems	• Organisational systems
Information management	• Knowledge management
People Management	• Human resource management

Foster (2013) refers to Juran as the godfather of quality management. Both Deming and Juran put leadership at the center of business success (Landesberg, 1999; Osayawe & McAndrew, 2005). Juran valued the importance of cost of quality, and he was the first person to develop the graphical representation of the CoQ Model (Sower & Quarles, 2003; Kaur, 2009; Palikhe, 2013; Trehan, et al., 2015). Juran also introduced the application of Pareto principles to solve quality management problems (Foster, 2013). Juran published some books and peer review papers in the field of quality management (Osayawe & McAndrew, 2005). Table 3 illustrates the Juran trilogy; this was the first structured sound standard of managing quality activities (Juran, 2005).

Juran believed in planning as the first point to quality improvement (Juran, 2005). The primary purpose of quality planning includes designing the process, identifying product attributes, the units of measurement, and resources required to support operations to meet business goals. The second point to quality improvement, according to Juran was quality control (*Ibid.*). Quality control involves the actual management of operational activities, taking measures, and identification of areas for improvement. The third phase of quality practice according to Juran was a quality improvement, which involves waste reduction and identification of nonconformities to the plans in the processes.

Table 3: Quality Trilogy (Juran, 2005; Foster, 2013)

Quality Planning	**Quality Control**	**Quality Improvements**
• Set quality objective • Collect customer requirements • Develop process boundaries • Develop a product or service acceptance criteria • Set the baselines	• Select unit of analysis • Monitor process behavior • Measure process results against the baseline • To highlight the difference between planned performance and actual performance • Document process behavior	• Identify areas for improvement • Document cause of the process failures • Formulate quality improvement teams • Constantly monitor to ensure compliance

Alongside Deming and Juran, Feigenbaum played a vital role in the development of quality management practice (Watson, 2005). Some of Feigenbaum's contributions to the progress of quality as a subject, incorporate the definition of systems engineering as ways to quality improvement. Feigenbaum also categorises the cost of quality to Preventive, Appraisal, and Failure cost. Feigenbaum was also commended as the first person to develop Total Quality Control, integrate administration strategies, and business theories with managerial principles (Quinn, 2002; Watson, 2005; Sower, et al., 2007; Trehan, et al., 2015). The other distinguished influence from Feigenbaum includes the movement of quality focus from a product based on both service and product-centered quality (*Ibid.*). The current research will partially use the Feigenbaum CoQ model to answer the research questions and achieve the objectives of this study.

2.2.6 1960-1970s Taguchi methods and other tools are developed

The traditional quality management approach defined in the previous sections focus on statistical process control (SPC) and embraces inspection. Taguchi's philosophy of quality management discredited investigation, conformance to specifications and promoted the reduction of variability of noise factors during the design (Zambanini, 1992; Pachpute & Bawa, 2016). Taguchi observed quality as two-dimensional objects: the customer view and the product view. The product quality refers to the ability of the product to perform its intended function without disappointment or affected by the environmental changes (Pachpute & Bawa, 2016). Customer quality refers to the client's perception of the point of sale (*Ibid.*). The process of developing a quality product is called sound engineering (Zambanini, 1992; Pachpute & Bawa, 2016).

Taguchi started the entirely new chapter in the field of quality management. Taguchi's quality philosophy includes quality engineering (target and loss function), a methodology for product design (system design, parameter design, and tolerance design steps), experiment design (using an orthogonal array) and analysis (using the signal to noise ratios) (Athreya & Venkatesh, 2012) . Taguchi maintains that the quality of the product starts from the design phase (Kundu, et al., 2015). The quality engineering philosophy, methodology for product design, experiment design and Taguchi data analysis approaches all refer to as Taguchi Methods.

The detailed application of Taguchi methods is cited in some research papers (Zambanini, 1992; Athreya & Venkatesh, 2012; Kundu, et al., 2015; Pachpute & Bawa, 2016). Taguchi's methods require some level of knowledge about the process or product features (*Ibid*.). The experience helps one to identify factors influencing the outcome or process performance. Despite the high rate of success in the application of Taguchi's version of the design of the experiment, the approach can be occasionally expensive.

Besterfield (2003) and Foster (2013) maintained that Ishikawa was also influential in Japan during the 1960s. Ishikawa developed seven tools of quality - see Table 4 below. The tools include a Fishbone Diagram, Histogram, Pareto Analysis, Flowcharts, Scatter Plots, Run Chart, and Control Chart (2003; Bose, 2012). Ishikawa's seven tools of quality still play a fundamental role across industries (Hekmatpanah, 2011; Bose, 2012; Astrakusuma & Saptono, 2014). Moschidis et al., (2016) used the seven tools of quality with other quality improvement tools to assess the quality management maturity of the organisation. Foster (2013, p. 61) summarised Ishikawa's philosophy of quality management in eleven points. The first aspects of Ishikawa's theory of quality management include education and understanding of customer requirements.

Table 4: Seven essential tools of Quality (Patti, et al., 2001; Besterfield, 2003)

Tools	Applications
1. Cause and Effect/Fishbone Diagram	• To identify the causes of the problems
2. Pareto Chart	• To identify 20 % reasons responsible for 80 % of the process issues
3. Checksheet	• This is the form used to collect data
4. Control Chart	• To assess the process stability
5. Histogram	• To display frequency distribution
6. Flowchart	• To provide a pictorial display of the process
7. Scatter Plot	• To display the relationship between two variables

2.2.7 1970-1980s quality becomes strategic and the significant adoption in the USA

The Deming and Juran's (detailed in 2.2.5 above) quality teachings created a substantial competitive advantage for Japan. As a result, the United States of America (USA) started to feel the pressure from the Japanese competitors (Modarress & Ansari, 1987; Foster, 2013). According to Hellman and Liu (2013), Philip Crosby started to incorporate quality into business strategies in the US as a way of responding to Japanese competition.

Crosby's quality philosophy was about discipline and the drive to doing things right the first time (Taidi, 2015). Crosby was instrumental in the development of the concept of zero defects to promote and explain the values of sound quality management (Bellows, 2004). Quality, according to Crosby is about meeting the requirements, and conforming to the specification, through the systematic approach to prevent defects (Bellows, 2004; Farooq, et al., 2007; Taidi, 2015). Crosby was also sensitive to the poor cost of quality, demeaning the process of inspection, testing and rectification of fault that should have been avoided during quality planning. Crosby viewed the cost of quality as the price tag of conformance and nonconformance to specifications and customer requirements (Nel & Pretorius, 2016). Crosby has further defined the Cost of Quality (CoQ) as Prevention + Appraisal + Failure + Opportunity cost (Sower & Quarles, 2003; Narasimhan, 2013; Trehan, et al., 2015).

Crosby believed that quality is an ongoing learning process and the belief, which resulted in the creation of Quality Management Maturity (QMM) grid see Table 5. The first column in Table 5 contains factors used to measure quality management and the rest of the column represents different stages of quality management maturity. Crosby’s model consists of five levels to gauge quality management maturity; the scholars adopted the model as the baseline to assess quality management maturity of the organisations (Moschidis, et al., 2016; Egberonbe, et al., 2017). The model forms the foundation for the current research to assess the quality management maturity of the South African manufacturing industries.

Table 5: Quality Management Maturity Grid adapted from (Baškarada, 2008, p. 20)

Measurement Categories	Stage 1: Hesitation	Stage 2: Developing	Stage 3: Clarification	Stage 4: Wisdom	Stage 5: World Class
Organisation understanding and approach	No Understanding of quality as an organisational tool	Recognise excellence, but no resources allocated to quality activities	Support quality improvement programmes and provide support	Senior Management plays a leading role in quality improvement. Quality is placed at the center of all business discussion.	Quality is a competitive advantage, and it forms part of business strategy
Quality Organisation Statues	Quality is the responsibility of specific departments. The inspection does not form part of the organisation	There is a quality leader, but the emphasis is still on evaluations	The Quality Department report to the Chief Executive or a similar role	Quality Manager is an officer in the organisation.	Quality is represented on the board of directors. Prevention is the primary concern in the organisation
Problem Handling	Problems are handled reactively as and when they occur	There are allocated teams to deal with quality problems on the short term bases	There is an effort to improve quality management. Moreover, issues are addressed openly	Problems are depicted as soon as they present themselves. A team from different departments are formulated to deal with quality issues	Problems are prevented in advance. Except in special cases
Cost of Quality as % of sales	Not reported Actual: 20%	Reported: 3% Actual: 18%	Reported: 8% Actual: 12 %	Reported: 6.5% Actual: 8%	Reported: 2.5% Actual: 2.5%
Quality Improvement	Informal and 'as and when' activities	Trying obvious short-term efforts	Implementing an established process with a clear understanding of the activities involved	Continuous improvement of the development processes	Quality improvement is the business of the day to day activities
Outline of company quality attitude	There is no clear understanding of quality problems	Search for the origin of quality problems	Management plays a leading role in identifying and solving quality problems	Fault prevention is part of business operations	There is a definite understanding of why quality is not a problem

2.2.8 1980-1990s TQM, MBQ AWARD, LEAN, and other tools

The authors referred to the total quality management (TQM) as an American approach to react to the competition imposed by Japanese quality management systems during 1980s (Quinn, 2002; Kolb & Hoover, 2012). According to Kolb and Hoover (2012), total quality management originated from the Feigenbaum theory of total quality control. In contrast, Shen and Lau (1995), argue that prior 1980s, the Japanese were already using the concept of total quality management. However, all the authors agreed on the idea of TQM that is an integration of leadership, customer focus, employee involvement, process improvement, and environmental consideration with the aim of continuous improvement to business performance.

The other prominent effort to improve quality in America during the 1980s was the establishment of the Baldrige National Quality Programme and the Malcolm Baldrige National Quality Award (MBNQA) (Foster, 2013, pp. 84-90). Figure 3 shows the MBNQA Framework, which helped to advance quality improvement in the USA during stressful times (*Ibid.*).

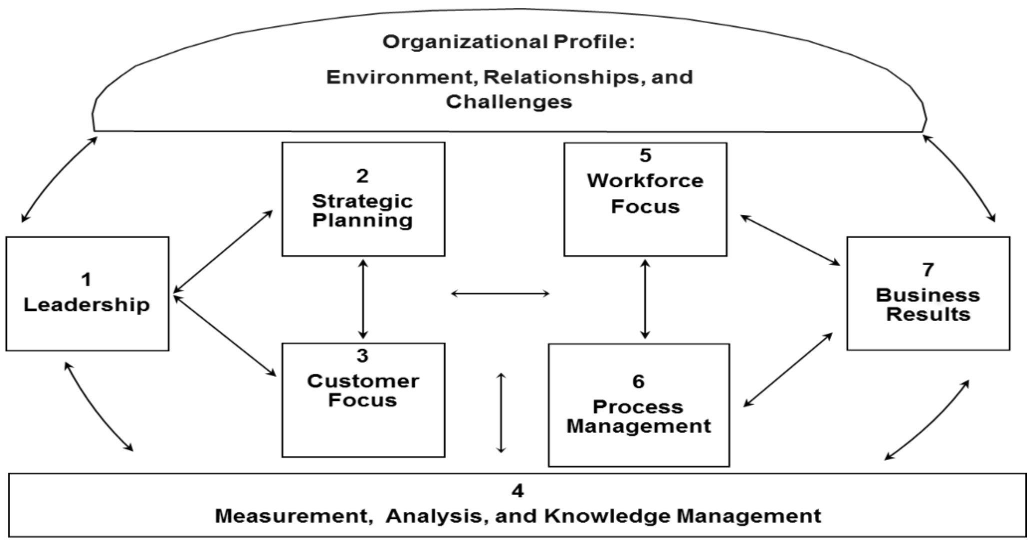

Figure 3: Malcolm Baldrige Framework (Foster, 2013, p. 84; Sukdeo, 2016, p. 18)

In the same year of the MBNQA system implementation, the International Organisation for Standardisation (ISO) based in Switzerland, issued the first version of ISO 9000 standard (McGovern & Brokaw, 2001; Kolb & Hoover, 2012) . The purpose of ISO 9000 was to standardise the effort to quality improvement across all industries. The ISO 9000 standard expanded the TQM factors by including a systematic approach to management, a factual approach to decision-making and mutually beneficial supplier relationships (Kumar & Balakrishnan, 2011). Since the invention of ISO 9000 certification, the number of companies registering as members of the International Organisation for Standardisation is growing every year (Kumar & Balakrishnan, 2011; Gutu, et al., 2012).

Gutu et al., (2012) maintained that the lack of management support, inferior innovations, and creativity of employees, the lack of internal audits, preventive maintenance and data analysis are significant challenges affecting ISO registered companies. In the same context, Kumar and Balakrishnan (2011) found that leadership, strategic alignment, quality frameworks, and social responsibilities form part of the difficulties confronting ISO affiliated organisations.

At the same time, Japanese quality practitioners did not stop striving for better quality products. During the 1990s, the Japanese started the concept of lean manufacturing (Ketkamon & Teeravaraprug, 2009; Todorova, 2013). In contrast, other researchers argue that the idea of lean has been in use since 1913 by the Michigan plant of Ford (Ngoune & Kholopane, 2016). Nevertheless, the researchers agreed on the primary goal behind the concept of Lean to reduce non-value adding activities, eliminate unpredictability of the processes, and irrational decisions in both the manufacturing and service sectors.

Despite the benefits and the competitive advantage associated with the Lean practice, the scholars argued that not all the companies implementing the Lean realise the expected benefits (Ferdousi, 2009; Todorova, 2013). The success of Lean implementation requires full management support, a positive attitude, clear goals and active members (Rusli, et al., 2014). The success of Lean practice depends on the understanding of tools and techniques associated with the application.

During the same period in 1984 Canadians established the quality award system to promote business excellence (Vokurka, et al., 2001). Figure 4 below indicates the criteria considered for the Canadian Quality Award (CQA). Both CQA and MBQA share the same features, except supplier development which is unique to CQA.

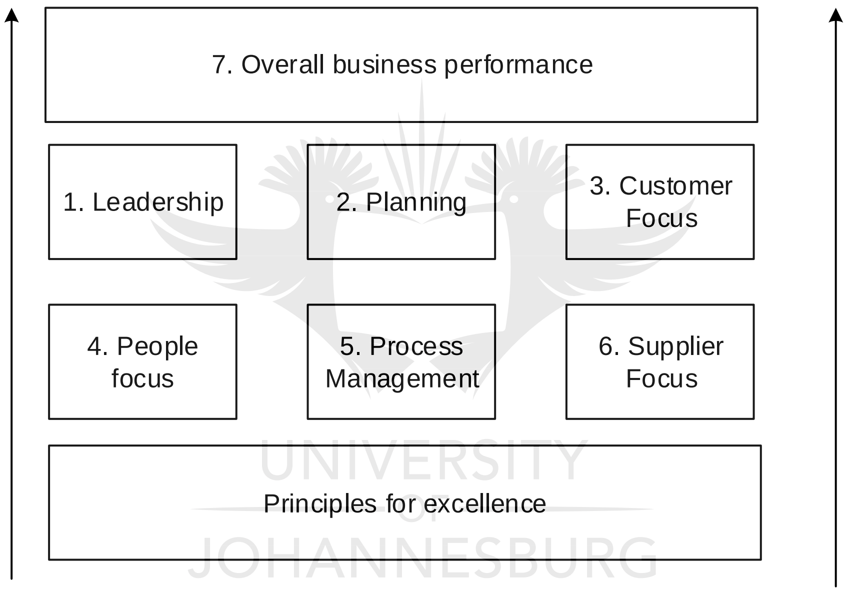

Figure 4: Canadian Quality Framework adopted from (Sukdeo, 2016, p. 23)

2.2.9 1990-2000s re-engineering and other quality developments

Before the 1990s, the traditional style of business improvement and quality management was always about incremental improvement. The conference paper by Devenport, Short, and Hammer in 1990 changed the conventional continuous improvement style of corporate development and excellence management to a more robust system called Business Process Re-engineering (BPR) (González-Benito, et al., 1999; Shen & Lau, 1995).

The BPR assumes that people know and are capable of doing their job. Therefore the necessary rethinking of business processes and radical changes are feasible. Business Process Reengineering is a top-down approach, where management dictates the shift in people. Rao et al., (2012) reported the 70% failure rate of Business Process Reengineering. The researchers argue that BPR did not take into consideration people in implementing radical changes, some of the revisions resulted in job losses and resistance to change (González-Benito, et al., 1999; Shen & Lau, 1995; Rao, et al., 2012).

Alongside with other quality management initiatives during the 1990s, Six Sigma (SS) changed the attitude toward quality improvement (Taidi, 2015). Most of the American and Japanese companies like General Electric, Bombardier, Sony and others, took advantage of the of SS to outplay their competitors (Arafeh, 2016). Bill Smith industrialised the idea of Six Sigma, the employee of Motorola in 1986; the aim which was to reduce defects, improve customer satisfaction, and to lower the cost of nonconformance (Quinn, 2002). Raisinghani (2005), maintains that the concept of SS has its beginning from Carl Fredrick Gauss (1777-1855) and Walter Shewhart during the 1920s.

The literature has no single definition of Six Sigma. However, most of the descriptions have the element of a data-driven approach, customer satisfaction, and cost reduction as the common factor (Raisinghani, 2005; Raisinghani, 2005; Muralidharan, 2015). Pochampally and Gupta (2014) demonstrate the application and the use of Six Sigma with examples. The concept of SS plays a critical role in the current study to understand how other researchers dealt with the chronic problem of the cost of quality.

From 1990 to the 2000s, the field of quality management witnesses the growth in quality awards from different countries. The award programmes invented during this period include the European Foundation for Quality Management (EFQM), Japan Quality Award (JQA) and

Singapore Quality Award (SQA) (Baškarada, 2008; Foster, 2013). According to Baškarada (2008), JQA is not different from the MBNQA system. Likewise, according to Sukdeo (2016), the EFQM is also similar to other quality award systems, except that it has added social impact as one of the criteria.

European Foundation for Quality Management (EFQM): the model was created on the bases of MBNQA and Deming Prize with the focus on business excellence (Baškarada, 2008). The EFQM excellence model was created in 1991 with the aim of promoting TQM and competitive advantage for the European companies.

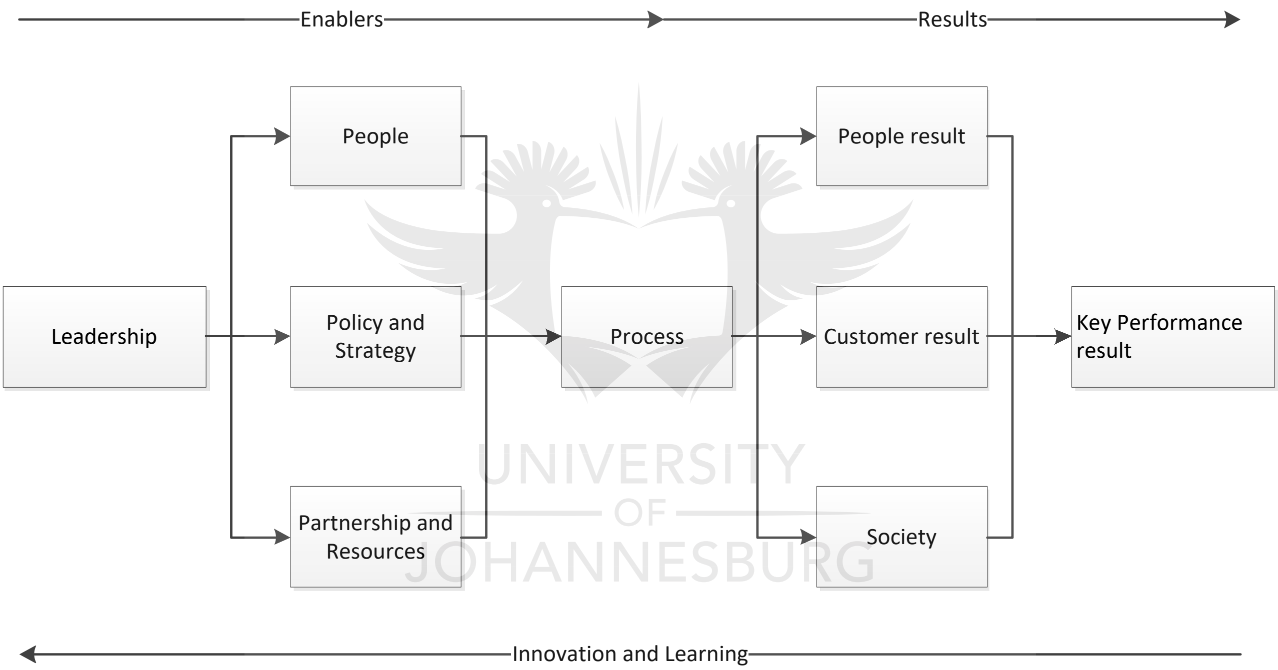

Figure 5: European Foundation for Quality Management (EFQM) adopted from (Baškarada, 2008, p. 33)

The model assumes that the effectiveness of the five enablers (Leadership, People, Policies, Partnership and Process) determines the four result areas (people result, customer result, society result, and critical performance result) (Bohoris, 1995; Baškarada, 2008). Baškarada (2008) claims that the applicants of the EFQM award receive feedback from the administrator, which is valuable in closing the gap in the maturity of the quality management system of the organisation. However, Davies (2004) identified a range of challenges in the implementation of the EFQM requirement. The issues include motivation, education, leadership involvement, employee involvement, the process of application, the integration process and the inability of the management team to maintain momentum. The issues were mainly embodied in the culture of the organisation and the inadequate project management process.

Japan Quality Award (JQA): In 1995, the Japan Productivity Centre for Socio-Economic Development (JPC-SED) set up the JQA under the administration of the Japan Quality Award Council (Baškarada, 2008). Figure 6 indicates the components of the JQA model which not too different from the MBNQA model. The JQA has its foundation from MBNQA with the focus on leadership, decision making, and social responsibility as business drivers. The strategic planning, strategic deployment, capability improvement for business and individuals, both form part of the system. Like in the MBNQA model information management, customer focus and result focus all play a critical role in the JQA model. JQA model promotes the TQM practice in Japan and awards the top achievers.

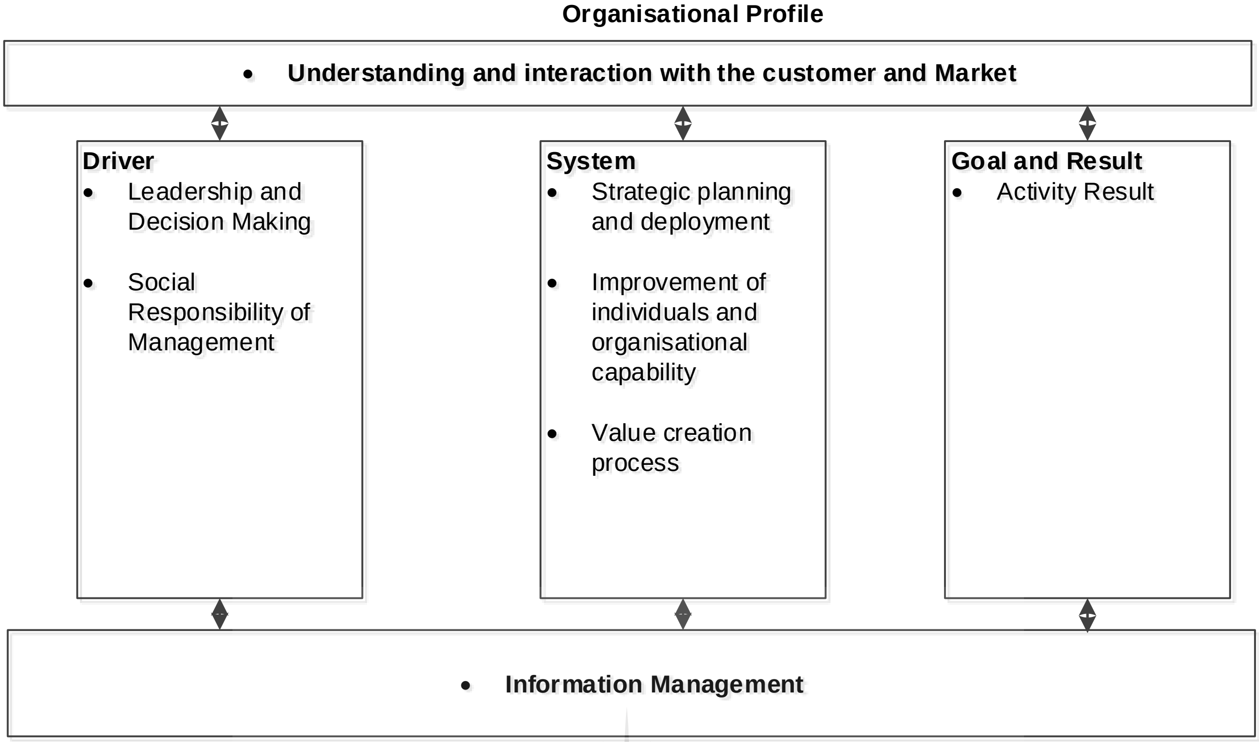

Figure 6: Japan Quality Award (JQA) adapted from (Baškarada, 2008, p. 28)

Singapore Quality Award (SQA): like all other quality award models, the purpose of the SQA is to promote the TQM in Singapore. According to Baškarada (2008), the SQA established in 1994. Figure 7 below shows the SQA model elements; the model is substantially based on the MBNQA and EFQM models. As indicated in Figure 7, SQA assesses seven factors similar to the MBNQA.

Lionis and Kougioumitzaki (2008), maintain that the participation of the quality award systems helps the companies to strive for excellence and become the best in their field of practice. In support Majumdar and Manohar (2015) maintain that the quality awards system helps the organisation to benchmark their quality systems against best achievers. Also, the scholar suggested that the quality awards criteria help the organisations to focus and be able to self-assess against a specific model.

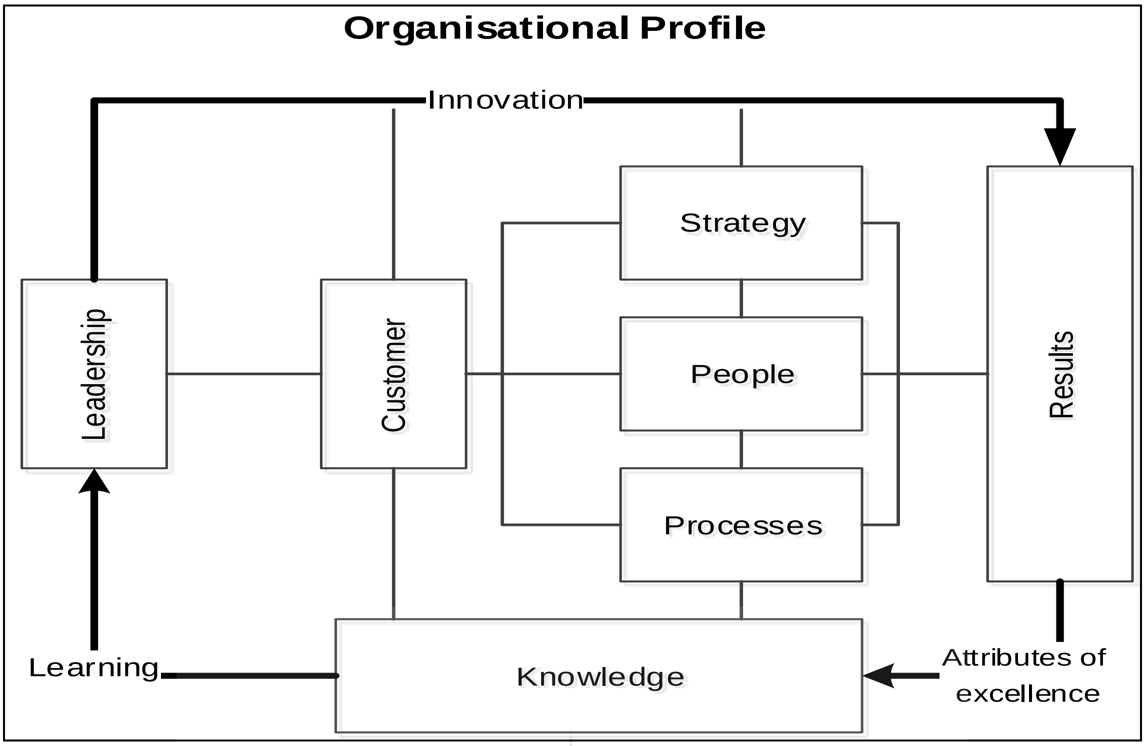

Figure 7: Singapore Quality Award (SQA) adapted from (Baškarada, 2008, p. 28)

2.2.10 Similarities and differences in the quality awards models

Table 6 below shows the similarities and differences in the quality awards models. As indicated in Table 6 below, leadership, strategic planning, and customer focus and employee focus have been the centre points for quality improvement for more than five decades (Baškarada, 2008). CQA and SQA resemble all the features of the MBNQA, which is the indication that the two models come from the Malcolm Baldrige National Quality Award. EFQM and JQA introduced social responsibility in the criteria, which indicate the shift in the quality management focus to include social responsibility as part of integrated quality management system. EFQM is a more business focus award system; it also assesses the ability of the organisation to develop and sustain the supplier-buyer or partnership and resource management (Davies, 2004; Majumdar & Manohar, 2015).

Table 6: Similarities and differences in the quality awards models adapted from (Baškarada, 2008, p. 34; Sukdeo, 2016, p. 25)

The 1950S	**The 1980S**		**The 1990s**		
Deming Prize	**MBNQA**	**CQA**	**SQA**	**JQA**	**EFQM**
1. Management Policies and their deployment	1. Leadership	1. Leadership	1. Leadership	1. Leadership	1. Leadership
2. Innovations	2. Strategic planning	2. Planning	2. Strategy	2. Strategic Planning	2. Strategy and policies
3. Preservation and improvement	3. Customer focus	3. Customer Focus	3. Customer	3. Customer focus	3. Customer results
4. Peoples Management	4. Human Resource	4. People Focus	4. People	4. Improvement of individuals and the organisation	4. People
5. Information management	5. Information and Analysis	5. Process Management	5. Process Management	5. Information Management	5. Process Management
6. Organisational systems	6. Process Management	6. Supplier focus	6. Knowledge	6. Results	6. People result
	7. Business result	7. General Commercial Performance	7. Result	7. Value creation	7. Key Performance results
				8. Social Responsibility	8. Society impact
					9. Partnership and resource management

2.2.11 2000-2010 Lean Six Sigma, Contingency theory gaining momentum

Lean Six Sigma is the amalgamation of Lean principles and Six Sigma ideas to improve quality, processes and cut down the time to provide the customer with a quality product (Muralidharan, 2015; Ngoune & Kholopane, 2016). Muralidharan (2015) referred to Lean Six Sigma as the most powerful corporate strategy, and the movement tool that ever existed in the past. Traditionally, Six Sigma uses the concept of Define, Measure, Analyse, Improve, and Control (DMAIC), which is a data-driven enhancement strategy to improve quality (Raisinghani, 2005; Ngoune & Kholopane, 2016). Table 7 below details the DMAIC processes, which are mainly grounded on the Plan-Do-Study-Act Cycle from Deming's principles of continuous quality improvement (Baškarada, 2008). According to Desai and Shrivastava (2008), six sigma aimed at reducing the errors or failure to 3.4 per million opportunities.

Ngoune and Kholopane (2016) further define the Six Sigma quality improvement initiative as the most adaptive approach to other quality improvements, which is why it was easy to combine the two separate practices (lean and six sigma). Marques et al., (2015) integrated the concept of Lean Six Sigma with ISO 9001: 2015 to demonstrate the flexibility of the idea.

Table 7: Six Sigma DMAIC adapted from (Hassan, 2013, p. 29; Shaikh & Kazi, 2015, p. 15)

Item	Description
Define	• This phase of the DMAIC process involves the identification of the customers. • Collect customer requirements and expectations. • Describe the structures of the product or service to meet customer needs • Define the process and procedures to meet customer requirements • Define known challenges to be resolved to meet customer needs • Define process perimeters and tools • Define a data collection strategy • Define the unit of measurement
Measure	• Collect work performance data • Monitor progress and observe changes
Analyze	• Compare plans and actual • Determine the reasons for deviation • Analysis of process stability • Identify and prioritize areas for improvement

Item	Description
Improve	• Benchmark the process to identify the best practice • Conduct audits of the continues improvement process • Use technology to advance the process
Control	• Develop preventive strategies to make sure that issues are detected in advance • Constantly monitor process behaviour • Provide training on the process and products

The introduction of Lean Six Sigma did not stop the instability in the global market and economic fluctuations. The environment continues to force businesses to look for better approaches to meet customer needs and not sticking with the static method of quality management. According to Sousa and Voss (2008), the contingency theories were a response to the changing business environment. The contingency theories, as tactics for quality management; appreciate and embrace the changes in the business atmosphere and suggest the alignment of business processes to meet different market conditions (Schniederjans & Schniederjans, 2015). The author further indicates that the concept of contingency theory is not new knowledge, its origin traced to leadership studies and organisational settings. The contingency theories appreciate the fact that there is more than one way to run the business. It helps the company to prepare and react correctly to different situations.

2.3 Quality Management Maturity (QMM)

Quality management maturity is the measure of organisational culture towards quality improvement (Sower, et al., 2007; Egberonbe, et al., 2017). The concept of quality management maturity is the theory, which involves continuous learning and adoption of proven methods in a specific field of practice (Patti, et al., 2001; Rosnah, et al., 2010). Egberonbe et al., (2017) defined quality management maturity as the way of understanding and accepting your organisational position in the market; and work to match the best achievers or the best achievable performance. Figure 8 shows the characteristic of different maturity levels from level 1 to 5.

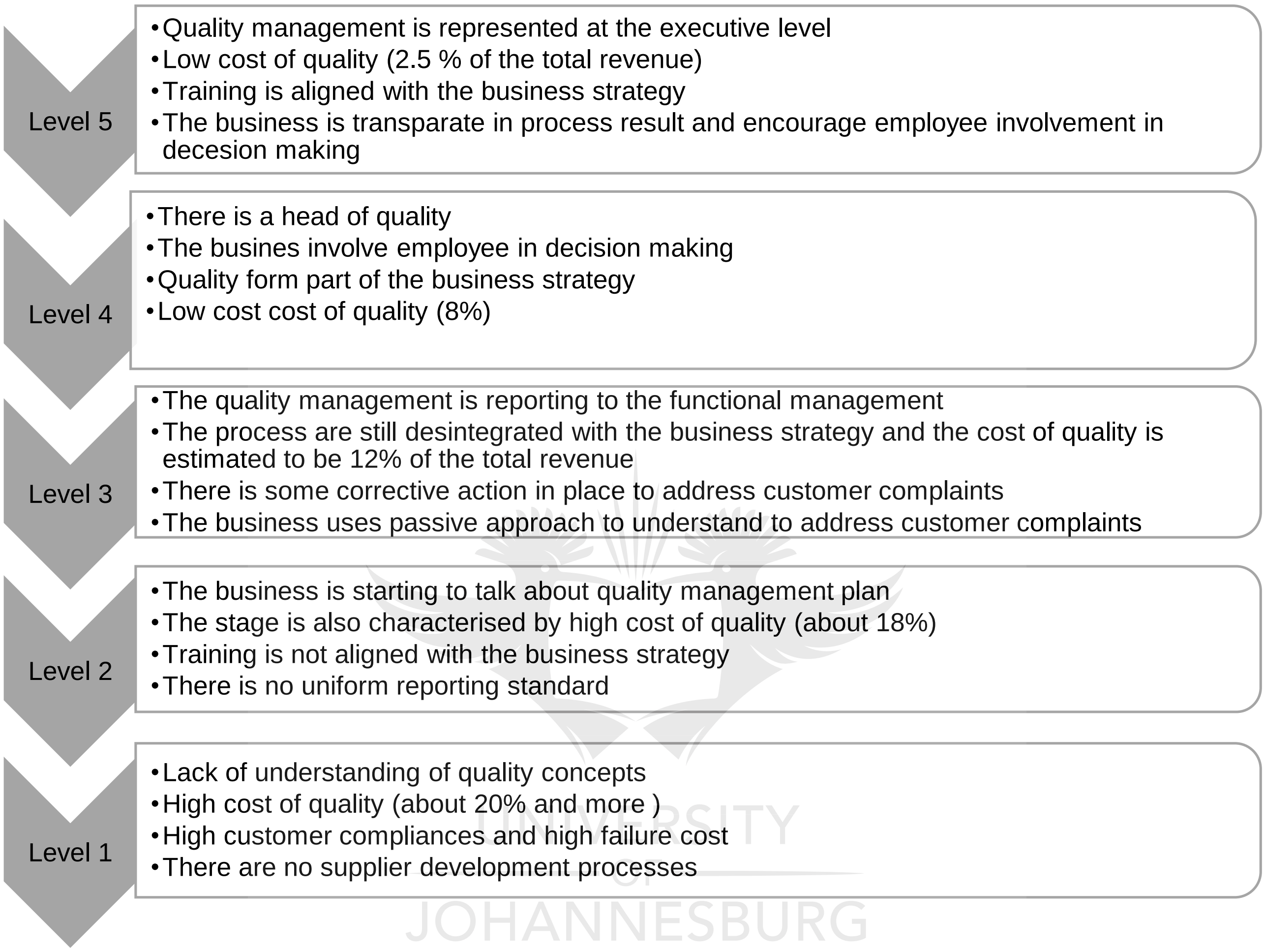

Figure 8: Quality Management maturity levels (Patti, et al., 2001; Baškarada, 2008; Xiaofen, 2013)

Rosnah et al., (2010) claim that the quality management maturity of the organisation is the function of time at which the organisation has adopted the formal quality programmes. According to the authors the timeframe for quality management maturity range between seven and twenty years. In contrast Patti et al., (2001) suggested that it will be misleading to use the number of years the organisation has adopted a quality management practice only to judge quality management maturity of the organisation. Garza-Reyes (2018) argue that quality management maturities not be seen as a linear process. Fok et al., (2003) maintain that the adoption of quality programmes; the understanding and application of quality management tools would explain the maturity of the organisation. There is an agreement among scholars that quality management maturity of the organisation starts from the culture and the attitude toward quality improvement (Fok, et al., 2003; Rosnah, et al., 2010).

According to Detert et al., (2000) culture is a set of norms, behaviour, and values within a specific environment. The culture of the organisation defines how things are done within the enterprise. Top management is a driving force in setting and directing the culture of the organisation (Sower & Quarles, 2003; Foster, 2013). It is a common understanding among scholars and practitioners that any quality initiative, which lacks senior management support, is doomed to fail (Lunenburg, 2010; Masejane, 2012; Egberonbe, et al., 2017). Nevertheless, organisational culture and management support cannot define quality management maturity as a stand-alone dimension. Figure 9 below, provides the summary of the dimensions used by other authors to measure the concept of quality management maturity (Patti, et al., 2001; Fok, et al., 2003; Egberonbe, et al., 2017). The authors suggested that the perception of employees within the organisation provide insight into the quality management maturity of the organisation. In addition to the typical variables from different authors, Patti, et al., (2001) added the organisational climate as another variable which needs assessment to understand the maturity system of the organisation better. There is evidence in (Kedem, 2004; Baškarada, 2008; Foster, 2013) suggesting that organisational climate is one of the factors which form part of the corporate profile during MBQA assessment.

Unlike the model detailed in Table 5, authors agreed that Figure 9 provides the snapshot not the detailed overview of the quality management maturity of the organiation (Patti, et al., 2001; Fok, et al., 2003; Egberonbe, et al., 2017). Moreover, different quality award systems like MBQA, CQA, and EFQM mainly influence quality management maturity dimensions The study by ASQ (2016, p. 10), extended the list of quality management maturity dimensions to ten variables. Despite the extension of other reviews, the theme and the content of quality management maturity remain unchanged.

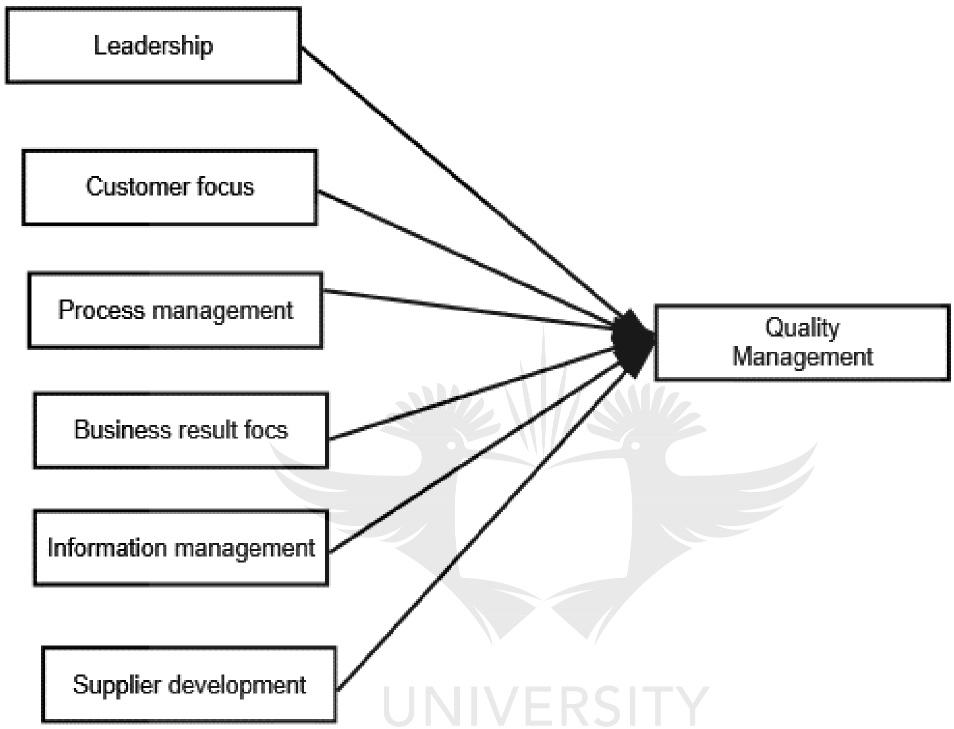

Figure 9: Dimensions of Quality Management maturity adapted from (Ahmad & Karimah, 2008, p. 7)

2.3.1 Leadership

Leadership is a systematic approach to influence people and groups to work towards the same objective (Gentry & Sparks, 2012; PMI, 2013). Loulas (2014) suggested that the process of leadership involves leaders and followers. The author further maintains that the process of leadership can create or break trust between the leader and followers. Gentry and Sparks (2012), suggested that leaders should strive to inspire and motivate people to work towards a mutual goal. The ability of the leader to create an encouraging working environment is a critical success factor in todays ever-changing business environment (Gentry & Sparks, 2012; Loulas, 2014).

Leadership and top management support are driving forces behind the successful implementation of any quality initiative (Egberonbe, et al., 2017). Egberonbe *et al.,* (2017) maintain that if leaders cannot show constant commitment and lead by example, then commonly, employees lose interest to support the business. Leaders are there to provide directions for the future of the organisation. Aletaiby, et al., (2017) suggested that leaders should create the culture and the climate which will allow people to advance within the organisation and support the companies to meet business objectives.

There is evidence in (Baškarada, 2008; Foster, 2013), suggesting the agreement among quality gurus that leaders are the primary drivers of the organisational culture. Ishikawa indicated that management should not show anger when presenting facts to the employee, while Deming is suggesting that leaders should drive out fear and involve employees in quality improvement (Foster, 2013). Quality gurus also agreed on providing employees with training, creating clear lines of communication between management and employees and creating cross-functional quality improvement teams (Barlow & Dale, 1983; Baškarada, 2008; Sparta Systems, 2016).

2.3.2 Customer focus

Foster (2013), defines the customer as the receiver of the products or services, this entity can be somebody within or outside the organisation. The author further suggests that interaction with the customer regularly involves transactions of any economic value.

The importance of identifying the customer requirement and customer satisfaction has always been the central point in the quality management discussions (Crosby, 1984; Chen, 2002; Besterfield, 2003; Cârstea, et al., 2014). The customer requirement can be both subjective (e.g., emotional, sense of being appreciated) and objective (e.g., artifact dimensions and service characteristic). Sukdeo (2016), maintains that the success of the organsation rests on understanding the customer needs. The author further suggests that the process of collecting the customer requirement end once all the identified requirements have been met. In support of the view, Zhang et al., (2003) suggested that the customer requirement should receive the priority in both product and service design. The author further indicated that the value chain in the organiszation should be flexible enough to accommodate ever-changing customer needs.

Awour (2014) maintains that the companies should be able to collect the perceptions of their customers about the products and services to remain in business. The customer feedback helps the companies to respond to ever-changing requirements which are driven by technology advancement and globalisation (Zhang, et al., 2003). Egberonbe et al., (2017) maintain that the information from the customers is only useful if it is taken into consideration during product or service design. According to Mehra and Ranganathan (2008), customer feedback can be collected using a passive approach or active methods. The passive approach involves the customer coming to the company with the concern, while in a proactive approach, the company calls the customer for the feedback. The authors maintain that customer focus is the significant portion of total quality management (Evans & Lindsay, 2013; Marques, et al., 2015; Sansalvador & Brotons, 2017).

2.3.3 Employee focus

Employee focus is one of the most discussed concepts in the total quality management and quality management maturity literature (Matlhape & Lessing, 2002; Gul, et al., 2012; Foudraine, 2015). The reason quality gurus and quality practitioners place more focus on employees' wellbeing; is the fact that without people there is no market (Gul, et al., 2012). According to Matlhape and Lessing (2002), companies do not reflect employees in their asset register, but they know that people are the most critical asset to business existence. The author further suggests that people are the most vital assets which can quickly leave the organisation or become a hazard if they are not well looked after.

Egberonbe et al., (2017) maintain that without a commitment from people, companies will not be able to support or achieve their business objective. Different quality gurus as indicated in Table 8 below support Egberonbe *et al.*'s views.

Table 8: Quality Gurus on employee focus Adopted (Baškarada, 2008)

Quality Guru	**Views on people's involvements in quality**
Juran	• Juran the quality improvement team to be made of people from different department of functions. • People should be provided with training to perform their duties.
Ishikawa	• People should be given an opportunity to voluntary join quality improvement teams or formulate one. • Training should be a continuing process
Deming	• People should feel free to question the standing practice and be allowed to suggest new improvement • Deming also promoted the involvement of different functions in improving product or service quality. • Deming was also a promoter of training and retraining of people
Cosby	• People must feel the presence of quality in the design, the art of other workers, product and service • People must have a clear line of communication with management to report quality issues, and the administration should advocate communication between internal and external customers • Everybody within the organisation must be trained in quality

Sukdeo (2016) supported the views from quality gurus that suggested the involvement of people in quality improvement and the establishment of training to increase competitive advantage. The benefit of engaging people in quality improvement depends on the alignment between human resource management policies and business strategies (Matlhape & Lessing, 2002; El Saghier & Nathan, 2013). Sukdeo (2016) cited different studies which indicate the positive relationship between employee wellbeing and business performance.

2.3.4 Process management

The process management concept deals with activities designed to integrate the raw material, labour, machinery, policies, and laws to produce the products and services (Foster, 2013; El Saghier & Nathan, 2013). According to Cârstea et al., (2014) the focus of quality management systems has shifted from product or service based quality to more process-oriented focus. The studies show a positive relationship between process management and business performance (De Bruin & Rosemann, 2005; Röglinger, et al., 2012; AlShathry, 2016).

Both Deming and Juran addressed the importance of process management and the reduction of variations in the processes (Tummala & Tang, 1996; Foster, 2013). According to the authors the concept of continuous improvement is mainly embedded in the process improvement. According to Tummala and Tang (1996), continuous improvement means continuously identifying waste, improving response time, improving productivity and efficiency of the system.

2.3.5 Business result focus

Business result focus is one of the criteria, which appears more frequently in some quality award systems, and it carries the majority of 450 points in the Malcolm Baldrige National Quality awards (Kedem, 2004; Baškarada, 2008; Foster, 2013). Business result focuses mainly on assessing the ability of the business to improve its critical performance indicators (Kedem, 2004). The result includes customer satisfaction, financial, employees, product or service, and achievement of targets and operational performance. Foster (2013) further suggests that the business result provides an excellent indication of how the business uses the information and manages knowledge to improve the key performance indicators. Patti, et al., (2001), argued that if quality forms part of the organisational culture, the business employee should know the business performance and be able to gauge against the best performers. To support the view Foster (2013), suggested that the business result should be visible on the business premises.

2.3.6 Measurements and knowledge management

Measurements is the process of assessing and documenting the past performance against the planned activities (Besterfield, 2003; PMI, 2013). Ishikawa provided seven tools of quality to collect and analyse data (Foster, 2013). Egberonbe *et al.,* (2017), also suggested that through data collection and analysis the business will be able to understand its strengths, weaknesses and improve its knowledge base. The authors further indicate that data can be collected using both qualitative and quantitative approaches. Patti et al., (2001) maintain that the intensive use and understanding of both management planning and quality management tools will indicate the maturity of the system.

On the other hand, knowledge management refers to the review and documentation of the process, business performance and lessons learned (Foster, 2013; PMI, 2013). Measurement and knowledge management is one of the criteria in the MBQA which carries a high of 90 points (Kedem, 2004). The element looks at how the business collects and aligns the operational activities to business objectives (Baškarada, 2008). Moreover, the criteria assesses how the information is used and generated to support the business.

2.3.7 Supplier development

Foster (2013) suggested that the business environment is becoming more complex with the customer expectations growing every day. The changes in the business domain make it difficult to ignore the role of the suppliers in the quality system. The newer quality award system like the Canadian Quality Award and the South African Excellence model has made the supplier development visible in their assessment (Sukdeo, 2016). The other quality award system hides supplier development under process management, and quality assurance categories (Baškarada, 2008; Foster, 2013).

Wagner (2006) defined Supplier development (SD) as the process of building a mutual benefit between the buying company and the supplier. Hahn et al., (1990) and Rezaei, et al., (2015) claim that SD is a systematic approach to developing and maintaining a network of competent suppliers. This process involves building a relationship with qualified suppliers and developing new suppliers in the absence of responsible suppliers (Hahn, et al., 1990; Rezaei, et al., 2015).

There is agreement among scholars that supplier behaviour has both a negative and positive impact on the business performance (Hahn, et al., 1990; Wagner, 2006; Foster, 2013; Rezaei, et al., 2015). The supplier behaviour which impact the business performance includes late deliveries, lack of capacity, lack of finances and technology to meet the demand (Hahn, et al., 1990; Rezaei, et al., 2015). Wagner (2006) discussed three ways of dealing with supplier performance, which include a switch between suppliers, building the capability in-house or create a partnership with the suppliers. The suggested strategy has both advantages and disadvantages. Rezaei et al., (2015) discourage the switch between suppliers or having a significant number of suppliers. The author suggested that the suppliers should be grouped into categories and develop the strategy to deal with a different group than a single supplier.

Wagner (2006) suggested that there are direct supplier development activities and indirect activities. The direct SD activities include training, providing financial support, and transferring of staff resources to support the suppliers (Hahn, et al., 1990; Wagner, 2006; Rezaei, et al., 2015). On the other hand, indirect SD activities include ad hoc supplier evaluation and inviting the suppliers to visit buyer sites. Rezaei, et al., (2015) also suggested that the supplier developer can move from essential development to advance supplier development.

2.3.8 Maturity assessment

Maturity assessment is the process of measuring the business features against the structured framework, which defines how the business processes, strategies, and results should change in each development phase (Wilson, 2013; Moschidis, et al., 2016; Andriani, et al., 2018). Maturity can be assessed to everything, which has an opportunity of developing or becoming better over time (Paulk, 2009).

According to Wilson (2013), maturity models provide the companies with the requirement to be the best in the field. The maturity models further give the companies their current position in an effort to become the best (Sower, et al., 2007; Wilson, 2013) . Garza-Reyes (2018) developed a systematic approach to assess the current state of the company quality management maturity. Moschidis et al., (2016) claim that Crosby was one of the first founders of the quality management maturity model. In support of the claim, de Bruin and Freeze (2005, p. 2) cited five models which used Crosby's model as their foundation. Table 9 below provides the list of eight maturity models which were developed on the bases of Crosby's model. Table 9 consists of seven columns with the first column providing the name of the model, the second column is the model originator; the third column is when the model was discovered, the fourth column is source or references. The remaining three columns contain the domian of the model, the model stages and the description of the model.

Table 9: Maturity Models

Maturity Model	Developer	Year of publications	References	Domain	Maturity Levels	Description
Project Management Maturity Model (PMMM)	Project Management Solutions	2012	(Pmsolutions, 2012)	Project Management	Level 1: Initial Process Level 2: Structured Processes and Standards Level 3: Organisational standards Level 4: Managed Process Level 5: Optimizing process	The model assesses the adoption of knowledge areas as described in the A Guide To The Project Management Body Of Knowledge (PMBOK GUIDE)
IS/ICT Capability Maturity Framework (IS/ITCMF)	Innovation Value Institute	2009	(Curry & Donnellan, 2012; Premiosgroup, 2012)	Information Technology	Level 1: Initial Level 2: Basic Level 3: Intermediate Level 4: Advance Level 5: Optimising	The model is designed to help information technology companies in the effort of meeting customer satisfaction
Business Process Management Maturity Model (BPMM)	(Rosemann and de Bruin, 2005)	2006	(De Bruin & Rosemann, 2005; Röglinger, et al., 2012)	Business Management	Level 1: Initial Level 2: Repeatable Level 3: Defined Level 4: Managed Level 5: Optimised	The model evaluates the business process
Organisational project management maturity model (OPM3)	PMI	2003	(Turner, et al., 2002; Khoshgoftar & Osman, 2008)	Project Management	Level 1: Initial Level 2: Repeatable Level 3: Defined Level 4: Managed Level 5: Optimised	Support the companies in implementing projects.
E-learning Maturity Model (eMM)	Victoria University of Wellington	2002	(Mukendwa, 2015)	Education	Level 1: Not adequate Level 2: Partially satisfactory Level 3: Largely sufficient Level 4: Full adequate	The model is designed to help the university in their e-learning and teaching effort
Document Process Maturity Model (DPMM)		1992	(Visconti & Cook, 2000)	Information Technology	Level 1: Ad hoc Level 2: Inconsistent Level 3: Defined Level 4: Controlled	The primary focus of the model is on documentation during software development
Capability Maturity Model Integration (CMMI)	Organisations from industry, government, and	1991	(Torrecilla-Salinas, et al., 2016)	Information Technology	Level 1: Initial Level 2: Repeatable Level 3: Defined	CMMI is the integration of different maturity models for an organisation

Maturity Model	Developer	Year of publications	References	Domain	Maturity Levels	Description
	the Software Engineering Institute (SEI)				Level 4: Managed Level 5: Optimised	aiming at improving their business process.
Capability Maturity Model (CMM)	Software Engineering Institute (SEI)	1987	(Paulk, 2009; Yeh, et al., 2017)	Information Technology	Level 1: Initial Level 2: Repeatable Level 3: Defined Level 4: Managed Level 5: Optimised	The model is designed to provide support to the IT companies in the software development and maintenance

The concept of maturity models has attracted the attention of both scholars and practitioners from different domains, see for example (De Bruin & Rosemann, 2005; Yeh, et al., 2017). The maturity model serves as a mirror or roadmap for business advancement, models share the same goal of improving the companies, and they also act as the frameworks for improving (Mukendwa, 2015). Most of the maturity models attempt to assess the level of advancement on the application of a specific set of tools, techniques or approaches in a particular area of practice sees for examples (Baškarada, 2008; Premiosgroup, 2012; Pmsolutions, 2012).

The models used by other authors to assess maturity include the Capability Maturity Model Integration, enterprise architecture maturity model, the European Foundation for quality management excellence model, process maturity model and project management maturity model. According to Baškarada (2008), the majority of maturity models originate from Crosby's quality management maturity grid.

Xiaofen (2013) integrated Crosby's model with ISO 9004:2009 standard and MBNQA factors to develop a quantitative approach to assess the quality management maturity index of the organisation. Like Crosby's model, Xioafen's approach evaluates companies on the five-point scale one being the lowest level and five being the excellent level. Egberonbe *et al.,* (2017) adopted a qualitative approach to assess quality management maturity of the Nigerian university libraries based on the five factors which are common to almost all quality systems (Leadership, customer focus, employee focus, process management, and Performance Measurement). Table 10 below shows the maturity assessment framework based on the EFQM, MBNQA and ISO 9001-2015. The first column in Table 10 provides the quality management factors, column two to six provide the charateritics of the factors in each phase of the maturity stage.

Table 10: Quality Management maturity assessment adapted from (Sower, et al., 2007, p. 124; Baškarada, 2008, pp. 62-65; Rosnah, et al., 2010, p. 57)

Variables	Level 1: Informal Approach	Level 2: Reactive Approach	Level 3: Stable Approach	Level 4: Continual improvement approach	Level 5: World Class
1. Customer focus	• There is no formal process or system to gather feedback from a customer • The blame is shifted to the customer • The customer feedback does not collaborate with business activities	• Customer feedback is collected using phone calls and emails. • The company uses insufficient approaches to collect customer feedback • The responses to the customer include the blame for not understanding the system, product or service from the customer. • The product or service	• The company is proactive in collecting customer feedback. • The customer receives a response with the details on what was done to correct the error and how it will be prevented in the future • The customer is not part of the problem-solving process	• The customer is involved in product design, and customer feedback is collected from a range of sources • The customer receives a detail response with the reason for the error and how it will be prevented in future	• There is a high level of transparency between the company and the customer. • The organisation uses different sources to understand customer requirement during product design. • The customer is continuously engaged in the resolution of the complaint
2. Process Management	• The process is the responsibility of a person doing work. • There is no process owners, the ownership of processes is mainly based on the individual's initiatives	• Process is informal design to implement changes • The effect of the process depends on individuals • There is no process to facilitate changes • There are standard operating procedures, and they are applied continuously	• There are definite communication channels between senior management and staff • There are process designed for regular alignment between senior management and staff • The process is designed to allow communication to	• There are definite communication channels between senior management and staff • The process is designed to allow communication to flow top down and bottom up • There is a system in place to remove any noise in the transmission • Processes are well documented, and work	• There are channels design to allow top down, bottom and lateral communication. • The communication is clear and reliable • There is a system in place to remove any noise in the communication • Processes are well documented, and work instructions are clear.

Variables	Level 1: Informal Approach	Level 2: Reactive Approach	Level 3: Stable Approach	Level 4: Continual improvement approach	Level 5: World Class
		• There is no process of resolving the problem; an individual provides a solution. • There is compliance with the best practice	flow top down and bottom up • Processes are well documented, and work instructions are clear • There are processes in place to resolve issues and tools are integrated with processes • There are no regular training sessions to create awareness of the process	instructions are clear. There are regular training sessions to create awareness of the process • There is the advance adoption of quality improvement tools and means are integrated with tools and techniques	There are regular training sessions to create awareness of the process. • There is the advance adoption of quality improvement tools and process are integrated with tools and techniques.
3. Employee Focus	• Employees are not involved in decision making • The managers use punishments to correct poor employee morale • The mistake is hidden from senior managers to protect jobs • Learning is subjective • There are no clear lines of communiqué between the organisation and workforces	• Employees are not involved in decision making • There are ad hoc training programmes, but there is no enforcement • Their errors are viewed as a result of people failing to follow instructions • Innovation is only entertained if it is from experienced staff members • Employees prevent changes	• The organisation is committed to the wellbeing of the staff • The training programme is designed to close the skills gap • Workforce members are supported in their capability development effort. • There is a commitment from the business to recognise top performance, but there is no system in place to facilitate the reward and recognition	• There are structures, processes and financial support to improve staff satisfaction. The wellbeing of the employee is the priority • There is formal quality improvement training. The training is designed to create awareness of quality practice and application of tools and techniques • Staff development is clear • There is a professional development programme • There is a commitment from the business to recognise top	• The organisation perceives employees and the most critical assets. • People feel and appreciate the commitment from the organisation • The training programme is aligned with the • corporate strategy • There are well-established development programmes and coaching • The organisation promotes professional

Variables	Level 1: Informal Approach	Level 2: Reactive Approach	Level 3: Stable Approach	Level 4: Continual improvement approach	Level 5: World Class
	• Innovation is discouraged • There are no formal training programmes, and training is as and when. • People feel that their work does not contribute to company development.	• The company is committed to staff development (there are staff bursaries and educational support) • It is the line manager's prerogative to recognise staff members; there is no formal reward and recognition system	• The staff members are sure about the purpose of the service and their contribution to the company	performance, and there are systematic and structures in place to distinguish excellent performance • Both leaders and employees understand their role and contribution to business development.	development for all staff members. • There is a commitment from the business to recognise top performance, and there are systematic and structures in place to verify excellent performance. The employees publicly appreciate the feel of love from the organiszation.
4. Information Management	• Knowledge is mainly stored on an individual's computer, and if they are not available, the information is lost. • The systems are disintegrated • There is no standard reporting • Ad hoc use of quality tools	• There is the application of basic statistics • Customer feedback is a performance indicator	• There are system and process in place to collect and store information, but the methods are redundant • There is a mismatch in the master data • There is some adoption of quality tools and techniques	• There are systems and processes in place to collect and store information, and they are aligned with the business strategy • The systems are integrated • There is a standard reporting procedure • The quality practice is set up to revile quality-related costs • To organisation conducts benchmarking studies to improve its quality systems	• There are systems and processes in place to collect and store information, and they are aligned with the business strategy • The systems are integrated • There is standard reporting • The quality practice is set up to revile quality-related costs • The company is used as a benchmarking partner

Variables	Level 1: Informal Approach	Level 2: Reactive Approach	Level 3: Stable Approach	Level 4: Continual improvement approach	Level 5: World Class
5. Leadership	• There is no vision and objectives are not clear • Leaders are not open about their actions • Trust is not the priority • People are paid to do their job there is no need for any further motivation • The leaders use anger to communicate facts • There is no commitment to staff development • Restricted flow of information from senior management to the staff • No strategic plan • The actions are mainly designed to react to specific events • There is no monitoring and control of activities to achieve the goals	• The leaders have explained the vision and mission of the organisation, but it is not well communicated • Leaders force change from the top down • The leadership tends to be selective in taking suggestions • Decision making is for senior management and executives • There is no plan to sustain staff performance • There is a lack of trust and openness • Leaders limit information to the staff members • There is an inflexible strategic plan, and it does not accommodate changes in the business market • The business activities are not linked to the	• The leaders have stipulated the vision, and the values of the organisation and they appear in all business documents and communication. • The leaders are open to the staff, but still, there are trust issues • People are motivated and willing to give suggestions • The strategic plans are developed as the response to market conditions • Some activities do not link back to the business strategy • Only senior staff has a visible goal which is connected to the policy • There are arrangements to monitor progress • The corporate strategy includes quality improvement	• The leaders have stipulated business vision, values, and objectives. The KPI, policies, and practices are designed from the plan. The approach appears in all business documents and communications. • The leader is open to the staff, and there is a sense of trust within the organisation • People are motivated and work as a team, and they inspired other people • Strategic plans are developed as a roadmap for the organisation • The business activities are linked with the corporate strategy • Goals to achieve the business strategy are pushed down to all staff members • There is a continuous monitoring system and corrective action	• The leader has explained the vision and values, and it is aligned with all business activities. Everybody in the company walks the talk • Trust and openness are the least of the problems within the organisation • The leaders motivate, inspire people and continuously give direction to the staff members. The leaders emphasise the need for quality improvement • Strategic plans are designed to direct the company and satisfy the customer needs • All activities are developed from the business strategy, and the policy is updated continuously as more information becomes available • Goals to achieve the business strategy are pushed down to all staff members • There is a continuous monitoring system with

Variables	Level 1: Informal Approach	Level 2: Reactive Approach	Level 3: Stable Approach	Level 4: Continual improvement approach	Level 5: World Class
	• It is uncertain about the organisational purpose • There is an imperfect process to track the progress of the complete goals	strategic plan, and they mainly react to specific events • The strategic plan is for senior management and staff members are not involved in strategic planning			corrective action. Any deviation is documented and uploaded to the dual system
6. Result Focus	• Only basic statistical • Poor and irregular result • Improvement is not an option because management rejects that poor conditions exist	• Customer feedback is viewed as a performance indicator • Key performance indicators are not well understood • The reports are not reliable, and they are nice to have	• Customer feedback is used to improve product or services • Quality Management tools are employed to monitor the stability of the process as a system	• The range of key performance indicators adapted to manage the business performance • There are alignment issues with the business strategy • There are charts which show real-time business performance	• The range of key performance indicator is tailored to achieve the business performance • The Key performance indicators are aligned with the business strategy • The result also indicates external factors like sourcing and risk

Variables	Level 1: Informal Approach	Level 2: Reactive Approach	Level 3: Stable Approach	Level 4: Continual improvement approach	Level 5: World Class
7. Supplier Development	• No relationship with suppliers • The suppliers do not meet the supply-demand • The business survives by searching for the alternative source of supply depend on the need at hand • Ad hoc supplier assessment • The company does not communicate the business strategy with the suppliers • There is no financial support for the suppliers. • There is no formal supplier network	• The structure and quality of the firm's supplier base is not competitive • The company is failing to find capable suppliers in specific areas • The business relies on the supplier switching • Ad hoc supplier assessment • There is no formal communication of the business strategy with the supplier • There is no capital support to the suppliers	• There is a limited supply development programme • The suppliers are on-site consultation • Supplier product is assessed in a formal manner • Supplier cost performance is evaluated in an informal manner	• There is a supplier development programme • The principal suppliers are part of the organisation • The suppliers receive on-site consultation training • Supplier product is assessed in a formal manner • Supplier cost performance is evaluated in an informal way • Official determines the process for the supplier • The business communicates the strategy with the suppliers • The company invests in the suppliers	• There is a supplier development programme • The principal suppliers are part of the organisation • The organisation transfers the employee on a temporal base to develop suppliers • They budget for supplier education and training programme • The organisation provides capital support of the suppliers • Suppliers receive regular feedback on their performance • Suppliers receive awards for their performance
8. Cost of quality	• There is no training and development programme. • There are no teams responsible for identifying the error and suggest improvement	• There is no training and development programme • Quality management is a function of the quality department • The is no assessment of the cost of quality	• There is a training programme but it is not in line with the business strategy which makes the cost of preventing issues moderate. • Cost of quality includes the cost of	• There are training programmes in places, and they are aligned with business goals. • The business is characterised by the high cost of the appraisal, which included calibration of testing equipment and final product testing	• The preventive activities are in line with the business goals and design to reduce loss • The business partner with the suppliers to reduce the cost of failure • There are clear communication channels to minimize

Variables	Level 1: Informal Approach	Level 2: Reactive Approach	Level 3: Stable Approach	Level 4: Continual improvement approach	Level 5: World Class
	• Quality data does not format part of decision making. • The total preventive costs are very low • The business depends on the quality systems of the supplier. • The company performs ad hoc audits as a means of compliance • The net cost of spoilage and rework is high since there is no process in place to correct defects.	• The total cost of quality is high. • The actual cost of quality can go up to 18% of the total revenue	correcting issues and inspection. • The failure cost is moderate	• The high preventive cost and appraisal activities reduce failure cost. • The total is set to be 8% and below • The figure reported on the cost of quality is not the actual cost of quality incurred.	the cost of non-conformance • The failure cost is relatively low, and every failure is documented and stored in the quality system. • The explicit process of resolving complaints and customer dissatisfaction • The total cost of quality is set to be less 2.5% of the total revenue

2.4 Cost of Quality

Since quality activities require some form of financial resources, the expenses to accomplish quality related activities is called total cost of quality (Sower, et al., 2007; Abdelsalam & Gad, 2009; Cheah, et al., 2011; Narasimhan, 2013). Schiffauerova and Thomson (2006), express the total cost of quality as the cost of doing the right things plus the cost of not doing the right things. The explanation is in line with Crosby's philosophy of quality, detailed in section 2.2.7. Trehan et al., (2015) describe the concept of CoQ as the method of expressing quality activities in financial terms. Most researchers maintain that although some companies claimed to be committed to quality improvement, they do not measure the cost of quality (Schiffauerova & Thomson, 2006; Abdelsalam & Gad, 2009).

According to Aniza (2014), companies use the model described in Figure 10 to allocate costs and determine the product price. In the absence of the value of quality practice in the organisation, the customers end up paying for all losses and waste generated during the production process plus the pre-determined percentage of the profit. The CoQ programme highlights the losses in the operations or activities and points out the areas of improvement to managers (Abdelsalam & Gad, 2009; Cheah, et al., 2011; Nel, 2013; Iren & Bilgen, 2014).

Cost of quality directly impacts the financial performance of the companies and customers, one will prefer to have an Ombudsman for the cost of quality. Unfortunately, currently, there are no laws which force the companies to report their loss of quality. The absence of the mechanism to force the reporting of the expense of quality, results in the quality-related costs remaining hidden.

The concept of cost of quality dates back to 1930 from Walter Shewart and further developed by Joseph Juran in 1951 (Chiu, 2002; Kaur, 2009; Trehan, et al., 2015). In contrast, Schiffauerova and Thomson (2006), argues that Armand Feigenbaum was the first to create quality costing analysis in 1943. The work of Sower et al. (2007), and Trehan et al., (2015) cited the model by Feigenbaum (1956), Masser (1957) which define the cost of quality as "Prevention, Appraisal, Internal failure, and external failure cost."

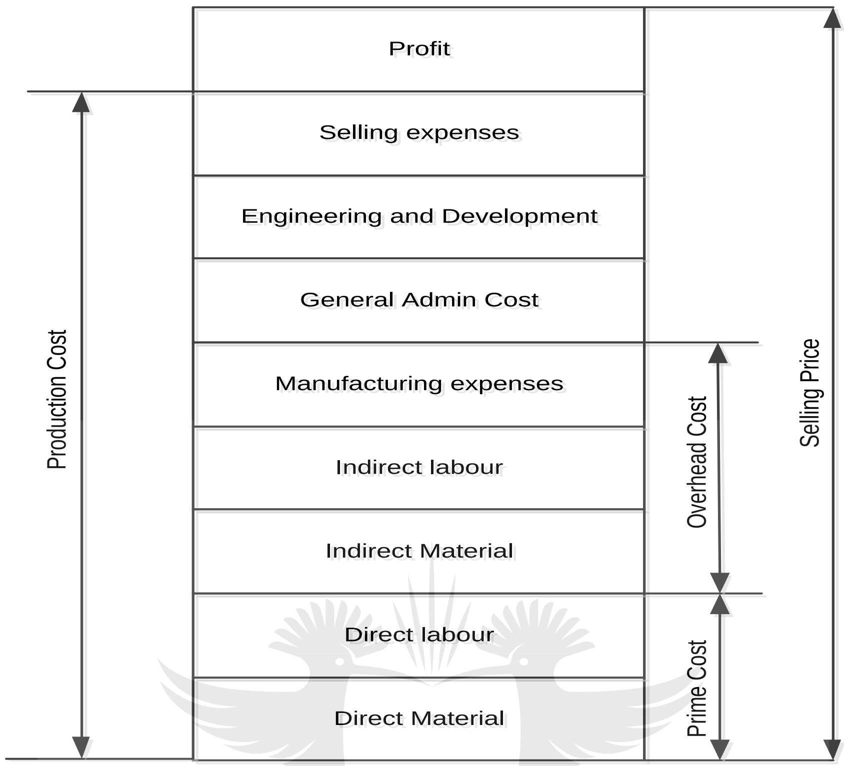

Figure 10: Traditional model to allocate cost (Aniza, 2014)

The Prevention cost refers to the expenses associated with activities like training; prototypes, workshops, brainstorming sessions designed to ensure that the company delivers quality results. According to Trehan et al., (2015), the other significant parts of prevention cost include quality assurance and total quality management programmes. The appraisal values refer to the activities designed to measure how well the process conveys the required quality levels (Goulden & Rawlins, 1995; Kaur, 2009). The examples of the appraisal cost include testing, inspection, and commissioning. The failure expenses are further separated into internal failure cost (failure within the organisation) and external failure cost (failures in the hands of the customer) (Cheah, et al., 2011; PMI, 2013; Taidi, 2015). The failure costs are exposed during appraisals (internal failure cost) and customer complaints (external failure cost). Therefore, the ultimate goal of CoQ is to identify the areas of improvement and produce a defect-free product or service (Trehan, et al., 2015)

Narasimhan (2013) cited Crosby's model, one of the experts, which defines the cost of quality as the cost of conformance and the cost of nonconformance. Crosby's model views the expense of quality as Prevention + appraisal + failure + opportunity cost (Sower & Quarles, 2003; Narasimhan, 2013; Trehan, et al., 2015). The prevention, evaluation and failure cost defined in Crosby's model contains the same meaning as identified by Armand Feigenbaum cost model cost (Sower & Quarles, 2003; Narasimhan, 2013). The opportunity cost refers to profit and revenue losses because of the quality-related breakdown (Schiffauerova & Thomson, 2006). The opportunity costs are usually an estimate based on the expert judgment or historical information used to assess the impact of malfunctions.

Trehan et al., (2015) detailed other models, which are an extension of Joseph Juran, Feigenbaum, Masser, and Crosby thinking of the cost of quality. Cheah et al., (2011) grouped the methods in

Table 11 to three general methods (quality cost model; process cost model; and activity-based costing (ABC) model. Other papers have grouped the models into five generic types, for example (Vaxevanidis & Petropoulos, 2008). For the determination of this study, there are three theoretical models of CoQ models; the other models are extensions of the three models. Due to the various perceptions about the quality and discovery of new information led to different models, methods of estimating, and calculating the cost of quality. Table 11 summarises the effort toward CoQ practice and improvements. The next section will review the different cost of quality models. The first column contains the development or model of cost of quality, the second column is the developer and the year of publication the last column is the source or references.

Table 11: Cost of Quality Measurements and Developments

Development or model	Originator	References
Graphical presentation of COQ	Juran (1951)	(Tsai, 1998; Chiu, 2002; Sower and Quarles, 2003; Vaxevanidis and Petropoulos, 2008; Arvaiovaet al., 2009; Kaur, 2009; Palikhe, 2013; Trehanet al., 2015; Nel and Pretorius, 2016; Sansalvador and Brotons, 2017)
Prevention, Appraisal, and Failure cost model (P-A-F)	Feigenbaum (1956), Masser (1957) and BS 6143	(Modarress and Ansari, 1987; Goulden and Rawlins, 1995; Chiu, 2002; Sower and Quarles, 2003; Soweret al., 2007; Vaxevanidis and Petropoulos, 2008; Kaur, 2009; Narasimhan, 2013; Palikhe, 2013; Trehanet al., 2015)
Process Model	Ross (1977)	(Ross, 1977; Porter and Ayner, 1992; Tsai, 1998; Goulden and Rawlins, 1995; Schiffauerova and Thomson, 2006; Vaxevanidis and Petropoulos, 2008; Cheahet al., 2011;Trehanet al., 2015)
Conformance and non-conformance model (Prevention+ Appraisal +Failure cost+ Opportunity cost)	Crosby (1984)	(Modarress and Ansari, 1987; Soweret et al., 2007; Kaur, 2009; Cheah et al., 2011; Narasimhan, 2013; Trehan et al., 2015)
P-A-F model is expanded to include Cost of Quality Design and ineffective utilization of the resource	Moderress and Ansari (1987)	(Modarress and Ansari, 1987; Cheah et al., 2011; Trehan et al., 2015)
An Activity Based Costing (ABC)	Cooper and Kaplan (1988) and in cooperated with COQ by Tsai (1998)	(Cooper and Kaplan, 1988; Tsai, 1998; Schiffauerova and Thomson, 2006; Vaxevanidis and Petropoulos, 2008; Cheah et al., 2011; Trehan et al., 2015)
Quality Management Activity Planning (Q-MAP)	Crossfied and Dale (1990)	(Tsai, 1998, Schiffauerova and Thomson, 2006; Trehan et al., 2015)
A graphic approach to reduced poor cost of quality using influence diagram	Chen and Tang (1992)	(Tsai, 1998; Chen and Tang, 1992; Trehan et al., 2015)
Cost-benefit model for COQ applications	Porter and Rayner (1992)	(Porter and Rayner, 1992; Trehan et al., 2015)
The Cost of Quality is classified as direct and indirect cost	Dahlgaard et al. (1992)	(Cheah et al., 2011; Trehan et al., 2015)
The process model got recognised and added to British Standards	BS 6143 (1992)	(Kaur, 2009;Trehan et al., 2015)
The graphical model developed by Juran (1951) is transformed to take into consideration the continuous improvement, and process enhancements lesson learned	Juran and Gryna (1993)	(Schiffauerova and Thomson, 2006;Trehan et al., 2015; Nel and Pretorius, 2016)
The three-level categorised model and process flow are used to depict activities in the manufacturing process. The amount of time spent on conformance and nonconformance is used to calculate the cost of quality	Goulden and Rawlins (1995)	(Tsai, 1998; Goulden and Rawlins, 1995; Trehan et al., 2015)

Development or model	Originator	References
The dynamic P-A-F model to accommodate learning and experience by the employee is introduced	Prasad and Tyson (1995)	(Trehan et al., 2015)
The mathematical COQ model is invented to calculate the cost of quality in a different stage of the manufacturing process.	Change et al. (1996)	(Trehanet al., 2015)
Three types of opportunity cost components are discovered i) Underutilisation of resources ii) Improper material handling, and iii) Poor service delivery	Sandoval-Chavez and Bervides (1998)	(Cheah et al., 2011; Trehan et al., 2015)
The system, which described the cost of quality as a direct and indirect cost, is introduced with the aim of communicating quality to the employees.	Harrington (1999)	(Trehan et al., 2015)
The model for the identification of new conformance levels and reduction of discrepancy in the outputs is introduced.	Waheba (2003)	(Trehan et al., 2015)
Two Cost of quality models are proposed i. The relative change in failure cost in line with the relative difference in Preventive price ii. The percentage switch in the product produced by a corresponding shift at the expense of quality.	Setijono and Dahlgaard (2006)	(Trehanet al., 2015)
The Preventive, Appraisal, Failure and Disruption cost is proposed (P-A-FD)	Tannock and Saelem (2007)	(Trehan et al., 2015)

2.5 Cost of Quality Models

This section presents the review of the cost of quality models and it is divided into nine sections. The first section 2.5.1 presents Juran's cost of quality models and the relevant developments over the years. Section 2.5.2 present the review of the preventive + appraisal + failure cost. Section 2.5.3 present the reviews on the process cost model and the applications. Section 2.5.4 present the reviews on the Activity-based costing model followed by section 2.5.5 which is the comparison of the similarities and differences of the different cost of quality models. Section 2.5.6 present the reviews on the methodologies to implement cost of quality. Section 2.5.7 review the cost of quality and accounting systems followed by section 2.5.8 which present the benefits associated with cost of quality. The challenges associated with cost of quality are presented in section 2.5.9.

2.5.1 Juran's CoQ model

Figure 8 below represents the first cost of the quality model developed by Juran in 1951 (Chiu, 2002; Kaur, 2009; Palikhe, 2013; Trehan, et al., 2015). Juran's graphical model is a static model pursuing to find the optimum quality level (x % quality level) for the organisation to meet its business objectives (Sower, et al., 2007; Cheah, et al., 2011). According to other authors the optimum quality level is a point where CoQ is favourable for the business (De, 2009; Marcus & Wallin, 2013). The model does not attempt to achieve 100% quality levels; it also does not take into consideration the organisational learning and technology advancements. The model assumes investment beyond the optimal point will not result in any quality improvement objectives (Sower, et al., 2007; Trehan, et al., 2015). Despite the downsides of the model, it played a critical role in the developments and discussions on the subject of the cost of quality.

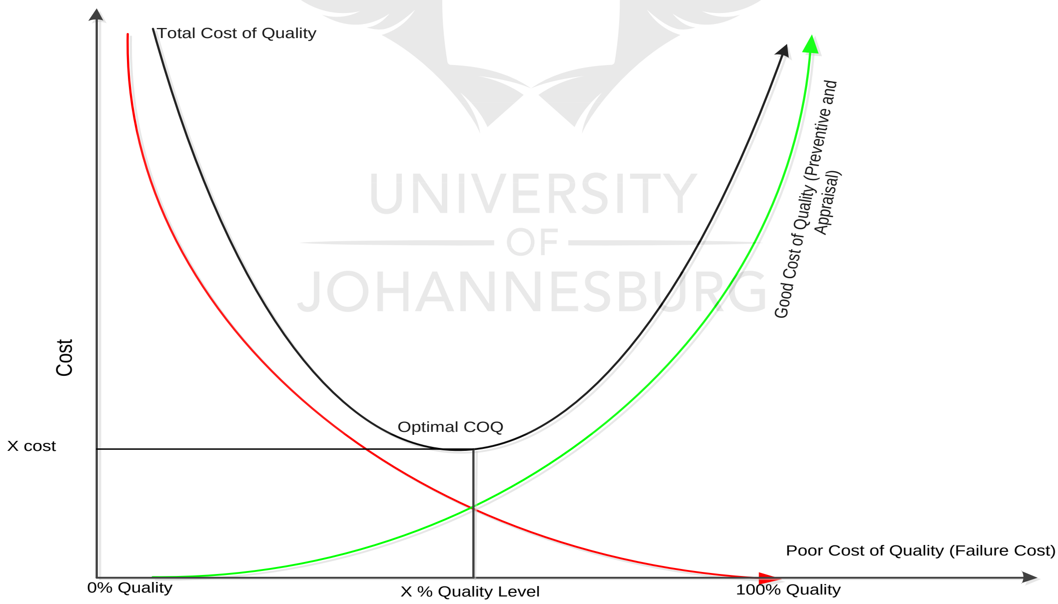

Figure 11: Juran's Model of Cost of quality (Chiu, 2002; Kaur, 2009; Kaur, 2009; Trehan, et al., 2015; Nel & Pretorius, 2016)

As cited by Nel and Pretorius (2016) and Schiffauerova and Thomson (2006), Juran and the associates appreciated the downfall of the model, and in 1993 they released the amended version of the model. Figure 12 represents the modified graphical presentation of

CoQ. The new model takes into consideration organisational learning and technology advancements. The model now seeks to achieve 100% quality levels or conformance to customer requirements with less financial effort. The model further assumes, that due to technological advancement, it is impossible to reach the optimal quality levels.

Freiesleben (2004), questioned the ability of both Juran's models to predict optimal levels at different quality requirements points. The author developed a model which predicts different optimal locations at a fix failure cost (Freiesleben, 2004). Tsai (1998) maintains that all these graphical models do not incorporate the overhead cost associated with quality activities. To overcome the exclusion of the expenses in the calculation, Tsai (1998) integrated the concept of Activity Based Costing with CoQ models. The companies using the models lacking components of overhead cost do not understand the extent of CoQ to their bottom line (*Ibid.*). The developments and critiques from other scholars play a critical role in the current research and expansion of theory.

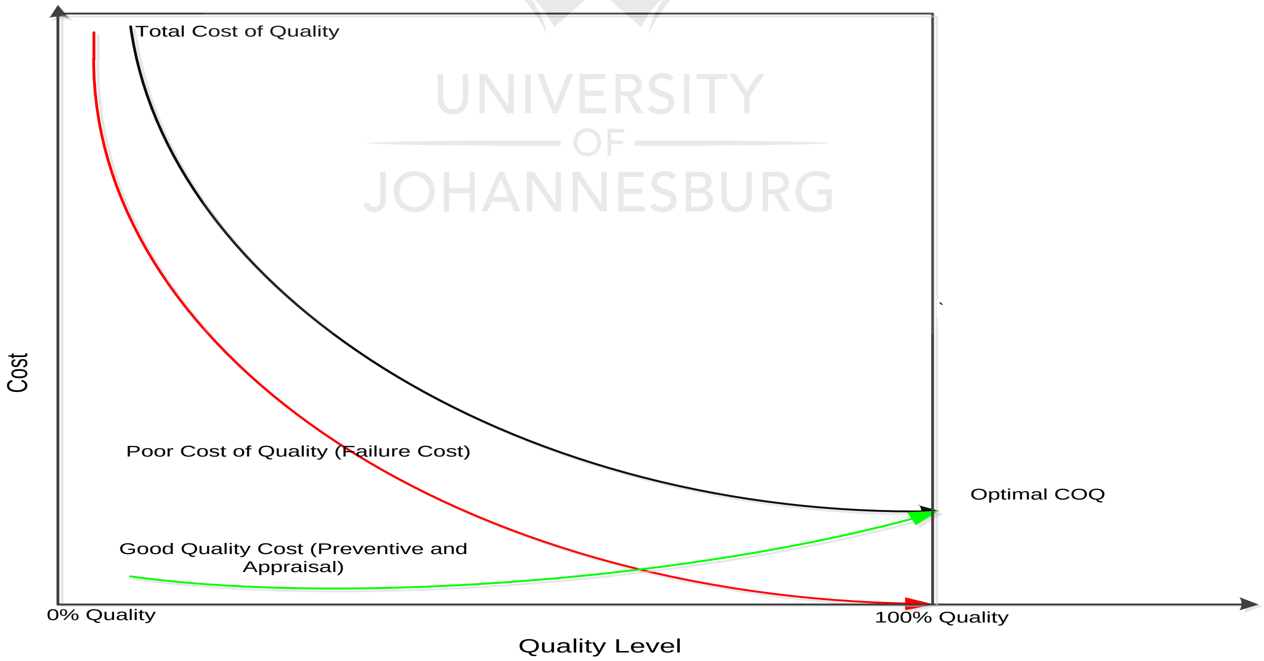

Figure 12: Amended graphical display of CoQ (Schiffauerova & Thomson, 2006; Nel & Pretorius, 2016)

2.5.2 Preventive, Appraisal, and Failure Cost model

The P-A-F model is one of the most adopted CoQ models in industries (Schiffauerova & Thomson, 2006; Sower, et al., 2007; Vaxevanidis & Petropoulos, 2008; Vaxevanidis, et al., 2009). According to the authors the model has its origin in Feigenbaum (1956), and Masser (1957) (Vaxevanidis, et al., 2009; Trehan, et al., 2015). The model classifies the cost of quality into three categories (Prevention, Appraisal, and Failure cost) (Sansalvador & Brotons, 2017). Figure 13 shows the basic roadmap to identify different types of expenses in the P-A-F model.

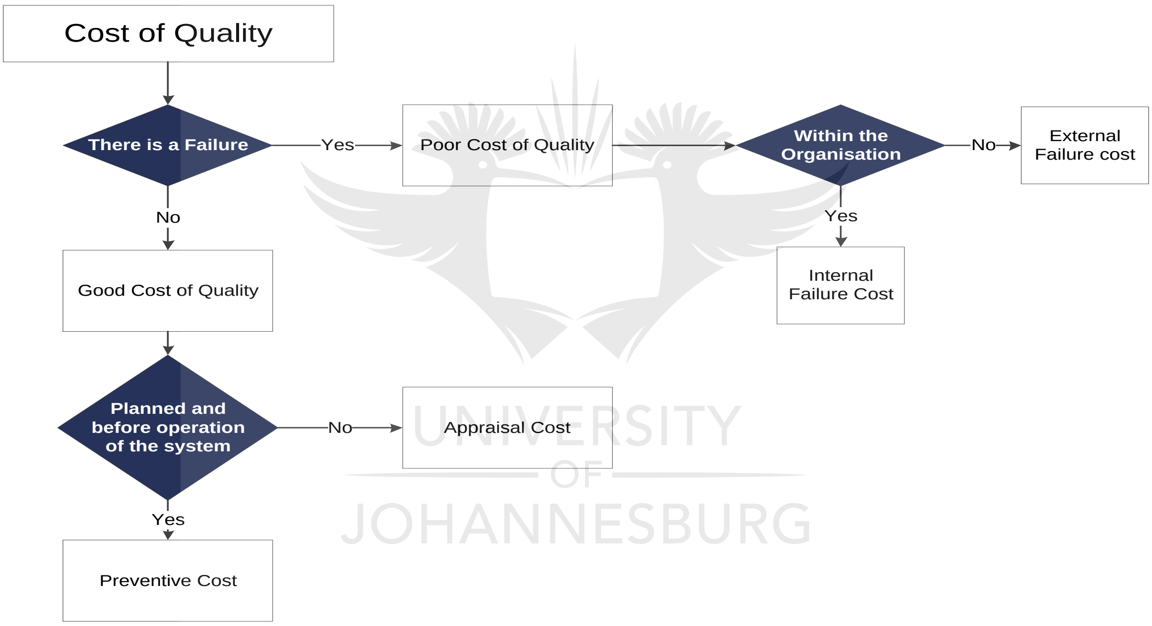

Figure 13: P-A-F Model (Vaxevanidis, et al., 2009; Trehan, et al., 2015)

The assumptions behind this model include, that the investment prevention and appraisal will reduce failure cost (Sower & Quarles, 2003; Trehan, et al., 2015). In general, the appraisal cost is the cost of monitoring and controlling the quality processes. Prevention costs are an expense incurred during the planning and development of the methods in most cases. Failure cost accounts for the disappointment of both appraisal and precautionary measures. Table 12 indicates different activities performed under each type of P-A-F categories. The first column provides the cost of quality categories and the second column is the element for each cost of quality category.

Table 12: P-A-F model categories and activities (Tsai, 1998, p. 722; Kaur, 2009, p. 75; Aniza, 2014, p. 12)

COQ Categories	COQ elements
Prevention Cost	• Design and improvement • Quality engineering • Training and development • Quality cycle activities • Statistical process control exercises • Supervision of prevention • Quality change project • Supplier development programme • Quality data social occasion, investigation and revealing • Quality review
Appraisal Cost	• Test and examination of incoming materials • Final Product testing and examination • Sampling approaching material • Supervision of analysis and reviews of work done • Depreciation of test apparatus • Maintenance of test apparatus • Plant services examination
Internal Failure Cost	• The net price tag of scrap • The net cost of spoilage • Modification work and material for the non-conforming product • Re-examination of reworked items • Disposal defective products • Disposal of defective product • Downtime caused by quality issues • Analysis of the underlying driver of irregularity • Retesting of rework products
External Failure Cost	• Cost of field adjusting and taking care of the objections • Warranty repairs and substitution costs • Liability emerging from faulty items • Lost deals appearing from notoriety for low quality • Return and payments arising from the quality issue item review • Repairs and substitution past the guarantee timeframe

Goulden and Rawlins (1995), maintain that the P-A-F model has some limitations, like the inability to trace cost between departments and from the sources. The authors further suggest that the model reinforces the responsibility of CoQ assessment to the quality department (*Ibid.*). The other challenges associated with the P-A-F model include partisanship in the allocation of activities and does not accommodate overhead cost (Tsai, 1998; Aniza, 2014; Nel & Pretorius, 2016) . Despite the downfalls, the model makes it easier to explain the concept of cost of quality to an individual who is not aware of the subject.

Crosby in 1984 redefined the model and classified the CoQ as indicated in Figure 14 (Sower, et al., 2007; Cheah, et al., 2011; Narasimhan, 2013). The conformance to principles and requirement was the dominant driving force behind Crosby's rationale of quality (Hellman & Liu., 2013). Crosby defined the cost of quality as the expenses incurred to do good things; the charge of failing to do proper work. Also, the opportunity associated with the failure to do good things (Cheah, et al., 2011; Trehan, et al., 2015).

Crosby introduced the new category (opportunity cost) to the P-A-F model. The opportunity cost refers to revenue not earned, the customer goodwill, reduced material handling, and a wrong decision (Modarress & Ansari, 1987; Vaxevanidis & Petropoulos, 2008; Trehan, et al., 2015) . Chen and Tang (1992) classified the CoQ in

Figure 14 as the direct and indirect cost of quality. The cost of conformance and nonconformance set to be a direct cost while opportunity cost is referred to as the indirect cost of quality. Nel (2013) defined opportunity cost as the hidden cost of quality.In most cases, the opportunity cost does not seem to be high at the onset, but as time goes by, the impact may result in the company closing down (Sansalvador & Brotons, 2017) - for example, if the product from a particular group repetitively inconveniences the customers, they will spread the news on social media and other platforms and as other people start to experience the same things, they will eventually avoid buying from the company. As a response to the challenge, Sansalvador and Brotons (2017) developed a method aimed at estimating the cost of the lost image as more customers experience dissatisfaction from the business.

Crosby was not the last person to visit the P-A-F model and identify gaps. Modarress and Ansari (1987) argued that Crosby, Feigenbaum, and Masser overlook the cost of quality associated with product design and unproductive use of the resources. The author used Taguchi's model of the experiment and Just in Time principles to justify the claims. Taguchi was one of the people, who advocated the importance of quality during the product design phase (Athreya & Venkatesh, 2012; Pachpute & Bawa, 2016).

Figure 15 below indicates Modarress and Ansari (1987) view of CoQ. The interpretations play a significant role in the improvement of the cost of quality (Vaxevanidis & Petropoulos, 2008; Trehan, et al., 2015). Athreya and Venkatesh (2012) maintain that product design is the key to the performance of the product. Moreover, the product design process can take more than four years, depending on the complexity of the product. The performance of the production team, operations, and maintenance crew all depend on the outputs of the design process

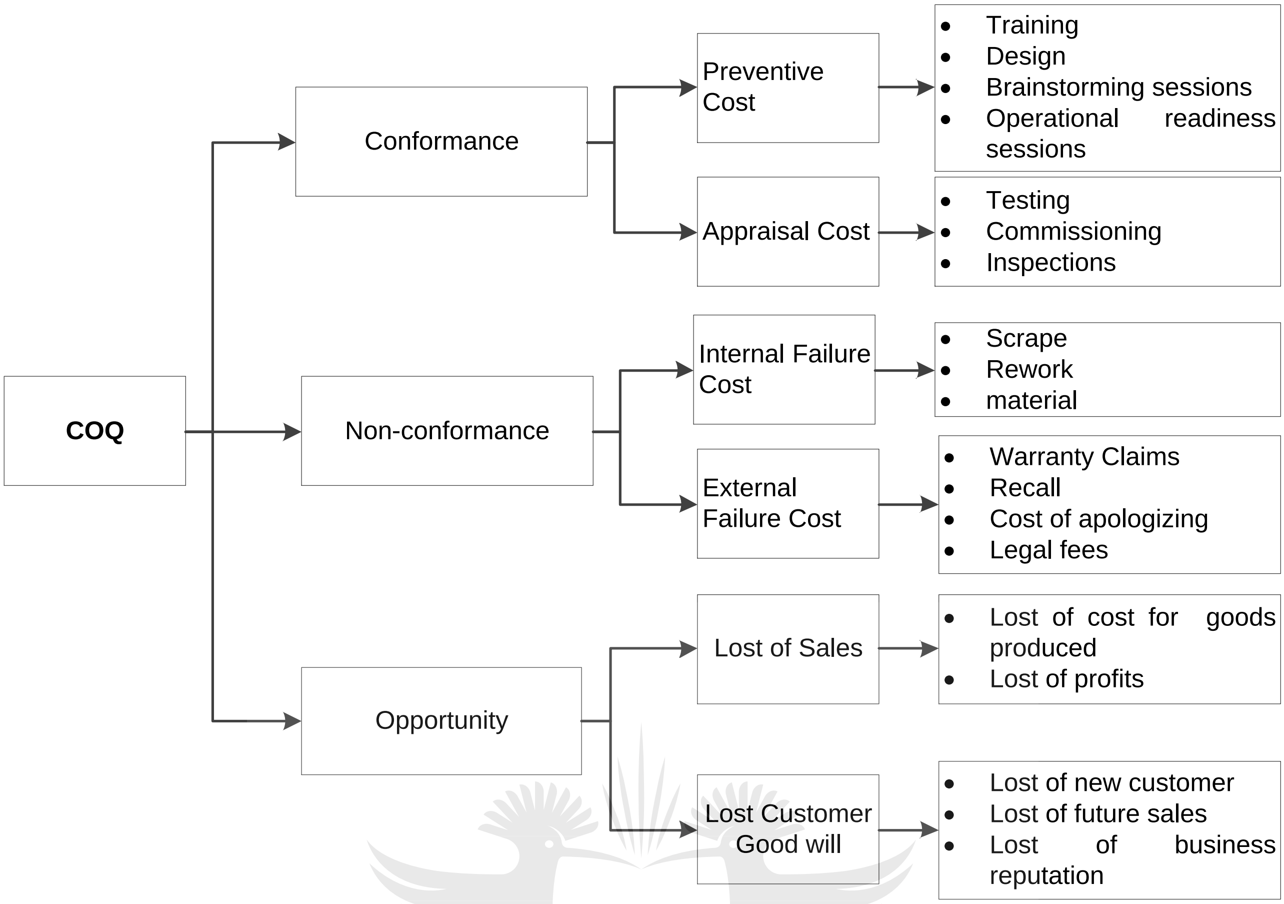

Figure 14: Crosby's CoQ Model (Narasimhan, 2013; Cheah, et al., 2011; Trehan, et al., 2015)

The other important point highlighted by Modarress and Ansari (1987) was the significance of reducing the stock levels. The author argues that the high stock level results in the inefficient use of the resource, for example, the inventories require security, cranes to move the stock and additional people to look after the inventory. Even though stock carries a capital portion, depreciation and interest; it also brings the component of the cost of quality. Hence Modarress and Ansari (1987) advocate the inclusion of inefficient utilisation of resources. Other researchers argue that the model suggested by Modarress and Ansari (1987) was never tested in practice (Cheah, et al., 2011; Trehan, et al., 2015). Due to the time constraints of this study excluded the developments suggested in (Modarress & Ansari, 1987).

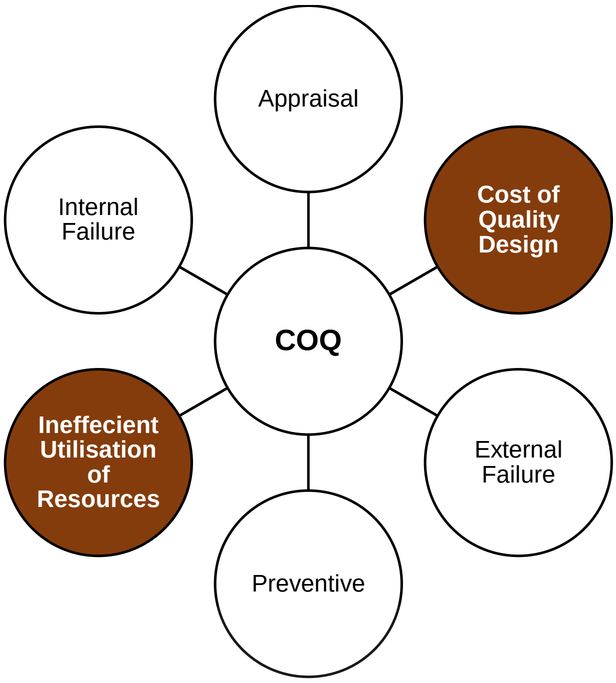

Figure 15: Modarress and Ansari (1987) CoQ Model

2.5.3 Process cost model

The process cost model is different from the traditional P-A-F model in a sense that conformance and nonconformance measurements are linked to the particular process, not the activities (Goulden & Rawlins, 1995; Schiffauerova & Thomson, 2006; Trehan, et al., 2015). In the process costing model prevention and appraisal cost are classified as cost of conformance (CoC), and external failure cost and internal failure cost are grouped as non-conformance cost (CoNC) (Trehan, et al., 2015). Process cost model referred to as a response to the downfalls of the standard P-A-F model, which cannot estimate the quality related expenses between departments (Goulden & Rawlins, 1995; Vaxevanidis & Petropoulos, 2008). A process model fundamentally characterises the value breakdown of the model capacities, the stream of information and output of a model. The process costing model is very flexible compared to the P-A-F model, and it makes it easy to trace quality activities between departments (Goulden & Rawlins, 1995). Figure 16 indicates a basic process model which includes inputs, controls, mechanism, and output.

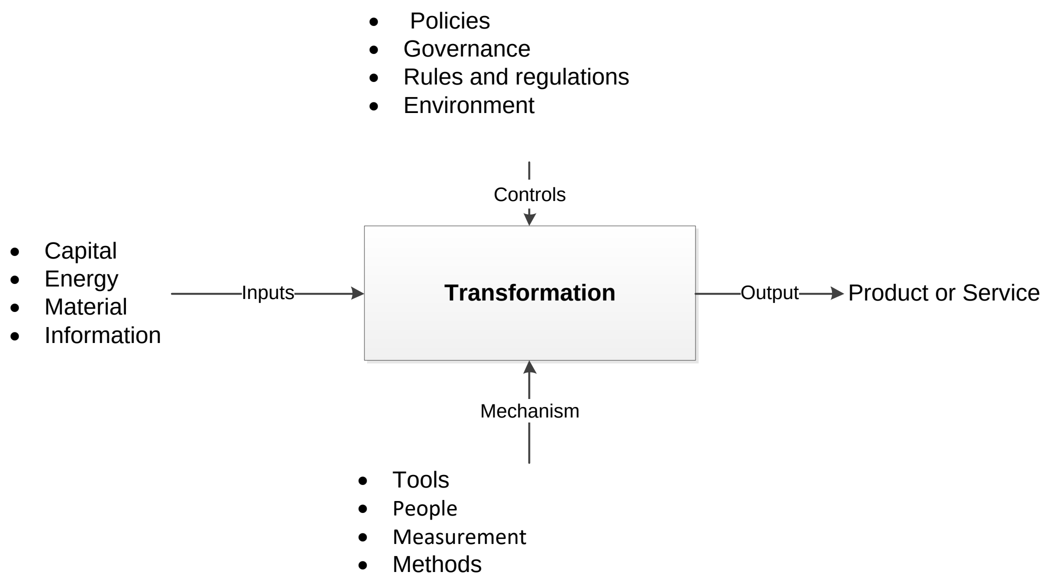

Figure 16: Basic Process Model adapted from ((Ross, 1977; Tsai, 1998; Goulden & Rawlins, 1995; Vaxevanidis & Petropoulos, 2008)

According to Vaxevanidis and Petropoulos (2008) the process cost model can be for a particular process within the organisation or the entire organisation. The authors also suggest that with the process cost model it is easy to create accountability (*Ibid.*). For example, in Figure 17 each head of the department can be responsible for the cost of quality in his or her section. Further illustrates the interactions between departments and the external environment. Again, in real life, each unit can be influenced by the external environment.

In the process costing model activities in the framework are mapped using a flowchart which in turn makes it easy to visualise the task and accountability. Tsai (1998) supports the view, suggesting that the process cost model lacks the arbitrary element induced by the P-A-F model since the focus is about the entire process.

Chen and Tang (1992) capitalised on the process costing model and developed a pictographic approach to poor cost of quality management. The initial phase of the model is the advancement or distinguishing evidence of the CoQ variables and draws the connection between the variables. The author additionally utilises the influence diagram to outline variables (*Ibid.*). Again the success of the process cost model depends on the commitment from the senior management and employee engagement (Goulden & Rawlins, 1995; Schiffauerova & Thomson, 2006; Vaxevanidis & Petropoulos, 2008).

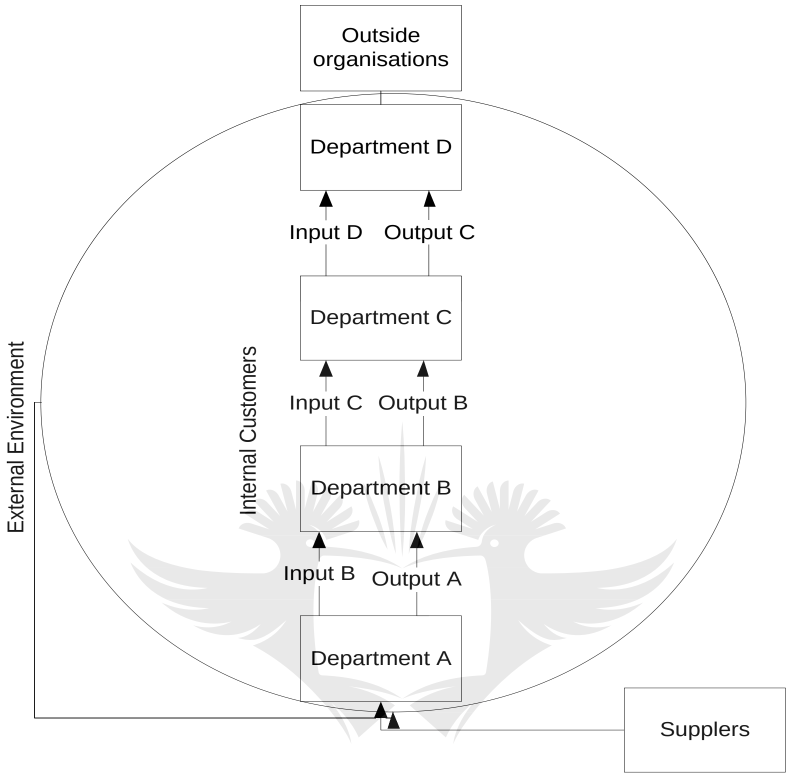

Figure 17: Basic Quality Chain

2.5.4 The activity-based costing model

The Activity Based Costing (ABC) model is a method of distributing the overhead cost across business activities (Moolman, et al., 2010; Nel & Pretorius, 2016). According to Ozyurek and Dinç (2014), ABC is the response to today's highly automated plants, which make it difficult for bookkeepers to allocate the indirect cost using the traditional cost account accurately. The traditional way of distributing overheads takes the total overhead cost and is divided by volume produced or hours of production. The old-style general results in the incorrect allocation of overhead, which leads to the improper product pricing see for example (Cooper & Kaplan, 1988; Tsai, 1998; Kaplan & Anderson, 2006; Aniza, 2014). The process of implementing the ABC model includes a definition of activities, allocation of resources, define cost drivers, determine cost pools and monitor the output (Kaplan & Anderson, 2006; Khataie & Bulgak, 2013). Figure 18 below describes the primary ABC model as defined by (Linassi, et al., 2016). The main purpose of the model is to identify and control non-value adding cost and actions (*Ibid.*).

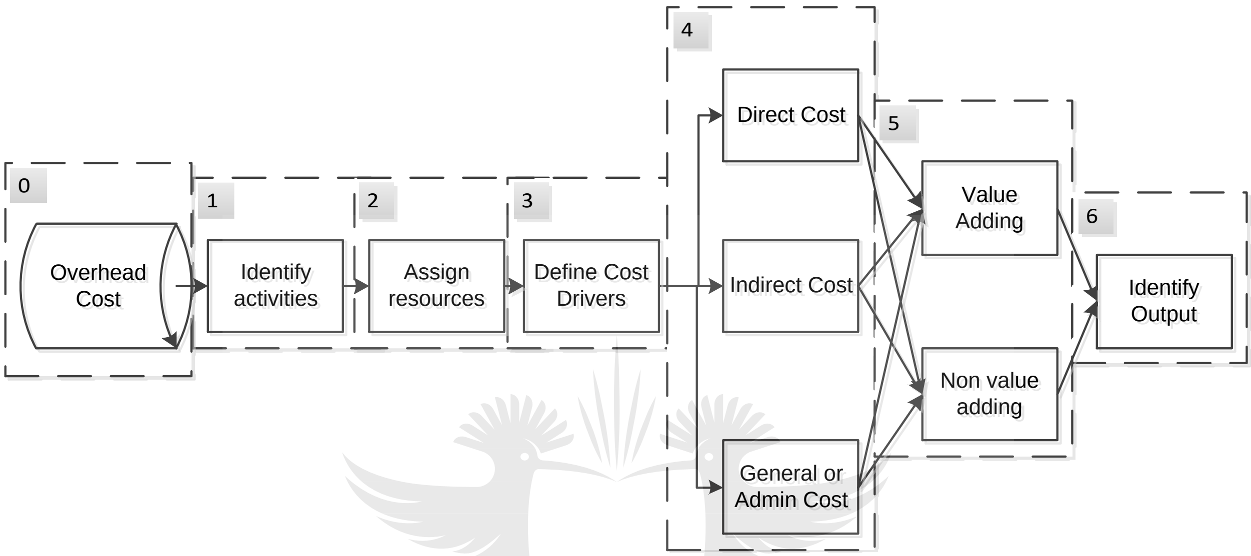

Figure 18: Basic ABC model (Linassi, et al., 2016)

The ABC model is designed to allocate the overhead cost. Therefore the first step in the process is to identify the activities incurred for the expenses. According to Kaplan and Anderson (2006), the traditional way of allocating resources to activities or overhead is to conduct interviews and ask people how they spend the funds. The percentage allocated during the meetings, then multiply the total overhead cost. In step three in Figure 18, the assigned overhead is divided by the quality produced by the particular activity; the answer becomes the cost per unit (*Ibid.*). Linassi et al., (2016) further classify activities into direct, indirect operations and general administration cost. The events are also organised as value adding and non-value adding activities (*Ibid.*). The primary objective of the model is to reduce the non-value adding activities.

The founders of the ABC model provide three basic rules to implement the ABC (Cooper & Kaplan, 1988, p. 98):

- “Focus on costly assets
- Highlight on assets whose utilisations changes substantially by item and item sort
- Focus on assets whose demand pattern is uncorrelated with customary portion measures like direct work, handling, and materials."

Tsai (1998) and Nel and Pretorius (2016) maintain that Cooper and Kaplan’s ABC model does not meet the requirement to qualify as a CoQ model. The expectations criticised include the exclusion of process cost and external cost as defined in other CoQ models 2.5.2 and 2.5.3. In the same context, Tsai (1998) disputed the ability of the traditional CoQ models to trace the cost of quality from the point of origin; also the traditional models do not accommodate overhead distributions. The author, maintains that the integration of Cooper and Kaplan’s ABC and Ross’s Process Costing Models will eliminate the existing gap in the field of CoQ. Figure 19 below shows the typical ABC model for quality improvement (Tsai, 1998).

The ABC model is a two-dimensional model, which aims at eliminating or reducing the non-value adding activities and associated costs (Tsai, 1998; Ittent, 1999; Hou, 2011; Nel, 2013). In the ABC –CoQ model, cost objectives which could be a product, department, or services demand certain activities, in turn, the activities require resources to be completed (Tsai, 1998; Vaxevanidis, et al., 2009; Nel, 2013). The activities needed to satisfy the requirements of cost objectives are determined through the event assignment of the model (Khataie & Bulgak, 2013).

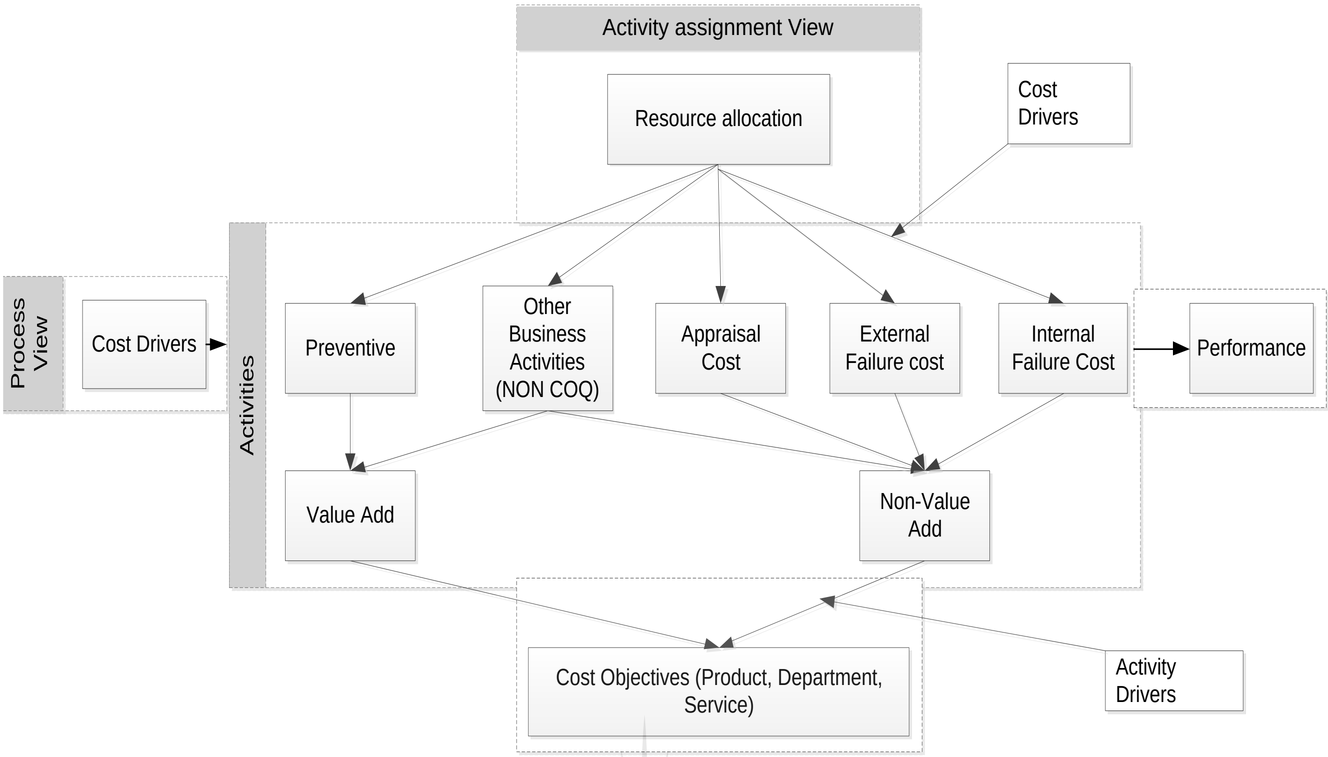

Figure 19: ABC –CoQ Model (Tsai, 1998; Ittent, 1999; Vaxevanidis, et al., 2009)

The interactions between functional sections within the organisation needed to deliver the actions are mapped using the flowchart through the process view part of the model. Table 13 below indicates the necessary steps in the implementation of the ABC-CoQ model

Table 13: ABC-CoQ Model Implementation (Ittent, 1999, p.493)

Steps and Type of Estimates	**Expert Judgement**	**Analogous Data**	**Parametric Analysis**
	Level of Accuracy		
	Lower	Medium	High
Define activities and estimate time	• Use the expert knowledge to determine activities and the associated time to complete	• Conduct an interview with the employee to identify actions and the time it takes to complete each event based on the previous similar work	• Detail process analysis, which includes physical measurement and recording of observations
Quality category assignment	• After defining activities, the next step is the assignment of the price of quality categories (Preventive, Appraisal, and Failure of events).		
Estimate the cost of each activity	• Use the rule of thumb	• Use the historical data	• Use a bottom-up approach to estimate the value and identify quality related expenses

Steps and Type of Estimates	Expert Judgement	Analogous Data	Parametric Analysis
	Level of Accuracy		
	Lower	Medium	High
Identify continuous improvement opportunities	• Use decision-making tools with the quality team or cost estimates	• Use a comparison approach to determine the highest opportunities	• Perform detail process analysis
Change the process to eliminate non-value adding activities	• Use internal surveys	• Perform Trends Analysis	• Implement the system to track and improve quality

Tsai (1998) and Ittent (1999) detailed the processes required to perform the ABC-CoQ cost model. Ittent (1999), further emphasises the importance of involving employees or team members in the development of the model. Khataie and Bulgak (2013) developed a dynamic system model to support decision making for managers to decrease the influence of non-value adding events.

2.5.5 CoQ model comparison

All CoQ models and initiatives are aimed at improving the competitive enterprise advantage and adding value to the customers. Despite the shared objectives among the CoQ models they are different in orientation, cost classification, and management. For example, the Process cost model is distinct from the traditional P-A-F model in the sense that conformance and nonconformance measurements are linked to the particular process. While in P-A-F model conformance and non-conformance relates to the activities. The ABC model, on the other hand, incorporates the features of the two models. Tsai (1998) and Vaxevanidis et al., (2009) used Table 14 below to distinguish differences between three Cost of Quality Models

Table 14: CoQ model comparison Adapted from (Tsai, 1998, p. 733; Vaxevanidis, et al., 2009, p. 279)

Aspect of Comparison	**Cost Of Quality Models**		
	(P-A-F Model)	(Process Cost Model)	(ABC-CoQ Model)
Orientation	Activity –Orientated	Process Oriented	Both Activity for cost assignment and Process for the Process view
Cost Classification	Prevention Appraisal Internal failure External failure	Conformance Non-conformance	Value added Non- value added
Overhead allocation	Not allocated		Overheads are distributed to activities by first identifying cost drivers
Traceability of cost from the point of origin	• Reason and pain matrix (Ngomane & Adendorff, 2012). Interviews and observations (marcus and wallin, 2013)		The activity drivers are used to trace cost
Tools for Improvement	Group creativity techniques (pmi, 2013: p115) • Brainstorming • Nominal group technique • Mind mapping • Affinity diagram • Multicriteria decision analysis • Pareto chart • Cause and effect diagram • Trend analysis		Benchmarking Processes or activity analysis Performance measurement

2.5.6 Methodology to Implement CoQ

In the literature reviewed, there is no single agreed set of theories and methods to implement the CoQ programme. According to scholars the companies are different, which make the implementing of CoQ to be different from one company to another (Kaur, 2009; Vaxevanidis & Petropoulos, 2008; Taidi, 2015; Trehan, et al., 2015). Other scholars, first attempt to get the buy-in from the companies' top management structures, and understand the existing practice in the organisations (Ngomane & Adendorff, 2012; Marcus & Wallin, 2013; Ozyurek & Dinç, 2014). Ngomane and Adendorff (2012) used the quality audits as the first point of understanding the current practice in their case study company. The authors (*Ibid.*) used the ISO requirement as the guide to identify the gap in the current system to table the implementation of CoQ. The authors further mapped the finding in the Reason and Pain matrix to determine the causes of noncompliance and estimate cost.

Marcus and Wallin (2013).used interviews, observations, and document reviews as the methods of getting an understanding of the existing company practice. While Nel (2013), used the series of meetings with management, training sessions with the employee of the case study company on the subject of CoQ, and document reviews to gain insight into the companies practice. The author (*Ibid.*) further worked with the employees of the case study companies to develop the P-A-F model to meet the business needs.

To implement the ABC model in the case study, Özkan and Karaibrahimoğlu (2013) focused on getting the buy-in from the managers from different disciplines and involvement of employees from the company under investigation. The author (*Ibid.*) formulated a cross-functional team and worked with the team to identify the business activities. Moreover, to classify the designated activities according to value-add and non-value adding activities. The author also linked the events to the cost categories of the P-A-F model for reporting purposes.

Similar to other authors Storck (2010) implemented the process costing model by first defining the objectives to be met and setting parameters. The author further illustrates the problem with the existing process and linking to the set goals. After considering the landscape of the problem, the author develops the process model to address the issues.

2.5.7 Cost of Quality and Accounting Systems

Scholars and practitioners maintain that the accounting systems cannot trace the quality related expenses (Sower, et al., 2007; Cheah, et al., 2011; Mahmood & Kureshi, 2014; Aniza, 2014). The economic structures were not designed to deal with quality related matters. The financial reports namely balance sheet, liabilities and income statements are meant to provide information to the shareholders, investors, and government. Leonardo and Fons (2012) maintain that some companies compile accounting reports to comply with regulations.

The accountants usually compile the accounting reports based on the information displayed to them, with no details or background knowledge of the activities incurring the cost. The absence of cost of quality component in the financial report, hide the real cost drivers, inefficiencies, and lead to improper decision-making (Khataie & Bulgak, 2013).

In contrast, CoQ costing focuses on specific activities and processes to eliminate inadequacies. These costs are not integrated with the accounting system in most organisations just because it is not clear who should be responsible for tracking and reporting the expense of quality (Leonardo & Fons, 2012). Unlike the accounting reports, it is not clear who should receive the CoQ details since there are no regulations commanding the compilation of CoQ statements.

The disintegration of the accounting system and CoQ create the gaps between layers of management within the organisations. For examples, general managers (GMs) based their decision on the financial reports, which does not disclose all the business inefficiencies. The operational manager who has a first-hand understanding of the problems will be frustrated by individual decisions from the GMs. However, if the financial systems are integrated with the cost of quality, the senior managers will be capable of making informed choices and supporting the operational managers (Leonardo & Fons, 2012)

2.5.8 Benefits Associated with CoQ

The CoQ is set to be the language of expressing quality issues in financial terms and the language which is better understood by senior management (Schiffauerova & Thomson, 2006; Sower, et al., 2007; Vaxevanidis, et al., 2009) . Vaxevanidis et al., (2009) further argue that the literature does not specify the benefits of implementing the CoQ programme. In contrast, other authors maintain that managers who decide without CoQ data found it difficult to sustain their decisions or to identify costs hidden by quality activities (Kaur, 2009; Leonardo & Fons, 2012).

The study by Schiffauerova and Thomson (2006) and Sower et al., (2007) found that the CoQ programme reduces the cost related to warranties and returns from customers. From the findings, it can be said that CoQ of quality implementation, reduces customer complaints and improves satisfaction. Kaur (2009)cited the company which has made savings of $53 million (approximately R139 million in 1989), and the total of $150 million (about R393 million between 1989-1991) in three years. The figures reported are only visible through the implementation of the sound CoQ programme, which requires the support of the sound quality system.

2.5.9 Challenges Associated with CoQ

Despite the reported benefit relating to the implementation of CoQ, and the interest from academics. The research studies maintain that the concept of CoQ is not well received from industries (Vaxevanidis & Petropoulos, 2008; Abdelsalam & Gad, 2009; Vaxevanidis, et al., 2009). Kaur (2009) found that about 21% of companies both private and public sector does not measure the cost of quality in India. Rasamanie and Kanapathy (2011)found that about 61% of manufacturing businesses in Malaysia do not gauge the expense of quality.

The scholars stated that the challenges associated with the implementation of CoQ are as follows (Schiffauerova & Thomson, 2006; Sower, et al., 2007; Aigbavboa & Thwala, 2014):

- Misalignment between the objectives of the Corporate Strategy and the CoQ goals
- Mismatch or disintegration between operational plans and CoQ
- Inadequate support from top management
- Exclusion of the financial team or department in the implementation of the CoQ programme
- Lack of skills and team developments
- Lack of control mechanisms

The findings of other authors play a critical role in the development of the theoretical foundation for the current research.

2.6 Benchmarking

The literature reviewed associates the beginning of benchmarking with Xerox Corporation in 1979 (Mohamed, 2012; Robin, 2015; Singh, et al., 2015). However, Moriarty (2011), maintained that the concept of benchmarking was already in use during the 1940s,as posited by Juran, Deming and other quality gurus. In support Foster (2013) cited Demining's rationale suggesting that the weak opposition is not good for the business. The idea of benchmarking involves comparing and gauging the processes, practice, and culture of one company to another to identify more efficient ways of meeting the customer demand (Williams, et al., 2012; Mohamed, 2012; Robin, 2015). Sweis et al., (2016) view benchmarking as one of the TQM tools, which help the organisation to identify the best achievable performance.

Foster (2013) explains the six types of benchmarking; these include "Financial, Process, Performance, Productivity, Strategic, and Functional benchmarking." In support, other authors suggested that there are eighty types of benchmarking demand (Williams, et al., 2012, pp. 256-257). The authors agreed that the application of each kind of benchmarking method differs with the objective of the organisation. Rendon (2015) conducted a process benchmarking in the United States' military processes. Goncharuk (2014), conducted strategic benchmarking in Ukrainian diaries to improve contract management processes. Kuzmicz (2015), performed a desktop benchmarking to the systematical analysis of the university development programmes. Singh et al., (2017) used the multi-criteria decision making to evaluate the benchmarking practice in service industries. Onatere-Ubrurhe (2016) established a benchmarking approach to the transport industry in Nigeria. The authors associated benchmarking with some benefits ranging from cost saving, safety improvement to efficiency enhancement (Mohamed, 2012; Saunders, et al., 2016).

A standard benchmarking process involves four general processes (Andersen & Moen, 1999; Chen, 2002). The procedures include planning (determining factors to benchmark and partner(s), documenting the observations, analysing the results and initiating improvements. Singh et al., (2017), used a different approach to benchmarking, the scholars started from the literature as the base line. Moreover, the authors used the survey questionnaire as the source of data collections. Ahren and Parida (2009) followed the four generic approaches to benchmarking in the case study of five railway companies. The literature indicates that there is more than one approach to benchmarking.

According to Williams et al., (2012), the benchmarking presents its challenges, which include reluctance of participants and lack of leadership support. The typical findings from different authors on the factors affecting the implementation of benchmarking include, negative thoughts, uneducated approach to benchmarking, and lack of access to data (Adewunmi, et al., 2015). The authors further argue that if there is a lack of support, an incapable team, and lack of funding then the benchmarking exercise will fail like any other project. According to Freiling and Sybille Huth (2015), benchmarking challenges differ depending on the type of benchmarking strategy. The authors maintain that the internal benchmarking can be much more comfortable compared to external benchmarking. The subsequent sections detailed the different types of benchmarking.

2.6.1 Financial benchmarking

The financial benchmarking involves assessment of the monetary figure of the organisation and comparing to another organisation; the aim is to identify the best performance and the standard practice in the industry (Ndirangu & Kamau, 2017). In most cases, financial benchmarking does not need direct interaction between the companies (Foster, 2013).The scholars maintained that financial benchmarking is a more natural type of benchmarking because most of the business financial reports are published on the internet (Foster, 2013; Ndirangu & Kamau, 2017). Hans-Arthur and Anne (2013) and Singh et al*.,* (2015) agreed that the companies performing financial benchmarking should be transparent on the unit of analysis and the variables involved in the assessment. The variables can include production cost, overhead cost, inventory management, cost and more (Ndirangu & Kamau, 2017).

2.6.2 Process benchmarking

Process benchmarking is the study of a specific business process with the aim of identifying the best practice, approaches, and performance (Hawley, et al., 2010). During the operation benchmarking the initiator selects the best performer in the industry and a specific process for observation and measurement (Foster, 2013). During the process benchmarking, the assessors have the advantage of selecting multiple performance indicators to assess the performance of the process (Gleich, et al., 2008; Hawley, et al., 2010). The companies involved in the process benchmarking also need to agree on the key performance indicators (Foster, 2013).

2.6.3 Performance benchmarking

Performance benchmarking is regarded as the most expansive method of benchmarking due to the number of variables involved (Hawley, et al., 2010). Performance benchmarking attempts to reveal the current position of the company if it is compared to the best in the market (*Ibid.*). The performance benchmarking involves measurements of variables such as cost per unit of production, overhead, and fault per unit produced (Gleich, et al., 2008; Foster, 2013). Mukherjee et al., (2002) used the concept of efficiency as the means of performance measurement. The authors assessed the utilisation of resources and compared with the output as a form of analysis.

2.6.4 Product benchmarking

According to Foster (2013) product benchmarking is mainly used during product design or improvement. The process of product benchmarking involves the dismantling of the competitor's product with the aim of understanding and improving the design. Storto (2017) views product benchmarking as a cost-effective way to advance and develop the technology. The method allows product designers to use the already available technology to promote their research and development initiatives.

2.6.5 Strategic benchmarking

The strategic benchmarking is different from other types of benchmarking in the sense that it is not limited by the industry type (Foster, 2013). The purpose of strategic benchmarking is to improve the overall business performance by studying other businesses' core competitive advantages (Foster, 2013). Onatere-Ubrurhe (2016) further provided the list of companies who benefited from strategic benchmarking which include Xerox Corporation, Bellwether housing, and Bath Ironworks.

2.7 Chapter Summary

This chapter provides the theoretical background to support the research and further highlights the arguments from different authors. The section further, summarises the development in the field of quality management, Quality Maturity, Cost of Quality and Benchmarking. The next chapter describes the research methodology and philosophical stance for the current research.

3. CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The previous section dealt with the literature review on the subject of quality management, cost of quality, and benchmarking. The current chapter explains the theoretical approaches, tools, techniques, and procedures adopted to answer the research questions. Figure 20 provides some of the topics covered in this chapter and the selected position to complete the research.

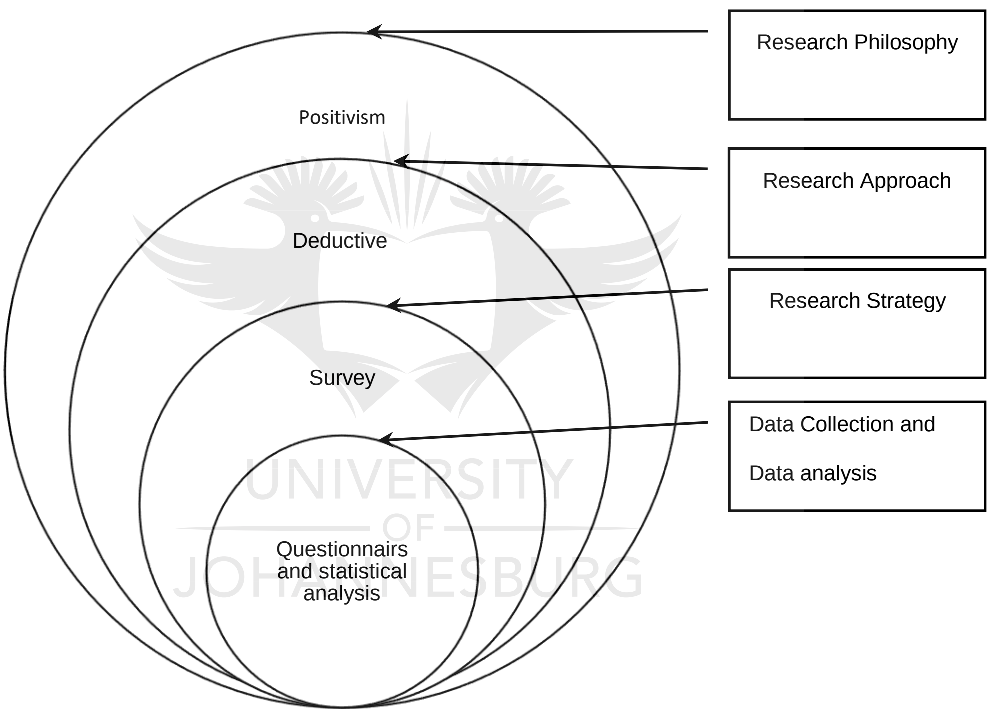

Figure 20: Research Onion (Saunders, et al., 2009, p. 108)

The term research methodology, in most cases, is used as an interchangeable term with the research methods. In this research, the research method is different from research methodology in a sense that the research methods refer to the set of tools, techniques, and procedures to collect and analyse data (Saunders, et al., 2009; Walliman, 2011). The research methodology refers to the guiding theories to conduct a research study (Saunders, et al., 2000; Carr, 2006; Saunders, et al., 2009).

According to scholars any systematic investigation aimed at finding new information and improve knowledge is derived from the set of beliefs and perception about the world (Saunders, et al., 2000; Walliman, 2011; Mkansi & Acheampong, 2012; Aliyu, et al., 2014). In research terms, the set of beliefs and worldview of the researcher is referred to as a research paradigm (Katebire, 2015). The research paradigm is concerned about the interpretation of reality, receiving and distribution of knowledge (Bracken, 2006; Aliyu, et al., 2014). The approach and strategies adopted for the current research are presented in the next section.

This chapter consists of fourteen sections - the first section 3.1 is the introduction. Section 3.2 presents the review in the research paradigm. Section 3.3 presents the review on the research approach and the approach adopted for the current research. Section 3.4 presents the literature on the research design and the research design adopted for the current research. Section 3.5 presents the research population. Section 3.6 presents the unit of analysis, while Section 3.7 presents the data analysis. Section 3.8 presents the data analysis, Section 3.9 presents the review on the validity and reliability and the strategies adopted in the current research to ensure validity and reliability. Section 3.10 presents the review on the correlation analysis and the methods adopted for the current research. Section 3.11 presents review on the statistical tools (Multiple linear regression) to assess the ability of quality management factors to predict cost of quality categories. Section 3.12 presents the strategy used to assess quality management maturity of the South African manufucturing industries, while Section 3.13 present the review on the banchmarking strategies.

3.2 Research Paradigm

The research paradigm mainly deals with the individual's interpretation of the reality concerning social entities, referred to as an ontology. This includes how to collect and distribute knowledge termed 'epistemology' (Bracken, 2006; Mkansi & Acheampong, 2012;

Ågerfalk, 2013). Despite the general definition of research paradigm Mkansi and Acheampong (2012) maintain that there is no consistency in descriptions and classifications of the research paradigm element. Saunders et al., (2009) and Aliyu et al., (2014) view the research paradigm as positivism, interpretivism, and pragmatism.

3.2.1 Positivism

Positivism holds the belief that real events are practical, observable and can be analysed using systematic methods (Kaboub, 2008; Walliman, 2011). Bracken (2006) and Aliyu et al., (2014) maintain that positivism research uses experiments, manipulative methods, hypothesis testing, and quantitative research methods to find the truth objectively. Under positivism, the researcher acts as an observer without physical interaction with the phenomena under investigation (Saunders, et al., 2009; Walliman, 2011)

Aliyu et al., (2014) maintain that anyone can reproduce the research result derived under the positivism paradigm; provided the same tools procedures be used under constant conditions. The positivist approach mainly links to natural science studies (Bracken, 2006; Ågerfalk, 2013). Ågerfalk (2013) discredited the ability of positivism to solve problems associated with people's emotions, political issues, and criminal behaviour. Positivist research assumes that the world adapts to permanent and unchanging rules of causes and effects (Saunders, et al., 2009).

The positivist research paradigm mainly employs the deductive research approach and quantitative data analysis (Bracken, 2006; Mkansi & Acheampong, 2012). The positivist approach was adopted in this research to objectively study quality management and cost of quality practice in the South African manufacturing sector and compare the result with the international companies.

3.2.2 Interpretivism

Aliyu, et al., (2014) defines interpretivism as an opposite of positivism by beliefs and how research is conducted under the two paradigms. The interpretivist believe in the knowledge created through the interaction between people and the environment (Saunders, et al., 2000; Aliyu, et al., 2014). The other distinction between positivist and interpretivist is the belief about reality; the positivist believes there is only one reality while the interpretivist believes there is more than one reality (Saunders, et al., 2009).

According to Walliman (2011), under interpretivism, the researcher forms part of the phenomena under investigation. The human experience, perception, values, and beliefs play a critical role in the outcomes of interpretivism. The positivist sees the reality created under this philosophy as the fabrication of an individual's knowledge (Saunders, et al., 2009).

The interpretivist mainly uses an inductive research approach, surveys, interviews, and qualitative data analysis as the research methods (Bracken, 2006; Mkansi & Acheampong, 2012). The result derived from interpretivism cannot be generalised; they are confined to a specific area of investigation (Ågerfalk, 2013). Hence, this method was not feasible in the current research due to the nature of the population, availability of resources and the time span of the research.

3.2.3 Pragmatism

Pragmatism takes the middle position between positivism and interpretivist. The philosophy takes the result obtained from the two traditional paradigms and placed them in action to verify the practicality (Kloppenberg, 1996; Saunders, et al., 2009). Different authors refer to pragmatism as the philosophy of action (Goldkuhl, 2004; Ågerfalk, 2010).

Under pragmatism, the research combines qualitative and quantitative analysis in one study to answer the research questions. Saunders et al., (2009) and Ågerfalk (2013) defined the utilisation of qualitative and quantitative analysis in one study as a mixed method. According to Goldkuhl (2004), pragmatism is not asking about what people think about their environment, but it seeks to understand people's behaviour within the context. The authors further define pragmatism as the paradigm of change and seek to understand how people react to the changes (Ågerfalk, 2010; Goldkuhl, 2012; Ågerfalk, 2013). This method was not selected for the current research because the current research only uses quantitative research data.

3.3 Research Approach

The research approach attempts to explain how the research derives the theory (Saunders, et al., 2009). The literature provides two traditional approaches to build arguments; those are referred to as inductive and deductive research approach (Saunders, et al., 2000; Walliman, 2011). Walliman (2011), introduced the new term (Hypothetico-Deductive Reasoning) in the discussions, which define a scientific research approach. The subsequent section discusses each type of these procedures in detail.

3.3.1 Deductive research approach

Saunders et al., (2009) linked the deductive research approach to the positivism or natural science paradigm. The authors also described the deductive research approach as a structured method. The method involves a literature review and hypothesis design (Saunders, et al., 2009; Walliman, 2011). The practitioners express theory in the operational terms, defined how the variables will be tested after formulating the assumption (Uma & Roger, 2009; Saunders, et al., 2009). After determining how the variables will be examined, the next step is to use quantitative data analysis to test the hypothesis or to answer the research questions.

The proposition can either be acknowledged or overruled based on the resulting outcomes of the test. Similar to the positivist paradigm, the research administrator is independent of the situation under investigation. Saunders et al., (2009) define deductive analysis as a low-risk research approach. Walliman (2011) maintains that the deductive research approach requires a more significant sample, and much more data compared to inductive studies. The features of the deductive research approach best fit the current research because the authors used the existing theories to identify the variables of interest and test procedures.

3.3.2 Inductive research approach

Deductive and inductive research approaches represent the opposite ends of the same bar. The inductive research approach is associated with the interpretivism paradigm (Soiferman, 2010). Inductive research develops theories through data collected in the form of text, document review, pictures, and observations. Under inductive studies, the investigator is not limited to what is already known (Saunders, et al., 2009). A researcher has more chances of discovering ground-breaking knowledge by interacting with individuals and the environment during inductive research approach (Walliman, 2011). The investigator has an opportunity to understand an individuals' perceptions and emotions that cannot be explained numerically. Under inductive research, the investigator associates directly with the phenomena under investigation.

Unlike the deductive research approach, inductive research does not need a bigger sample size. Moreover, it is more likely to use qualitative data analysis (Uma & Roger, 2009; Saunders, et al., 2009). Soiferman ((2010) referred to the inductive research approach as the bottom-up. Saunders et al. (2009) and Walliman (2011) encourage the use of more than one data collection method under the inductive research approach to gain a different view of the same issues. Hence, the inductive approach was not appropriate for the current research; this current research requires a bigger sample size and uses quantitative data only.

3.4 Research Design

The research design is the overall approach to answer the research question; it involves research strategy and time horizons (Saunders, et al., 2000). Figure 21 shows the interactive processes designed to meet the objectives of the current research. The first process on the design was the literature review, which created a broader understanding of the field of study and identification of the variables. As a result of the literature review process, two systematic literature review papers were submitted and accepted for the International Conference on Industrial Engineering and Engineering Management (IEEM 2018) (Makhanya, et al., 2018a; 2018b). The lessons learned from the two publications played an essential role in the selection of the research strategy to answer the research question.

The research strategy is an integral part of the research design which explains how data is collected to respond to the research questions and provides feedback to research objectives (Wedawatta, et al., 2011). The research tactics described in the literature, include an experimental research strategy, a case study, a survey, a grounded theory, action research, and archival research (Uma & Roger, 2009; Walliman, 2011). Saunders et al., (2009) maintain that no research strategy is better than the other. The type of questions, the available information and the nature of phenomena, determine the procedure for the research study. The authors discuss the advantages and disadvantage of various research strategies (Ali & Birley, 1999; Saunders, et al., 2000; Walliman, 2011). The current study selected the survey as a preferred research strategy.

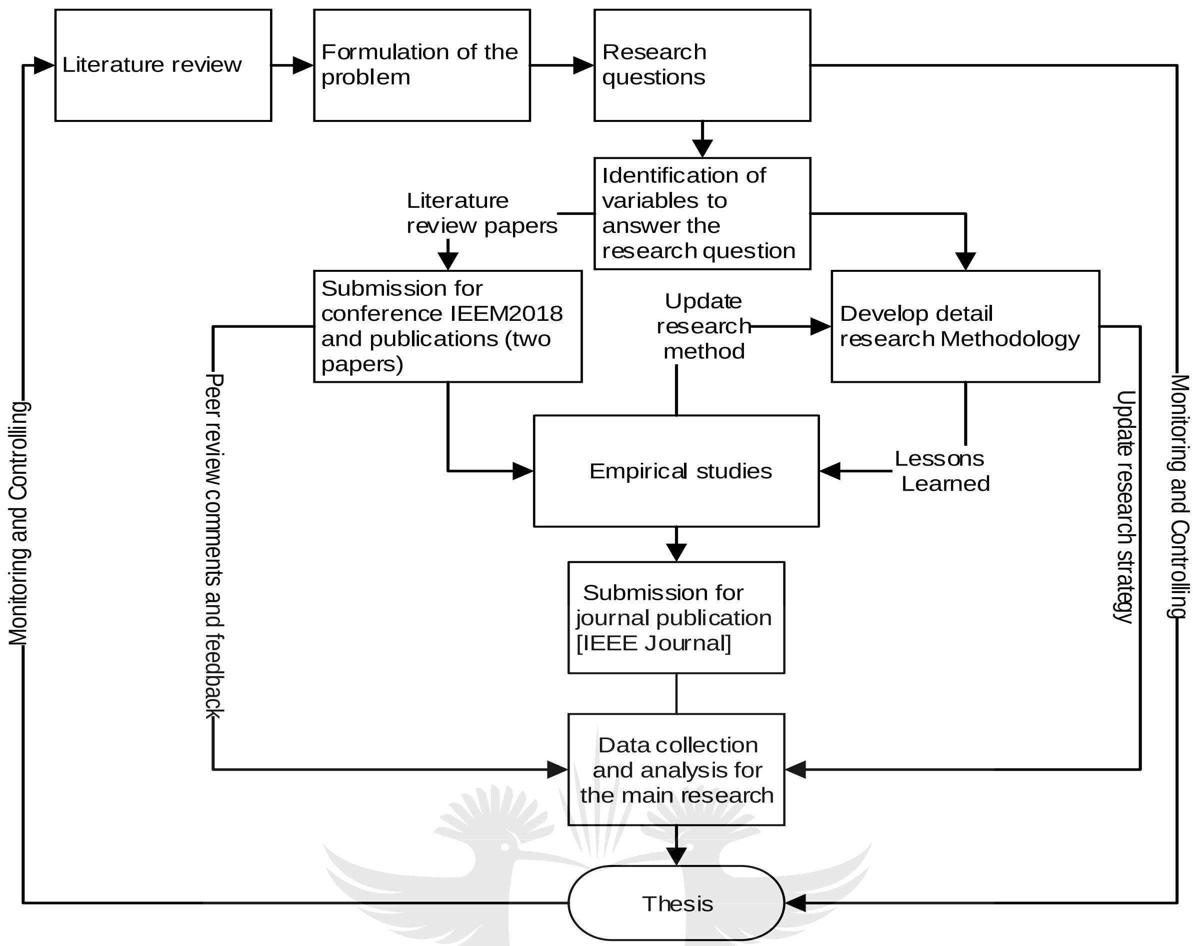

Figure 21: Research strategy

3.4.1 Survey research

A survey is a systematic approach of collecting information from the pre-defined or sampled group of people (Ali & Birley, 1999; Saunders, et al., 2000; Walliman, 2011). The survey research method is highly used in studying human behaviour, opinions, perceptions, preferences, and attitude (Julie , 2015; Mhaka & Roy, 2018). In the survey research, data are collected in a uniform approach (Kate , et al., 2003). Justyna (2016) defined the survey research method as a measure of latent variables from people. The latent variables refer to the concept which cannot be measured or observed using a standard measuring tool (Adamantios, et al., 2008; Sabina, 2018). According to Sabina (2018) the latent variable only exists because of some items which defined the hidden variable called the latent variable.

The example of latent variables includes wisdom, health, knowledge, and satisfaction (Justyna, 2016).

The survey research method has the following distinct factors (Kate , et al., 2003; Mathiyazhagan & Nandan, 2010):

- The survey research involves the selection of the sampling
- The data collected from the sample estimate the particulars of the community
- The ability to assess unknown factors from the large group of people like knowledge and perceptions which were not going to be possible using other methods.

The current research used the latent variables (quality management maturity and cost of quality) to derive a quantitative explanation of how the two variables relate to each, to benchmark the cost of quality between global companies and South African companies. The assessment of the two variables is based on the information provided by people. Since the study requires knowledge of the broader communities and the nature of the data needed to answer the research question; the survey research was selected as a preferred research strategy.

3.4.2 Different types of surveys

The time factor is the main component which distinguishes different types of inquiry. There are two different types of reviews which are cross-sectional surveys and longitudinal surveys (Julie, 2015). The cross-sectional study provides information about how things are at a specific point in time (Saunders, et al., 2009). The longitudinal survey attempts to observe the phenomena over the period of time (Owens , 2002; Mathers, et al., 2009). The current research opted for the cross-sectional survey to provide a snapshot description of the variables of interest.

3.4.3 Advantages and disadvantages of the survey

Survey research has both advantages and disadvantages, and Table 15 shows some of the advantages and disadvantages identified from the literature.

Table 15: Advantages and weaknesses of the survey

Author (s)	**Advantages**	**Disadvantages**
Rice et al., (2017)	• Easier to access new population • Large sample estimate • Lower cost • Flexible • Reliable information • Provide empirical data	• The low response rate • Financial motivation issue • Limited access to certain portals • Limited length of the study • Unable to collect non-behavioural data • It contains the element of bias
Mathiyazhagan and Nandan (2010)	• It accommodates a different type of data collection (face to face interviews, telephones, and online questionnaires)	• Low response rate
Mathers *et al.,* (2009)	• The survey has both internal and external validity • The result of the study can be generalised across the population • It is a cost-effective way of finding what people do or think • The survey can cover a wide spread of the community • The investigation is considered the most ethical way of collecting data • The survey is flexible, and they use different types of data collection methods	• The review is highly dependent on the sample frame • The study falls short in explaining why people act or think the way they do
Glasow (2005)	• Ability to collect data from the sample of the more significant population • Usually, are cheaper and accessible to obtain information which can be generalised across the population • The survey measures a hidden variable that cannot be assessed using other approaches	• It is only providing the estimate not the actual truth of the population • The information can be biased • It is prone to intentional misrepresentation of truth
Calvert and Pope (2005)	• The survey provides a quick response compared to another method	• The study received through e-mail are easy to ignore
Kelley et al., (2003)	• Research produces data based on the real-world observation • The ability to cover a significant geographic area • Large amount of data at a low cost	• Data generated lack details on the issues • It is challenging to obtain a high response rate

The objectives of the current research require data from the general population within a short period. The advantages of the survey research detailed in Table 15 provided all the necessary characteristics to meet the objective of the current research.

3.5 Population

The word population refers to the total group of interest which could be people, companies or events (Uma & Roger, 2009). The community in the current research is the manufacturing companies operating in South Africa and the global space. It is difficult to express the number of the population size accurately in the present study. The literature defines the broad population which is difficult to estimate as a hard-to-reach population (Goel & Salganik, 2010; Shaghaghi, et al., 2011). The subsequent sections detail the sampling process adopted for the current research.

3.5.1 Sample frame

The sample frame is the list of all the population members or items (Uma & Roger, 2009; Walliman, 2011). The population of interest in the current research is too broad, as such it was not feasible to obtain a single source of manufacturing companies in South Africa. The next section details the process followed to select the members of the population.

3.5.2 Sampling method

The sample is a part of the bigger universe called population (Uma & Roger, 2009; Etikan, et al., 2016). The small group of the population is selected to participate in the investigation, with the aim of reducing cost and time it will take to study the entire (Etikan, et al., 2016). The findings from the group can be generalised across the whole population (Greener, 2008; Saunders, et al., 2009).

The literature provides two methods of selecting the sample from the population, which includes probability sampling and nonprobability sampling (Wilmot, 2005; Oppong, 2013). According to Uma and Roger (2009) in probability sampling, all the members of the population have an equal chance of being selected as study subjects. According to Etikan, et al., (2016) probability sampling is costly and impossible when the population is too broad. Nonprobability sampling is cheap and applicable if the community of interest cannot be easily defined (*Ibid.*). Table 16 shows the advantages and disadvantages of the different sampling methods.

Table 16: Advantages and disadvantages of sampling methods adapted (Uma & Roger, 2009; Etikan, et al., 2016)

Sampling methods	**Advantages**	**Disadvantages**
Probability sampling	• Generalisable • The study subject has an equal chance of participating in the study. • Eliminate sampling biases	• It is costly and time-consuming • It is impossible when the population is too broad • Requires theoretical support and a significant number of the participant for statistical generalisability
Nonprobability sampling	• Cheap and flexible time wise • Preferable when dealing with sensitive issues • Applicable when the population of interest is broad	• The subject selection is not predictable • Curtails generalisables • Element of bias

The current research requires information from the hard-to-reach population (Marnewick, 2013; Dragan & Isaic-Maniu, 2013). The use of a probability sampling method in the present investigation was costly and infeasible. It was also difficult to identify the sample frame due to population size. The literature suggested chain referral sampling as the best method, where it is difficult to estimate the population (Goel & Salganik, 2010; Shaghaghi, et al., 2011). Chain referral sampling belongs to non-probability sampling (Dragan and Isaic-Maniu, 2013). The studies identified snowball, respondent-driven sampling and indigenous field work sampling as the commonly used method to identify hard-to-reach population (Southern, et al., 2008; Dragan & Isaic-Maniu, 2013).

During the snowball sampling, the researchers identify the initial study subjects and use the group to attract more respondents. Snowball sampling is also known as chain-referral which assumes that people in the same business environment know each other (Johnston & Sabin, 2010). The research also stands a better chance of getting a bigger sample size because the study subject may refer to an unlimited number of peers (Southern, et al., 2008). The main downfall of the snowball sample is an element of bias where friends recruit each other to increase the response rate (Shaghaghi, et al., 2011).

Respondent-driven sampling is a form of snowball sampling which uses some payment to recruit participants (Shaghaghi, et al., 2011).The participant is paid for taking part in the study and for providing references. The participant is limited to the number of people they can hire to parttake in the review (Heckathorn, 2011). The research lets the participants utilise their peers (Southern, et al., 2008). The respondent-driven sampling requires the participant to have a unique participating number and the unique recruiting number. The indigenous field work sampling is similar to the respondent-driven sampling which accepts that during the indigenous field work the field workers receive training on how to go about collecting data (Platt, et al., 2006).

The cited chain referral sampling method is all based on the snowball sampling with added features like incentive, and training of field workers. The snowball sampling method is mentioned as a preferable approach to attract people, who know people, to provide information (Marnewick, 2013). The current research opted for the snowball sampling method as the way of getting hold of the members of the population.

3.5.3 Sample selection

Due to the nature of the population, it was difficult to identify the sample frame for the current study. The researchers used the 'known members' of the sample for the referral, and they were requested to distribute the survey link to their network (Dragan & Isaic-Maniu, 2013).

The process involves:

- Identifying the authors in the field of quality management, cost of quality in the manufacturing industry
- Sending the survey link to the authors and requesting them to distribute the survey
- Contacting the industry bodies like the Engineering Council of South Africa (ECSA); The South African Institution of Mechanical Engineering (SAIMechE); Project Management South Africa (PMSA) and Survey Monkey
- Contacting the companies known to the researchers and requesting the participation and asking for a referral to their network suppliers, competitors, and partners.
- To ensure that the data was collected from the target population the researchers included disqualifying questions which prevented the participant from continuing if she/he does not meet the requirement.

3.6 Unit of Analysis

The unit of analysis is what the researcher wants to collect data about, for example cities, communities, companies, and families (Uma & Roger, 2009; Patel, 2009). According to Uma and Roger (2009), the unit of analysis can be individuals, groups, divisions, industries, companies, and countries. The unit of study in this research was the manufacturing companies.

Patel (2009) also referred to the unit of analysis as a situation the researcher wants to investigate. Patel (2009) also suggested that the unit of analysis should not be confused with a unit of observation. The unit of observation describes the data, for example, this study was reviewing organisations, but the data were collected from individuals. The individual represents the unit of observation, and the organisations represent the unit of analysis.

Greener (2008) further cautioned the researchers not to confuse the unit of analysis and variables. Greener (2008) defined a variable as the features of the object which will vary from one object to another. There are two types of variables defined in the literature -

dependent variable and independent variables (Uma & Roger, 2009; Patel, 2009). According to the authors *(Ibid.*), the changes in the independent variable are natural, while the changes in the dependent variable strongly depend on the changes in other variables. Table 17 illustrates the unit of analysis and the variables which were used to answer the research questions.

Table 17: Unit of analysis, variable and measurements

Unit of analysis	**Variables**
Organisations	1) Demographics
	2) Leadership 3) Customer focus 4) Employee focus 5) Process management 6) Result focus 7) Information Management 8) Supplier development 9) Cost of quality

3.7 Data Collections

This section details how the pieces of information (data) were collected to answer the research questions. According to Uma and Roger (2009) two types of data (primary and secondary) can be used to respond to research questions. According to various authors, primary data refer to the information collected by the researcher for a specific investigation (Greener, 2008; Saunders, et al., 2009). The authors (*Ibid.*) define secondary data as the information adapted from existing sources, such as newspapers, company records, and government publications. The current study chose primary data, as the source of information, required to answer the research question. Figure 22 indicates the adopted design to collect data for the current research.

This study followed a five-step process to collect the data required to answer the research questions. The first step involves the formulation of ideas and building the vocabulary on the subject of quality, quality management, maturity and research methodology. Artino Jr *et al.,*

(2014) suggest a literature review as the starting stage to understand the construct and its relation to other variables.

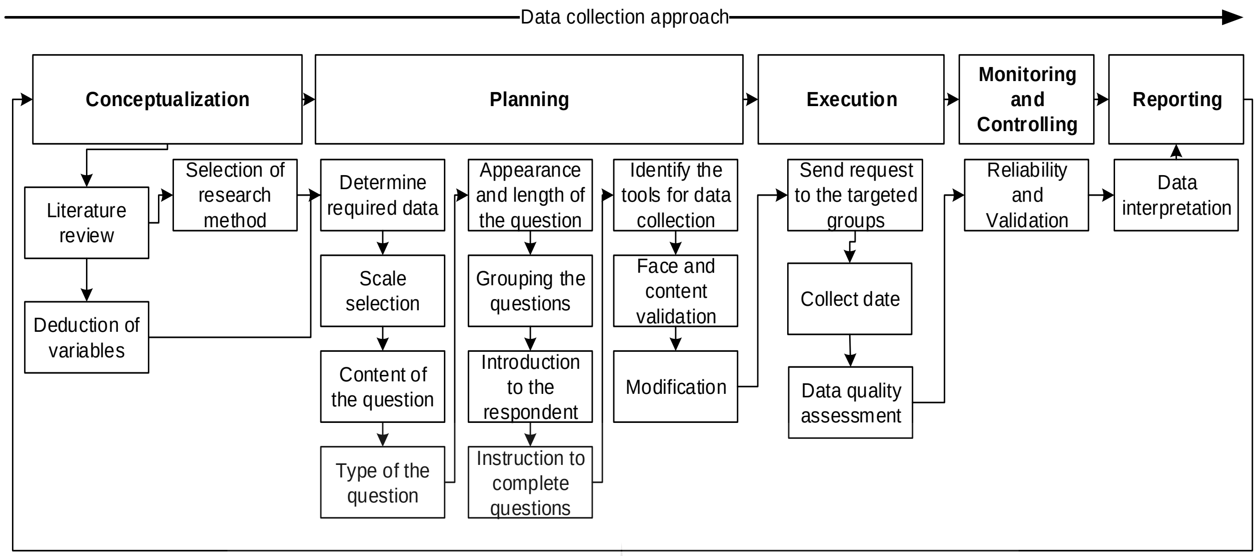

Figure 22: Data collection design

The second step of the plan involved eleven sub-processes, aimed at ensuring that the process produces data, appropriate for the study objective. The sub-processes include determining the type of data required to answer the research question, the source of data and scaling. Other procedures involve, identifying the content of the information and the appearance of items. Once the planning process was completed and approved by study leaders and the University of Johannesburg's ethics committee, the subsequent step was the implementation of the plan; the subsequent section provides the details of the implementation processes and data analysis.

3.7.1 Methods of data collection

Data collection methods are systematic approaches used by researchers and academics to prove the argument or to answer the research question (Allison, 2016). Multiple types of data collection methods exist. The most frequently used methods include interviews, observation, and questionnaires (Uma & Roger, 2009; Jean, 2017). According to Uma and

Roger (2009) the study location and the purpose of the inquiry, determine the choice of data selection. The authors (*Ibid.*) cited other factors, such as availability of the resource, the period of the study and the experience of the research administrator regarding certain of the deciding factors in the choice of the data collection method.

Jean (2017) maintains that the choice of data collection has the potential to make or destroy the credibility of the research. In support, Allison (2016) cites multiple scientific research articles which used methods considered unethical to advance the body of knowledge. The historical studies cited by Allison (2016), resulted in establishing numerous institutions and boards to control the ethical behaviour in data collection. Institutional review boards for medical and human science research and universities' ethical committee boards are cognisant of institutions designed to control ethical behaviour in data collection. The data collection method should support future research and build credible knowledge. The data collection method should be free of bias, misleading and reproducible. The subsequent section was dedicated to improving the current study rigor; it detailed the frequently used data collection method, presenting its advantages and disadvantages (Allison, 2016; Jean, 2017).

3.7.2 Interviews

Paul et al., (2008) associated interviews with the qualitative research method. According to Uma and Roger (2009), the interviews are useful in exploring the issues affecting individuals. Greener (2008) classifies the interviews into two categories: structured and unstructured. In the informal interviews, researchers do not structure the questions up front, but they pose open-ended questions, aiming to gain more information from the respondent (Greener, 2008; Uma & Roger, 2009). According to Paul, et al., (2008) the ability of the researcher to benefit from unstructured interviews, depends on the knowledge and expertise to pose the follow-up questions.

Unlike the unstructured interviews, the structured interviews require specific background inquiries as an idea of the needed information that is necessary for the study (Saunders, et al., 2009). In the formal meeting, questions and sequence of questions are designed up front. The interviews can be conducted using diverse types of media; specific items could include face-to-face interviews, telephonic interviews and online interviews. Table 18 indicates the advantages and disadvantages of various kinds of conversations. The first column in Table 18 contains the type of interviews, the second column contains advantages for each type of interview, while the last column contains disadvantages.

Table 18: Advantages and Disadvantages of the interviews (Greg, et al., 2006; Paul, et al., 2008)

Types of interviews	**Advantages**	**Disadvantages**
Unstructured Interviews	• The ability to pose follow-up questions • Ability to provide an explanation to the respondent or to rephrase the question	• Easily affected by language and other cultural constraints • Prone to bias • Costly • The possibility of misinterpreting the participant's point of view during data capturing
Structured Interviews	• All the participants respond to the same questions • The questions are prepared upfront • It allows the researcher to pose the combination of both closed and open-ended questions	• Easily affected by language and other cultural constraints • Prone to bias • Costly • The possibility of misinterpreting the participant's point of view during data capturing

3.7.3 Observations

Observations refer to the method of data collection where the researcher witnesses the behaviour or phenomena within a defined environment (Bryant, 2015). Two specific types of observations are identified, indicating participant and nonparticipant observation (Walliman, 2011). Participant observation refers to the process of interaction directly with the environment to collect data (Bryant, 2015). For example, in understanding the processes involved in building a house, the opportunity may be offered to assist during the building process. In the nonparticipant observation, no direct interaction with the environment is required. The researchers who want to know how the birds built the nest might spend time looking at the birds without providing assistance. Table 19 provides advantages and disadvantages of observational data collection methods.

Table 19: Advantages and disadvantages of observations (Uma & Roger, 2009; Walliman, 2011; Bryant, 2015)

Type of observations	Advantages	Disadvantages
Participant observation	• Ability to capture first information of the events • Ability to learn new things or behaviour that other individuals will not like to reveal • Does not limit the researcher on the exit theories and practice	• The possibility of misinterpreting the field notes • Time-consuming • It might be difficult to generalise the result
Nonparticipant observation	• Limited personal interference of the researcher	• May lack details if the researcher is observing from a distance • Costly

3.7.4 Questionnaires

Questionnaires or surveys are used in qualitative and quantitative research (Walliman, 2011). During the questionnaire data collection, the participants received the prepared list of questions and asked to select their preference (Uma & Roger, 2009). Other research also provides the respondent with the opportunity to write their comments to increase the understanding of the phenomena under investigation. The conventional approaches to conducting questionnaires include personally administrated surveys, postal surveys, and online questionnaires. Table 20 indicates the advantages and disadvantages of each identified method to conduct research.

Table 20: Methods of conducting the survey (Uma & Roger, 2009, pp. 184-201; Walliman, 2011, pp. 97-98)

Method of data collection	Advantages	Disadvantages
Personal	• High response rate • The research can assist the respondent to answer the question	• It can be time-consuming • It is expensive to cover a significant geographic location
Postal	• It is easy to cover a significant geographic location	• Poor response rate • Postal costs are involved • Requires the follow-up strategy
Electronic or internet survey	• Inexpensive • Covers larger geographic locations • Less time-consuming • Easy to make follow-ups	• Poor response rate

3.7.5 Data collection methods comparisons

Table 21 indicates the advantages and disadvantages of various data collection methods. All data collection methods hold advantages and disadvantages. The choice depends on the availability of resources, the timeframe of the study, the level of accuracy and the geographic spread of the research. This study attempts to collect data from the organisations, operating in South Africa and globally. The range of the target population makes it challenging or infeasible to conduct interviews or decide on observation as the choice of data collection. The questionnaires are the feasible option for the current research. The subsequent section details the process employed in planning, developing and monitoring the development of surveys, while reporting on the results.

Table 21: Data collection methods comparisons

Data collection method	Advantage	Disadvantages
Interviews	• Ability to pose follow-up questions • Ability to provide an explanation to the respondent or to rephrase the question • Can be structured or unstructured • It allows the research to use the combination of both closed and open-ended questions	• Easily affected by language and other cultural constraints • Prone to bias • Costly • The possibility of misinterpreting the participant's point of view during data capturing

Data collection method	Advantage	Disadvantages
Observation	• Ability to capture first information of the events • Ability to learn new things or behave that other individuals will not like to reveal • Does not limit the research on the exit theories and practice • Limited personal interference of the research	• The possibility of misinterpreting the field notes • Time-consuming • Must demonstrate a benefit to the study cited • It might be difficult to generalise the result
Questionnaires	• Ability to cover the large population • Respondents answer the question in their own time • Inexpensive and easy to manage • No personal inference of the researcher	• The development and preparation require much more time

3.7.6 Questionnaire process mapping

Figure 23 indicates the design that guided the development of the survey questionnaire for this study. Artino Jr, et al., (2014) and Regmi et al., (2016) observed questionnaires as a frequently used data collection method, collecting information, such as emotions, understandings, and perceptions. Artino Jr et al., (2014) suggest that there is no agreed method to develop the questions. The authors developed the seven-step process that can be used as a guide to creating questionnaires. Likewise, Uma and Roger (2009) developed a frame that comprises four primary procedures, which was modified to meet the needs of the current research.

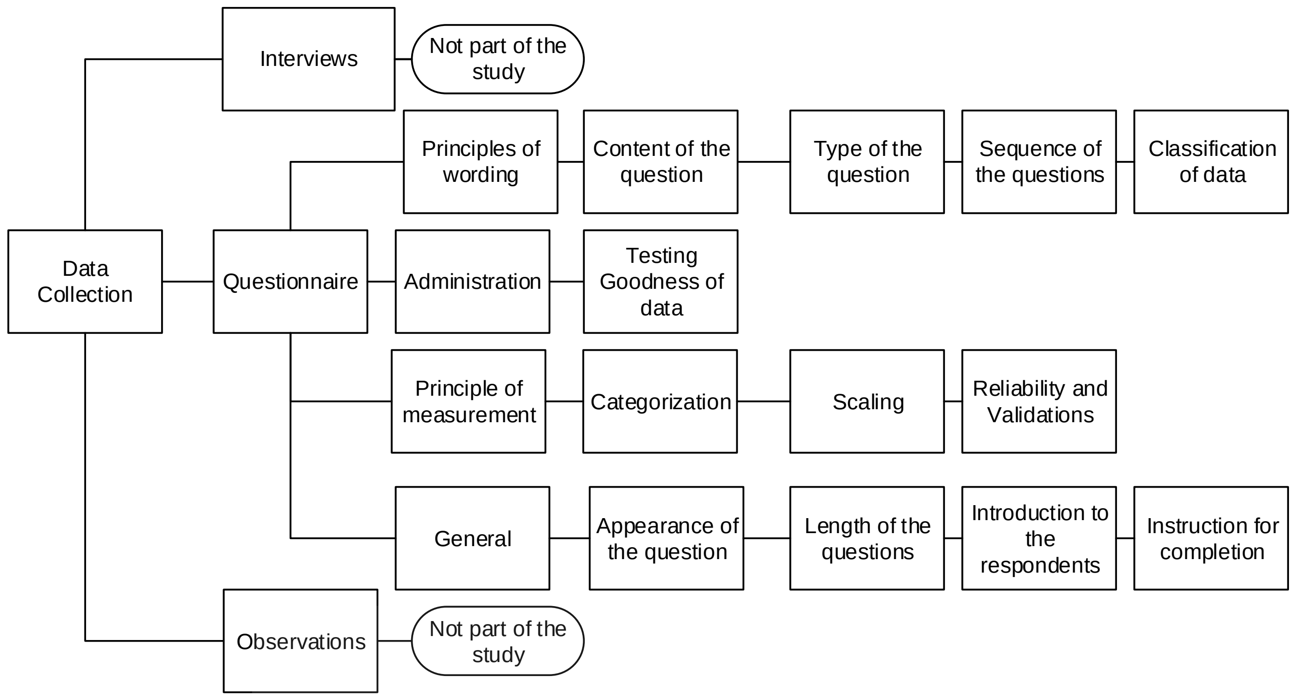

Figure 23: Data collection approaches (Uma & Roger, 2009, p. 199)

Regmi et al., (2016) maintain that the questionnaires should be designed as such that there are no ambiguities in the interpretation. This research adopted the processes presented in (Uma & Roger, 2009; Artino Jr, et al., 2014), to develop the questionnaires. The process involves the following:

- The principles of wording deal with the phrasing of the questions, subject features, the language and classification of the items. The questionnaire design process aims at ensuring the questionnaires use the appropriate wording for the targeted sample. The method further attempts to remove the uncertainty that might derive from inadequate question sequencing and inappropriate item wording.
- Questionnaire administration deals with data collectors, distribution of questionnaires and storage of the information obtained from the respondents. The primary goal of this process is to ensure that data included for analysis, meet the required quality standard. The method also forms part of the study audit trail and the creation of the response database.

- Principles of measurement deal with the scale selections, the measurement of concepts, reliability assessment and validity assessment. The literature provides four types of scales, which include nominal scale, ordinal scale, interval, scale and ratio scale
- Nominal scale refers to the scale that attempts to measure categories or classification, such as social belonging, gender, and racial groups, amongst others (Allen & Seaman, 2007). An ordinal scale attempts to measure the ranking order, such as, in case of the race, there is a first, second and third position (Allen & Seaman, 2007; Uma & Roger, 2009) . The ordinal numbers do not attempt to quantify the distance between position one and two, but they provide the ranking order (Brown, 2011).
- The interval scale ensures that the measurement from point to point are equal; it contains meaningful values (Brown, 2011). The example of interval scales includes centuries and temperature measurement. The other distinguishing criteria are the variables; interval variables are continuous.
- According to Brown (2011), a ratio scale is similar to the interval scale, but in the interval scale, the number zero does not mean absence. In the ratio scale, the number zero means non-existence. The other feature of the ratio scale is the global system of units (SI), such as height (meter), weight (tonnes), and power (watts).
- As the instrument for categorising items and measurements of the variables of interest, the current researchers selected the Likert scale. A Likert scale is an instrument recording the respondents' rating of the items, from 'strongly agree' to 'strongly disagree' (Allen & Seaman, 2007). According to Brown (2011), the Likert scale indicates the interval scale. In contrast, Allen and Seaman (2007) classify the Likert scale as an ordinal scale. Brown (2011) acknowledges other authors' views and provided a detailed explanation of why the Likert scale should be treated as an

interval scale. The current study yielded the opinion adopted by Brown (2011) and addressed the Likert scale as an interval scale. The processes and approaches used to ensure the reliability of the study are detailed in sequence in Section 3.8.

- The last methods on the design, deal with the way the questions appear, the length and it provides general information on the purpose of the study, including instructions on completion of the survey.

3.7.7 Questionnaire arrangement

This section presents the method used for grouping of the research questionnaires. The aim was to improve the data collection process. The surveys comprise three main sections with each part measuring a different concept. The first section (Section A) attempts to collect information about the profile of the individual participating in the study. This section was also aimed at rejecting the individual who does not belong to the target group by including screening questions.

Section B comprises seven questionnaires that attempt to measure the concept of quality management. Studies indicated customer focus, process management, employee focus, leadership, result focus, measurement, and knowledge management as the frequently used concepts to measure quality management maturity (Punnakitikashem, et al., 2010). The current research used the same constructs to measure the concept of quality management.

The data collected from Section B was used to assess the quality management maturity, exploring the correlation between cost of quality categories and quality management factors. The data were also used for benchmarking the quality management practice between the South African manufacturing sector and international manufacturers. Section C measures the concept CoQ and it comprises four questionnaires that attempt to measure the prevention cost, appraisal costs, failure costs and hidden costs.

3.7.6.1 Section A: Demographic information

The section assesses the profile of the respondents which include age group, level of education, and the number of years in the industry, the province where the participant is working and country, current position, and type of industry. The last question was used as a screening question to prevent people who do not form part of the target population from taking the survey.

The section also assesses participation in quality management practice through the involvement in award systems, implementing quality management initiatives and global certification (Patti, et al., 2001; Moschidis, et al., 2016; Garza-Reyes, 2018). Table 22 indicates the variables assessed in this section and the purpose of measuring each variable.

Table 22: Section A - general information

Variables of measurement	Determination
i) Demographic information: The information is critical to understand the audience and the representation of the target population.	• To assess the character of the study participants • To reject people who do not form part of the target population
ii) Quality management participation: The information about the initiatives taken by the organisation to improve quality participate in understanding how the organisation advances its quality management system. To be able to assess the quality management of the company and the CoQ management, it was essential to understand the association between global standard and participation in quality awards systems	• To determine the drive for the company to improve quality management • To determine the level of association with the global standard • To determine the level of participation in quality awards

3.7.6.2 Section B: Quality management

This section assesses the level of quality management practice from the participating organisations. The assessment is based on the seven variables which are: customer focus, process management, employee focus, leadership, business result focus measurement, knowledge management and supplier development. Table 23 shows the quality management variables used for measurement and the reasons for the assessment.

Table 23: Section B- quality management theoretical framework

	Variables of measurement	Determination
i)	**Customer Focus**: A customer is a crucial component of quality management, and organisations exist to serve customers. It is essential to understand how the organisation manages customer needs (Khataie & Bulgak, 2013; Narasimhan, 2013)	• To assess how the organisation collects customer requirements • To evaluate if the organszation used the customer feedback to improve quality • To determine the ability of the organisation to resolve customer complaints.
ii)	**Process Management**: Processes play a vital role in quality improvement, defines how things flow within the organisation and how activities are executed (AlShathry, 2016)	• To assess the ability of the organisation to documents processes • To evaluate the strength of the organisation to create awareness about the business processes • To examine the ability of the organisation to improve the processes
iii)	**Employee Focus**: The ability of the employees to perform to the expectations and to participate in the success and failure of the organisation (Mosadeghrad, 2014)	• To assess the talent of the organisation to return skills • To check if the organisation motivates the employees to express their views • To evaluate if the organisation recognise and award high performance
iv)	**Leadership:** Leaders should strive to inspire and motivate individuals to work towards a mutual goal (Gentry & Sparks, 2012). Leadership and top management support are driving forces behind the successful implementation of any quality initiative.	• To gauge if the leaders motivate and encourage good performance • To assess if the leader set an objective for the employee • To measure the ability of the leaders to sustain the quality management effort • To assess the ability of the leaders to communicate with the vision of the company
v)	**Business result Focus**: The result explains the ability of the business to improve its critical performance indicators and the ability to meet its commitment (Foster, 2013).	• To assess the ability of the company to use the result to improve quality • To determine the strategies to enhance the business result • The use of quality management instruments to improve results
vi)	**Measurement and Knowledge Management:** analysis refers to the process of assessing and documenting past performance against the planned activities. Knowledge management refers to the review and documentation of the processes, business performance and lessons learned (Besterfield, 2003).	• To identify the level of investment in quality education and training • To assess the ability of the organisation to use past information to predict the future
vii)	**Supplier development (SD):** This is a process of building a mutual benefit between the buying company and the supplier (Wagner, 2006). The supplier behaviour has both a negative and positive impact on the business performance	• To assess the ability of the organisation to monitor the supplier performance • To examine the strength of the organisation to uplift the suppliers • To determine the power of the organisation to align the contractor with the business objectives

3.7.6.3 Section C: Cost of quality

This section assesses the level of the CoQ practice from the participating organisations. The assessment is based on the five variables that includes, i) preventive costs, ii) appraisal costs, iii) external failure cost, iv) internal failure cost and v) hidden costs. The literature identified the P-A-F model as the most used CoQ model to assess quality-related costs (Vaxevanidis & Petropoulos, 2008; Trehan, et al., 2015). Other researchers suggest that the P-A-F model does not reflect overhead costs and opportunity costs. To accommodate the inabilities of the P-A-F model, this study modified the model, adding more questions relating to hidden costs. Table 24 shows the CoQ variables of measurement and the reasons for the assessment.

Table 24: Section C: The costs of quality theoretical framework

Variables of measurement	Determination
i) Prevention costs: This refers to costs, ensuring that the quality activities can produce the product which is fit for purpose (Trehan, et al., 2015). It involves training and design of the processes required to support the delivery of the result, product or service which is fit for use.	• To investigate the capacity of the organisation to understand the costs associated with product design • To study if the corporation collect costs associated with selecting the suppliers • To determine the ability of the corporation to consider the CoQ improvement activities
ii) Appraisal costs: this is the costs of monitoring and controlling the quality processes. It includes the audit and other cost design to ensure the product or service to comply with the requirement (Vaxevanidis & Petropoulos, 2008)	• To check the ability of the enterprise to apprehend costs associated with inspections and testing • To determine the ability of the employer to recognisze the value of monitoring and manage quality actions • To check the capacity of the employer to use the field evaluation cost to improve quality
iii) Internal failure costs: this refers to costs incurred as the result of the product, processes, and service failure, while the product or service was still in the hands of the supplier (Kaur, 2009).	• To determine the capability of the company to apprehend the economic influence of internal failure • To evaluate if the company has the system to gather cost associated to rework and scrap • To evaluate if the employer has a system in place to acquire cost related to non-conformance
iv) External failure cost: refer to costs incurred due to the failure that occurred in the hands of the customer. The price may include loss of opportunities, warranty, and legal suit (Aniza, 2014).	• To examine the capacity of the company to understand the value associated with product or service recall • To evaluate the power of the enterprise to recognise the economic impact of warranty claims • To study the capability of the organisation to estimate costs related to losing to possibilities due to product or service failures

Variables of measurement	Determination
v) **Hidden costs:** The fundamental function of CoQ exercise is to expose all the hidden costs and to point the direction towards addressing the non-value-adding expenses (Cermakova & Bris, 2017).	• To examine the capability of the business to discover hidden costs • To evaluate the potential of the firm to recognise costs associated with inventory levels • To evaluate the ability of the employer to verify costs associated with processes delays

3.7.7 Execution of questionnaires

This section provides a detailed step-by-step approach that was followed to collect data from the target audience. This research adopted the chain referral approach to identify participants through industry bodies, companies and people known to the researchers (Marnewick, 2013). The following subsection outlines the processes followed in implementing questionnaires.

3.7.7.1 Contacting potential participant

The researchers in the current inquiry contacted industry bodies, companies, academic and researchers as a primary seed to identify participants. The industry bodies contacted for the support of the study include the South African Institution of Mechanical Engineering (SAIMechE), Engineering Council South Africa (ECSA), Project Management South Africa (PMSA). The process of contacting industry bodies and companies includes visiting the website and obtaining the contact details. The subsequent process includes calling the organisations and sending the e-mail with the survey link for distribution to their network.

To find the contact detail for the researchers and the academics, the research team used two databases which were UJoogle and Emerald Insight. The two databases were identified to have the most publications in the field of quality and CoQ management (Makhanya, et al., 2018a; 2018b). The team used the following search terms “Quality management or Quality improvement” and “Cost of Quality or Poor Cost of Quality or Economic of Quality” and “Engineering or manufacturing” to identify the relevant authors. The researcher selected a period of eleven (11) years 2007- 2018 and the assumption that the academics and researchers publishing within this time frame were still active in the field and will be willing to provide support. The researcher identified and sent the emails to three hundred and seven (307) authors, and other papers did not have the contact details, and the destination servers rejected other emails (180 e-mails rejected). Both the chain referral from the publications and Survey Monkey audience team provided the ability to communicate with the targeted population.

3.7.7.2 Data collection process

The study used the Survey Monkey, the online survey platform to collect data to answer the research questions (Sreejesh, et al., 2014). The process involved an online configuration of the questionnaires, loading the email detail of the target group, arranging data collectors and distribution of the survey link. The internet data collectors were opened for four months (2018 October to January 2019). During this period, no action was required from the researching team, except for distributing reminders to the target group. After a four month period, the online survey was closed. The data collected from the online platform were then transferred to a Microsoft Excel spreadsheet and stored in SPSS for data analysis.

3.8 Data Analysis

The previous section focused on getting the data required to answer the research question and the current section focuses on bringing meaning to the collected data. According to Uma and Roger (2009) data analysis involve data coding, entering the data into databases, editing data, tabulation of information, and interpretation. The literature provides two types of data analysis; these include qualitative and quantitative data analysis (Kothari, 2004).

Qualitative data refer to the information presented in the form of text, pictures, and other similar non-numerical information (Saunders, et al., 2009). Quantitative data referred to the information presented in a numerical format and analysed using statistical methods

(Greener, 2008; Walliman, 2011). According to Kothari (2004), the term analysis refers to the examination of information with the aim of finding patterns and relationships.

Data analysis for the current study can be classified as both qualitative and quantitative data analysis (Walliman, 2011). Qualitative data analysis was applied in systematic literature review papers with the aim of understanding the variables of interest and their relationship with other variables (Makhanya, et al., 2018a; Makhanya, et al., 2018b). The qualitative data analysis acted as the foundation for the current research to identify the variables and building of the vocabulary. The variables identified through qualitative data analysis were further used to collect quantitative data. Empirical quantitative data were collected through online questionnaires and the results were presented in Chapter 4.

The research uses the Likert scale as a tool for soliciting opinions from the participants about the status of their quality management system. A Likert scale is a tool where the respondents are requested to rate the items from strongly agree to strongly disagree. According to Brown (2011), the Likert scales are considered as the interval scale. In contrast, Allen and Seaman (2007) discuss the Likert scale as an ordinal scale. Likewise, Onatere-Ubrurhe (2016) applied the Likert scale as an ordinal scale to benchmark the transport system between the United Kindom and Nigeria.

Brown (2011) acknowledged other authors' views and provided a detailed explanation of why the Likert scale should be treated as an interval scale. The current research takes the stand adopted by Brown (2011) and classify the Likert scale as an interval scale. The Likert scale consists of items, where the participant selects their choices of answers from disagree completely (1), disagree (2), neither agree nor disagree (3), agree (4), agree completely (5). The choice of answers helps the research team to apply descriptive statistics like correlation coefficients, mean and standard deviations. The researchers in the field of engineering management use the correlation coefficient as the method to identify the level of agreements for items on the Likert scale (Marnewick, 2013; Sukdeo, 2016). Likewise, the current research used correlation coefficients to identify items which have a negative correlation and remove them to improve the internal consistency of the Likert scale items. The study used the IBM Statistical Package for Social Sciences (SPSS) version 25, IBM SPSS AMOS version 25 graphics and excel spreadsheet as a tool for statistical data analysis.

3.8.1 Preliminary and missing data analysis

The preliminary data analysis presents the frequencies and percentages of observations without any data treatment, identification of missing data, type of missing data and developing the strategy to deal with missing data (Li, 2013; Roni, 2014). It is sometimes difficult to avoid having missing data on survey research. The missing data on the survey research can be due to some reasons ranging from an unwillingness to provide the view, forgetting to take the question or having no clue on how to respond to the question. Missing values, reduce the sample size and create problems during the statistical analysis (Soley-Bori, 2013).

There are three assumptions about the missing data which also determine the strategy to handle the missing information; these include missing completely at random (MCAR), missing at random (MAR), and not missing at random (NMAR) (Soley-Bori, 2013; Roni, 2014). MCAR assumes that the missing data is not influenced by both observed and unobserved data; which make it easy to test using observed values (Li, 2013). On the other hand, MAR assumes that missing data has everything to do with observed values, but not dependent on unobserved values, which make it difficult to test (*Ibid.).* NMAR assumes that the missingness is related to the missing value itself and other sample variables can provide the predictions for the missing values (Madden, et al., 2017). The study used the Little's MCAR test to assess the nature of the missing data and excluded section A (demographic information) (Roni, 2014). According to Van Ness *et al*., (2007) the Little's MCAR test assumes that missingness is entirely at random. According to Madden et al., (2017) the p-value greater than 0.05 suggests that the data is missing completely at random but if the p-value is less than 0.05 the data are not missing completely at random.

The literature provides four different strategies to deal with the missing values; these include removing cases with missing values, replacing the missing values with the mean, Multiple imputations (MI) and Expected maximisation (EM) (Roni, 2014; Madden, et al., 2017). The first two methods are a more natural way of dealing with the missing data. Both multiple imputations and expected maximisation used simulated data to replace missing data (Madden, et al., 2017) . However, Roni (2014) discourages the removal of missing values and replacements with means because this leads to bias and reduces the statistical power of the data. The authors recommended the imputations and expected maximisation as an alternative depending on the nature of the missing data (Roni, 2014; Madden, et al., 2017). The current research used expected maximisation as a strategy to remove the missing data and maintain the sample size.

3.9 Validity and reliability

Different scholars defined validation as a measure of the truthfulness of the research (Maxwell, 1992; Burke, 1997; Uma & Roger, 2009). Drost (2011) provided five different strategies or methods to improve research validity; which included "statistical conclusion validity, internal validity, construct validity and external validity." According to Saunders et al., (2009) the validation methods cited by Drost are more concerned about the study results. The validation should start from the development of the measuring tool to ensure that it produces the intended result (Uma & Roger, 2009). The literature provided three basic methods for improving the validity of the study which includes Face validity, Content validity and Construct validity (Greener, 2008; Sreejesh, et al., 2014). Face validity assesses the ability of the scale to measure what it claims to be measuring based on the appearance. The content validity is concerned about the representation of the items to measure the concept. Criterion validity is concerned about discriminating individuals based on the set criteria, and this method was not adopted for the current research. The next section provides the details of the validation methods selected for the current research.

3.9.1 Face Validity

The research adopted face validity as the first method of ensuring that the survey questionnaires were measuring the intended concept (Saunders, et al., 2009). The first draft of the survey questionnaires had 85 questions. The draft was distributed to scholars and statisticians at the University of Johannesburg for their review and comment.

3.9.2 Content Validity

Content validity was mainly concerned about how well the selected items measure the concept of interest (Saunders, et al., 2009). The questionnaires were developed from the comprehensive literature review processes to ensure that the scale will include most of the items required to measure the concepts of interest. The face validation process with the support of the study leaders, who are experts in the field of study, also played a critical role in ensuring the content validity of the measuring tool. The research team had regular meetings to discuss the comments from the reviewers in section 3.9.1.

As a result of the face validity and content validity processes, the theoretical or conceptual frameworks were amended. Table 25 shows the amended quality management frame as the result of the face validity and content validity processes. The table consist of three columns: the first column contains quality management, the second column included the reasons for inclusion and the last indicated the include factors and exclude factors. The process retained five factors (customer focus, process management, employee focus, leadership and business result focus). Two variables (measurement knowledge management and supplier development) were not included for further analysis.

Table 25: Amended quality management theoretical framework

Variables of measurement	Determination	Included/ excluded
i) **Customer Focus**: A customer is a crucial component of quality management, and organisations exist to serve customers. It is essential to understand how the organisation manages customer needs (Khataie & Bulgak, 2013; Narasimhan, 2013)	• To assess how the organisation collects customer requirements • To evaluate if the organszation used the customer feedback to improve quality • To determine the ability of the organisation to resolve customer complaints.	Included
ii) **Process Management**: Processes play a vital role in quality improvement, defines how things flow within the organisation and how activities are executed (AlShathry, 2016)	• To assess the ability of the organisation to document processes • To evaluate the strength of the organisation to create awareness about the business processes • To examine the ability of the organisation to improve the processes	Included
iii) **Employee Focus**: The ability of the employees to perform to the expectations and to participate in the success and failure of the organisation (Mosadeghrad, 2014)	• To assess the talent of the organisation to return skills • To check if the organisation motivates the employees to express their views • To evaluate if the organisation recognises and awards high performance	Included
iv) **Leadership:** Leaders should strive to inspire and motivate individuals to work towards a mutual goal (Gentry & Sparks, 2012). Leadership and top management support are driving forces behind the successful implementation of any quality initiative.	• To gauge if the leaders motivate and encourage good performance • To assess if the leader set an objective for the employee • To measure the ability of the leaders to sustain the quality management effort • To assess the ability of the leaders to communicate with the vision of the company	Included
v) **Business result Focus**: The result explains the ability of the business to improve its critical performance indicators and the ability to meet its commitment (Foster, 2013).	• To assess the ability of the company to use the result to improve quality • To determine the strategies to enhance the business result • The use of quality management instruments to improve results	Included
vi) **Measurement and Knowledge Management:** analysis refers to the process of assessing and documenting past performance against the planned activities. Knowledge management refers to the review and documentation of the processes, business performance and lessons learned (Besterfield, 2003).	• To identify the level of investment in quality education and training • To assess the ability of the organisation to use past information to predict the future	Excluded
vii) **Supplier development (SD):** This is a process of building a mutual benefit between the buying company and the supplier	• To assess the ability of the organisation to monitor the supplier performance • To examine the strength of the organisation to uplift the suppliers	Excluded

Variables of measurement	Determination	Included/ excluded
(Wagner, 2006). The supplier behaviour has both a negative and positive impact on the business performance	• To determine the power of the organisation to align the contractor with the business objectives	

Table 26 shows the amended cost of quality framework after face validity and content validity. The face validity and content validity process retained the same structure on the cost of quality conceptual framework but integrated internal and external failure cost to failure cost.

Table 26: Amended costs of quality theoretical framework

Variables of measurement	Determination
i) Prevention Costs: This refers to costs to ensuring that the quality activities can produce the product which is fit for purpose (Trehan, et al., 2015). It involves training and design of the processes required to support the delivery of the result, product or service which is fit for use.	• To investigate the capacity of the organisation to understand the costs associated with product design • To study if the corporation collect costs associated with selecting the suppliers • To determine the ability of the corporation to consider the CoQ improvement activities
ii) Appraisal Costs: this is the cost of monitoring and controlling the quality processes. It includes the audit and other cost design to ensure the product or service to comply with the requirement (Vaxevanidis & Petropoulos, 2008)	• To check the ability of the enterprise to apprehend costs associated with inspections and testing • To determine the ability of the employer to recognise the value of monitoring and manage quality actions • To check the capacity of the employer to use the field evaluation cost to improve quality
iii) Failure Costs: this refers to costs incurred as the result of the product, processes, and service failure, while the product or service was still in the hands of the supplier (Kaur, 2009).	• To determine the capability of the company to apprehend the economic influence of internal failure • To evaluate if the company has the system to gather cost associated to rework and scrap • To evaluate if the employer has a system in place to acquire cost related to non-conformance • To examine the capacity of the company to understand the value associated with product or service recall • To evaluate the power of the enterprise to recognise the economic impact of warranty claims

Variables of measurement	Determination
	• To study the capability of the organisation to estimate costs related to losing to possibilities due to product or service failures
iv) Hidden costs: The fundamental function of CoQ exercise is to expose all the hidden costs and to point the direction towards addressing the non-value-adding expenses (Aniza, 2014).	• To examine the capability of the business to discover hidden costs • To evaluate the potential of the firm to recognise costs associated with inventory levels • To evaluate the ability of the employer to verify costs associated with processes delays

The questionnaires were also updated to align with the amended conceptual frame as shown in appendix A.5. The next section detailed other processes used to ensure the validity of the research.

3.9.3 Factor analysis

3.9.3.1 Exploratory factor analysis

The authors on the current research did not identify the theory detailing the quality management and cost of quality practice in the South African manufacturing industry. Hence, it was important to first explore the construct structure of the concepts of interest based on the responses received from the survey. The literature suggested factor analysis as a useful tool to measure the latent variable (de Winter & Dodou, 2012; Astrakusuma & Saptono, 2014). There are two basic types of factor analysis: those that include confirmatory factor analysis and exploratory factor analysis. The exploratory factor analysis ignores the existing theory on the latent variable and derives the concept structure based on the observations (Watson, 2017). On the other hand, confirmatory factor analysis attempts to confirm the theory by assessing how well the observed variables measure the latent construct (Field, 2009).

Williams et al. (2012) provided five step-by-step processes for performing factor analysis. ,The five steps include assessment of the data suitability for factor analysis; deciding on the extraction method; determining the rotation method and finding the meaning out of the result. The suitability of data for factor analysis refers to the sample adequacy and the number of respondents or cases per item (Williams, et al., 2012; Roni, 2014). The authors recommended the Kaiser-Meyer-Okin (KMO) measure of sampling adequacy and Bartlett’s test of sphericity to judge the suitability of data for factor analysis. The KMO index assesses the probability of data to explain the concept of interest; it is a number from 0 to 1, the number above 0.6 or close to 1 is acceptable for factor analysis (Astrakusuma & Saptono, 2014). The factor analysis also requires Bartlett’s test of sphericity to have p-value <0.05.

Extraction refers to the technique used to reduce the items into factors (Williams, et al., 2012). SPSS has about seven extraction methods with principal component analysis (PCA) and principal axis factoring (PAF) cited as the most used (Williams, et al., 2012; Astrakusuma & Saptono, 2014). The PCA is referred to as the method for factor reduction while PAF was associated with structure detection (Boduszek, n.d.). The current research opted for a PAF method to detect the structure of the two concepts of interest quality management and cost of quality.

The literature provides a range of methods for determining the factor extraction criteria which includes the Kaiser’s criteria (that is the eigenvalue greater than one) and scree plot which were cited as the most popular strategies (Roni, 2014). Hence, the current research used both the eigenvalue greater than one and the scree plot as extraction criteria. The research also followed the strategy suggested in (Field, 2009), to identify the factors which were loading to one item and remove double loading.

The SPSS has about five rotational methods, the choice for each is determined by the underlying assumption about the relationship of the factors (Williams, et al., 2012) The orthogonal Varimax/Quartimax and oblique Oblimin/Promax were mostly used as rotational method (Astrakusuma & Saptono, 2014). Orthogonal varimax produced factors which do not relate to each other while Promax assumes correlation among factors. The current research used Promax, which was assumed to have a more accurate result (Williams, et al., 2012).

3.9.3.2 Confirmatory factor analysis

This research used a structural equation model (SEM) to assess the relationship between the observed variables and latent construct and also to assess the relationship among latent factors. Awang (2012) suggested SEM as a useful tool to perform a confirmatory factor analysis and assessment of construct validity. Figure 24 shows an example of an SEM with its basic features.

The small cycles within $error_n$ represent error associated with each observed variable (Schumacker & Lomax, 2010). The observed variable is presented by the square box while the cycle with F_n represents the latent variables associated with observed variables. The single-headed lines pointing away from the cycle indicated the influence of the latent variable to the observed variables. The three-star represents the level of association between the observed variables and unobserved variables (Schumacker, 2010). Other authors use ʎ to represent factor loading for example (Savalei & Bentler, 2006; Blunch, 2012). The double-headed line represents the correlation between two factors. While R squared represent the percentage explained by the latent factor to each observed variable (Awang, 2012).

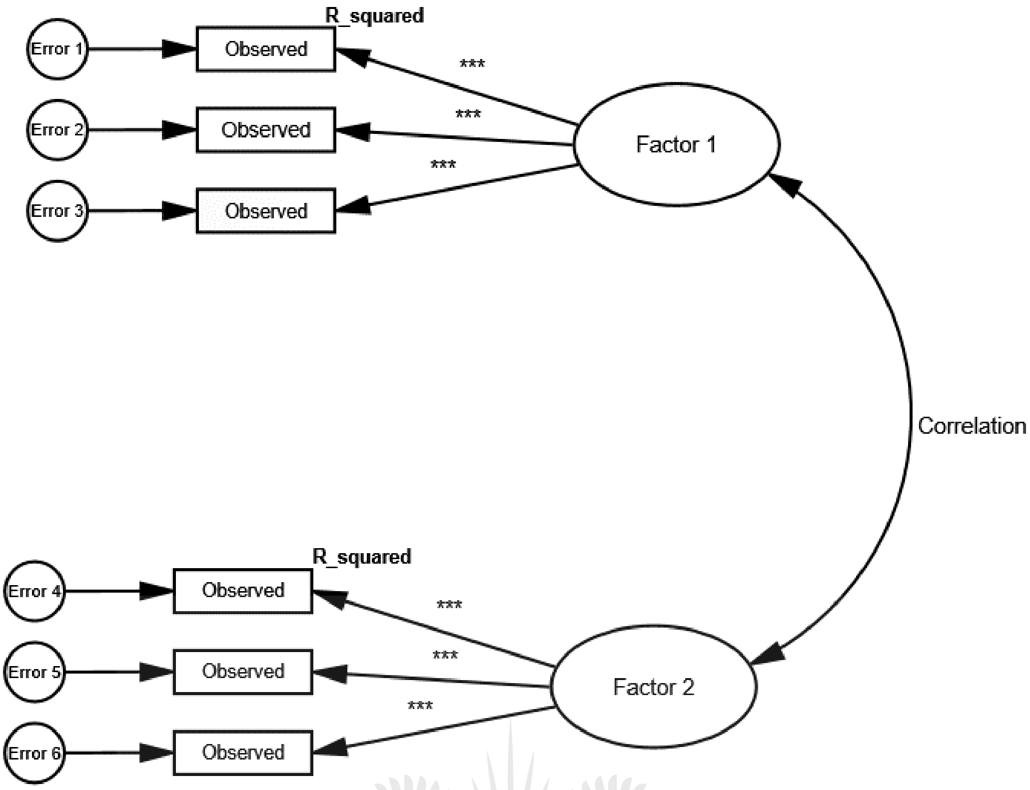

Figure 24: Structural equation model (Schumacker, 2010, p. 78; Blunch, 2012, p. 134)

Schumacker and Lomax (2010).provided the guideline and example on how to perform structural equation modeling in the analysis of a moment structures (AMOS). Likewise, Arbuckle (2010) also provided similar tips on using AMOS to perform confirmatory factor analysis. Blunch (2012) emphasises that the researcher(s) should report on the model fit which should include “fit measures based on the non-central chi-square distribution or absolute fit measurement”. Hooper, et al., (2008) maintained that the chi-square fit model is the most used model but it is sensitive to sample size. The model tests the null hypothesis suggesting that the data fit the model, when the p-value is less 0.05 the assumption is rejected, (Hooper, et al., 2008; Schumacker, 2010). Karakaya-Ozyer and Aksu-Dunya (2018) conducted the literature review study to identify the normal practice in the use of SEM and the scholar identified the following indices in Table 27 as mostly used to assess the model. The first column contains the model fit indices and the second column contains criterias.

Table 27: Model fit indices (2018, p. 284)

Fit indices	Criteria
Chi-square	P-value ≥ 0.05
Degree of freedom (Df)	
Relative chi-square (CMIN/DF)	2 ≤ CMIN/DF≤ 3
Comparative fit index (CFI)	≥ 0.95 excellent and ≥ 0.9 good
Good fit index (GFI)	≥ 0.95 excellent and ≥ 0.9 good
Root mean square error of approximation (RSMSEA)	≤ 0,05 excellent
Standardised root mean square residual (SRMR)	≤ 0.08 good

According to Blunch (2012), most of the model fit indices fall under absolute fit measurement, which is assessment without any reference model. Comparative fit index (CFI) falls under relative fit measures; which judges the fitness of the model based on the ideal model created by the software (Blunch, 2012). The current research used the indices identified in Table 27 to judge the model fit of the SEM.

3.9.4 Construct validity

Construct validity was intended to measure how well the tool or the questionnaire measures the concept of quality management and cost of quality (Saunders, et al., 2009; Uma & Roger, 2009). Uma and Roger (2009) maintain that for the tool to have construct validity, it needs to have both convergent and discriminant validity. Convergent validity is present when two measurements, measuring the same thing are highly correlated and discriminate validity requires the two factors to have low or no association (Brown, 2000). Alarcón, et al., (2015) defined convergent validity as a measure of how well the observed variable measures the latent construct. The author further defined discriminant validity as the measure of correlation among factors or latent construct.

Awang (2012) suggested the use of average variance extracted (AVE) from confirmatory factor analysis result. According to the author, the formula to calculate the AVE is given by:

$$AVE = \frac{\sum \lambda^2}{n} \quad \text{Equation 1}$$

Where λ represent the factor loading for each observed variable and n is a number of item per latent variable. The AVE should be ≥ 0.5 for the latent variable to have convergent validity. According to Roni (2014) for the latent variable to demonstrate discriminant validity, the average extracted variance should be greater than maximum shared squared variance (MSV). The MSV is the square root of the highest correlation coefficient among latent constructs meant to measure different things (Essmui, et al., 2014). The current research adopted the convergent validity and discriminant validity as the measure of construct validity.

3.9.5 Reliability

The term reliability in research refers to the consistency of the instrument to produce a stable and error-free result. It also applies to the quality of the processes and details of the procedures to replicate the study result (Saunders, et al., 2009). This research used Cronbach's Alpha as the measure of internal consistency. Cronbach's Alpha measures how well the Likert scale items complement each other. Uma and Roger (2009) suggested Cronbach's Alpha of 0.6 as the acceptable level of internal consistency. Other authors recommended Cronbach's Alpha of 0.7 and above as the acceptable internal consistency (Saunders, et al., 2009; Walliman, 2011). Hence, the current research opted for the internal consistency of 0.7 and the items which were affecting the reliability of the scale were removed from the scale.

3.10 Correlation analysis

Correlation analysis is mainly about establishing a relationship between two or more quantitative variables (Gogtay & Thatte, 2017). The literature provides a range of methods designed to measure the level of association which normally range from -1 to +1 (Asuero, et al., 2006; Gogtay & Thatte, 2017). The negative correlation means that as one variable increases the other one decreases, while the positive correlation means an increase in independent variable results in an increase in the dependent variable. On the other hand, number zero represents no correlation between the set of data. There are two types of correlation analysis provided in the literature which include parametric (Pearson correlation (r)) and non-parametric (Spearman 's correlation (rho)). Both of the applications have a different application (Gogtay & Thatte, 2017). The parametric assumes a normally distributed data while non-parametric assume the opposite. The research used the Pearson correlation (r) to assess the level of association between the factor which makes up the independent variable (quality management) and dependent variables (cost of quality).

Bewick and Cheek (2003) introduced the concept of the p-value in the discussions and the scholar maintains that the p-value attempts to test the hypothesis which suggests that there is no relationship between values being assessed. A p-value of less than 0.05 suggests that there is a significant statistical relationship between the variables. The p-value > 0.05 indicate insignificant to no relationship between the variables. When dealing with the sensitive issues which require the highest level of assurance, the p-value should be adjusted to 0,01 or lower (Zheng, et al., 2017). The current research used the p-value < 0.05 which is the mostly used p-value in social science to test the statistical significance of the relationship between quality management variables and cost of quality categories (Wan, 2013; Gogtay & Thatte, 2017).

3.11 Multiple linear regression

Linear regression takes the concept of correlation analysis a step further to include the variance of outcome variable explained by the independent variable(s), it is also used to predict the dependent variable based on the predictor's behavior (Uyanık & Güler, 2013). The linear regression analysis can be used to predict one outcome variable based on a single independent variable which is called a simple regression analysis. The model for simple regression analysis is presented as (Wan, 2013):

$$Y = \beta_1 + \beta_2 X + \varepsilon \quad \text{(Equation 2)}$$

Where Y represents the outcome variable, and X represents the independent variable; β_1 represent the interception point of X and Y. β_2 was the coefficient or the slop which means when X increase by one unit Y will increase byβ_2. The symbol ε represents the random error in the model (Eregno, 2013).

When the outcome variable is based on more than one predictors, the model is called a multiple linear regression model (Brown, 2009). According to Amral et al., (2007) the multiple linear regression model can be constructed and used as follows:

$$Y = \beta_1 + \beta_1 X_1 + \beta_2 X_2 .. + \beta_n X_n + \varepsilon \quad \text{(Equation 3)}$$

Where Y is a dependent variable, X_n represent predictor variables, β_i represents the slope of the independent variables while symbol ε represents the random error. This research used the multiple linear regression analysis to identify the level of linear relationship between quality management variables (predictor) to each cost of quality category. The multiple linear regression from SPSS was also used to identify the percentage of variance for each cost of quality categories explained by the quality management model (Tranmer & Elliot, 2008; Lee, et al., 2013).

Like most of the statistical tools, multiple linear regression analysis operates under certain assumptions. Some of the assumptions include that the outcome variable should be in the form of an interval or ratio scale, that the variables need to have a linear relationship, normally distributed with no extreme outliers (Chan, 2004). Pallant (2007) also suggested that multiple linear regression analysis is also sensitive to the sample size. According to the author, the sample size should be N> 50 + 8m, where N is a sample size and m is a number of independent variables. The study used the formula to check the adequacy of the sample size for multiple linear regression analysis.

Chan (2004) and Roni (2014) detailed the step by step processes of checking the multiple linear regression assumptions in SPSS and model construction. The current research used the step by step process suggested in (Pallant, 2007, pp. 155-165), to perform and analyse the multiple linear regression analysis in SPSS.

The first step involves the assessment of the assumptions. The assumptions include checking the multicollinearity which is the level of correlation among the variables in the model (Roni, 2014). According to Pallant (2007) the independent variable should not be correlated above 0.70. Any correlation above 0.70 indicate multicollinerity. Roni (2014) suggested collinearity statistics from SPSS output as the other measure of multicollinearity. The collinearity statistics contains tolerance and variance inflation factors (VIF). The tolerance should be greater than 0.1 and VIF should be less than 10. The tolerance of less than 0.10 and VIF of greater than 10 indicates multicollinearity. The first step also includes the identification of the outliers and their influence in the data set. The current research used the Mahalanobis distance and the Cook's distances to identify the outliers and their associated influence in the data set. The Mahalanobis distance was used in conjunction with the critical chi-square values of p-value of 0.001 to identify the outliers (Pallant, 2007, p. 157)). Any Mahalanobis distance value above the critical chi-square values shows the existence of the outliers. These values were identified and removed from the data set. Pallant (2007, p. 158) further suggests that the data set with the Cook's distances greater than one should be identified and removed from the data set.

The second step is the evaluation of model result which include three main outputs from SPSS. The first output is the model summary table which contains R (the correlation between dependent variable and independent variables), R square (the amount of the dependent variable explained by independent variables) and adjusted R square (the optimal value of R square). The second output is the analysis of variance (ANOVA) which provide the overall model fit using the F distribution. The F distribution, test the null hypothesis suggesting that the R square of the model is equal to zero (Field, 2009, pp. 353-357). The p-value less than 0.05 reject the hypothesis and the alternative hypothesis suggesting that the R square of the model is not equal to zero is adopted. This output was important in this research to identify the ability of the quality management factors to predict the cost of quality categories.

The third output is the coefficients of the model; this output provides the level of contribution for each independent variable in the model. This output is used in the current research to identify the quality management factors which are highly associated with each of the cost of quality categories.

3.12 Quality management maturity assessment

The survey used the Likert scale items to evaluate the concept of quality management and cost of quality. Quality management had 24 items and the cost of quality had 20 items from the literature reviewed. The Likert scale ranging from strongly disagree (1) to strongly agree (5) or not at all familiar (1) to extremely familiar (5) with the statement were adopted to assess the practice in the participants' organisation (Andriani, et al., 2018). The research team used exploratory and conformity factor analysis to refine the factors quality management and cost of quality. The means scores of the constituents were utilised as an indication of quality management practice. Table 28 shows the criteria adopted in the current research to assess quality management maturity.

Table 28: Criteria for evaluating quality management maturity (Xiao, et al., 2012, p. 419)

Maturity grade	Maturity level	Mean scores
5	World Class	(4.5;5.0)
4	Continual improvement approach	(3.5;4.4)
3	Stable Approach	(2.5;3.4)
2	Reactive Approach	(1.5; 2.4)
1	Informal Approach	< 1.5

3.13 Benchmarking quality management

To compare quality management practice between the South African manufacturing companies and other manufacturers in the global market the study had two surveys which were running concurrently. The results were compared using a statistical tool called relative importance index (RII). The relative importance index is the weighted average which is normally used for ranging the item which is perceived as important by the participant (Choudhry, et al., 2014).

The RII is used in the literature for a different purpose for example (Somiah, et al., 2015) used the RII to ascertain reasons prompting illegal siting of residential buildings in Ghana. Gupta, et al. (2018) used RII to identify risk associated with investment in non-listed estate funds in India. In (Raja, et al., 2018) RII has used a method to prioritise the construction activities for sustainable design. Onatere-Ubrurhe (2016) used the RII for benchmarking the transport system between Nigeria and the UK. Due to the flexibility of RII, it was adopted in the current research to benchmark quality management practice between the South African manufacturing industry and the international market. The formula below was used to calculate the RII as suggested in (Choudhry, et al., 2014; Onatere-Ubrurhe , 2016).

$$\text{RII} = \left(\frac{\sum F}{5\ N}\right) * 100\% = \left(\frac{1n_1+2n_2+3n_3+4n_4+5n_5}{5N}\right) * 100\% \text{ (Equation 4)}$$

Where F is the weighted score given to each item by the respondents on the Likert items ranging from 1 to 5. The small n_1 represents the number of respondents who strongly disagree with the statement or who strongly believed that the statement was not applicable to them. The second n_2 is the total number of respondent who disagree with the statement, n_3 to a total number of the respondents who are unsure, n_4 agree or confirmed the application in their environment. The fifth n_5 represents the number of respondents who fully support the statement, 5 represent the highest rating in the five-point Likert scale items and N is the total number of respondents.

3.14 Chapter Summary

This chapter detailed the step by step process adopted to select the sample frame, the data collection method, and data analysis. The section further outlines the philosophical stance of the research, the research design, and the research strategy.

The study collected data from the broader community and survey research was identified as a more efficient research strategy to achieve the objective of the study. This chapter detailed the survey development process and questionnaire design as an instrument for data collection. The next chapter presents the study result and statistical tests adopted in the current research.

4. CHAPTER 4: ANALYSIS AND PRESENTATION OF RESULT

4.1 Introduction

The study investigated the quality management practice and the cost of quality in the South African manufacturing industry. The literature maintains that in today's business environment, companies are forced to provide high-quality product and service with limited resources. Cost of quality has become the heart of achieving business excellence and the method of identifying hidden cost to unlock business potential. Despite the benefits associated with quality management and the cost of quality, very little was identified about the relationship between the two concepts in the South African manufacturing industry. The research team also did not identify the study which attempted to assess the quality management maturity of the industry. Hence, the research had the following five main objectives:

a) To derive from the literature the concepts of cost of quality and quality management

b) To explore the relationship between quality management elements and the cost of quality categories in the South African manufacturing sector

c) To explore the ability of the quality management factors to predict the cost of quality categories in the statistical model in the South African manufacturing sector

d) To identify the quality management factors which are highly associated with the cost of quality categories in the statistical model in the South African manufacturing sector

e) To identify the level of quality management maturity in the South African manufacturing industry

f) To benchmark quality management practice between the South African manufacturing industry and international manufacturing companies

As part of the process to achieve the study objectives; the study investigated the different types of research methods and compared the advantages and disadvantages. The survey research method was selected as the method of inquiry due to its ability to reach the bigger community at a low cost, and its flexibility. The research team had the challenge to identify the sample frame for the current research, as a result the snowball sampling was selected to identify the target sample members. Data were collected using the online platform called Survey Monkey. The survey link was distributed to the industry bodies, manufacturing companies, and scholars; they were requested to participate and share the link with their network. The survey was opened for four months (October 2018 to January 2019) and collected a total of 119 responses in South Africa and 19 responses from the international community. The next sections provided the stages and processes followed for data analysis.

4.2 Stages of data analysis

Figure 25 illustrates the process followed in the current research to present the observations, analysis, and modelling of the data.

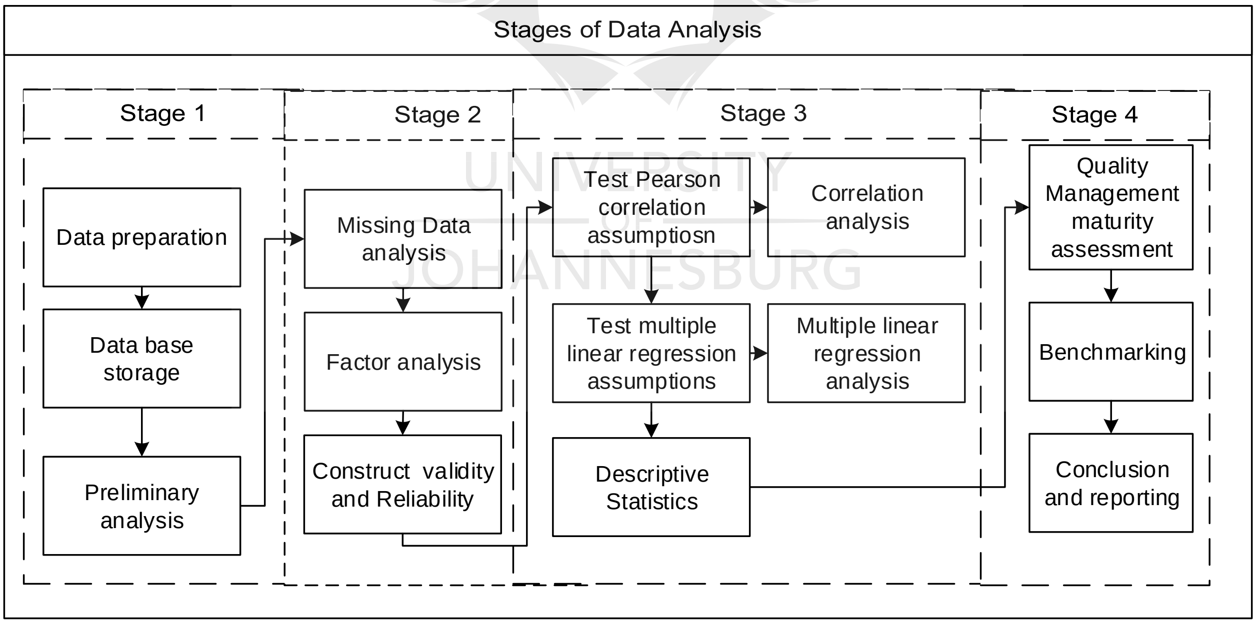

Figure 25: Data analysis stages

Stage one involves capturing the data in SPSS and excel spreadsheet, data coding and preliminary analysis. Stage two involves checking the data quality and assessment of validity and reliability. Stage three assesses the relationship between quality management factors and cost of quality categories. Stage four involves the assessment of quality management maturity of the South African manufacturing sector and benchmarking quality practice between South African companies and international companies.

Preliminary data analysis involves the process of presenting the observations from the responses in frequency and percentages. The preliminary data analysis results were presented in section 4.3. After presenting the observations, the next process was to inspect the data for the missing values; identify how the data were missing and develop the strategy to deal with the missing data. Section 4.4 presents the missing data analysis results and the strategies adopted to deal with missing data.

The factor analysis was used to refine the items used to measure the concept of quality management and cost of quality. The results from factor analysis were used to establish reliability and validity of the study and eliminate the items which were not correlated with their respective factors. The factor analysis, reliability and validity result were presented in section 4.5. The reliability and validity analysis followed by the correlation analysis and the result were presented in section 4.6. The study used multiple linear regression analysis to assess the ability of quality management factors to predict the cost of quality categories and identify the quality management factors which were highly correlated with cost of quality categories in the models. The results of the multiple linear regression model were presented in section 4.7. Section 4.8 presented the results of quality management maturity assessment and ranking the factors according to their maturity levels from highest to lowest. The benchmarking result was presented in section 4.9 and the last section 4.10 presented the chapter summary.

4.3 Preliminary data analysis

The section presents the research observations, and the first part 4.3.1 presents the frequencies and the percentage of the demographic information. Section 4.3.2 presents the adoption of quality improvement, certification and participation in the award programmes. Section 4.3.3 to section 4.3.14 represent the frequency and percentages of observations related to quality management questions and the cost of quality related observations start from 4.3.15 to 4.3.22.

4.3.1 Demographic information from South Africa

Table 29 provides the sample characteristic which includes age groups, qualifications, years of experience, current positions and the province where the respondents work in frequencies and percentages.

Table 29: Demographic information

Items	Frequency	Percent	Cumulative Percent
How would you describe your current age group?			
Less 20 years old	0	0%	0%
20-25 years old	1	1%	1%
26-30 years old	14	11%	12%
31-35years old	25	21%	33%
36-40 years old	20	17%	50%
41-45 years old	17	14%	64%
46-50 years old	14	11%	75%
More than 50 years old	28	25%	100%
Total	**119**	**100%**	
What is your highest qualification?			
Less than Grade 12	2	2%	2%
Grade 12 (Matric, STD 10)	7	6%	8%
Post Matric Diploma or Certificate	28	24%	32%
Baccalaureate Degree(s)	37	31%	62%
Postgraduate Degree (s)	42	35%	97%
Other	3	3%	100%
Total	**119**	**100%**	
How long have you been in the industry?			
Less than One year	1	1%	1%
1-5 years	11	9%	10%
6-10 years	38	32%	42%
11-15 years	28	24%	66%

Items	Frequency	Percent	Cumulative Percent
16-20 years	9	8%	73%
More than 20 years	32	27%	100%
Total	**119**	**100%**	
Which of the following best describes your current job level?			
Owner/Executive/C-Level	15	13%	13%
Senior Management	21	18%	30%
Middle Management	44	37%	67%
Intermediate	28	24%	91%
Entry Level	10	8%	99%
Other (please specify)	1	1%	100%
Total	**119**	**100%**	
In what province do you work?			
Northern Cape	0	0%	0%
Eastern Cape	7	6%	6%
Free State	2	2%	8%
Western Cape	4	3%	11%
Limpopo	1	1%	12%
North West	1	1%	13%
KwaZulu-Natal	9	8%	20%
Mpumalanga	5	4%	24%
Gauteng	90	76%	100%
Total	**119**	**100%**	

The respondents were asked to select their age group from the predetermined set of answers with the aim of determining the sample features. The majority (24%) of the respondents were older than 50 years old. The second largest group (21%) was between the ages of 31-35 years old. The respondents who were younger than 25 years old formed 1 % of the total respondents. The age distribution result shows that the participants were mature enough to partake in the research.

The majority (35%) of the respondents had a postgraduate degree followed by 31% with a baccalaureate degree. The respondents who had qualifications less than grade 12 formed the smallest group of 2%. The result indicated that the respondents had a sufficient level of education to interpret and understand the questionnaire.

The employment status of the respondents shows that the majority (37%) were middle management and intermediate managers (24%). The study also received support from both senior managers (18%) and owner/executives (13%) which indicate the importance of quality in the industry. Also, the majority of the respondents in the current research were people who are both involved in operations and setting up the strategies of the organisations.

The respondents came from almost all the provinces in South Africa with Gauteng topping the list by 76% of total responses, Kwazulu Natal had a total of 8%, followed by Eastern Cape by 6%, with other provinces contributing 4% and below. Based on the result, the data collection method was able to collect the views of the industry across the country.

4.3.2 In your opinion, which of the following applies to your company? The organisation…..

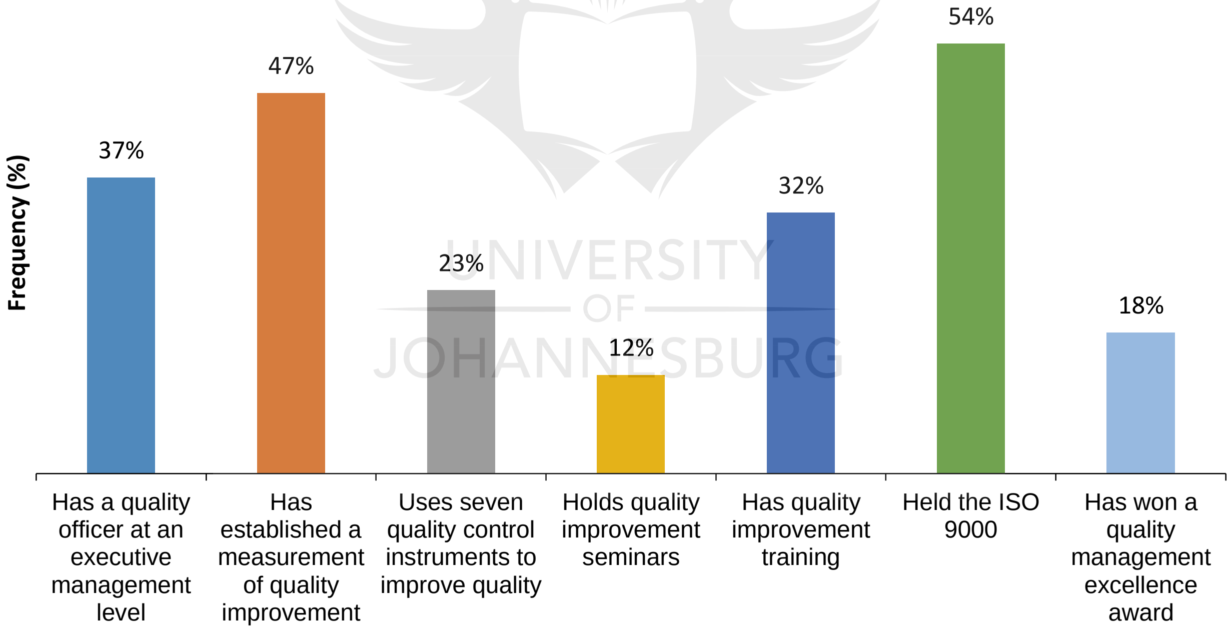

Figure 26: Adoption of quality programmes

The question identified the initiatives and participation of the industry in advancing quality management. The respondents were provided with the list of the seven choices, and they were requested to select as many of the choices as applicable to their organisations. The majority (54%) of the respondents indicated that their organisation has an ISO certificate.

The result confirmed the upward trend in the number of companies who hold the ISO certificates in South Africa (Commitee, 2018). The respondents (47%) indicated that the South African manufacturing industry had established the key performance indicators to gauge quality improvement. Others (37%) indicated that quality was represented at an executive management level, which indicated that the industry understands the importance of quality management (Foster, 2013). As indicated by 32% of the respondents the industry invested in quality management training and skills development.

The information sharing sections and conferences remain the major area which needs to improve since only 12% of the respondents indicated they had quality management seminars. Sukdeo (2016)found that South African companies do not take part in reward programmes. The finding of this research confirms the claim since only 18% of the respondents indicated had won the quality management award.

4.3.3 In this section, we require your opinion of process management within your organisation. Kindly select your level of agreement or disagreement with the statements in the table below:

In this section, the respondents had to express their views from strongly disagree (1), disagree (2), neutral (3) agree (4) and strongly agree (5). The descriptive result of the observations was presented in Figure 27. The strongly disagree and disagree were combined because they express the same idea in different levels, similar to agree and strongly agree. The majority (59%) of the participants indicated that the workflows were visible in the workplaces. 22% of the respondents maintain that the workflows were not visible. The invisibility of the workflows makes it challenging to identify the bottlenecks and waste within the system (Yimer, 2013; Shaikh & Kazi, 2015). Other people (19%) decided to reserve their comments or did not have a full understanding of the questions and selected neutral on this question.

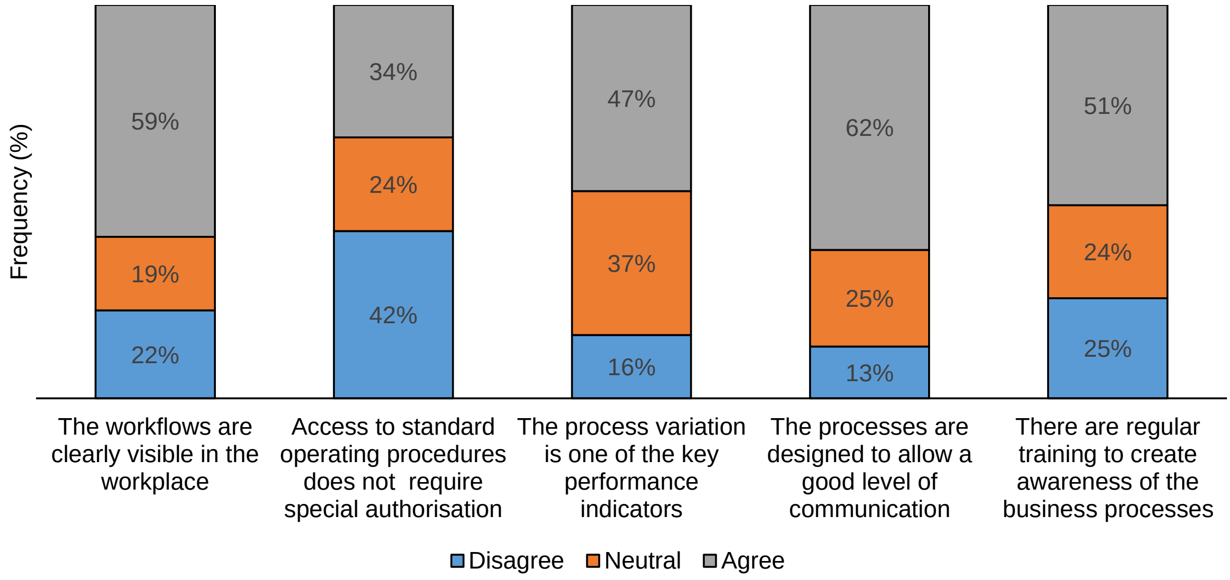

Figure 27: Opinion on process management

4.3.4 In this section, we require your opinion on customer focus within your organisation. Kindly select your level of agreement or disagreement with the statements in the table below:

Masejane (2012) suggested that the organisation should strive to understand customer needs and use multimedia to collect customer requirements.

The majority (46%) of the respondents maintain that their organisations used market research to collect the customer requirement. Others (38%) reserve their comment, while 16% are suggesting that they do not use the market research to solicit the customer requirement. The majority (60%) maintains that their processes allow customer involvement during product or service design. The involvement of customers during product or service design plays a critical role in achieving business excellence.

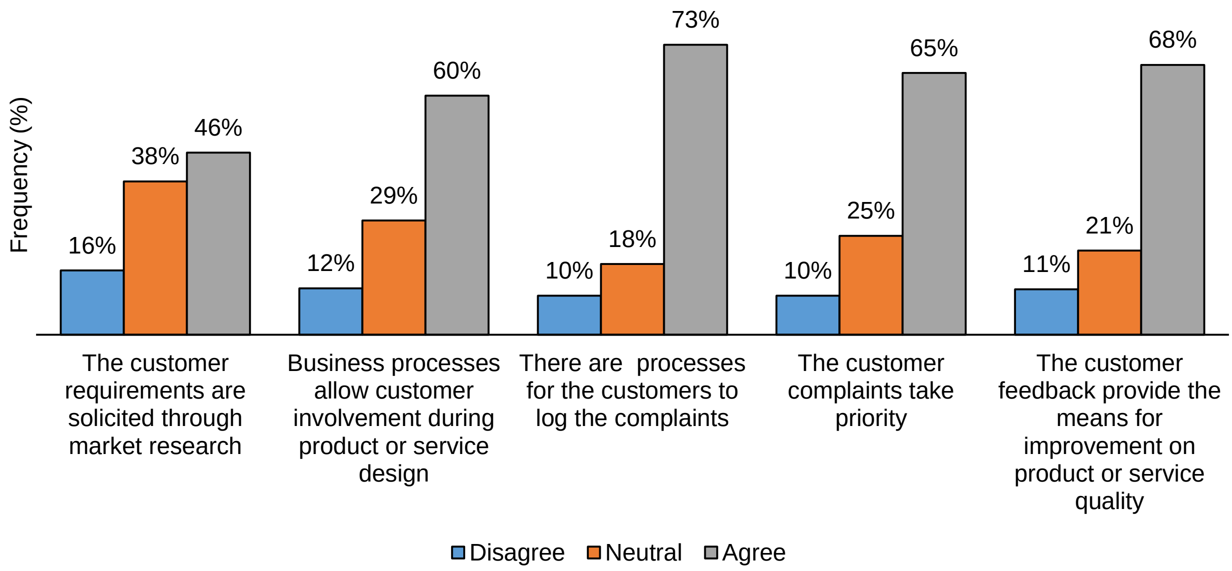

Figure 28: Opinions on customer focus

The business should also design the process and procedure for the customers to log their grievances and the processes should be designed in such a way that the customers take priority (Foster, 2013). Hence, 73% of the participants suggested that they have the processes in place to manage customer complaints, and 65% suggesting that customer complaints take priority. The result also indicates that the manufacturing industry in South Africa honour the customers.

4.3.5 In my organisation, employees prefer to remain with the organisation rather than work elsewhere.

Employees are the most critical assets in the organisation, they need to be trained, and the organisation should create strategies to retain the skills (Tummala & Tang, 1996). Figure 29 shows that the majority 43% (29% agree and 14 % strongly agree) suggested that employees within the organisations prefer to remain with the companies. Another 33% decided to reserve their comments, or they were not sure on how to respond to the question. According to Saunders, et al., (2009) other people do not like to reveal information which could be seen as bad mouthing the company or projecting a negative picture of their organisations. Out of the total respondents, 24% (10 strongly disagree, and 14 % disagree) suggested that people do not prefer to remain with the organisation.

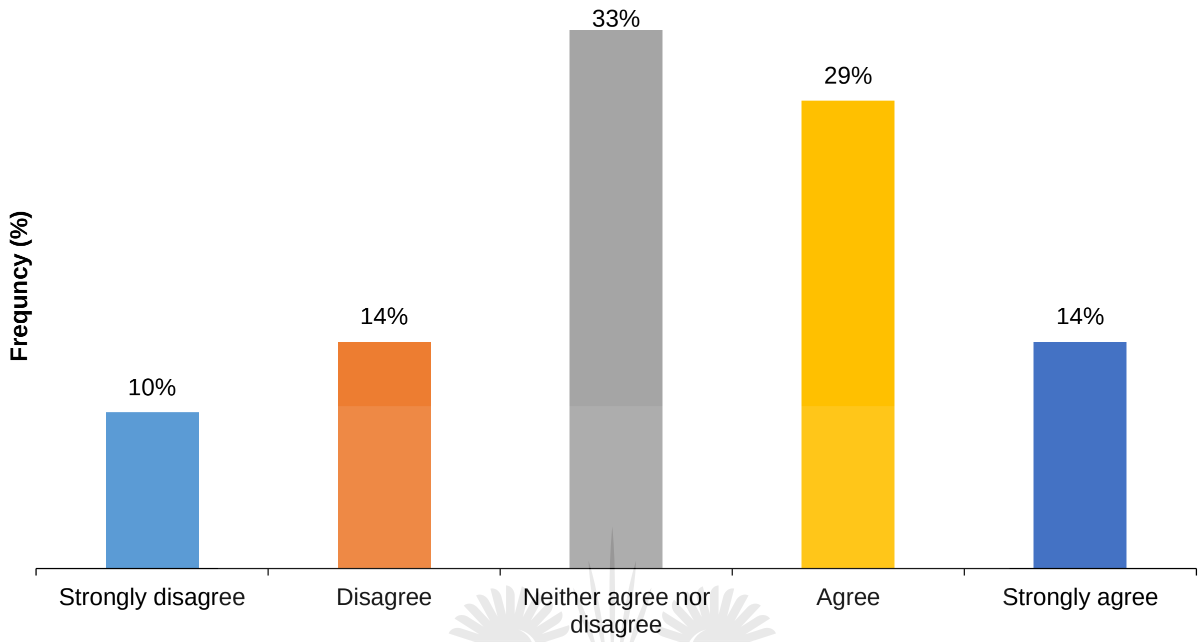

Figure 29: Employees prefer to remain with the organisation

4.3.6 The organisation, I am working for creates an environment that encourages employees to perform to the best of their abilities

Deming appealed to the organisations to remove barriers, drive out fear and allow the employee to appreciate the value of their work (Metri, 2006). Joseph Juran also shares the same sentiments and suggested employees should be recognised and trained (Juran, 2005). Figure 30 shows that the majority of the respondents, 55% (44% agree and 11% strongly agree) believed that the companies create an environment which promote high performance. Only 20% (8% strongly disagree, and 12% disagree) believed that their companies were not creating the environment which promotes high performance, others 25% decided to be neutral. The result indicates that the manufacturing industry in South Africa invests in the wellbeing of the employees.

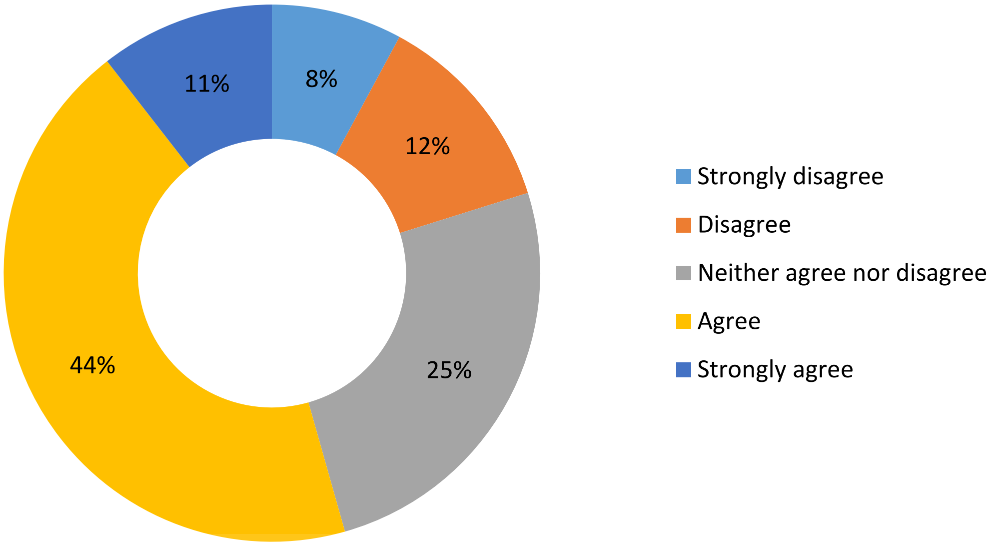

Figure 30: Employee motivation

4.3.7 Please select the level of familiarity with your reward and recognition system

According to Matlhape and Lessing (2002), companies should create the reward and recognition system which motivate the employee to perform to the best of their abilities.

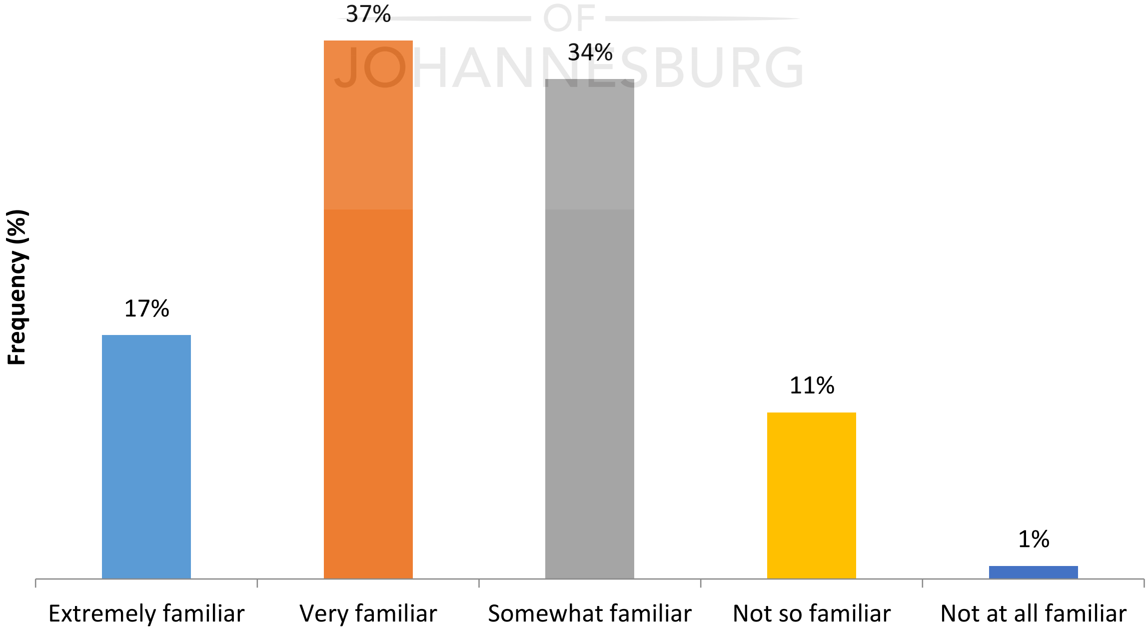

Figure 31: Awareness of reward and recognition system

The majority 54% (extremely 17% and very 37% familiar) indicated the highest level of familiarity with their reward and recognition system. Among the respondents, 34% indicated the moderate level of familiarity, while 11% were not so familiar with their reward and recognition system. The smallest percentage 1% indicated that they were not at all familiar with their reward and recognition system. The result indicated that industry rewards and recognises the employees.

4.3.8 In my organisation, individuals do not hide their mistakes in fear of losing their jobs?

Deming in his 14 points of quality management maintains that the organisations should drive out fear, and people should not be scared to report the mistakes (Metri, 2006).

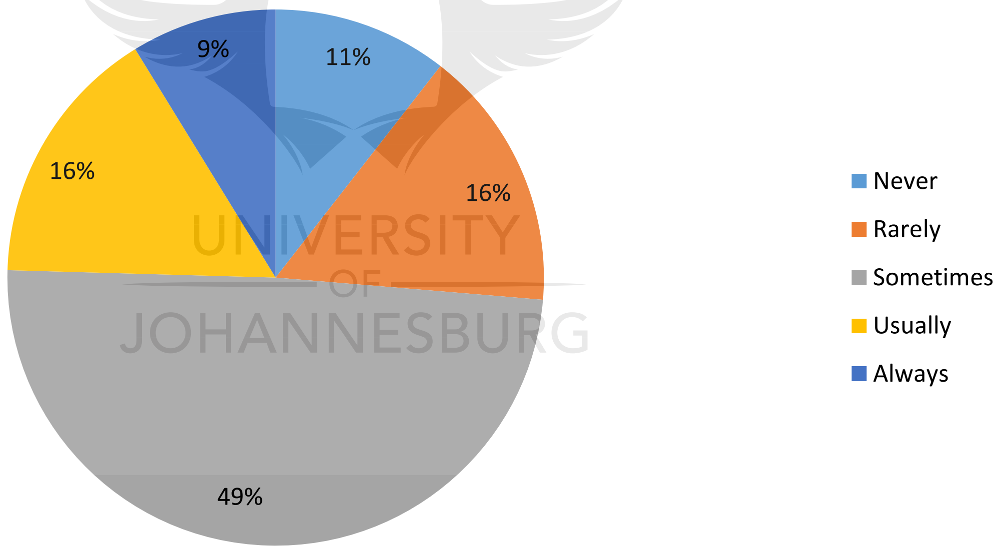

Figure 32: Reporting of an individual's mistakes

In the study, the majority (49%) of the respondents feel that people sometimes hide their mistakes in fear of losing their job. While 27% (11% never and 16% rarely) feel that people were not comfortable with disclosing their mistakes. The other group 28% (16% usually and 9% always) believed that the people do not hide the mistake in fear of losing their jobs.

4.3.9 Management within my organisation recognises good job performance.

Sower *et al*., (2007) identified management as the critical component in planning, organisation and motivation of employees. In the agreement, the majority (39%) of the respondents indicated that management in their organisations recognises good performance. The views were also expressed by 11% strongly agreeing with the statement. The total of 23% (8% strongly disagree, and 15% disagree) and people did not believe that their management recognises good performance. Another 28% did not agree or disagree with the statement, which also shows a mixed view about the ability of the manager to recognise good performance.

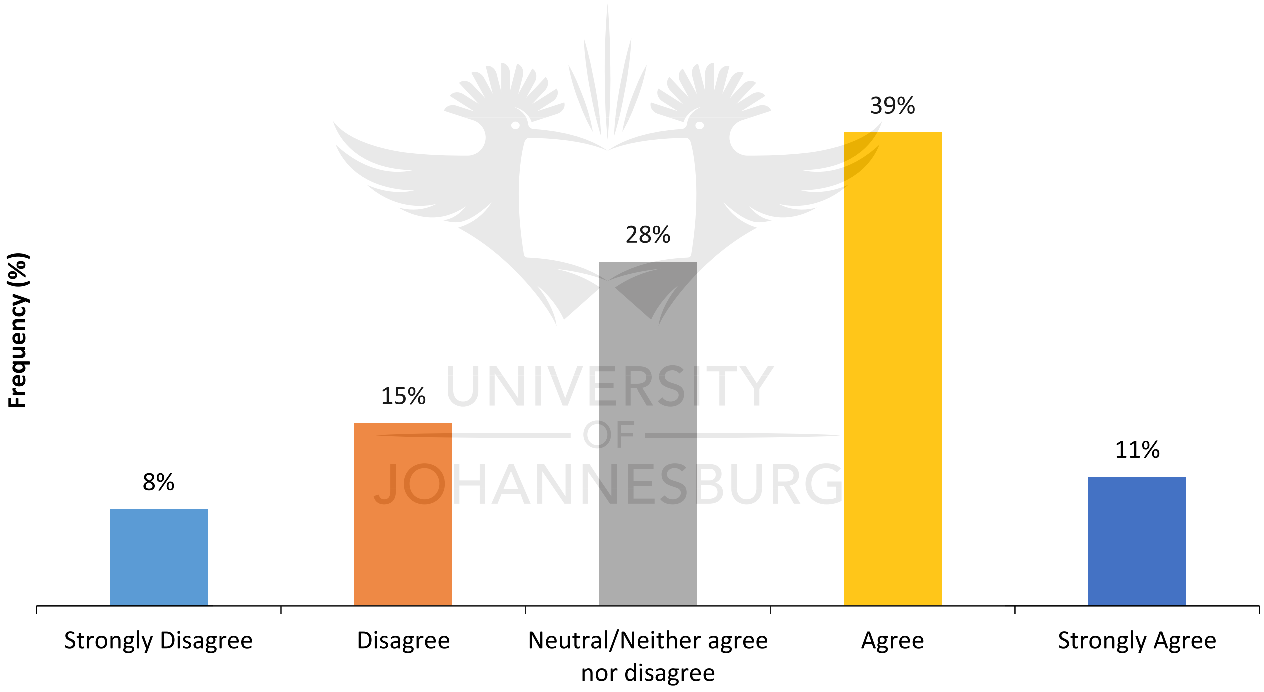

Figure 33: Performance recognition

4.3.10 In this section, we are looking for your opinion on the business result focus. Please select your level of agreement or disagreement with the statements in the table below:

The organisation should establish the key performance indicators, develop the processes to get the real-time business performance and create knowledge to boost the result (Shaikh & Kazi, 2015).

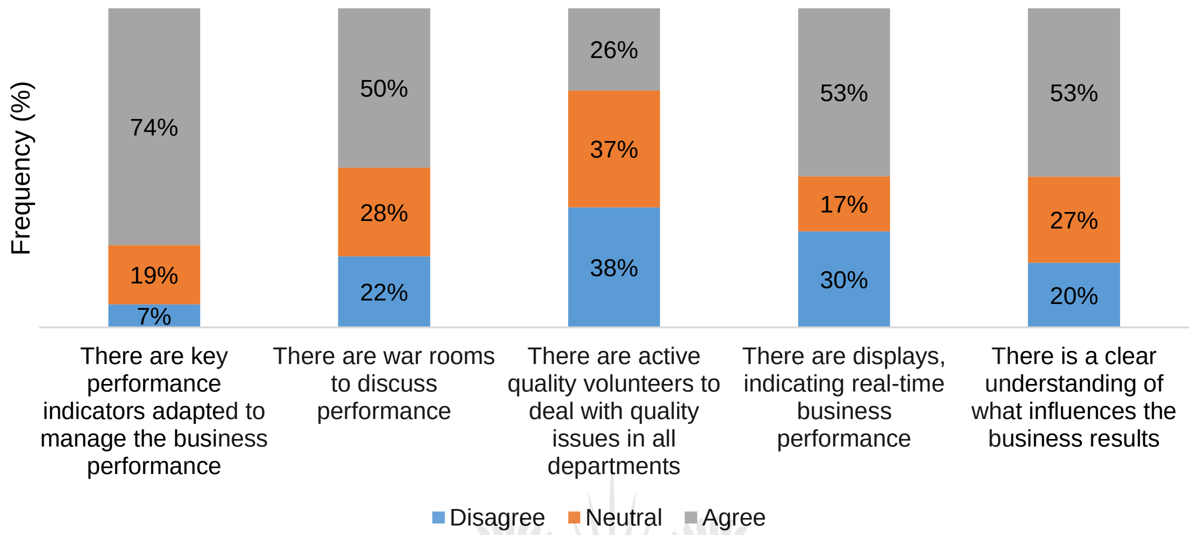

Figure 34: Opinion on business result focus

Figure 34 shows that the majority (74%) of the respondents believed that the companies had developed critical performance indicators. The other majority of 50% indicated they have war rooms to discuss business performance. However, the respondents (38%) indicated that there were no active quality volunteers to deal with quality issues. The majority (53%) indicated that they had real-time displays of the business result. The majority (53%) indicated there was a clear understanding of what influences the business result. However, 20% indicated that they do not know what influences business performance.

4.3.11 Senior management and employees trust each other

According to Egberonbe et al., (2017) leaders and senior managers should create a trust between them and their followers. The presence of trust within the organisation creates a sense of dependability.

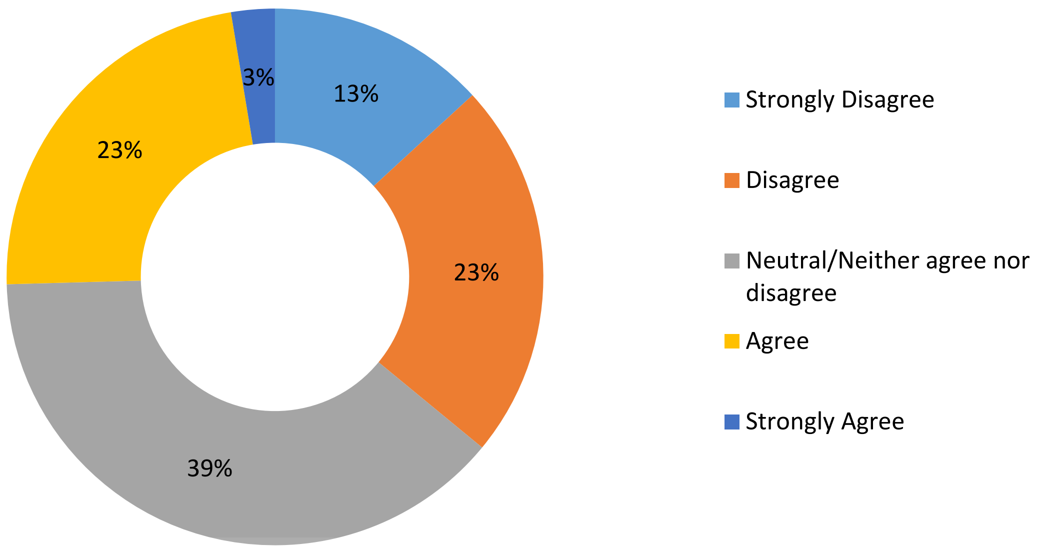

Figure 35: Senior management and employees trust each other

Figure 35 shows that the majority 36% (13% strongly disagree and 23% disagree) do not believe that senior management and employees trust each other. Only 26 % (23% agreed, and 3% strongly agreed) with the statement, which makes the trust between employees and managers an area which needs improvement.

4.3.12 Leadership motivates employees to improve the quality of products or services

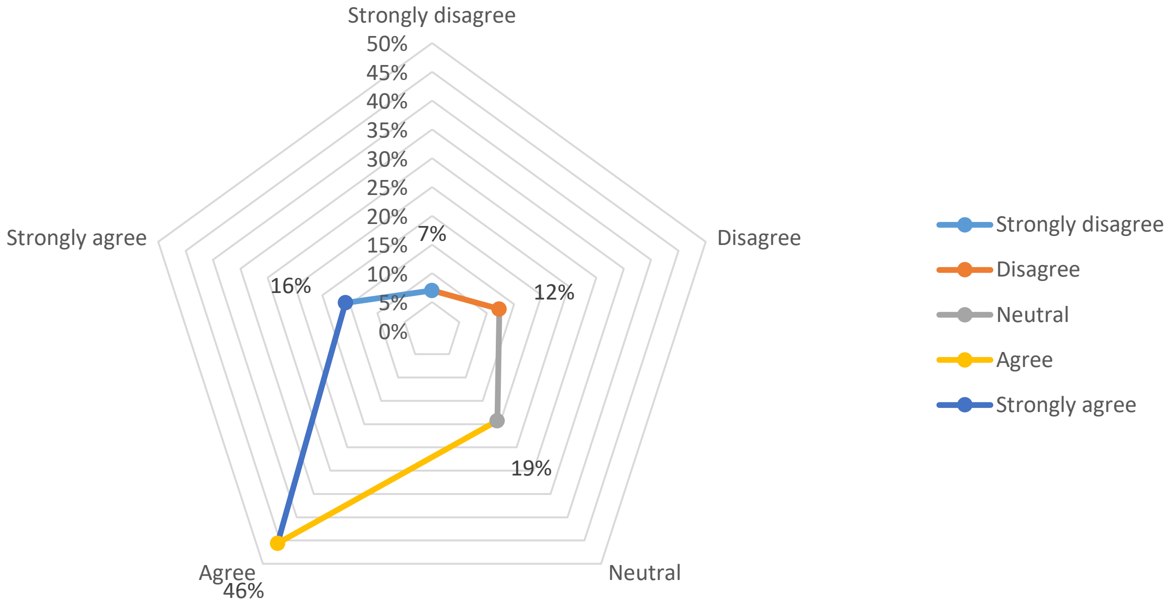

Figure 36: Leadership motivate employees to do better

Leaders are responsible for setting the strategies of the organisation, creating the vision, motivating and aligning people with the business goals (Weinstein, et al., 2009). The majority 62% (46% agree, and 16% strongly agree) in Figure 36 believed that leaders motivate the employees to improve the quality of the service or products. The small percentage of 19% (7% strongly disagree, and 12% disagree) do not believe that the leaders were motivating people to improve the product or service quality.

4.3.13 How involved are employees in setting the company's objectives?

Foudraine (2015) argued that companies involving employees in strategic development and setting up the company objectives outperformed those who do not involve their employees.

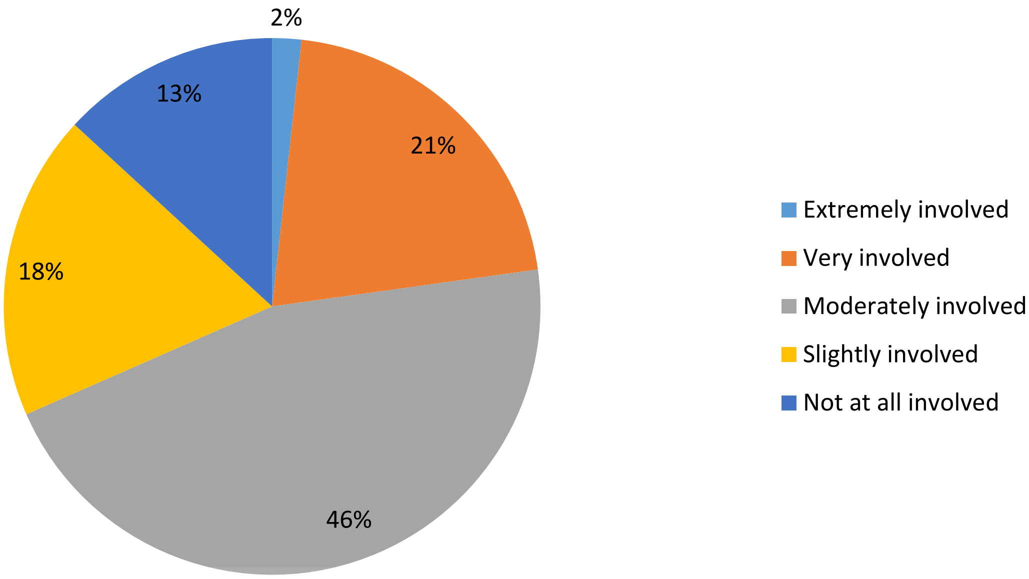

Figure 37: Level of employee involvement in setting the company objectives

In Figure 37 the majority (46%) of the respondents suggested there is moderate involvement of the employees in setting up business objectives. The second majority 31% (18%, slightly involved and 13%, not at all involved) indicated limited to no involvement of employee involvement in setting up the business strategy. The smallest percentage 23% (2% extremely involved and 21% very involves) shows the high involvement of employees in strategic development.

4.3.14 Management measure the effectiveness of the action plans

Management should continuously measure the effectiveness of the action plans and adjust the strategies as more information becomes available. Figure 38 provided detailed feedback on the ability of the management to measure the effectiveness of the action plans in the South African manufacturing sector.

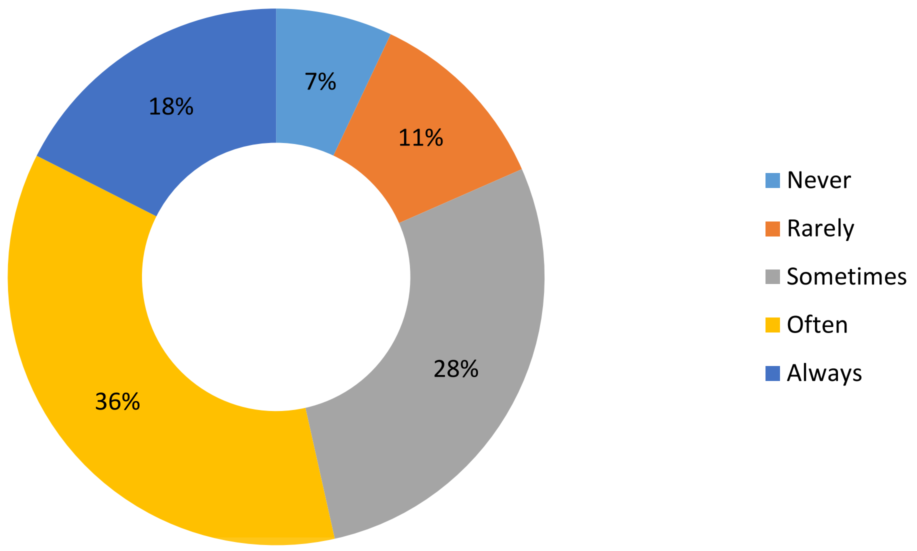

Figure 38: Management measure the effectiveness of the action plan

The majority 36% of the respondents indicated that action plans were often measured for effectiveness. The other 28% suggested that there was no consistency in the assessment of the effectiveness of the action plans. Eleven percent (11%) of the respondents suggested that the effectiveness of the action plan was assessed on an ad hoc basis. The smaller group, 7% suggested that they did not measure the usefulness of the action plans at all.

4.3.15 In this section, we require your opinion on the appraisal cost within your organisation. Kindly select your level of agreement with the statements in the table below: The organisation report the cost related to ….

Companies concerned about their customer satisfaction, the reputation and compliance with regulatory requirement invest in testing, inspection, and calibration of their tools (Bhero & Dlamini, 2015).

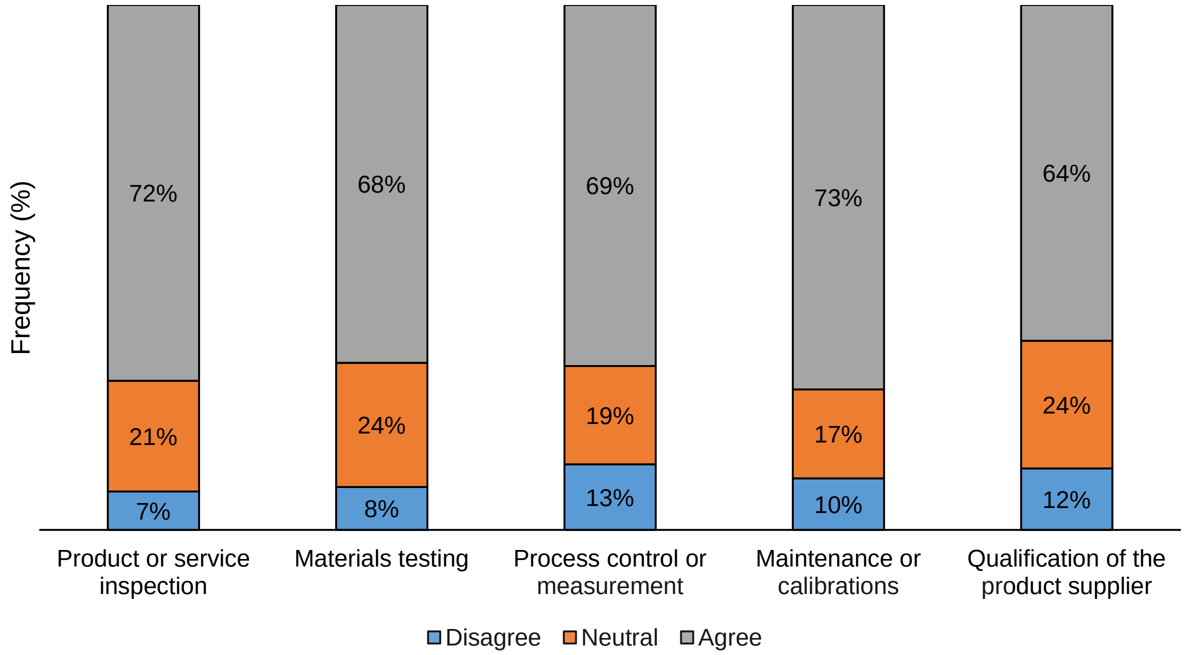

Figure 39: Appraisal cost items

Figure 39 shows that South African manufacturing companies assess the cost associated with the product or service inspection (72% agreed). The majority (68%) confirmed that they were assessing the cost related to material testing and a tiny percentage (8%) suggested that they were not assessing the cost related to material testing. The industry was also assessing the cost related to process control (69 % agreed). The small number of respondents (10%) who also suggested that they were not assessing the cost related to maintenance or calibrations. The overall results indicated that the South African manufacturing industry was managing the appraisal cost.

4.3.16 In this section, we are looking for your opinion on prevention costs. Please select your level of agreement or disagreement with the statements in the table below: The organisation assesses the cost related to….

According to Taidi (2015) prevention cost refers to the cost of establishing and sustaining business excellence. The prevention cost includes the expenses of training employees and setting up the quality standard within the organisation.

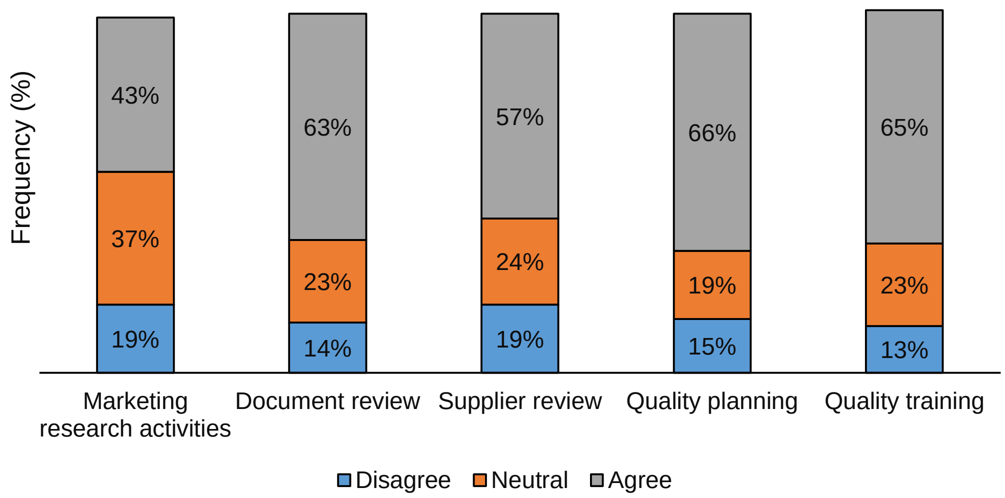

Figure 40: Prevention cost items

Figure 40 shows that the majority (43%) of the respondents believed that the companies were measuring the cost related to marketing research activities. The total of 37% was not sure if the companies were assessing the marketing cost or not. The smallest percentage 19% suggested that their companies were not assessing such cost. The industry also manages the cost related to document reviews (63% agreed), supplier (57% agreed) and quality training (65% agreed). The result also shows that the companies were not managing the prevention the same way with an average of 16% disagreeing with the statement.

4.3.17 The organisation assesses the cost related to the product or service recall

Product recall forms part of the external failure cost, the expenses incurred due to the product disappointment at the hands of the customer (Kaur, 2009). Hence, the majority, 52% (46% agreed, and 6% strongly agreed) of the respondents believed that the companies were assessing the cost related to a product recall. However, 20% (15 % disagreed, and 5% strongly disagreed) suggesting their companies were not managing the cost related to the product or service recall.

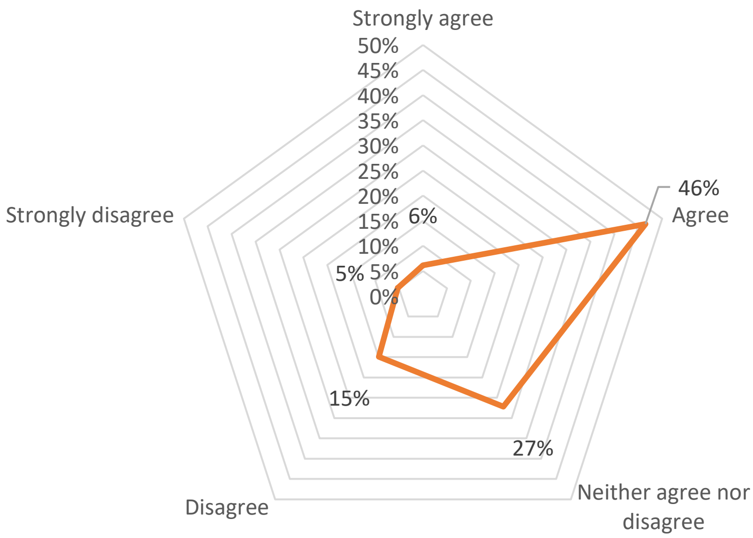

Figure 41: Assessment of cost related to the product or service recall

4.3.18 The organisation assesses the cost related to material or stock losses

Figure 42 shows that the majority 59% of the respondents (47% agreed and 12% strongly agreed) who believed that their companies manage the cost related to stock loss. There was a small percentage 17% (12% disagreed, and 5% strongly disagreed) who believed that the companies do not manage the cost related to stock losses.

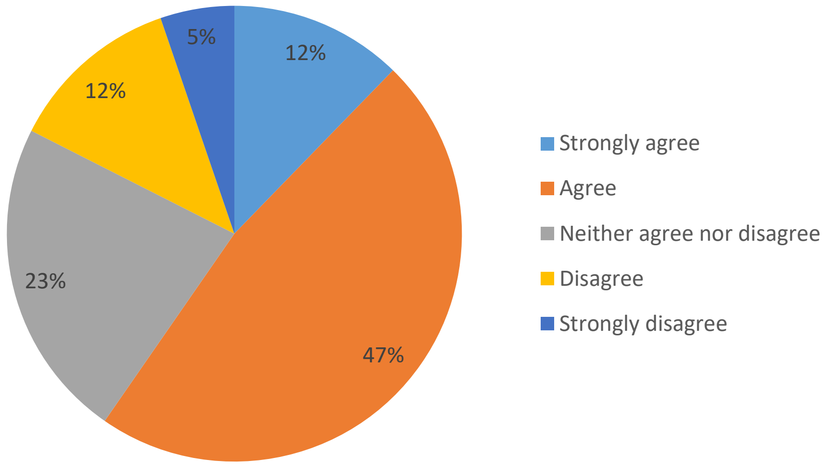

Figure 42: Assessment of cost related to material or stock loss

4.3.19 The organisation assesses the cost related to re-inspection and retest

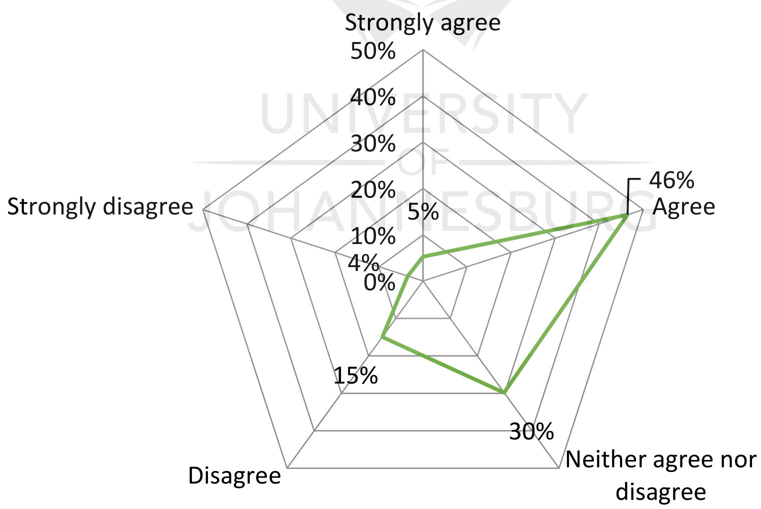

Figure 43: Assessment of the cost of re-inspection and retest

Re-inspection occurred after the product failed to meet requirements and needed to be reworked to bring it to the required standard (Abdelsalam and Gad, 2009). Figure 43 shows that, in the current research, the majority 51% (5% strongly agreed and 46% agreed) believed that the companies do assess the cost related to re-inspection. The total of 19% (15% disagreed, and 4% strongly disagreed) believed that the companies were not assessing such cost.

4.3.20 The organisation assesses the cost related to scrap due to poor quality

The scrapping cost due to poor quality also forms part of failure cost, which could be both internal and external failure cost (Al-Saket, 2003) .

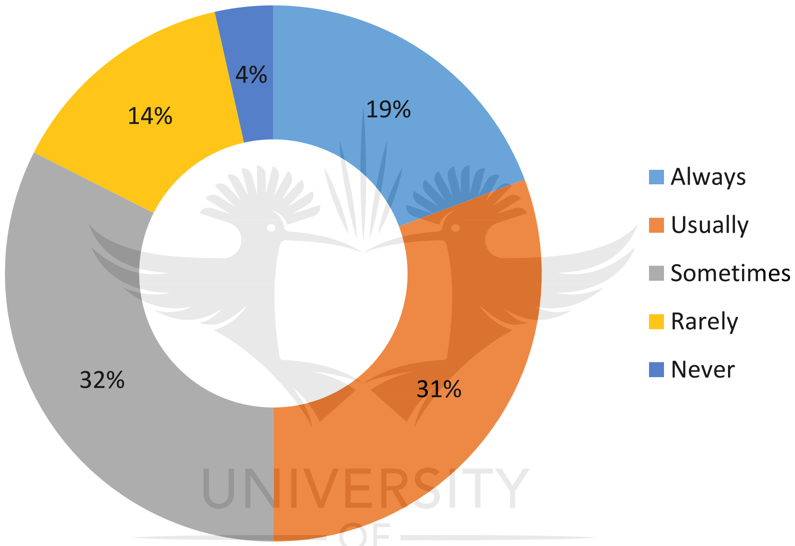

Figure 44: Assessment of cost related to scrapping due to poor quality

The majority (32%) of the respondents indicated the inconsistency in the assessment of the cost related to scrapping as a result of poor quality. Another more significant group (31%) suggested that they usually assess this type of cost. While a total of 19% suggested that their companies assess the cost related to scrap as a result of poor quality consistently. The total of 14% suggested that they assess the cost on an ad hoc basis. There was also a small percentage of 4% who suggested they do not assess the cost of scrapping as a result of poor quality. The result indicated the inconsistencies in the assessment of cost related to scrapping due to poor quality.

4.3.21 The organisation assesses the cost related to design corrections

Hermans and Liu (2013) maintain that modern companies faced the challenge of multiple suppliers and continually changing customer requirements which increase the cost of product design.

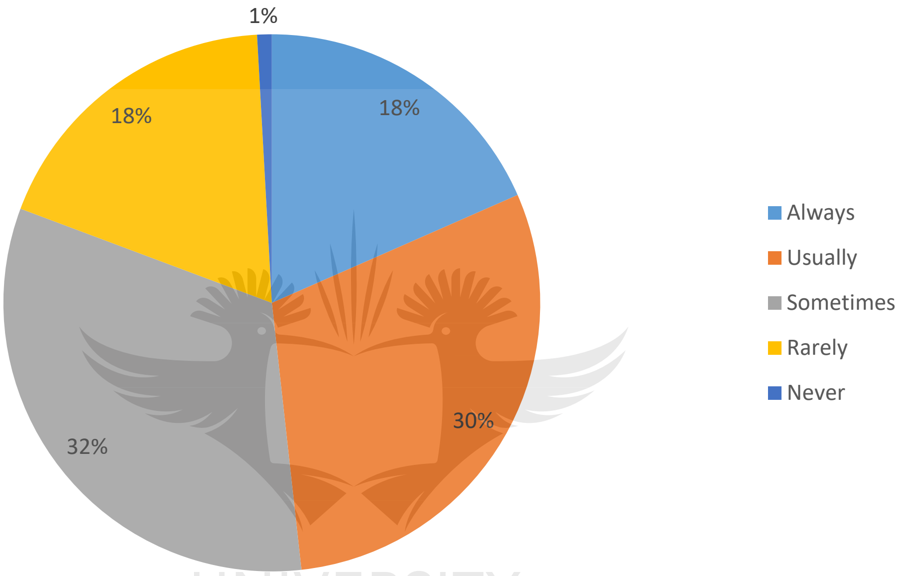

Figure 45: Assessment of the cost related to design correction

The majority in Figure 45 (18% always and 30% usually) of the respondents indicated that the companies manage the cost related to product design. The total of 32% suggested that there was no consistency in the assessment of the cost related to design correction. Another group, 18% suggested that the costs were managed on an ad hoc basis, while 1% suggested these were not assessed.

4.3.22 In this section, we are looking for your opinion on the following cost element. Please select your level of agreement or disagreement with the statements in the table below:

The hidden costs are part of any organisation, and it is easy to ignore because they are not accommodated by standard financial reporting systems (Vaxevanidis, et al., 2009) . The opportunity or hidden cost includes failure to provide the product or service to the customers, underutilisation of resources, delays within the organisation and suppliers (Cheah, et al., 2011).

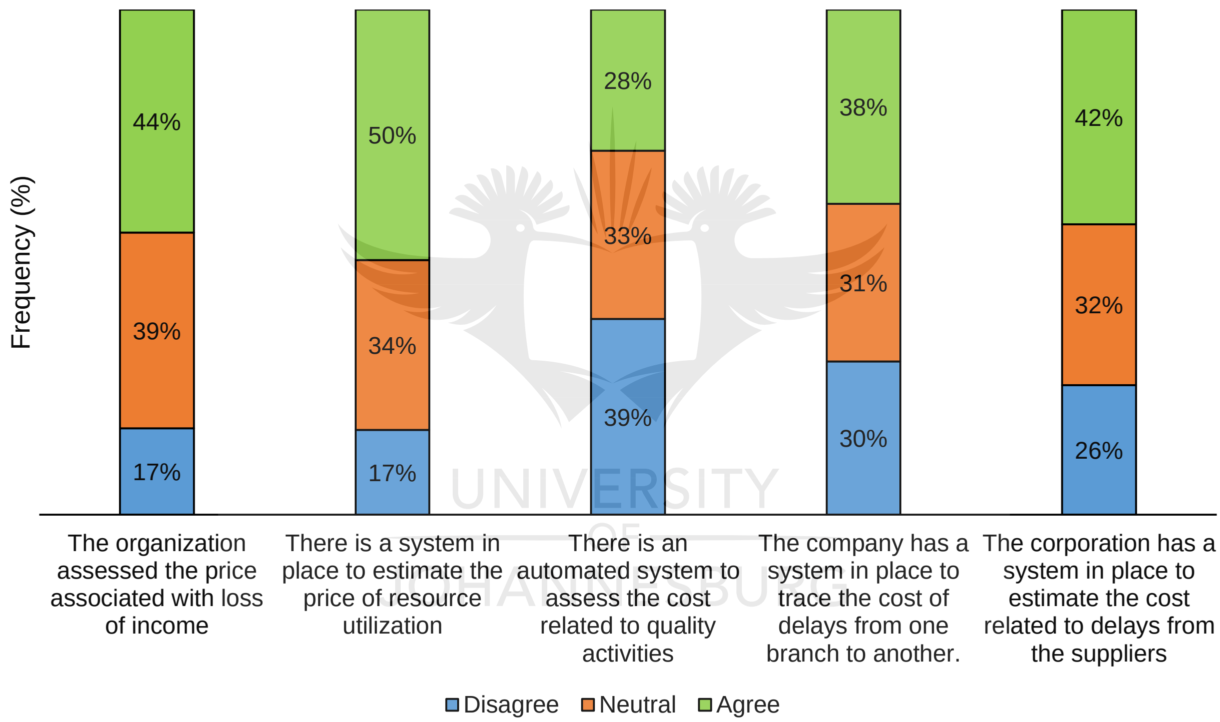

Figure 46: Hidden cost of quality

The mainstream (44%) of the respondents suggested that their companies assess the cost related to income losses. The total of 39% was not sure or reserve their comments, while 17% suggested that they are not assessing such cost. The majority 50% also indicated that their organisations manage the cost associated with the utilisation of the resources. The cost related to quality activities was not automated in the South African manufacturing industry which was confirmed by 39% of the respondents. Only 28% suggested that they had the system in place to automate the cost related to quality activities.

The result also shows that the majority (38%) of the respondents had the system in place to trace the cost of delays between the departments. The total of 30% suggested that there was no system in place to trace the cost of delays between departments. Likewise, the industry was managing the cost related to delays from the suppliers, which was confirmed by the majority of 42% of the respondents. The total of 26% suggested there was no tracing of the cost related to supplier delay.

4.4 Missing data analysis

According to Soley-Bori (2013), sometimes it is difficult to avoid the missing data entirely in the survey research due to a number reasons ranging from an unwillingness to provide the answer or no clue on how to respond to the questions. Missing values reduce the sample size and create problems during the statistical analysis (Roni, 2014). Figure 47 shows the summary of the missing data for the forty-four Likert scale items (variables) 31, 82% of the items have one or more missing data. Out of 119 people who answered survey questions, 12 (10, 08%) missed one or more questions, and in total, the survey had 32 (0,611%) missing data. It is not advisable to completely ignore the missing data.

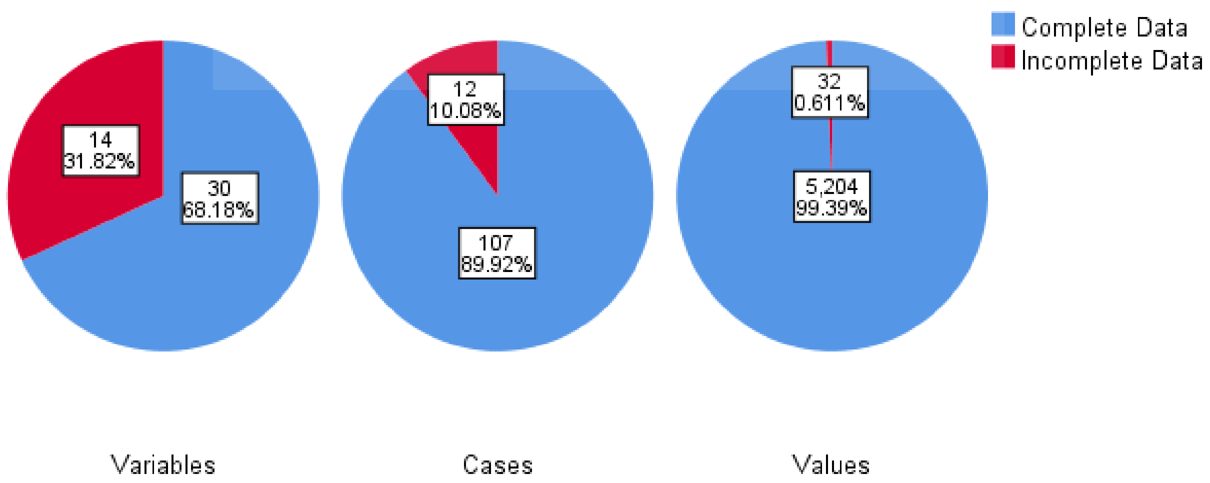

Figure 47: Overall summary of missing data

4.4.1 Little's MCAR test

The current research used the Little's test of missing completely at random (MCAR) to check how data were missing. According to Van Ness et al., (2007) the Little's MCAR makes an assumption or hypothesis that the data are not missing completely at random ($p< 0,05$). The significant statistical $p< 0,05$ shows that the data are not missing at random, but the $p> 0,05$ suggest that the data are missing completely at random (Madden *et al*., 2017). The current research's Little's MCAR test result (Chi-Square = 479.346, DF = 453, p =0.189) indicated that data were missing completely at random. When the data is missing completely at random; Roni (2014) suggested the use of multiple imputations, and expected maximisation to replace the missing values. Hence, the current research used expected maximisation as the method of replacing the missing data and maintaining the sample size.

4.5 Study rigor

The research used three types of validation which is face validation, content validation and construct validation. The validation process in this study followed a sequence of sub-processes, the first process was the face validity, the second process was content validity, and the final process was the construct validity. The scholars from the University of Johannesburg, engineering management school were requested to review the questionnaires and provide their opinion on the validity of the tools. The authors also used Survey Monkey survey expert, the team of senior statisticians from Statkon, literature review and Professors from the University of Johannesburg.

The survey questionnaires were distributed to the volunteers using the Survey Monkey. The team was requested to review the questionnaires and comment. The volunteers were given two weeks to review the questions. The volunteers suggested that the survey was too long; suggested that the questionnaire should include a rating, multiple choice questions, and update demographic information; some of the items were regarded as irrelevant. The research team met after the commentary sessions were closed to review the comments and updating the tool (survey questionnaires). After including all the changes which were suggested by the team of scholars and experts the survey questionnaires were submitted to the university's ethics committee for approval. The subsection reflected the changes which resulted from a face validation process and suggestions from the team.

The original survey questionnaires had a total of 85 questions (12 for demographic information, 44 quality management and 29 cost of quality). Through the first and the second validation processes, the items on the questionnaire were reduced to 50 questions (6 questions for demographic information, 24 questions for quality management and 20 for the cost of quality).

The research team further used the exploratory factor analysis (EFA) to refine the items to measure the concept of quality management and cost of quality. The confirmatory factor analysis was also used to confirm the construct validity of the tool used to collect the data. The results from confirmatory factor analysis were further used to assess the convergent validity and discriminant validity. The sections below provide the result for both exploratory factor analysis and confirmatory factor analysis.

4.5.1 Exploratory factor analysis of quality management

4.5.1.1 Sample adequacy for quality management data

The research followed the advice from Field (2009), by systematically removing the weak items, the items which had the measures of sampling adequacy (MSA) less than 0.6.

Table 30: Measures of Sampling Adequacy (MSA)

Items	First iteration	Second iteration	Third iteration
Item 17	0.459		
Item 18	0.462	0.506	0.511
Item 10	0.586		
Item 11		0.493	

As shown in Table 30 the first analysis identified Item 17, Item 18 and Item 10 as weak items with the respective MSA 0.459, 0.462 and 0.586. Item 17 was removed first from the analysis and the second iteration identified Item18 to have the MSA = 0.506 and Item 11 with MSA = 0.493. Item 11 was the second indicator to be removed from the analysis and the third analysis identified Item 18 as the only indicator which had the MSA less 0.6 and it was removed, thus all the remaining items had the MSA more than 0.6.

Table 31 shows the overall suitability of quality management data for factor analysis. The concept of quality management had the KMO index of 0.760 which was more than the recommended 0.6 (Watson, 2017). The Bartlett test shows the result of chi-square = 922.897 (Df =210) and p-value = 0.000 which was an indication that the concept of quality management did not have the sample problem (Williams, et al., 2012).

Table 31: KMO and Bartlett's test for quality management

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.760
Bartlett's Test of Sphericity	Approx. Chi-Square	922.897
	df	210
	Sig.	0.000

4.5.1.2 Factor extraction for quality management

The study uses the eigenvalue greater than one as the first extraction method of which the results were presented in Figure 48 and Table 89 on page 330. As indicated in Figure 48 only six factors had the eigenvalue greater than one and explained 65.279% of the total variance.

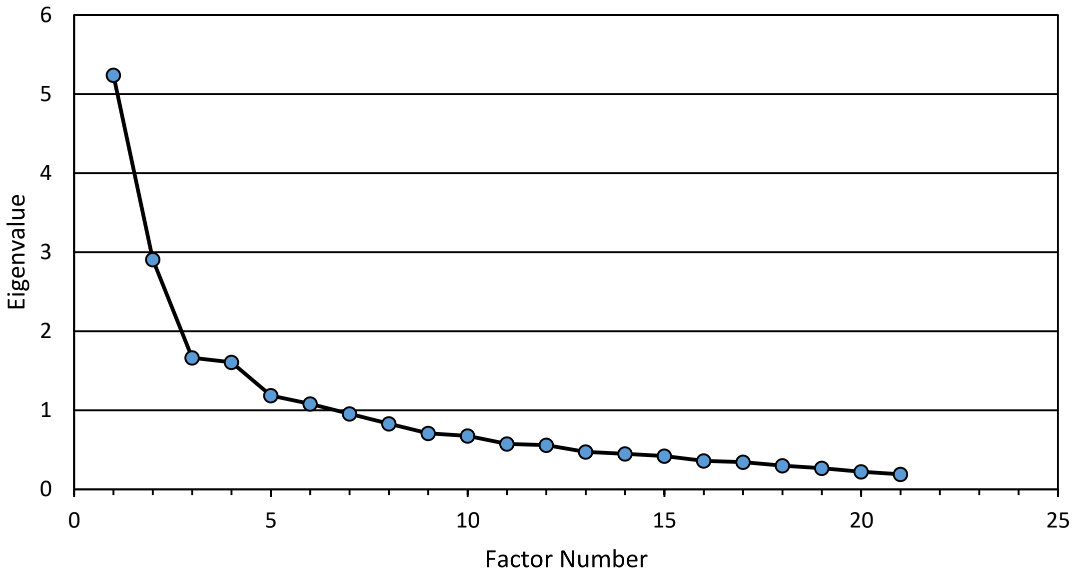

Figure 48: Scree plot for quality management factors

4.5.1.3 Pattern matrix for quality management factors

Table 32 shows the factor loading, percentage explained by each factor, cumulative percentages for selected factors and internal consistency for each factor. Factor 6 was excluded from further analysis because it was loaded to only one item and was causing double loading. Item 2 and Item 42 were also removed from the analysis because they were redundant. During the EFA process, a total of 5 items was removed from the quality management construct.

Table 32: Pattern matrix for quality management factors

Label	Description	F 1	F 2	F 3	F 4	F 5
Item 12	The process variation is one of the key performance indicators	0,601				
Item 14	There is regular training to create awareness of the business processes	0,741				
Item 10	The workflows are clearly visible in the workplace	0,770				
Item 13	The processes are designed to allow a good level of communication	0,924				
Item 5	The customer requirements are solicited through market research		0,642			
Item 8	The customer complaints take priority		0,681			
Item 6	Business processes allow customer involvement during product or service design		0,698			
Item 9	The customer feedback provides the means for improvement on product or service quality		0,707			

Label	Description	F 1	F 2	F 3	F 4	F 5
Item 7	There are processes for the customers to log the complaints		0,717			
Item 41	There are war rooms to discuss performance			0,564		
Item 40	There are key performance indicators adapted to manage the business performance			0,601		
Item 43	There are displays, indicating real-time business performance			0,767		
Item 44	There is a clear understanding of what influences the business results			0,769		
Item 15	Loyalty				0,599	
Item 19	Performance				0,611	
Item 16	Encouragement				0,872	
Item 3	How involved are employees in setting the company's objectives?					0,379
Item 1	Senior management and employees trust each other					0,521
Item 4	Management measures the effectiveness of the action plans					1,039
	% of Variance	24.951	13.838	7.928	7.658	5.648
	Cumulative %	24.951	38.790	46.718	54.376	60.023
	Cronbach's Alpha	0.821	0.815	0.773	0.737	0.697

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalisation.
a. Rotation converged in 6 iterations.

As indicated in Table 32, factor 1 was made up of five (4) items reported on the five-point Likert scale and explained 24.951% of the total variance with the factor loading ranging from 0.601 to 0.924. Factor 1 also had internal consistency (Cronbach's Alpha) of 0.821. Factor 2 had five (5) items reported on the five-point Likert scale and explained 13.838% of the total variance. Factor 2 also had factor loading ranging from 0.642 to 0.717 with the Cronbach's Alpha of 0.815 and factor 1 and 2 explained the total cumulative variance of 38.790%.

Factor 3 was made up of four (4) items from the five-point Likert scale and explained 7.928% of the total variance. Factor 3 also had a high factor loading ranging from 0.564 to 0.769 and the internal consistency of 0.773. The combination of factor 1, 2 and 3 explained the total variance of 46.718%. Both factors 4 and 5 had a total of 3 items with factor 4 explaining 7.658% of the total variance and factor 5 explaining 5.648 % of the total variance. Factor 4 had a high loading from 0.599 to 0.872 and the internal consistency of 0.737. Factor 5 had the factor loading from 0.379 to 1.039 and the internal consistency of 0.697. The five factors explained the total of 60.023 % of the total variance.

After analysing the factors, the research team reviewed the pattern matrix in conjunction with the literature to check which latent constructs were associated with each group of items (factors). As a result, factor 1 was associated with process management; factor 2 was associated with customer focus, factor 3 was linked to business result focus; factor 4 was linked with employee focus and factor 5 with leadership.

4.5.1.4 Reliability before and after EFA of quality management

After removing the items and redefining the factors associated with quality management it was important to check, the effect of the EFA process in the internal consistency of the selected factors.

Table 33: Internal consistency before and after EFA

Latent variables	Cronbach's Alpha before EFA	Cronbach's Alpha after EFA
Process management (F1)	0.76 (N = 5)	0.82 (N = 4)
Customer focus (F2)	0.82 (N = 5)	0.82 (N = 5)
Business result focus (F3)	0.79 (N = 5)	0.77 (N = 4)
Employee focus (F4)	0.64 (N = 5)	0.74 (N = 3)
Leadership (F5)	0.68 (N = 4)	0.70 (N = 3)

The result in Table 33 shows that the EFA analysis improved Cronbach's Alpha for process management from 0.76 to 0.82 by reducing the number of items from 5 to 4. Customer focus results were not affected by EFA analysis as the Cronbach's Alpha remain at 0.82 and the number of items remains the same. The EFA process reduced the Cronbach's Alpha for business result focus from 079 to 0.77 and the number of items from 5 to 4. The EFA improved the internal consistency for employee focus from 0.64 to 0.74 by eliminating two items. Leadership was also reduced from one item and the Cronbach's Alpha dropped from

0.68 to 0.70. The EFA process returned the internal consistencies which were above 0.70 for all factors, hence the EFA result were further used for conformity factor analysis.

4.5.2 Confirmatory factor analysis of quality management

Table 34 shows the model fit result based on the selected indices and the result shows that the factors taken from the EFA had the good model fit, with chi-square statistic of 167.011 (df =142) and p-value = 0.074 which was more than 0.05 The model also had CMIN/Df = 1.17, CFI =0.965> 0. 90, GFI= 0.877 < 0.9, RMSEA = 0.039 and SRMR = 0.065. The model was accepted as a good fit for the data because model fit indices were within the acceptable range (Ghazali, et al., 2018)

Table 34: Model fit indices of quality management

Fit indices	Criteria	Observed values
Chi-square	P-value ≥ 0.05	167,011 (P-value = 0.074)
Df		142
CMIN/DF	2 ≤ CMIN/DF≤ 3	1.176
CFI	≥ 0.95 excellent and ≥ 0.9 good	0.965
GFI	≥ 0.95 excellent and ≥ 0.9 good	0.877
RSMSEA	≤ 0,1 fair	0.039
SRMR	≤ 0.08 good	0.065

As presented in the path diagram, Figure 48, it was evident that the observed variables had the highest factor loading from their respective latent variables. Customer focus had the total of 5 items with item 9, 8, 7, and 5 appeared to be best displays of customer focus, the four items had the standardised regression weight of about 0.78, 0.72 and 0.75 and 0.66 respectively. Customer focus explained about 61% of the variance in item 9, 51% variance of item 8 and 56% variance of item 7. Item 6 and Item 5 scored the second highest values with Customer focus explaining a total variance of 44% in item 6 and 25% in item 5. Process management had a total of 4 items with item 13, 10, 14 and 12 appearing to be the best indicators of process management. The four items had the factor loading ranging from 0.61 to 0.89 with process management explaining a higher total variance of 78% of item 13.

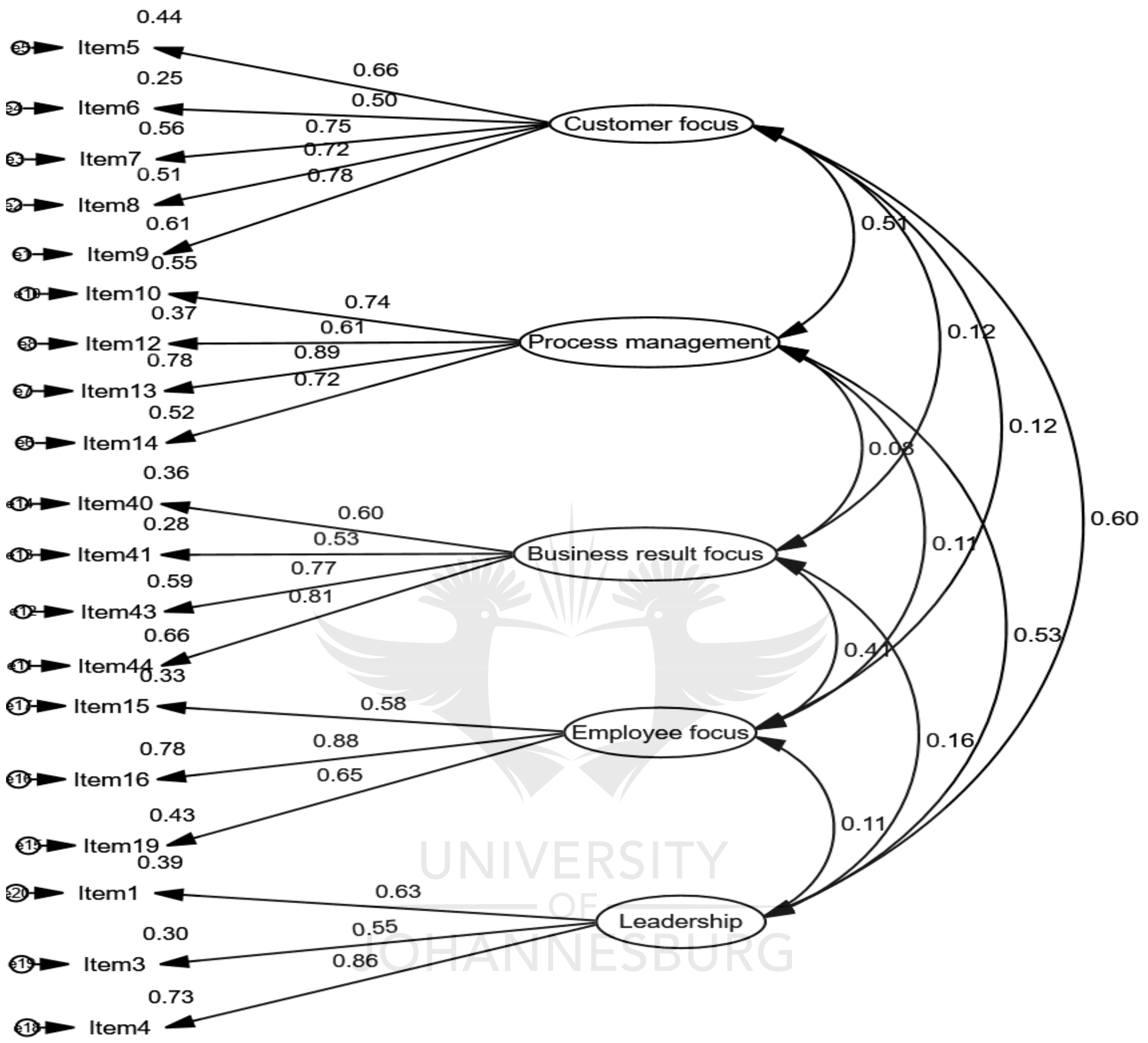

Figure 49: Quality management SEM

Business result focus had a total of four items and it was evident that the four items were best indicators of their respective factor. Their factor loading was, respectively, 0.81, 0.77, 0.53 and 0.60. In addition, business result focus explained about 66% of the total variance in item 44 and 59% in item 43; while item 40 and item 41 had the squared multiple correlations of 0.36 and 0.28, respectively.

Employee focus had three items and all the items appeared to be the best indicators of the latent variable. Their factor loading was respectively: item 16 had the highest standardised regression weight of 0.88, followed by item 19 with 0.65. Item 15 had the lowest factor loading of 0.58. Employee focus explained the highest variance of 78% in item 16, item 19 had the squared multiple correlations of 0.43 and item 16 was at the bottom with the squared multiple correlations of 0.33.

Leadership had also three items with item 4 appearing to be the dominating indicator of latent factor. Item 4 had a standardised regression weight of 0.86 followed by item 1 with 0.63. Leadership explained the highest total variance of 74% in item 4, while the latent variable explained the total variance of 39% in item 1 and 30% in item 3, respectively.

4.5.2.1 Correlation of quality management factors

Table 35 shows the correlation matrix between quality management factors and the results indicate that the factors were moderately correlated.

Table 35: correlation matrix for quality management factors

Latent factors	**Process Management**	**Customer focus**	**Business result Focus**	**Employee focus**	**Leadership**
Process Management	1				
Customer focus	0.514	1			
Business result Focus	0.077	0.119	1		
Employee focus	0.108	0.112	0.411	1	
Leadership	0.528	0.602	0.159	0.107	1

The factors had follow highest correlation coefficient, respectively:

- Process Management had 0.528 between process management and leadership
- Customer focus had 0.602 between customer focus and leadership
- Business result focus had 0.411 between business result focus and employee focus
- Employee focus had 0.411 between employee focus and business result focus
- leadership had 0.602 between leadership and customer focus

4.5.2.2 Maximum shared variance (MSV) of quality management

Table 36 shows the result of the maximum shared variance of quality management factors ranges factors had MSV ranges 0.2 to 0.4. The respective MSV for each were process management = 0.3, customer focus = 0.4, business result focus = 0.2, employee focus = 0.2 and leadership = 0.4.

Table 36: Maximum shared variance of quality management

Latent variables	Highest correlation coefficient	Square of the highest correlation coefficient
Process Management	0,53	0,3
Customer focus	0,60	0,4
Business result focus	0,41	0,2
Employee focus	0,41	0,2
Leadership	0,60	0,4

4.5.2.3 Average variance extracted (AVE) of quality management

Table 37 shows the result of the average variance extracted for each factors, all the factors had the AVE ranging from 0.5 to 0.6.

Table 37: Average variance extracted of quality management

Latent factors	Label	Factor loading ʎ (standardised)	(ʎ)^2	Average variance extracted (AVE)
Process management	Item 14	0,72	0,52	0,6
	Item 13	0,89	0,78	
	Item 12	0,61	0,37	
	Item 10	0,74	0,55	
Customer focus	Item 9	0,78	0,61	0,5
	Item 8	0,72	0,51	
	Item 7	0,75	0,56	
	Item 6	0,50	0,25	
	Item 5	0,67	0,44	
Business result focus	Item 44	0,81	0,66	0,5
	Item 43	0,77	0,59	
	Item 41	0,53	0,28	
	Item 40	0,60	0,36	
Employee focus	Item 19	0,66	0,43	0,5
	Item 16	0,88	0,78	
	Item 15	0,58	0,33	
Leadership	Item 4	0,86	0,73	0,5
	Item 3	0,55	0,30	
	Item 1	0,63	0,39	

4.5.3 Construct validity and Reliability of quality management

All the latent variables included in quality management framework had the high internal consistency ranging from 0.70 to 0.82, AVE ranged from 0.5 to 0.6 and MSV ranged from 0.2 to 0.4.

Table 38: Construct validity and reliability for quality management latent variables

Latent variables	Cronbach's Alpha after CFA	Convergent validity AVE ≥ 0.5	Discriminant validity AVE ≥ MSV
Process Management	0.82 (N = 5)	0.6 > 0.5	0.6 > 0.3
Customer focus	0.82 (N= 4)	0.5 = 0.5	0.5 > 0.4
Business result focus	0.77 (N = 5)	0.5 =0.5	0.5 > 0.2
Employee focus	0.74 (N = 3)	0.5 = 0.5	0.5 > 0.2
Leadership	0.70 (N = 3)	0.5 = 0.5	0.5 > 0.4

As indicated in Table 38 process management had the internal consistency of 0.82, the AVE > 0.5 and MSV = 0.3 which was less than 0.6. Customer focus had Cronbach's Alpha after CFA of 0.82, the AVE = 0.5, MSV =0.4, the MSV was less than AVE. The business result focus had the internal consistency of 0.77, the AVE = 0.5, MSV =0.2 and MSV < AVE. Employee focus also had the internal consistency of 0.74, AVE = 0.5, MSV = 0.2 and MSV < AVE. Leadership had the lowest internal consistency of 0.70, AVE = 0.5, MSV = 0.2 and MSV < AVE.

4.5.4 Exploratory factor analysis of CoQ

4.5.4.1 Sample adequacy for the cost of quality

All the items in the cost of quality framework had the measures of sampling adequacy greater than 0.6 and no item was removed. Table 31 shows the data suitability assessment result for the cost of quality data. The data had the KMO index of 0.857, and Bartlett's Test of Sphericity was significant (p<0, 05). The cost of quality had satisfactory data or sample size for factor analysis.

Table 39: KMO and Bartlett's test for the cost of quality

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.857
Bartlett's Test of Sphericity	Approx. Chi-Square	1407.239
	df	190
	Sig.	0.000

4.5.4.2 Factor extraction for the cost of quality

Figure 50 shows the scree plot for the cost of quality factors and as indicated in Figure 50 and Table 92 on page 342; the research used the eigenvalue more than one as the extraction criteria; as a result, three factors were selected for further analysis

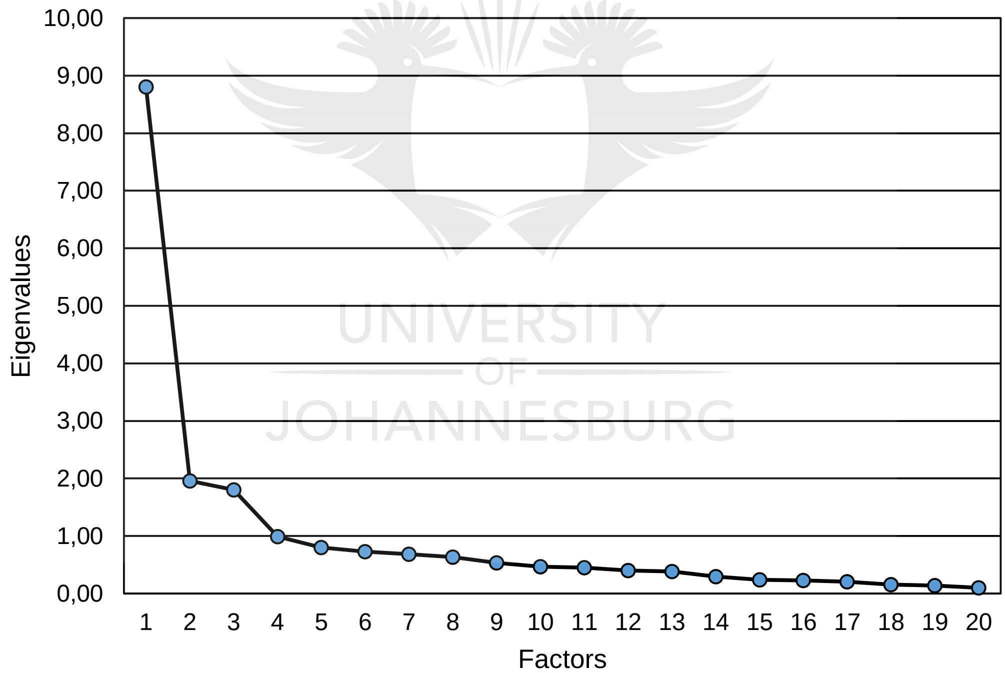

Figure 50: Scree plot for the cost of quality factors

Unlike the quality management pattern matrix, the cost of quality EFA produced a clean pattern matrix which did not need the identification of factors which loaded inadequately and double loading. Factor 1 loaded to 10 items with the factor loading ranging from 0.529 to 0.93, factor 2 loaded to five items with factor loading ranging from 0.622 to 0.810. Factor 3 also loaded to five items at an average of 0.672. Table 40 shows that the items were measuring their respective latent factors well. The three factors also had high internal consistency; factor 1 had the Cronbach's Alpha 0.91, F2= 0.88 and F3 = 0.86.

Table 40: Pattern matrix for cost of quality factors

Label	Description	F1	F2	F3
Item 20	Product or service inspection	0.725		
Item 21	Materials testing	0.529		
Item 22	Process control or measurement	0.570		
Item 23	Maintenance or calibrations	0.667		
Item 24	Qualification of the product supplier	0.615		
Item 25	Marketing research activities	0.641		
Item 26	Document review	0.748		
Item 27	Supplier review	0.730		
Item 28	Quality planning	0.931		
Item 29	Quality training	0.698		
Item 30	The organisation assesses the cost related to the product or service recall		0.716	
Item 31	The organisation assesses the cost related to material or stock losses		0.680	
Item 32	The organisation assesses the cost related to re-inspection and retest		0.819	
Item 33	The organisation assesses the cost related to scrap due to poor quality		0.750	
Item 34	The organisation assesses the cost related to design corrections		0.622	
Item 35	The organisation assessed the price associated with loss of income			0.550
Item 36	There is a system in place to estimate the price of resource utilisation			0.708
Item 37	There is an automated system to assess the cost related to quality activities			0.459
Item 38	The company has a system in place to trace the cost of delays from one branch to another.			0.891
Item 39	The corporation has a system in place to estimate the cost related to delays from the suppliers			0.753
	% of Variance	44.02	9.79	9.02
	Cumulative %	44.02	53.81	62.82
	Cronbach's Alpha	0.91	0.88	0.86
Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalisation.				
a. Rotation converged in 7 iterations.				

To put the meaning to the factors, the research team reviewed the pattern matrix in conjunction with the literature to check which latent variables were associated with each group of items (factors). As a result factor 1 was associated with the cost of conformance; factor 2 was associated with failure cost, factor 3 was linked to hidden costs.

4.5.4.3 Reliability before and after EFA of the cost of quality

Table 41 shows a comparison of the Cronbach's Alpha before and after the factor analysis, the result shows that the EFA regrouped the original variables from 3 to 4 variables. The items for appraisal cost and preventive cost were grouped to one factor, the factors for failure cost and hidden cost remain unchanged. The item derived from theory to measure appraisal cost had the internal consistency of 0.87, while preventive cost had the Cronbach's Alpha of 0.89. The failure cost had the Cronbach's Alpha of 0.88 measured by five Likert scale items, the failure cost did not change, similar to hidden costs. The new factor had 10 items and the highest internal consistency of 0.91.

Table 41: reliability before and after EFA of the cost of quality

Latent variables	Cronbach's Alpha before EFA	Cronbach's Alpha after EFA
Appraisal cost	0.87 (N = 5)	
Preventive cost	0.89 (N = 5)	
Failure cost (F2)	0.88 (N = 5)	0.88 (N = 5)
Hidden cost (F3)	0.86 (N = 5)	0.86 (N = 5)
Cost of conformance (F1)		0.91 (N = 10)

Because the theoretical framework had the high internal consistency the research had the choice to choose from the theoretical framework or the empirical framework. The best framework was determined by the correlation between variables. The theoretical model identified appraisal cost and preventive cost to be measuring the same thing with the highest correlation of 0.76 (see Figure 67 on page 346). According to Roni (2014) the correlation of

0.7 and above shows that the factors are measuring the same thing. The factors from the EFA result were moderately correlated and they were used for CFA of the cost of quality factors.

4.5.5 Confirmatory factor analysis (CFA) of the cost of quality

As indicated by the result in Table 42 the initial model had the chi-square statistics of 401.85 (DF =167) and p-value = 0.000 which was less 0.05 and definitely rejects the assumption of a good fit for the data. The model also had CMIN/DF = 2.41 which was within the acceptable range. The model had the CFI =0.84 which was less than 0.9, RMSEA = 0.11 more than 0.1, SRMR = 0.074 which was within the range of 0.05 and 0.08 (Schumacker, 2010). The result shows that the model was not acceptable because model fit indices were not within the acceptable range. The research followed the strategy suggested in (Awang, 2012) to systematically remove the observe variable with the factor loading of 0.6 and less. As a result Item 20, Item 21, Item 23, Item 24, Item 26, Item 30, Item 31 and Item 35 were systematically removed from the model.

The removal of the nine items improved the model fit as indicated in Table 42, the last column. The final model had the chi-square statistics of 74.48 (DF =41) and p-value = 0.001 which was less 0.05 and also rejected the assumption of a good fit for the data. The model had CMIN/Df = 1.82 which was within the acceptable range. The model had the CFI =0.95 which was more than 0.9, RMSEA = 0.08 less than 0.1, SRMR = 0.06 which was within the range of 0.05 and 0.08. The final model was accepted for further analysis because most of the model fit indices were within the acceptable range.

Table 42: Model fit indices of the cost of quality

Fit indices	Criteria	Observed values (1st run)	Observed values (Final run)
Chi-square	P-value ≥ 0.05	401.85 (P-value = 0.000)	74.48 (P-value = 0,001)
Df		167	41
CMIN/DF	2 ≤ CMIN/DF≤ 3	2.41	1.82
CFI	≥ 0.95 excellent and ≥ 0.9 good	0.841	0.95

Fit indices	Criteria	Observed values (1st run)	Observed values (Final run)
GFI	≥ 0.95 excellent and ≥ 0.9 good	0.75	0.90
RSMSEA	≤ 1 fair	0.11	0.08
SRMR	≤ 0.08 good	0.07	0,06

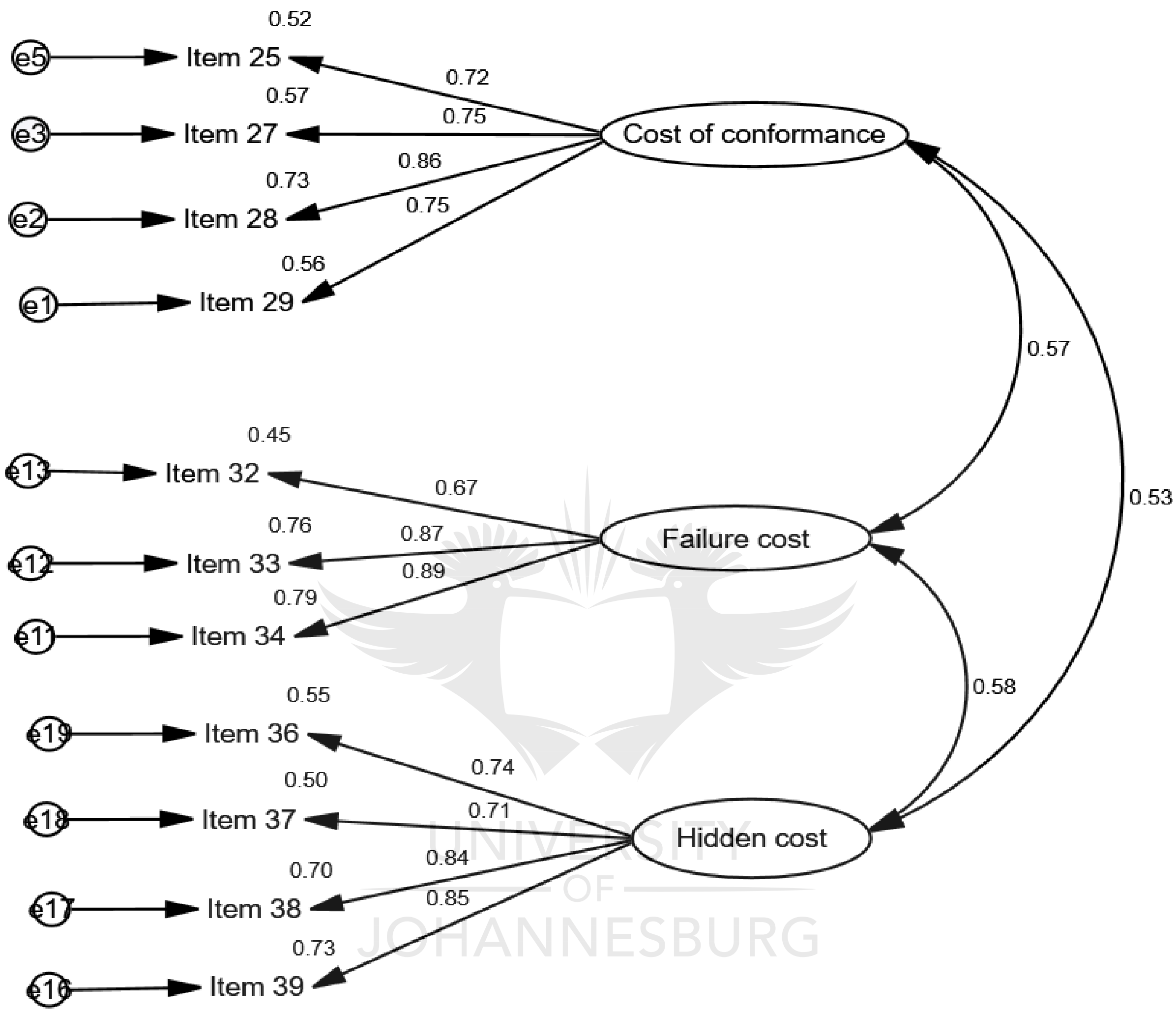

Figure 51: Cost of quality SEM

Figure 51 shows the path diagram for the cost of the quality structure and the result indicated that the retained items had a high factor loading to their respective latent variables. Cost of conformance retained four items with the factor loading ranging from 0.72 to 0.86 and the factor explained the total percentage ranging from 52% to 73% of the total variance to its items. Item 28 seemed to be the best indicator of cost of conformance with the highest factor loading of 0.086.

Failure cost retained three items with the factor loading ranging from 0.67 to 0.89. Item 33 and Item 34 were the best indicators of failure cost with the respective factors of 0.87 and 0.89. Failure cost the total variance ranging from 45% to 79% to its respective items. Hidden costs retained four items with the factor loading ranging from 0.71 to 0.85 and the factor explained the total variance ranging from 50% to 74% of the observed items associated with it.

4.5.5.1 Correlation of cost of quality factors

Latent variables	Cost of conformance	Failure cost	Hidden cost
Cost of conformance	1		
Failure cost	0.57	1	
Hidden cost	0.53	0.58	1

The factors had following the highest correlation coefficients, respectively:

- Cost of conformance had 0. 57 between cost of conformance and failure cost
- Failure cost had 0.58 between failure cost and hidden costs
- Hidden cost had 0.58 between hidden costs and failure cost

4.5.5.2 Maximum shared variance (MSV) of the cost of quality

Table 43 shows the maximum shared variance of the cost of quality factors and failure cost and hidden cost had MSV= 0.34 and hidden cost had MSV= 0.32.

Table 43: Maximum shared variance (MSV) of the cost of quality

Latent variables	Highest correlation coefficient	Square of the highest correlation coefficient
Cost of conformance (F1)	0.57	0.32
Failure cost (F2)	0.58	0.34
Hidden cost (F3)	0.58	0.34

4.5.5.3 Average variance extracted (AVE) of the cost of quality

Table 44 presents the result of the AVE for each factor in the cost of quality concepts and cost of conformance had AVE = 0.6, failure cost had AVE = 0.7 and hidden cost had AVE=0.6.

Table 44: Average variance extracted of the cost of quality

Latent variables	Label	Factor loading ʎ (standardised)	(ʎ)^2	Average variance extracted (AVE)
Cost of conformance	Item 29	0,75	0,56	0,6
	Item 28	0,86	0,73	
	Item 27	0,76	0,57	
	Item 25	0,72	0,52	
Failure cost	Item 34	0,89	0,79	0,7
	Item 33	0,87	0,76	
	Item 32	0,67	0,45	
Hidden cost	Item 39	0,86	0,73	0,6
	Item 38	0,84	0,70	
	Item 37	0,71	0,50	
	Item 36	0,74	0,55	

4.5.6 Construct validity and reliability of the cost of quality

Table 45 shows the reliability (Cronbach's Alpha), convergent validity and discriminant validity results for cost of quality factors.

Table 45: construct validity and reliability of cost of quality

Latent variables	Cronbach's Alpha after EFA	Cronbach's Alpha after CFA	Convergent validity AVE ≥ 0.5	Discriminant validity AVE > MSV
Cost of conformance	0.91 (N = 10)	0.85 (N = 4)	0.6 > 0.5	0.6 > 0.3
Failure cost	0.88 (N= 5)	0.84 (N =3)	0.7 >0.5	0.7> 0.3
Hidden cost	0.86 (N = 5)	0.86 (N = 4)	0.6 > 0.5	0.6 > 0.3

The confirmatory factor analysis process reduced the number of items for the cost of quality factors from 20 items to 11 items. The new formation had the Cronbach's Alpha ranging from 0.84 to 0.85 which means the items were complimenting each other well. However, both exploratory factor analysis and confirmatory factor analysis results had the good internal consistency (Alpha >0.7). Cost of conformance (F1) had the Cronbach's Alpha of 0.85 after the CFA, AVE = 0.6 which was a good indicator of convergent validity and AVE was greater than the MSV of 0.3. Failure cost (F2) had the Cronbach's Alpha of 0.84, EVE = 0.7> 0.5 and MSV of 0.3 which is less than 0.7. Hidden cost (F3) had the internal consistency of 0.86, AVE = 0.6 > 0.5, and MSV = 0.3 <0.6.

The CFA results were adopted for correlation analysis, multiple linear regression analysis. The study used exploratory factor analysis result to assess the quality management maturity of the South African manufacturing sectors and benchmarking. The exploratory factor analysis result had high internal consistency and a high number of items to assess and compare quality management practice between South African companies and international organisations.

4.6 Correlation Analysis

The section presents the relationship between quality management factors and cost of quality factors. Table 46 shows the Pearson correlation (r) of quality management and cost of quality factors. The quality management and cost of quality factors demonstrated the existence of linear correlations among them (see Figure 69 to Figure 83 from page 352 to 360). The box plot (Figure 84 on page 361) was used to identify the outliers in the data set and the identified outliers were within the acceptable range and they were not removed from the data set.

Table 46: Pearson Correlation between quality management and cost of quality factors

Latent variables		**Cost of conformance**	**Failure cost**	**Hidden cost**
Process Management	*r*	0.248**	0.187*	0.088
	p-value	0.003	0.021	0.169
Customer focus	*r*	0.285**	0.146	0.058
	p-value	0.001	0.056	0.266
Business result focus	*r*	0.359**	0.379**	0.463**
	p-value	0.000	0.000	0.000
Employee focus	*r*	0.399**	0.285**	0.376**

Latent variables		Cost of conformance	Failure cost	Hidden cost
	p-value	0.000	0.001	0.000
Leadership	*r*	0.155*	0.041	0.078
	p-value	0.046	0.330	0.200
**. Correlation is significant at the 0.01 level (1-tailed).				
*. Correlation is significant at the 0.05 level (1-tailed).				

The result shows that process management was highly correlated with the cost of conformance (r = 0.248) and the correlation was significant at p-value = 0.01. Process management was also correlated with failure cost (r = 0.187) and the correlation was significant at p-value = 0.05. The result shows that there was no strong correlation (r = 0.088) between process management and hidden cost at p-value = 0.169.

Customer focus was identified to be highly correlated with cost of conformance (r= 0.285 and p-value = 0.01). The result did not provide enough evidence to judge the relationship between customer focus and failure cost since the p-value was too close to 0.05 (r = 0.146 and p-value =0.056). The result indicated that there was no association between customer focus and hidden cost (r = 0.058 and p-value = 0.266)

Business result focus was identified to be highly correlated with all the cost of quality categories. The correlation (r = 0.359) between business result focus and cost of conformance was significant at p-value = 0.01. Similar to the failure cost and the business result focus the result indicated a high correlation (r = 0.379 and p-value significant at 0.01). The result also indicated a strong correlation between hidden cost and business result focus (r = 0.463 and p-value significant at p-value = 0.01).

Employee focus was also identified to be highly correlated with all the cost of quality categories. The result shows that the cost of conformance was highly correlated with employee focus (r = 0.399 and significant at 0.01). Failure cost and employee focus were also highly correlated and the relationship was significant at 0.01 (r = 0.285 and p-value =

0.001). The result further indicates the strong relationship between hidden cost and employee focus (r = 0.376 and the relationship was significant at 0.01).

The result shows that leadership was only associated with the cost of conformance and it did not correlate with other costs of quality categories. The result indicated that the cost of conformance and leadership relationship was significant at 0.05 (r = 0.155 and p-value = 0.046). The result did not provide the evidence to claim the relationship between leadership and failure cost (r = 0.041and p-value = 0.330). Similarly, the result shows that there was no relationship between leadership and hidden cost (r = 0.078, and p-value = 0.200).

4.7 Multiple linear regression

The section presents the result of how well the quality management variables predict the cost of quality categories. The section also provides the amount of variance explained by the quality management variables to each cost of quality category and identifies the quality management variables which best predict the cost of quality categories. Due to the fact that the linear regression has a stringent set of assumption; it was important to first check and satisfy the assumption prior to the actual analysis. According to Pallant (2007) the correlation among independent variables should not be more than 0.7, the sample size should be N> (50+ 8m) where N represents the sample size and m the number of independent variables in the model. The author further suggests that the data set should not have the extreme outliers and regression standardised residuals should be normally distributed.

4.7.1 Multicollinearity

The multicollinearity was assessed using two methods, the first step was to review the correlation among independent variables. The result in Figure 49 shows that all the variables were moderately correlated below 0.7. The result in Table 47 confirmed that there was no multicollinearity among the independent variables. The process management had the tolerance of 0.585, VIF = 1.708 which was well within the threshold of 0.1 from the tolerance and VIF of 10. Customer focus had the tolerance of 0.677 which is the variance not explained by other factors and VIF= 1.477, business result focus had a tolerance of 0.878, VIF = 1.140. The employee focus also had the tolerance of 0.892, VIF = 1.121 which was followed by leadership with the tolerance = 0.655 and VIF= 1.526. All the variables indicated that they were not highly correlated which satisfy the multicollinearity assumption.

Table 47: Collinearity statistics

Independent variables	Tolerance	Tolerance > 0.1	Variance Inflation Factor VIF	VIF < 10
Process management	0.585	Yes	1.708	Yes
Customer focus	0.677	Yes	1.477	Yes
Business result focus	0.878	Yes	1.140	Yes
Employee focus	0.892	Yes	1.121	Yes
Leadership	0.655	Yes	1.526	Yes

4.7.2 Identification of influential outliers and normality

To identify the outliers which were out of range the current research used the Mahalanobis and Cook's distances and chi-squared critical values as suggested in (Pallant, 2007, p. 157). The Mahalanobis distance greater than the chi-squared critical values indicate that the outlier is out of range similar to the Cook's distances greater than 1. In the current research, two cases were identified to have the Mahalanobis distance of 25.525 and 21.325 which were well more than the critical chi-squared value of 20.52 (see Figure 91 on page 366) and for the number of independent variables equal to five (Pallant, 2007, p. 157). The cases were removed from the data set which left the maximum Mahalanobis distance of 16.336 which was less than 20.52, the maximum Cook's distance was 0.109 which was less than one (see Table 98 on page 367).

The research used a normal probability plot of regression standardised residual and histogram to judge the normality of standardised residuals. All the standardised residual were within the acceptable range of 3.3 and -3.3 (see Figure 85 on page 362, Figure 87, on page 363 and Figure 89 on page 365). The P-P plots also show that the observed values were reasonably aligned with the straight line which shows the normality (see Figure 86 in page 362, Figure 88 in page 364, Figure 90 on page 365).

4.7.3 Cost of conformance multiple linear regression model

The result in Table 48 shows the strong correlation (R = 0.544) between the cost of conformance and quality management framework made of process management, customer focus, business result focus, employee focus, and leadership. The predictors explained a total variance of 29.6% (R square = 0.296) of the conformance cost.

Table 48: Cost of conformance model summary

R	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
0.544	0.296	0.264	0.659
a. Predictors: (Constant), Process management, Customer focus, Business result focus, Employee focus, Leadership			
b. Dependent Variable: Cost of conformance			

Table 49 shows the ability of the predictors to forecast the cost of conformance and the result provided sufficient evidence that the model was predicting the outcome variable so well (F(5; 111) = 9.329 and p =0.000).

Table 49: Model fit statistics of the cost of conformance

ANOVA					
	Sum of Squares	**DF**	**Mean Square**	**F**	**Sig.**
Regression	20.229	5	4.046	9.329	0.000
Residual	48.136	111	0.434		
Total	68.364	116			
a. Dependent Variable: Cost of conformance					
b. Predictors: (Constant), Process management, Customer focus, Business result focus, Employee focus, Leadership					

Table 50 shows the Coefficients of the cost of conformance model with beta (B) representing the amount of change in the outcome variables for each unit change in the predictor variables when other independent variables remain constant.

Table 50: Coefficients of the cost of conformance

Variables	Unstandardised Coefficients		Standardised Coefficients	t-statistic	Sig.
	B	Std. Error	Beta		
(Constant)	0,784	0,447		1,752	0,082
Process management	0,183	0,104	0,183	1,758	0,081
Customer focus	0,204	0,110	0,180	1,860	0,065
Business result focus	0,245	0,085	0,244	2,869	0,005
Employee focus	0,258	0,073	0,299	3,552	0,001
Leadership	-0,086	0,093	-0,091	-0,922	0,358
a. Dependent Variable: Cost of conformance					

Let Process management = X_1, Customer focus = X_2, Business result focus = X_3, Employee focus = X_4, Leadership = X_5, Constant = b_0 and random error = ε

Therefore, the constant (b_0) = 0.784 which is the interception point for predictors and the outcome variable. This is also the amount of cost of conformance when all the independent variables are equal to zero.

Process management (X_1) had the coefficient of 0.183 with the standard error of 0,104 which is the unreliability associated with the slop, the t-statistic of 1.758 and the p-value = 0.081. The coefficient of 0,183 indicates the amount of increase in the cost of conformance for every unit increase in the process movement when other variables in the model remain constant. The p-value greater than 0.05 indicated that process management was not highly associated with the cost of conformance.

Customer focus (X_2) had a coefficient of 0.204, the standard error =0.110, the t statistic of 1.860 which shows the distance of the coefficient (0.204) from zero and p-value = 0.065. The result indicated that each unit increase in the customer focus results in 0.204 increase in the cost of conformance, and again the result shows that the customer focus is not highly associated with the cost of conformance at p-value greater than 0.05.

Business result focus (X_3) had the coefficient of 0.245, the standard error of 0,085, t-statistic of 2.869 and the p-value = 0,005. The p-value less than 0.05 and t statistic indicated that the business result focus was highly associated with the cost of conformance. The relationship was such, that for every unit increase in business result focus resulted in 0.245 in the cost of conformance when other variables remain unchanged.

The employee focus (X_4) had the coefficient of 0.258 with the standard error of 0.073, the t statistic of 3.552 and p-value of 0.001. The result provided sufficient evidence that the employee focus was highly associated with the conformance at a p-value less than 0.05. The association was such that every unit change in employee focus results in 0.258 change in the cost of conformance when other predictor variables remain constant in the model.

Leadership (X_5) had the coefficient of -0.086 with the standard error of 0.093, the t-statistic of -0.922 and p-value of 0.358. The result shows that the leadership was not highly associated with the cost of conformance in the model at the p-value greater than 0.05. However, the result shows that the unit increase in the leadership would result in 0.086 decreases in the cost of conformance when all other variables in the model remain unchanged.

Based on the result above the model of the cost of conformance was constructed as:

Y $(CoC) = 0.784 + 0.183X_1 + 0.204X_2 + 0.243\,X_3 + 0.258X_4 - 0.086X_5 + \varepsilon$ (Equation 5)

Where CoC = Cost of Conformance

X_1 = Process management

X_2 = Customer focus

X_3 = Business result focus

X_4 = Employee focus

X_5 = Leadership

ε = Random error

4.7.4 The failure cost multiple linear regression model

Table 51 shows the model summary for failure cost as the dependent variable and process management, customer focus, business result focus, employee focus and leadership as the independent variables. The result shows a positive relationship (R = 0.475) between the failure cost and the quality management variables. The predictors also explained a total variance of 22.5% (R square = 0.225) of the failure cost.

Table 51: Failure cost model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.475	0.225	0.190	0.739
a. Predictors: (Constant), Process management, Customer focus, Business result focus, Employee focus, Leadership			
b. Dependent Variable: Failure cost			

According to the result in Table 52, the predictors were able to predict the failure cost with (F (5; 111) = 6.457 and p = 0.000).

Table 52: Model fit statistics of failure cost

ANOVA					
	Sum of Squares	**DF**	**Mean Square**	**F**	**Sig.**
Regression	17.661	5	3.532	6.457	0.000
Residual	60.721	111	0.547		
Total	78.382	116			
a. Dependent Variable: Failure cost					
b. Predictors: (Constant), Process management, Customer focus, Business result focus, Employee focus, Leadership					

Table 53 shows the model coefficients, the t-statistic and the p-values for each variable in the model.

Table 53: Coefficients of the cost of failure cost

Variables	Unstandardised Coefficients		Standardised Coefficients	t-statistic	Sig.
	B	Std. Error	Beta		
(Constant)	1.071	0.502		2,132	0,035
Process management	0.240	0.117	0.224	2,047	0,043
Customer focus	0.112	0.123	0.092	0,908	0,366
Business result focus	0.356	0.096	0.332	3,721	0,000
Employee focus	0.144	0.082	0.156	1,763	0,081
Leadership	-0.188	0.105	-0.185	-1,791	0,076
a. Dependent Variable: Failure cost					

Let Process management = X_1, Customer focus = X_2, Business result focus = X_3, Employee focus = X_4, Leadership = X_5, Constant = b_0 and random error = ε

The model had the interception of 1.071 with the standard error of 0.502 with the t-statistic of 2.132 and p-value 0.035. Process management had the coefficient of 0.240 with the standard error of 0.117, the stat of 2.047 and p-value of 0.043. The t-statistic and p-value result shows that the coefficient of process management was not equal or closer to zero in the model. The result shows that the process management was highly associated with failure cost, such that for every unit increase in process management results in 0.240 increase in the failure cost when all other variables remain constant.

Customer focus was not highly associated with the failure cost with the coefficient of 0.112, the standard error of 0.123, and the t-statistic of 0.908 which shows that the value of coefficient was close to zero. The relationship was also confirmed by a p-value of 0.366 which was more than 0, 05. The coefficient of 0.112 means for every increase in customer focus, the failure cost will adjust by 0.112 when other variables remain constant in the model.

Business result focus had the coefficient of 0.356 and the standard error of 0.096, the t stat 3.721 and p-value = 0.000. The result shows that the failure cost was highly associated with business result focus and the correlation was such that every unit increase in the business result focus result in 0.356 increase in the failure cost when other variables remain unchanged.

Employee focus had the coefficient of 0.114, the standard error of 0.082, t-statistic of 1.763 and p-value of 0.081. The result shows that the employee focus did not have the high contribution in predicting the failure cost; the unit increase in employee focus only result in 0.114 increase in the failure cost where other variables remain constant.

Leadership had the coefficient of -0.188 with the standard error of 0.105 and the t-statistic of -1.791 with the p-value of 0.079. The result shows that the leadership was not highly associated with failure cost, as such that for every unit increase in the leadership only results in 0.188 decreases in the failure cost when other variables remain unchanged.

Based on the result above the model of failure cost was constructed as:

Y $(Failure\ cost) = 1.071 + 0.240X_1 + 0.112X_2 + 0.356X_3 + 0.144X_4 - 0.188X_5 + \varepsilon$ (Equation 6)

Where Y = Failure cost

X_1 = Process management

X_2 = Customer focus

X_3 = Business result focus

X_4 = Employee focus

X_5 = Leadership

ε = Random error

4.7.5 Hidden cost multiple linear regression model

The result in Table 54 shows that the model of quality management made up of process management, customer focus, business result focus, employee focus, and leadership was strongly correlated (R = 0.532) with a hidden cost. The quality management variables explained a total variance of 28.3% (R square = 0.283) of the hidden cost.

Table 54: Hidden cost model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.532	0,283	0,251	0,705
a. Predictors: (Constant), Process management, Customer focus, Business result focus, Employee focus, Leadership			
b. Dependent Variable: Hidden cost			

The F distribution in Table 55 shows that the selected variable were good predictors of hidden cost (F (5; 111) = 8.770 and p-value < 0.05)

Table 55: Model fit statistics of hidden cost

ANOVA					
	Sum of Squares	DF	Mean Square	F	Sig.
Regression	21,765	5	4,353	8,770	.000
Residual	55,097	111	0,496		
Total	76,862	116			
a. Dependent Variable: Hidden cost					
b. Predictors: (Constant),), Process management, Customer focus, Business result focus, Employee focus, Leadership					

Table 56 indicates the hidden cost model parameters, which include coefficients, t-statistic, and p-values.

Table 56: Coefficients of the cost of hidden cost

Variables	Unstandardised Coefficients		Standardised Coefficients	t-statistic	Sig.
	B	Std. Error	Beta		
(Constant)	0,965	0,479		2,015	0,046
Process management	0,163	0,112	0,153	1,458	0,148
Customer focus	-0,070	0,117	-0,058	-0,597	0,552
Business result focus	0,414	0,091	0,389	4,537	0,000
Employee focus	0,221	0,078	0,242	2,841	0,005
Leadership	-0,074	0,100	-0,073	-0,737	0,463

Variables	Unstandardised Coefficients		Standardised Coefficients	t-statistic	Sig.
	B	Std. Error	Beta		
a. Dependent Variable: Hidden cost					

Let Process management = X_1, Customer focus = X_2, Business result focus = $X_{3,}$ Employee focus = $X_{4,}$ Leadership = X_5, Constant = b_0 and random error = ε

The model had the interception of 0.965 with the standard error of 0.479

Process management had a coefficient of 0.163, the standard error of 0.112, the t-statistic of 1.458 and p-value = 0.148. The result shows that the process management was not one of the big contributors in the model. The unit increase in process management only result in 0.163 increase to the hidden cost when other variables remain constant and the contribution was significant at p-value > 0.05.

Customer focus had the coefficient of -0.070 with the standard error of 0.117, the t-statistic of -0.597 and p-value of 0.148. The result shows that the customer focus was not a good predictor of hidden cost. The unit increase in the customer focus results in 0.070 decreases in the hidden cost when all other variables remain constant.

Business result focus had the coefficient of 0.414 with the standard error of 0.091, t-statistic of 4.537 and the p-value of 0.000. The result shows that the business result focus was highly associated with hidden cost, as such that every unit increase in the business result focus let to 0.414 increase in the hidden cost. The increase in only true when other variables in the model remain constant.

Employee focus had the coefficient of 0.221 with the standard error of 0.078, the t-statistic of 2.842 and p-value of 0.005 which was less than 0.05. The result shows that the employee focus was highly associated with the hidden cost. The unit increase in the employee focus leads to an increase of 0.221 in the hidden cost when other variables remain unchanged.

The result also shows that leadership was not highly associated with the hidden cost with the coefficient of -0.074 which was significant at p-value = 0.463. The coefficient of -0.074 means for every unit increase in the leadership, the hidden cost decrease by 0.074; when other variables remain constant in the model.

Based on the result above the model of failure cost was constructed as:

$$Y\ (Hidden\ cost) = 0.965 + 0.163X_1 - 0.070X_2 + 0.414X_3 + 0.221X_4 - 0.074X_5 + \varepsilon \quad \text{(Equation 7)}$$

Where Y = Hidden cost

X_1 = Process management

X_2 = Customer focus

X_3 = Business result focus

X_4 = Employee focus

X_5 = Leadership

ε = Random error

4.8 Quality Management Maturity In the South African Manufacturing Industry

Table 57 shows the descriptive statistics (Cronbach's Alpha, means and standard deviations) for the eight factors used to assess the quality management maturity in the South African manufacturing industry. All the variables had the internal consistency of Cronbach's Alpha more than 0.7 except leadership which had 0.70. The low standard deviation shows that people's views were not too far apart and data point are too close to the mean.

Table 57: Cronbach's Alpha, standard deviation and means of the measures

Variables	Cronbach's Alpha	Mean	Std. Deviation
Customer focus	0.82	3.667	0.721
Cost of conformance	0.85	3.587	0.763
Failure cost	0.84	3.432	0.818
Process management	0.82	3.416	0.792
Business result focus	0.77	3.397	0.760
Employee focus	0.74	3.317	0.888
Hidden cost	0.86	3.188	0.815
Leadership	0.70	3.034	0.817

The factors were ranked from the highest mean score to the lowest. The customer focus had the highest mean score of 3.667 which shows that the South African manufacturing industry prioritises the customers. The cost of conformance had the second highest score of 3.587, which further confirmed that the industry prioritises the compliance to requirements. The two factors were identified in level four in the quality management maturity scores selected for the current research.

Failure cost falls in the third place with the mean score of 3.432 and it was identified to be in level three. Process management had a mean score of 3.416 in level three of the maturity scale. Business result focus was in the fifth position with a mean score of 3.397 in level three. In position six was employee focus with the mean score of 3.317 in level three of the maturity scale. The hidden cost scored the second lowest score of 3.188 in level three followed by leadership which had the lowest score of 3.034 in level three on the selected scale.

4.9 Benchmarking quality Management

The study used the survey questionnaires to collect the information required to benchmark quality management practice between South African and global manufacturing companies. The survey collected a total of 119 responses in South Africa and 19 from the international community. The result presented in this section includes the demographic information, adoption of quality management initiatives and factors identified during exploratory factor analysis. The exploratory factor analysis structure was selected because it had high internal consistency and high number of items to compere quality management practice between South African companies and international companies.

4.9.1 Demographic information

The international respondents were requested to indicate the country where they work. Figure 52 shows that the majority (90%) of the respondents come from the United States of America, 5% from Nigeria and 5% from Canada. The result clearly shows that the observations cannot be generalised across the international community. The result was only used to compare the observation between the data collected in South Africa and the data collected outside South Africa.

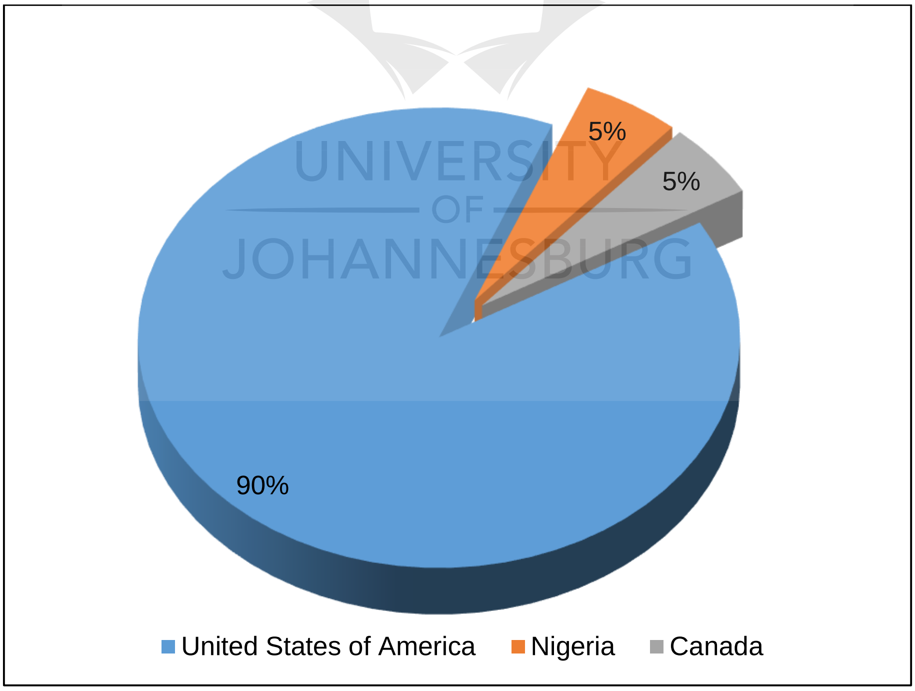

Figure 52: Respondent location

Figure 53 compares the age distribution of the respondents. The majority (58%) of the international participant and 25% of the South African members were more than 50 years old. The youngest participant from the international participants was between 31- 35 years and in South Africa was between 20-25 years old. The result shows that the participants were an adult in both observations.

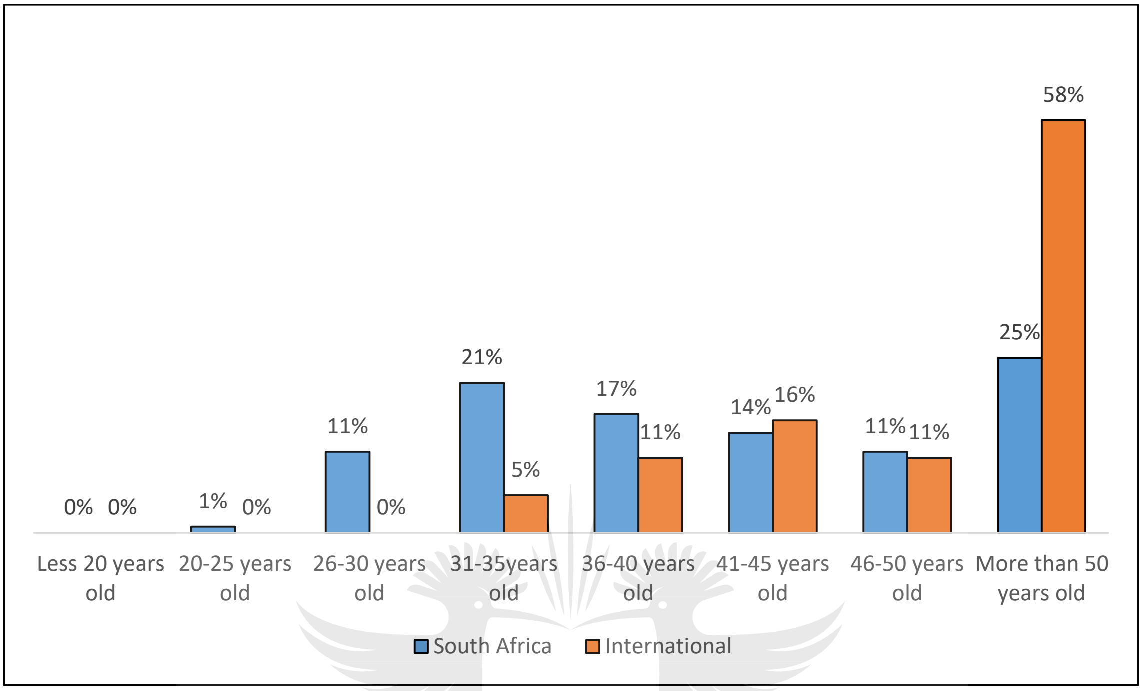

Figure 53: Evaluation of age distribution

Figure 54 compares the educational qualifications of the respondents from South Africa and the international community. In both observations majorities of the respondents had their post-graduate degrees; the South Africans had a total of 35% compared to 26% for the international community. In South Africa, 31% of the respondents indicated that they had baccalaureate degrees and only 26% of the international respondents selected this category. South Africa also led the post-matric diploma or certificate categories by 24% compared to 21% of the international responses. The result shows the participants had the relevant level of education to partake in the study.

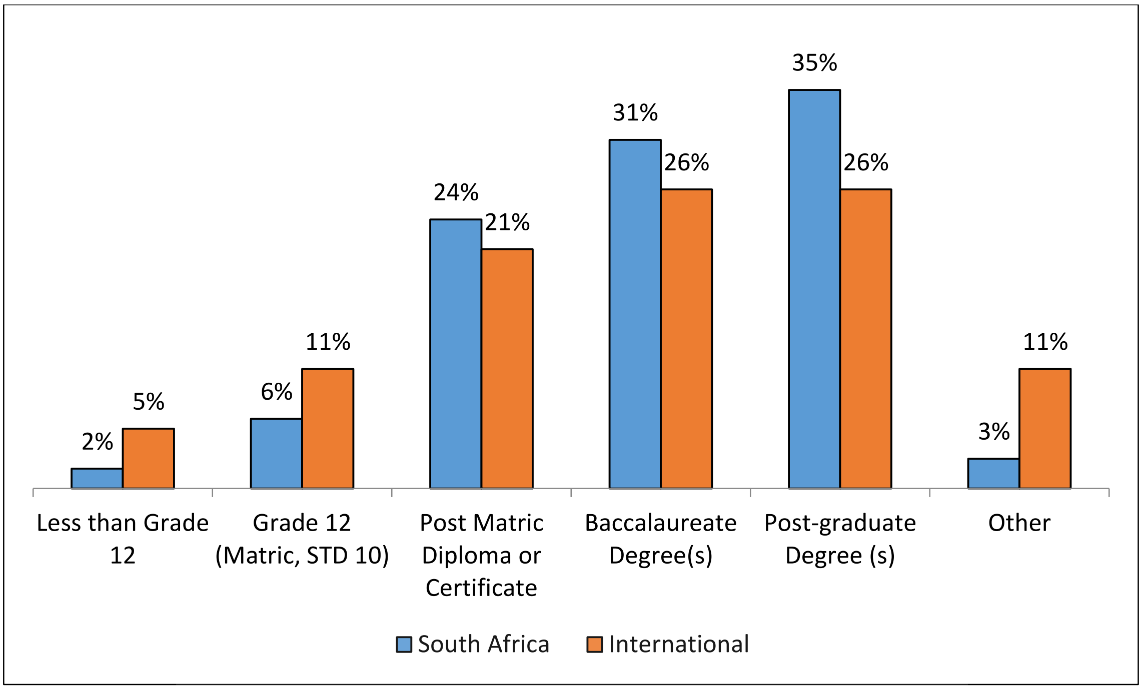

Figure 54: Evaluation of qualifications

Figure 55 compares the experience of the respondents and the majority (47%) of the respondents from the international community had experience of more than 20 years in the manufacturing industry. In SA only 27% of the respondents selected the experience of more than 20 years of working experience. The majority (32%) of the respondents in SA indicated that they had the experience ranging from 6-10 years in the industry.

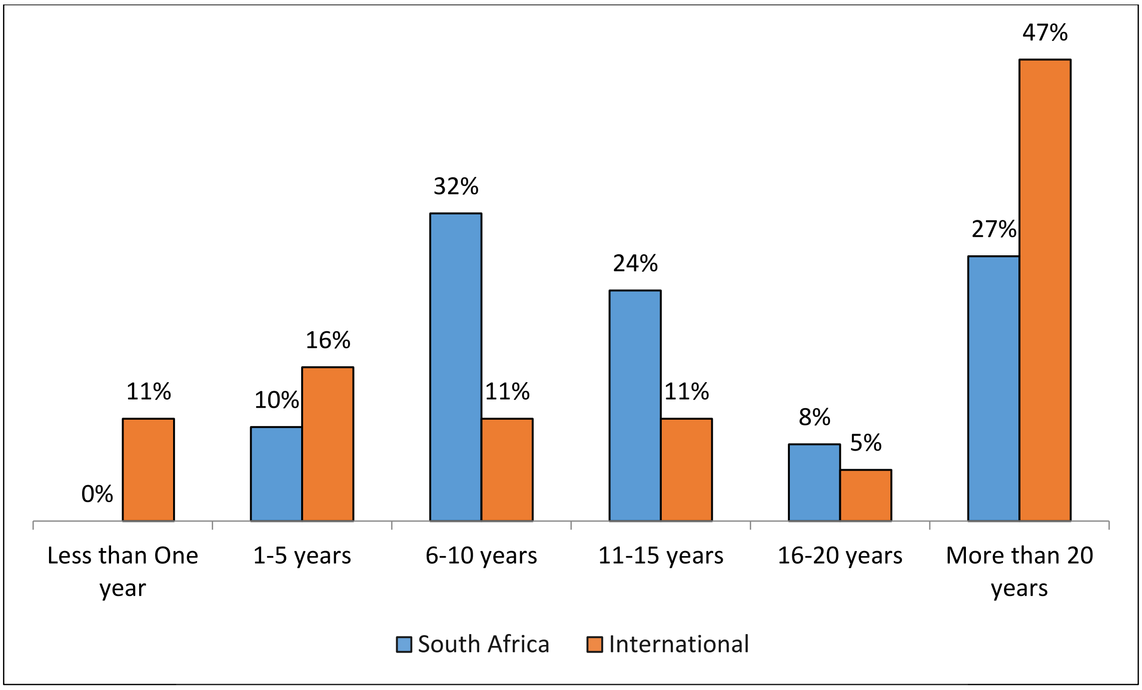

Figure 55: Comparison of experience

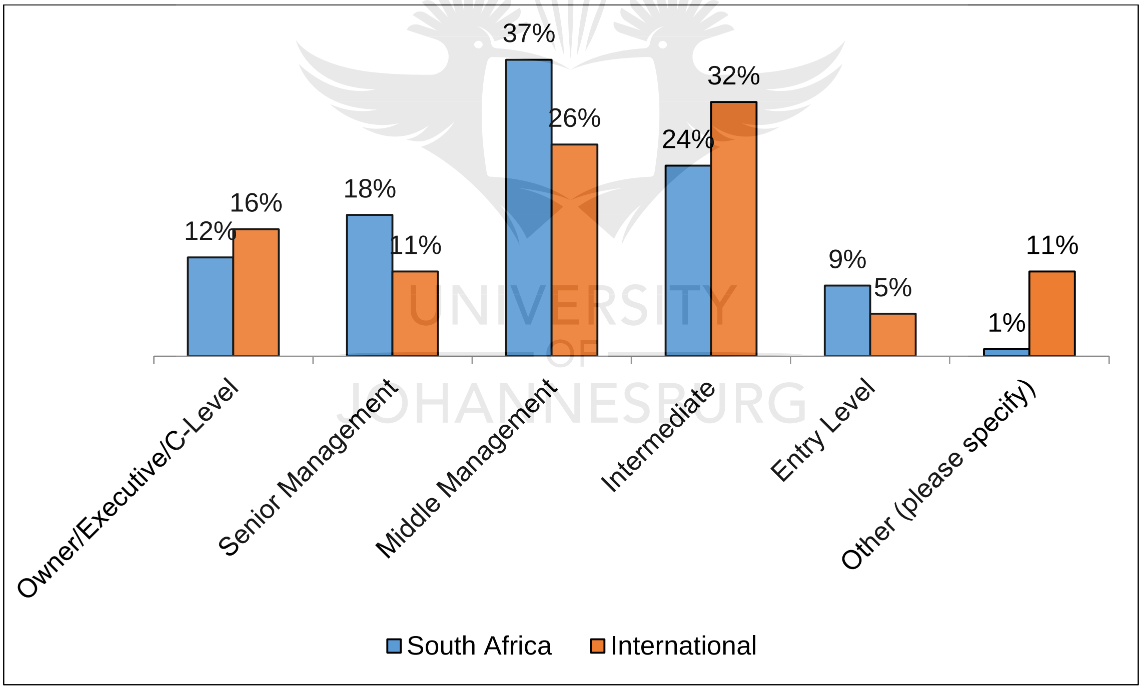

Figure 56: Comparison of positions

Figure 56 compares the job positions of the respondents and the result shows that majority (37%) of the respondents in South Africa were middle managers and the middle managers formed 32% of the international respondents. The result also indicated that the study attentions the attraction of Owner/ Executive managers, 16% of international responses and 12% from South Africa.

The result shows that participants were qualified individuals, who had years of experience in the manufacturing industry and they were in influential positions in their organisations. The South African respondents shared similar characteristics with the international participants when comparing the age group, educational qualifications, years of experience and their job title.

4.9.2 Benchmarking of quality management initiatives

Figure 57 compares the adoption of quality initiatives between South Africa and observations outside South African manufacturing industries.

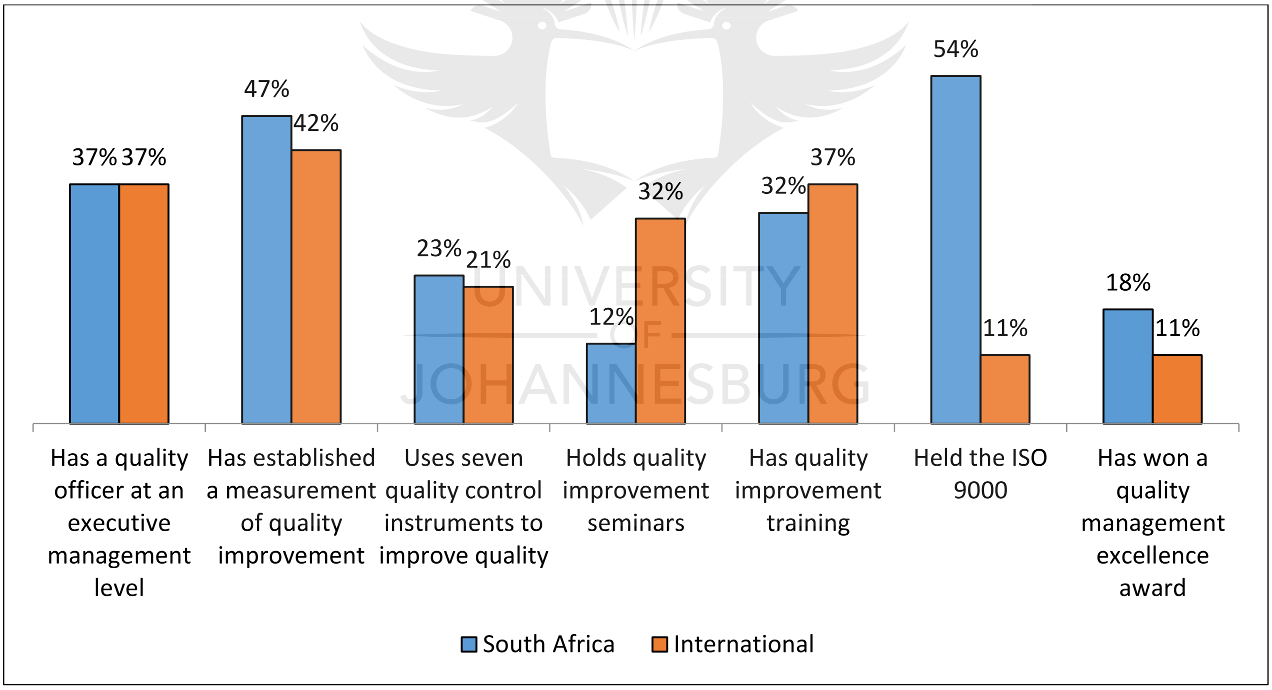

Figure 57: Benchmarking of quality initiatives

The result shows that the manufacturing companies in South Africa and outside South Africa had the quality officer at executive management, which was confirmed by 37% in both responses. South Africa scored the highest - 47%, compared to 42% from an international participant in the establishment of quality improvement measurements. With the use of quality management tools, the South African manufacturing industry scores 23% which were higher than 21% from its counterparts. The international participants (32%) indicated that they were holding quality improvement seminars and only 12% from South Africa confirmed that they had quality improvement seminars.

The majority (37%) of the international members indicated that they had quality improvement training and only 32% from South Africa confirmed that they had quality improvement training. The majority (54%) of the respondents in South Africa shows that they had an ISO 9000 certificate and only 11% indicated to have ISO 9000 certification from international participants. The majority (18%) of the South African respondents indicated that they have won quality management excellence awards and from the international participants only 11% indicated that they had won such an award.

4.9.3 Benchmarking leadership

Figure 58 presents the RII result of the items used to measure the concept of leadership in quality management.

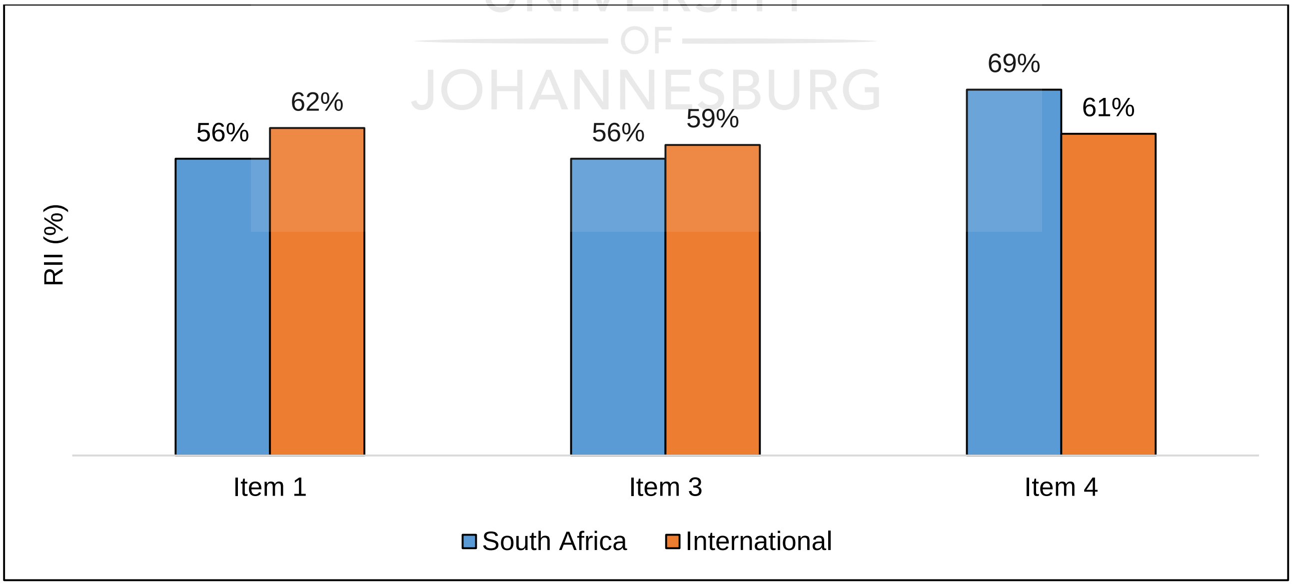

Figure 58: Benchmarking leadership

In item 1 had RII= 56% from South African result and the result from the international participant had RII= 62%. Item one was used to measure trust between management and employees and RII< 60% indicated the lack of trust between the two parties. According to Onatere-Ubrurhe (2016), RII < 60% indicate the lack of practice or existence of the concept of interest.

Item 3 assesses the involvement of employees in setting the business objectives and this item had RII = 56% in South Africa and from the international result the RII = 59%. The RII result identified the involvement of an employees in setting the business objective as an area which needs attention from both South Africa and internationally. The result further shows the involvement of employees in setting up the business objective was too minimal compared to the international observed result.

Item 4 assesses the ability of management to measure the effectiveness of the action plan. Both results had the RII > 60%, which means that companies do measure the effectiveness of the action plans. The result indicated that South Africa was more active in measuring the effectiveness of the action plans with RII= 69% compared to 61% of the international result. In overall, both results had the RII= 61% on the concept of leadership.

4.9.4 Benchmarking customer focus

Customer focus was assessed using five items and Figure 59 shows the RII result for each item. For more details in the description of the items (see Table 87 on page 324). The RII values for both results were more than 60%, which indicated that the customer focus was the important concept in the manufacturing industry. Item 5 which assessed the use of market research to solicit the customer requirement. The result of the international participants had RII= 72%, which was higher than 67% from South Africa.

Item 6 assessed the involvement of customers during product or service design and the result from South Africa indicated an RII= 72%, which was higher than the RII= 68% from the international result. The results show that the South African manufacturing industry value the importance of customer involvement during product or service design. The result (item 7) also shows that the manufacturing industry has established the process for the customer to log a complaint which was confirmed by RII= 78% from the international result and RII= 77% of the South African manufacturing industry.

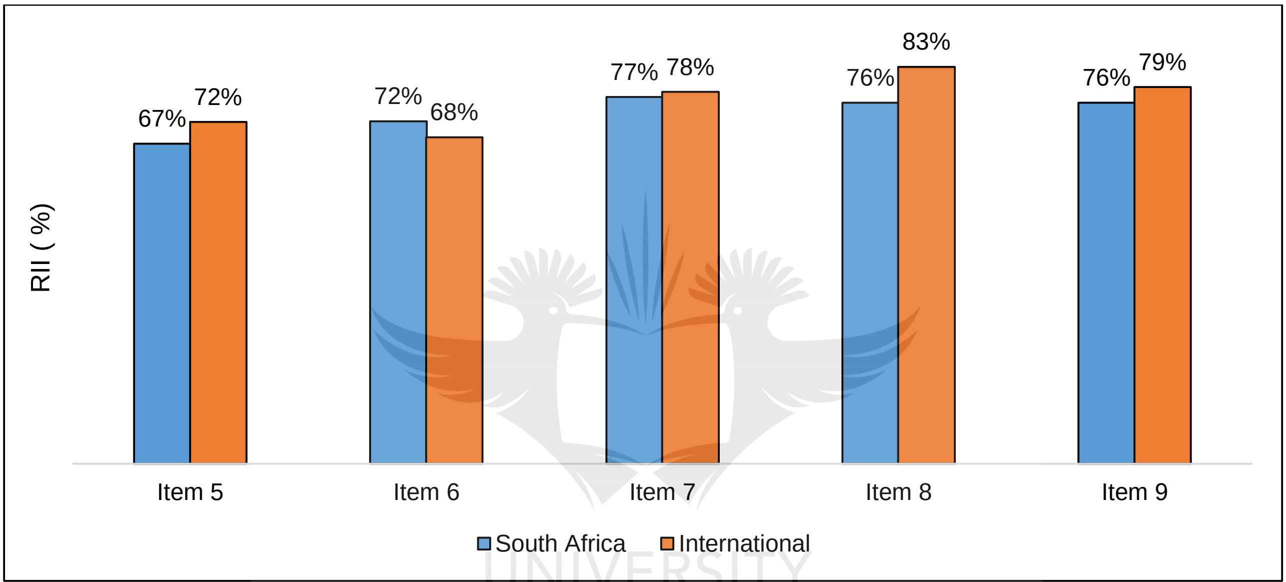

Figure 59: Benchmarking customer focus

Item 8 assessed the treatment of customer complaints and both results show that the customer complaints take priority in the manufacturing sector with the RII greater than 70% for both observations. But the international result had the highest RII= 83% and South African had RII= 76%. The result (item 9) further shows that the manufacturing industry used the customer feedback as the means for improvement and this was confirmed by RII =76% for the South African result and RII= 79% from the international result. Overall the international result had the highest RII= 76% (see Table 100 on page 369) and the South African result had an overall RII= 73% (see Table 99 on page 368)

4.9.5 Benchmarking process management

Process management was assessed using four items and Figure 60 shows the RII result for the four selected items. The South African result had the RII lower than that of the international result, for example, in item 10 the international responses had the RII= 80% and South Africa had the RII = 69%. Item 10 assessed the visibility of workflows in the workplace. The international respondents show that the workflows were highly visible in their workplace, The South African indicated a gap of about 11% (80% -69%) between the two observations.

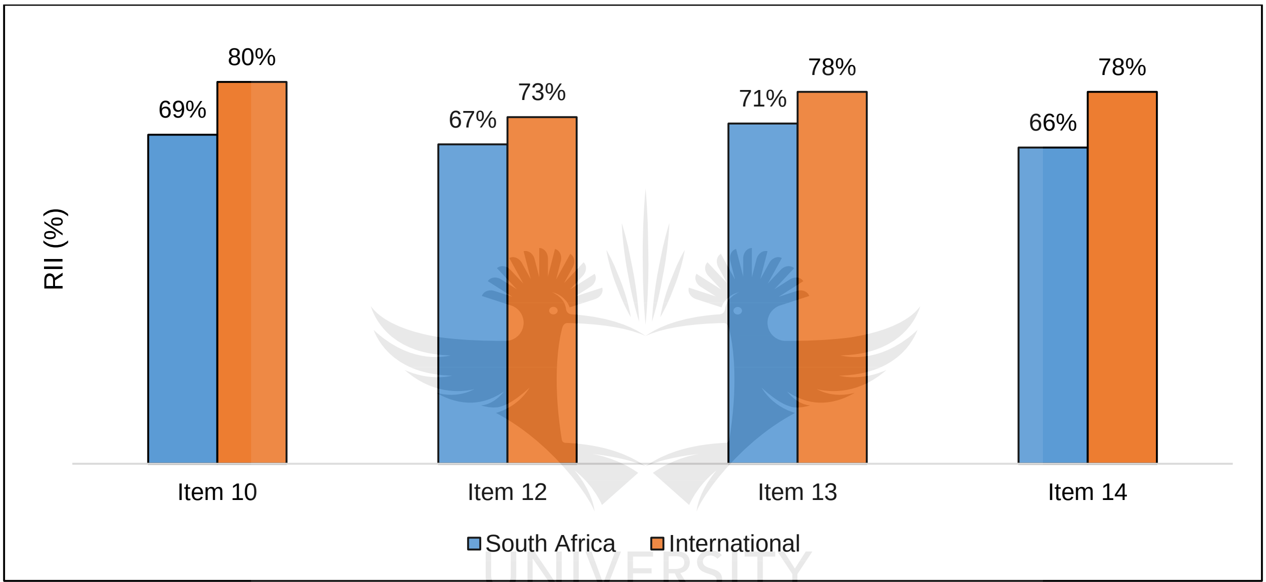

Figure 60: Benchmarking process management

Item 12 assessed the measurement of the process performance and the international responses which had the RII= 73% and South Africa had the RII= 67%. The result of item 13 indicated that the process was designed to allow smooth communication flow, which was indicated by RII= 78% of international responses and RII= 71% from South Africa. Item 14 asked the respondents if they had regular training to create awareness of the business processes. The international responses had the RII= 78%, which indicated that there was such training. The South African result also indicated that there was such training with RII= 66% and there was a gap of 12% (78% - 66%) between the two observations. Overall the international result had the highest RII= 77% (see Table 100 on page 369) and the South African result had an overall RII= 68% (see Table 99 on page 368)

4.9.6 Benchmarking business result focus

The business result focus was assessed using four items and Figure 61 presents the RII result for each item. The outer circle in Figure 61 presented the result of international observation and the inner circle shows the result from South Africa. The result shows that both responses had RII > 60%. Item 40 asked the respondents to indicate if their organisations had established key performance indicators to manage the business result. The responses from South Africa had the highest RII=74% and international responses had the RII = 66%.

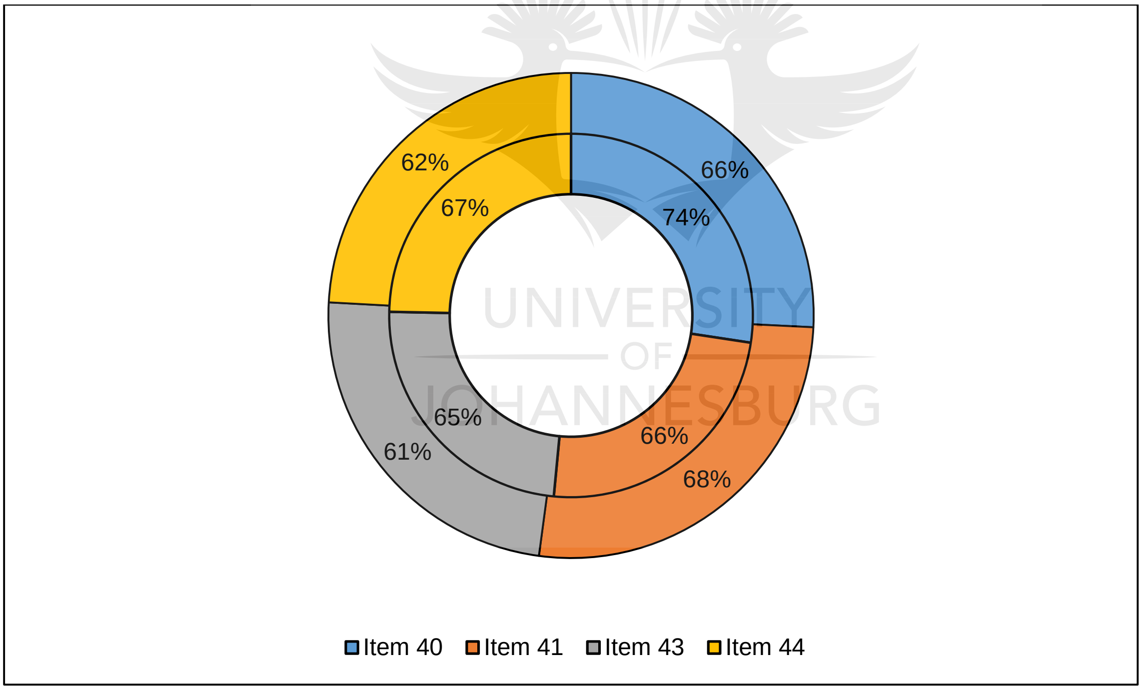

Figure 61: Benchmarking business result focus

Item 41 asked the respondents their level of agreement with the statement “There are war rooms to discuss performance” from strongly disagree to strongly agree. In this item, the international responses had the highest RII = 68% and South Africa had RII= 66%. Item 43 assessed the real-time visibility of business result. In item 43 the responses from South

Africa had the RII = 65%, which was higher that RII= 61% of international responses. Item 44 asked the respondents if there was a clear understanding of factors influencing the business result. The responses from South Africa had the highest RII = 67% and the international responses had R = 62%. Overall the international result had the RII= 64% (see Table 100 on page 369) and the South African result had an overall RII= 68% (see Table 99 on page 368)

4.9.7 Benchmarking employee focus

Employee focus was assessed using three items and the result was presented in Figure 62. In item 15 the respondents were requested to select their level of agreement from ‘strongly disagree’ to ‘strongly agree’ with the statement “In my organisation, employees prefer to remain with the organisation rather than work elsewhere”.

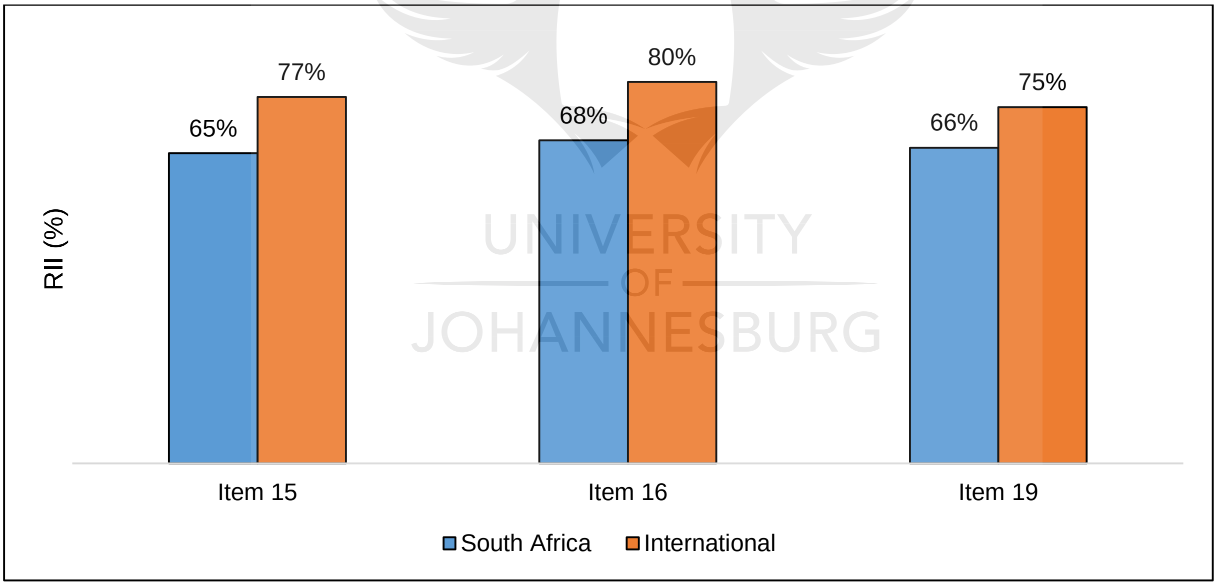

Figure 62: Benchmarking employee focus

The result shows that employees were loyal to their organisation with was confirmed by RII > 60% from both international responses and South African result. The international result had RII=77% and South African result had the RII= 65%, which means the South Africans were less likely to remain with one company, compared to their international counterparts. Item 16 assessed the ability to create an environment which encourages the employee to perform to the best of their ability. The international responses had the RII= 80% and South Africa was lagging behind with RII= 68%; there was a gap of 12% (80%-68%) between the two results. Item 19 assess the ability of the management to recognise job performance and the international responses had the RII= 75%, which was more than the RII= 66% from South Africa. In overall the international result had the highest RII= 77% (see Table 100 on page 369) and the South African result had an overall RII= 66% (see Table 99 on page 368)

4.9.8 Benchmarking cost of conformance

Cost of conformance consists of four items which were all assessed using the Likert scale items. As shown in Figure 63, both the international result and the South African result had RII > 60%, which indicate the importance of cost of conformance in the manufacturing sector. South African results were below the international result in all cost items in the cost of conformance category. In overall the international result had the highest RII= 76% (see Table 100 on page 369) and the South African result had an overall RII= 70% (see Table 99 on page 368)

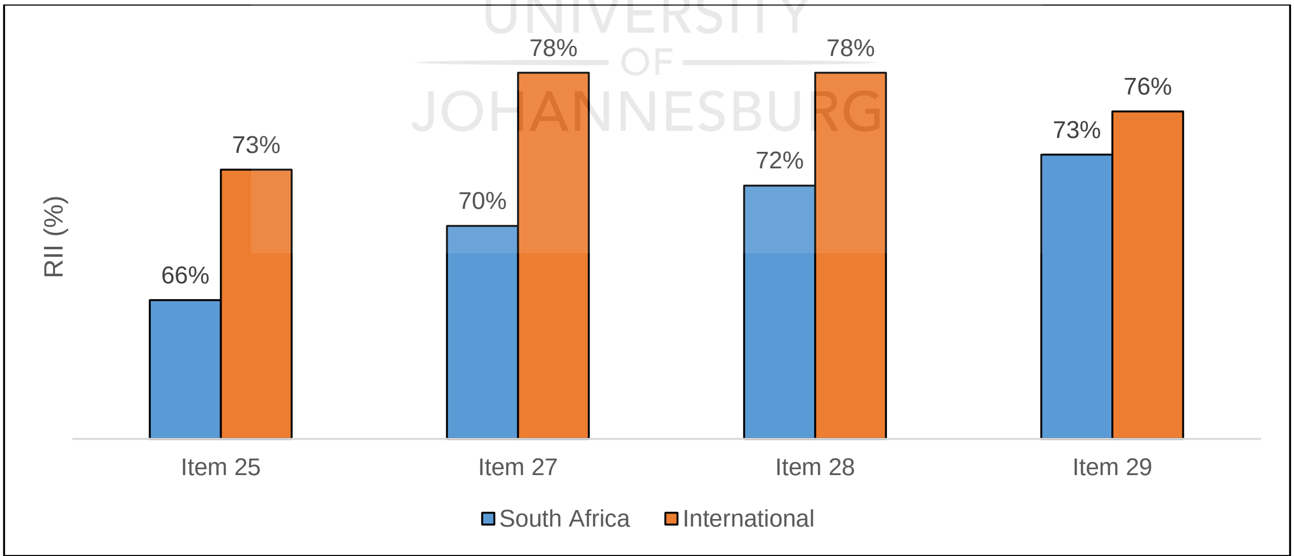

Figure 63: Benchmarking cost of conformance

4.9.9 Benchmarking failure cost

The assessment of failure cost in industries was assessed using three items as indicated in Figure 64. Item 32 assessed the ability of the organisation to assess the cost related to re-inspection and retest. In this item 32, the international results had the RII= 69%, which was higher than RII= 67% observed from South Africa.

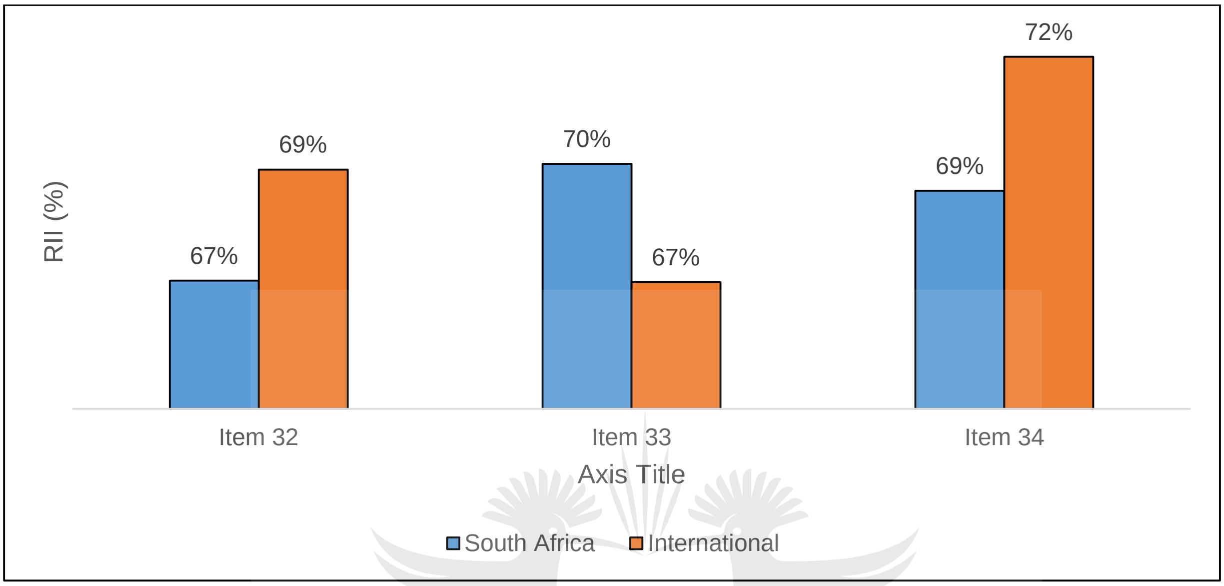

Figure 64: Benchmarking failure cost

South Africa dominated the result in item 33, which was asking the respondents to select their level of agreement with the statement "The organisation assesses the cost related to scrap due to poor quality". The result from South Africa had RII= 70%, which was more than RII= 67% of international responses. Item 34 asked about the management of cost related to design correction and both result shows that the manufacturing industry assess the cost related to design correction. The international result had the RII of 72% and South African had RII of 69% which that the international companies were more concern about cost related to design correction. In overall the international result had the highest RII= 69% (see Table 100 on page 369) and the South African result had an overall RII= 69% (see Table 99 on page 368)

4.9.10 Benchmarking hidden cost

Hidden cost was assessed using four items (item 36 to 39) and the results were presented in Figure 65. In this category, the international result outperformed the South African observations, for example, in item 36 the international responses had the RII= 72% which was higher than 68% from South Africa. Item 36 asks if the organisations had the systems in place to estimate the price of resource utilisation and from the results both the international and South African manufacturing companies assess cost associated with the utilisation of resources. In item 39 (The corporation has a system in place to estimate the cost related to delays from the suppliers) both results had the same RII value of 64%. In overall the international result had the highest RII= 68% (see Table 100 on page 369) and the South African result had an overall RII= 63% (see Table 99 on page 368)

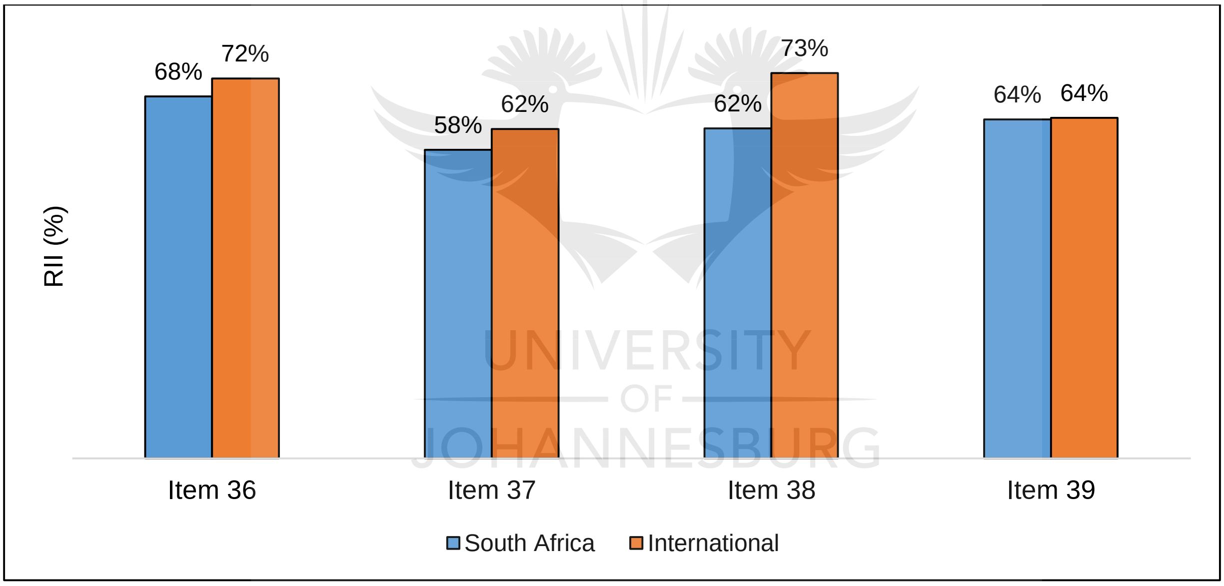

Figure 65: Benchmarking hidden cost

4.10 Chapter summary

The chapter presented the findings from a total of 138 respondents (119 from the South African manufacturing industry and 19 from the international manufacturing sector). The first section presented the observations from the South African manufacturing sector, which was followed by the missing data analysis and the strategy used to replace the missing data. The third section presented the factor analysis, which included exploratory factor analysis and conformity factor analysis for both quality management and cost of quality factors. The factor analysis result was used to calculate the average extracted variances and maximum shared variances. The average extracted variance and maximum shared variance were used to judge the construct validity of the survey questionnaire and the result was presented in this chapter. The chapter also presented the internal consistency which was used to judge the ability of the selected items to measure the same concept.

The chapter also presented the statistical tests which were used to check the relationship between quality management variables and cost of quality categories. After the correlation analysis, the chapter presented multiple linear regression analysis which provided the amount of variance explained by quality management variables in the cost of quality categories. The variables which were the best predictors of the cost of quality categories were also presented in this chapter.

The chapter further presented the maturity of the quality management practice in South African manufacturing industry. Lastly, the chapter compared the quality management practice with that of the international responses using the relative importance index. The next chapter provides an interpretation of the results.

5. CHAPTER 5: DISCUSSION AND INTERPRETATION OF FINDINGS

5.1. Introduction

The study investigates two main concepts - quality management and cost of quality within the South African manufacturing industry and benchmarking the practices with the international responses. Chapter one paved the background of the study, provided the problem statement, study objectives, and justification. Chapter two reviewed how quality management and cost of quality has changed over the years and was used to develop the theoretical foundation and the survey questionnaires. Chapter three detailed the research methodology adopted for the research, the step by step process adopted to analyse data and assess study rigor. The previous section, Chapter four, provided the pieces of information and the process outputs from dismantling and regrouping of statistical data. The main purpose of this chapter is to provide the reflection and the meaning of the result in Chapter four.

Section 5.1 introduces the chapter and details the layout while section 5.2 presents the finding on the responses and the demographic information. Section 5.3 presents the finding of the missing data analysis and the strategy employed to deal with missing data. Section 5.4 presented the findings on the validity and reliability of the study. The relationship between quality management factors and cost of quality categories was presented in section 5.5. The findings on the ability of the quality management factors to predict the cost of quality categories and the quality management factors, which were highly associated with the cost of quality categories are presented in section 5.6. Section 5.7 presents findings on the quality management maturity of the South African industry. Sections 5.8 presents findings on the benchmarking analysis between the South African manufacturing industry and global responses.

5.2. Responses and demographic information

The study used a survey and literature review as a research method, and the data were collected using a questionnaire supported by an online platform (Survey Monkey). The snowball sampling approach played a critical role in identifying the target sample members. The industry bodies, companies, individuals who were known to the research team, and scholars were requested to provide the support to reach the target sample. The study collected a total of one hundred and nineteen (119) responses within South Africa. The respondents came from eight (8) provinces (Gauteng, KwaZulu Natal, Mpumalanga, North West, Limpopo, Western Cape, Free State, and Eastern Cape). The responses confirmed the report by South African Trade and Industry (2017) suggesting that Gauteng province had the highest average (46.5%) number of manufacturing companies. While Northern Cape was averaging below 2%, hence this study did not receive any response from the Northern Cape. The study received responses from all provinces which had the highest density of manufacturing companies (South African Trade and Industry , 2017). From the international responses the study received the feedback from 19 respondents and more details were covered under section 4.9.

The demographic information plays a critical role in identifying the sample characteristics, sample representation and judging the study rigor (Arnold & Göb., 2009). The study assessed the demographic information using age group, educational level, experience, job title, and respondents' locations. According to Nithyashri and Kulanthaivel (2012), the result in Section 4.3.1 shows that all the participants in the study were adult to senior adult. Simonds and Brock (2014) maintain that this age group value knowledge and pay more attention to details as they advance within the group. The study confirms the claims by other authors since the majority of the respondents had postgraduate degrees (45%) and baccalaureate degrees (31%).

The respondents had experience ranging from one (1) years to more than 20 years of working experience. The spread of experience indicated that the study benefited from people who were still learning the environment to people who fully understood the environment. The study also received support from all management levels; with the majority coming from middle management, intermediate managers, senior management, executive managers.

According to Mtengezo (2018), middle management, senior management, and executives devote more time to planning and developing organisational strategies. The intermediate managers provide a link between the workforce and senior management and plays a critical role in providing feedback on the effectiveness of the business strategies. People who participated in the study influence business decisions and also had the highest level of education and experience. Hence, the findings of this research can be trusted as the true reflection of quality management and the cost of quality practices from the respondents' environments.

5.3. Missing data analysis

According to Soley-Bori (2013), it is always not easy to completely avoid the missing data in the survey results. Hence, the current research had 0.611% of the missing data from 14 respondents in 12 questionnaire items. The Little’s MCAR test (Chi-Square = 479.346, Df = 453, p =0.189) indicated that data were missing completely at random. Roni (2014) suggested multiple amputations and expected maximisation to replace the missing values in the instances where the data are missing completely at random. Hence, the current research used expected maximisation as the method of replacing the missing data and maintain the sample size.

5.4. Reliability and Validity

The study investigated the concepts which cannot be measured using the standard assessment meter (Justyna, 2016). The concept of quality management and cost of quality practice depends on the perceptions; preferences, knowledge, and people's behaviour. The research used the literature review to identify the variables to measure the concept of interest and developed the framework which was used to develop the survey questionnaires.

The questionnaires were subjected to a different validation process to ensure that they were measuring the intended concept. The first processes included the face validation and content validation, which involved the senior statistician, Survey Monkey questionnaire expert, quality management experts and scholars from the University of Johannesburg. During the face validation process, the volunteers complained about the length of the survey questionnaires and suggested some items be removed from the survey. The research team held meetings to review the comments which resulted in the reduction of the questionnaires from 85 to 50 questions.

The later process was the construct validity which was done during the data analysis process. The research team did not identify any set of survey questionnaire which could be used without modification to collect the required data to answer the research questions. As a result, the team developed a new set of the survey questionnaire. Hence, the study used factor analysis as part of construct validity. The literature suggested factor analysis as a useful tool to measure the latent variables (de Winter & Dodou, 2012). The exploratory factor analysis was used to reduce the number of observed variables, determine how well the factors were associated with their respective items to refine and improve the quality of the theoretical framework. Watson (2017) suggested exploratory factor analysis in the instances when the research does not make any assumptions about the relationship of the factors. The author suggests a conformity factor analysis to confirm the theory. The current research followed the step-by-step process to perform the factor analysis as suggested in (Williams, et al., 2012). The interpretation of the results was presented in the subsections below.

5.4.1. Reliability and validity of quality management

The first process in assessing the study rigor after data collection was to calculate the internal consistency on the theoretical framework for both quality management and cost of quality. This section presents the result of quality management concepts which had five factors (Process management, customer focus, business result focus, employee focus, and leadership) after face and content validation. The theoretical framework for quality management factors had internal consistency ranging from 0.64 to 0.82. According to Uma and Roger (2009), the internal consistency for the theoretical framework was within the acceptable range of 0.6 to 1. However, the literature recommends the internal consistency of 0.7 and above (Saunders, et al., 2009; Walliman, 2011).

5.4.1.1. Exploratory factor analysis of quality management

Before performing the factor analysis, it was important to first identify items which had weak measures of sample adequacy (MSA) <0.6 (Field, 2009). Using the systematic approach detailed by Field (2009) and Pallant (2007) to first determine the items with the lowest MSA, remove them from the calculations and re-run the analysis again until all items with MSA less 0.6 are removed. As a result, three items were removed from the quality management items. The subsequent process was to assess the overall sample adequacy using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity. The quality management items had the KMO index of 0.760 which was more than the recommended 0.6 (Watson, 2017). The Bartlett’s test (chi-square = 922.90 (Df =210) and p-value = 0.000) confirmed that sample size was adequate for factor analysis (Williams, et al., 2012).

The research used the principal axis factoring and the eigenvalue greater than one as the method for factor reduction. The scree plot also provided the ability to extract the factors for further analysis. The study further used the Promax as a factor rotation method in SPSS. The analysis retained a total of six factors which had the eigenvalue greater than one; the factors explained a total of 65.279% of the total variance in quality management. Out of the six factors extracted, factor 6 was excluded from further analysis because it was only loading to one item as a result only five factors were retained for further analysis. Table 58 provides the parameters of quality management factors after exploratory factor analysis.

Table 58: Quality management latent variables parameters after EFA

Latent variables	Number of items	Loading range	Internal consistency	Variance explained %	Cumulative %
Process management (Factor 1)	4	0.601 to 0.924	0.82	24.95	24.95
Customer focus (Factor 2)	5	0.642 to 0.717	0.82	13.84	38.79
Business result focus (Factor 3)	4	0.564 to 0.769	0.77	7.93	46.72
Employee focus (Factor 4)	3	0.599 to 0.872	0.74	7.66	54.38
Leadership (Factor 5)	3	0.379 to 1.039	0.70	5.65	60.02

The findings show that after exploratory factor analysis all the items were highly associated with their respective factors with the high internal consistency of 0.7 and above. The factors explained the highest variance of 60.02% of the concept of quality management. The exploratory factor analysis improved the internal consistency of the factors by removing items which were inadequately associated with their respective factors.

5.4.1.2. Confirmatory factor analysis of quality management

The study used the structural equation modeling in AMOS software version 25 to perform a confirmatory factor analysis and the results were used for construct validity (Awang, 2012). To perform the confirmatory factor analysis the researchers had the choice to choose from the theoretical framework or empirical framework for the exploratory factor analysis. The result of the exploratory factor analysis was selected for confirmatory factor analysis because of the higher internal consistency.

The empirical result from exploratory factor analysis had the best model fit. The model had chi-square statistic of 167.011 (DF =142) and p-value = 0.074 which was more than 0.05. The model also had CMIN/Df = 1.17 < 3, CFI = 0.965> 0. 90, GFI = 0.877 < 0.9, RMSEA = 0.039 < 0.05 and SRMR = 0.065 < 0.08. The model was accepted as a good fit for the data because model fit indices were within the acceptable range (Ghazali, et al., 2018). Table 59 shows the findings on the quality management concept after confirmatory factor analysis. The result shows that all factors had the highest factor loading and the factors explained the high variance in their respective items.

Table 59: Quality management factors after confirmatory factor analysis

Latent variables	**Items**	**R- square**	**Factor loading**	**Cronbach's Alpha**	**AVE ≥ 0.5**	**AVE ≥ MSV**
Process management	Item 10	0.55	0.74	0.82	0.6 > 0.5	0.6 > 0.3
	Item 12	0.37	0.61			
	Item 13	0.78	0.89			
	Item 14	0.52	0.72			
Customer focus	Item 5	0.44	0.67	0.82	0.5 = 0.5	0.5 > 0.4
	Item 6	0.25	0.50			
	Item 7	0.53	0.75			
	Item 8	0.51	0.72			
	Item 9	0.61	0.78			
Business result focus	Item 40	0.36	0.60	0.77	0.5 = 0.5	0.5 > 0.2
	Item 41	0.28	0.53			
	Item 43	0.59	0.77			
	Item 44	0.68	0.81			
Employee focus	Item 15	0.33	0.58	0.74	0.5 = 0.5	0.5 > 0.2
	Item 16	0.78	0.88			
	Item 19	0.43	0.66			
Leadership	Item 1	0.39	0.63	0.70	0.5 = 0.5	0.5 > 0.4
	Item 3	0.30	0.55			
	Item 4	0.73	0.86			

The process management had four items with the factor loading ranging from 0.61 to 0.89. The high factor loading indicates that the items were good indicators of process management (Schumacker, 2010). Item 13 appeared to be the perfect indicator for process management with the highest factor loading 0.89 and process management explained the total variance of 78% in item 13. The items for process management had an internal consistency of 0.82. The high Cronbach's Alpha shows that the items were measuring the same thing (Saunders, et al., 2009). The items had the average variance extracted 0.6; which was more than 0.5. According to Awang (2012) and Roni (2014), the average variance extracted greater than 0.5 shows that the construct had convergent validity. Process management also had the maximum shared variance of 0.3 which was less than 0.6. Essmui, et al., (2014) maintained that the average variance extracted greater than maximum shared variance is the better indicator of the construct validity. The findings show that the process management latent variable had both reliability and construct validity.

Customer focus had five items with the factor loading ranging from 0.5 to 0.78. Item 9 appeared to be the best indicator of customer focus with the factor loading of 0.78 and customer focus explained the total variance of 61% in item 9. The items for customer focus were complementing each other well with the internal consistency of 0.82. The items also shared the total variance of 0.5 which indicated the convergent validity. Customer focus had the maximum share variance of 0.4 less than 0.5, which shows that the latent variables had both convergent validity and discriminant validity, which translates to construct validity.

Business result focus had a total of four items with the factor loading ranging from 0.53 to 0.81. Item 44 was identified as the perfect indicator of business result focus on the factor loading of 0.81 and the corresponding R square of 0.68. The business result focus items were complementing each other well with the Cronbach's Alpha of 0.77 and the total shared variances of 0.5. The business result focus also had both convergent validity (AVE = 0.5) and discriminant validity (AVE ≥ MSV) (Roni, 2014; Essmui, et al., 2014).

Employee focus had three items with the factor loading ranging from 0.58 to 0.88 and R square, ranging 0.33 to 0.78, which indicated that the items were adequately associated with employee focus (Schumacker & Lomax, 2010). Employee focus had the internal consistency of 0.74 greater than the recommended 0.7 (Saunders, et al., 2009). The items measuring the construct of employee focus had the average variance extracted of 0.5 which shows the convergent validity (Awang, 2012). The concept also had the maximum shared variance of 0.2, which was last than the average variance extracted of 0.5, which indicated that the concept had construct validity (Essmui, et al., 2014; Roni, 2014)

Leadership had a total of three items with the factor loading ranging from 0.35 to 0.86 and R square ranging from 0.30 to 0.73. The factor loading and R square result show that the item was strongly associated with leadership (Schumacker, 2010). The items had the internal consistency of 0.7 which was within the acceptable range (Roni, 2014). The items measuring the concept of leadership had an average variance of 0.5 and the maximum shared variance of 0.4. The findings show that the concept of leadership had both convergent validity (AVE = 0.5) and discriminant validity (AVE ≥ MSV) (Essmui, et al., 2014).

All the quality management factors had good factor loading of their respective items (factor loading ≥ 0.3), which shows the good relationship between items and (Schumacker & Lomax, 2010). All quality management factors had the Cronbach's Alpha of 0.7 and above which shows that the items were complementing each other in measuring their respective factors (Saunders, et al., 2009). The items also had the average variance extracted of 0.5 and above which was the best indicator of convergent validity (Awang, 2012). The average shared variance was greater than the maximum shared variance in all factors which indicated discriminant validity. The presence of convergent validity and discriminant validity represent construct validity (Brown, 2000; Schumacker & Lomax, 2010). The findings indicated that the results generated from the quality management factors can be trusted because the results had both reliability and validity.

5.4.2. Reliability and validity of CoQ

The theoretical framework for the cost of quality (CoQ) had four factors which were appraisal cost, prevention cost, failure cost, and hidden cost. The factors had a total of five items each which equate to twenty items for the cost of quality. The factors had high internal consistency and the results are presented in Table 60. The higher internal consistency of the four factors confirmed the result of the face and content validity.

Table 60: Internal consistency for CoQ theoretical framework

Latent variables	Cronbach's Alpha
Appraisal cost	0.87 (N = 5)
Preventive cost	0.89 (N = 5)
Failure cost	0.88 (N = 5)
Hidden cost	0.86 (N = 5)

5.4.2.1. Exploratory factor analysis for CoQ

Although the theoretical framework had higher internal consistency; it was important to refine the questionnaire items because they were never assessed for construct validity before. Like the previous section, the first process was to identify the items which had a low measure of sample adequacy (MSA). All the twenty items had the SMA greater than 0.6, as a result, no item was removed for further analysis. Overall, the CoQ had the KMO index of 0.86 higher than the recommended 0.6 and Bartlett's test of Sphericity result (Chi-Square = 1407.24 (DF = 190) and p-value < 0.05) confirmed that the sample was sufficient for factor analysis.

The principal axis factoring and the eigenvalue greater than one were used as the strategy for factor extraction. The study used the Promax for factor rotation and the analysis retained the total of three factors which had the eigenvalue greater than one. The retained factors explained the total cumulative variance of 62.82%. The exploratory factor analysis result combined the items for appraisal cost and prevention cost into one factor. Crosby's cost of quality model grouped the two cost categories and called them the cost of conformance (CoC) (Sower, et al., 2007; Trehan, et al., 2015). The study adopted the Crosby's approach and named the emerged factor cost of conformance. Table 61 shows the CoQ parameters after the exploratory factor analysis.

Table 61: CoQ latent variables parameters after EFA

Latent variables	Number of items	Loading range	Internal consistency	Variance explained %	Cumulative %
Cost of conformance	10	0.529 to 0.931	0.91	44.02	44.02
Failure cost	5	0.622 to 0.819	0.88	9.79	53.81
Hidden cost	5	0.459 to 0.891	0.86	9.02	62.82

The findings show that the factors were highly correlated to their respective items. Cost of conformance had the factor loading ranging from 0.529 to 0.931 with the highest internal consistency of 0.91 and explained the total variance of 44.02%. Likewise, failure cost had five items loading from 0.622 to 0.819 with the internal consistency of 0.88 and explained the total variance of 9.79%. Hidden cost also had five factor loading from 0.459 to 0.891 with the internal consistency of 0.86 and explained the total variance of 9.02%. The result shows that the items were highly associated with their respective factors and they were complementing each other well to measure their latent variables (Pallant, 2007; Field, 2009; Roni, 2014).

5.4.2.2. Confirmatory factor analysis for CoQ

The factors from exploratory factor analysis were used for confirmatory factor analysis to assess the convergent validity, discriminant validity and construct validity. The model had the chi-square statistics of 401.85 (DF =167) and p-value = 0.000 which was less 0.05 and definitely rejected the assumption of a good fit. The model also had CMIN/DF = 2.41< 3 which was within the acceptable range. The model had the CFI =0.84 which was less than

0.9, RMSEA = 0.11 more than 0.08. According to Hooper et al., (2008) the RMSEA ranging between 0.05 and 0.1 shows fair fit and greater than 0.1 shows poor fit and 0.11 was out of range. The model had SRMR = 0.074 which was within the range of 0.05 and 0.08. Awang (2012) and Ghazali, et al., (2018) recommended the removal of items with the factor loading of 0.6 and below to improve model fit. The research adopted the advice from other authors as a result nine items were systematical removed from CoQ structural equation model.

The final model indicated the improvement with CMIN/DF = 1.82 which was within the acceptable range. The model had the CFI =0.95 which was more than 0.9, RMSEA = 0.08 less than 0.1, SRMR = 0.06 which was within the range of 0.05 and 0.08. The final model was accepted for further analysis because most of the model fit indices were within the acceptable range.

Table 62: CoQ factors after confirmatory factor analysis

Latent variables	**Label**	**Factor loading λ (standardised)**	**Cronbach's Alpha after CFA**	**Convergent validity AVE ≥ 0.5**	**Discriminant validity AVE > MSV**
Cost of conformance	Item 29	0.75	0.85	0.6 > 0.5	0.6 > 0.3
	Item 28	0.86			
	Item 27	0.76			
	Item 25	0.72			
Failure cost	Item 34	0.89	0.84	0.7 > 0.5	0.7 > 0.3
	Item 33	0.87			
	Item 32	0.67			
Hidden cost	Item 39	0.86	0.86	0.6 > 0.5	0.6 > 0.3
	Item 38	0.84			
	Item 37	0.71			
	Item 36	0.74			

Cost of conformance had four items with the factor loading ranging from 0.72 to 0.86. Item 28 appeared to be the best indicator of the cost of conformance with the factor loading of 0.86 and the R-square of 0.74. Cost of conformance items had the internal consistency of 0.85, the average variance extracted of 0.6 and the maximum shared variance of 0.3. The high internal consistency shows that the items were complementing each other very well.

The average variance extracted of 0.6 shows that there was convergent among the items and maximum shared variance of 0.3 shows that the factor was unique from other factors. The presence of convergent validity (AVE> 0.5) and discriminant validity (AVE > MSV) are indicators of construct validity (Schumacker & Lomax, 2010). Hence, cost of conformance factor demonstrated both reliability and construct validity.

Failure cost had three items with the factor loading ranging from 0.67 to 0.89. Item 34 was found to be the best indicator of failure cost with the factor loading of 0.89 and the R-square of 0.79. The items for failure cost had the internal consistency of 0.84, the average variance extracted of 0.7, and a maximum shared variance of 0.3. Again, the findings show that the result had both reliability and construct validity.

Hidden cost had four items with the factor loading ranging from 0.71 to 0.86. Item 39 and 38 were found to be the best indicators of hidden costs with the respective factor loading of 0.86 and 0.84. The hidden cost items had the internal consistency of 0.86, the average variance extracted of 0.6 and the maximum shared variance of 0.3. The findings show that all the cost of quality factors had both reliability and validity (Schumacker & Lomax, 2010). The result generated from quality management and cost of quality frameworks can be trusted because both concepts had reliability and validity.

5.5. The relationship between quality management factors and CoQ categories

Foidl and Felderer (2015) maintain that the growing interest in Industry 4.0 creates pressure on the already stress manufacturing industry as customers demand more for less. The pressure created by globalisation and Industry 4.0; made it compulsory for the organisation to buy into quality management practice. The literature cited the cost of quality as a way of measuring the effectiveness of the quality management system (Sower & Quarles, 2003; Taidi, 2015). Lari and Asllani (2013) demonstrated that the cost of quality could be adopted as an overall measure of business performance. Despite the power of quality management and cost of quality in improving the business performance; the authors on the current research did not identify any work which assessed the relationship between quality management factors and cost of quality categories.

This section presents the findings on the relationships between quality management factors and the cost of quality categories. The first section 5.5.1 presents the relationship between process management and each cost of quality categories (cost of conformance, failure, and hidden costs). Section 5.5.2 presents the findings on customer focus and cost of quality categories, while section 5.5.3 shows the findings on the correlation on business result focus on CoQ categories. The last two sections 5.5.4 and 5.5.5 present the correlations between costs of quality categories and employee focus and leadership.

5.5.1 The relationship between process management and CoQ categories

Table 63 provides the findings on the relationship between process management and the cost of quality categories.

Table 63: Correlation between process management and CoQ categories

Quality management factor	Cost of quality category	Pearson (r)	Sig. (p-value)
Process Management	Cost of conformance	0.248**	0.003
	Failure cost	0.187*	0.021
	Hidden cost	0.088	0.169
**. Correlation is significant at the 0.01 level (1-tailed).			
*. Correlation is significant at the 0.05 level (1-tailed).			

Process management has a critical role in business success and the implementation of quality improvement (Kwateng & Justice, 2017) Hence, the study finds the high correlation (r = 0.248 and p-value = 0.003) between process management and cost of conformance. Failure cost was also found to be positively correlated (r = 0.187) and the relationship was statistically significant at 0.05. Hidden cost was not highly correlated with process management (r = 0.088) and the relationship was significant at p-value =0.169 which shows that there was no relationship between the two factors.

5.5.2 The relationship between Customer focus and CoQ categories

Table 64 presents the findings on the correlation between customer focus and the cost of quality categories.

Table 64: Correlation between customer focus and CoQ categories

Quality Management factor	CoQ Category	Pearson (r)	Sig. (p-value)
Customer focus	Cost of conformance	0.285**	0.001
	Failure cost	0.146	0.056
	Hidden cost	0.058	0.266
**. Correlation is significant at the 0.01 level (1-tailed).			
*. Correlation is significant at the 0.05 level (1-tailed).			

Aniza (2014) maintained that the traditional approach of compiling the manufacturing statement hid the cost related to inefficiencies; as a result, the cost is transferred to the customer. The result provides the evidence that the customer focus was positively associated with cost of conformance and the relationship was statistically significant at p-value 0.01 (r = 0.285; p-value = 0.001). The result did not provide sufficient evidence to conclude that there was a relationship between customer focus and failure cost (r = 0.146; p-value =0.056). Similar to a hidden cost, the study did not provide enough evidence to conclude the existence of the relationship between customer focus and hidden costs (r = 0.058; p-value = 0.266). The cost of conformance was the only cost of quality categories which was identified to correlate with the customer focus.

5.5.3 The relationship between business result focus and CoQ categories

The business result focus is about setting the key performance indicators, development of processes to continue to improve business performance and meeting customer requirements (Kedem, 2004; Foster, 2013). Table 65 shows the findings on the business result focus and cost of quality categories.

Table 65: Correlation between business result focus and CoQ categories

Quality Management factor	CoQ Category	Pearson (r)	Sig. (p-value)
Business result focus	Cost of conformance	0.359**	0.000
	Failure cost	0.379**	0.000
	Hidden cost	0.463**	0.000
**. Correlation is significant at the 0.01 level (1-tailed).			
*. Correlation is significant at the 0.05 level (1-tailed).			

The result shows that the business result focus was positively associated with all cost of quality categories. The relationship between cost of conformance and business result focus was positive and statistically significant at p-value = 0.01 (r = 0.359; p-value = 0.000). Failure cost was positively associated with the business result focus, and the relationship was statistically significant at p-values = 0.01 (r =0.379; p-value = 0.000). Hidden cost was also found to be positively correlated with business result focus and the relationship was statistically significant at p-value = 0.01 (r= 0.463; p-value = 0.000). The result shows that business result focus is highly associated with the cost of quality.

5.5.4 The relationship between employee focus and CoQ categories

According to Matlhape and Lessing (2002), companies do not reflect employees in their asset register, but they know that people are the most critical asset to business existence. The author further suggests that people are the most vital assets which can quickly leave the organisation or become a hazard if they are not well looked after. Table 66 shows the findings on the relationship between employee focus and the cost of quality categories. Employee focus was found to be positively correlated with all the cost of quality categories.

Table 66: Correlation between employee focus and CoQ categories

Quality Management factor	CoQ Category	Pearson (r)	Sig. (p-value)
Employee focus	Cost of conformance	0.399**	0.000
	Failure cost	0.285**	0.001
	Hidden cost	0.376**	0.000
**. Correlation is significant at the 0.01 level (1-tailed).			
*. Correlation is significant at the 0.05 level (1-tailed).			

The relationship between conformance cost and employee focus was found to be positive and statistically significant at 0.01 (r = 0.399; p-value = 0.000). The failure cost was also positively associated with the employee focus and statistically significant at 0.01 (r = 0.285; p-value = 0.001). Likewise, the hidden cost was also found to be positively correlated with employee focus, and the relationship was statistically significant (r = 0.376; p-value = 0.000). Employee focus was also found to be highly associated with all cost of quality categories.

5.5.5 The relationship between Leadership and CoQ categories

Leadership is the foundation responsible for a generation of business values, sharing of resources, and hierarchy in decision making (Corfield & Paton, 2016). Patti et al., (2001) identified leadership as an important component of quality improvement. Table 67 shows the relationship between leadership and cost of quality categories.

Table 67: Correlation between leadership and CoQ categories

Quality Management factor	CoQ Category	Pearson (r)	Sig. (p-value)
Leadership	Cost of conformance	0.155*	0.046
	Failure cost	0.041	0.330
	Hidden cost	0.078	0.200
**. Correlation is significant at the 0.01 level (1-tailed).			
*. Correlation is significant at the 0.05 level (1-tailed).			

Cost of conformance was positively associated with the leadership and the relationship was statistically significant at 0.05 (r = 0.155; p-value = 0.046). The result did not provide sufficient evidence to conclude that the relationship between leadership and failure cost was not equal to zero with p-value = 0.330. Similar to a hidden cost, the result did not provide sufficient evidence that the correlation between leadership and the hidden cost was not equal to zero at p-value = 0.200.

5.6. Quality management model to predict the cost of quality categories

There is agreement among authors that the cost of quality is the critical element in the successful implementation of the quality management system (Sower, et al., 2007; Mitreva, et al., 2017). The authors in the field of quality management use different variables to assess the concept of quality management which includes leadership, continues improvement and customer focus (Ahmad & Karimah, 2008; Masejane, 2012). Likewise, the current research used process management, customer focus, business result focus, employee focus and leadership as a measure of quality management. The five elements were used to explore how well the quality management factors predict the cost of conformance, failure cost and hidden cost and the findings were presented in this section. The section also presented the amount of variance explained by quality management factors in each cost of quality categories. The section further presented the quality management predictors which were highly associated with the cost of quality categories and multiple linear regression model.

The section consists of three sections with section 5.6.1 detailing the findings of the model to predict the cost of conformance as an outcome variable and leadership, customer focus, business result focus and employee focus as independent variables. Section 5.6.2 presents the findings of the model to predict failure cost, while section 5.6.3 detail the model to predict hidden cost as dependent variables and leadership, customer focus, business result focus and employee focus as independent variables.

5.6.1 Ability of quality management factors to predict the cost of conformance

The findings indicated that quality management made up of process management, customer focus, business result focus, employee focus, and leadership was highly correlated (R =

0.544) with the cost of conformance. The independent variables explain 29.6 % of the cost of conformance, and the model significantly predicts the cost of conformance (F (5; 111) = 9.329 and p = 0.000). According to Tranmer and Elliot (2008), the five quality management variables are the best predictors of the cost of conformance. Cost of conformance is the total cost accumulated to ensure that the product or service meets all the requirement (Özkan & Karaibrahimoğlu, 2013; Moschidis, et al., 2016). The findings of the current research confirmed that the cost of conformance depends on the quality management system.

The findings identified business result focus (p-value =0.005) and employee focus (p-value = 0.001) as two variables which were highly associated with the cost of conformance in the model. The relationship was strong, such that the unit increase in business result focus led to a 0.245 increase in the cost of conformance when other variables remain constant. Likewise, the unit increase in employee focus leads to 0.258 increase in the cost of conformance when other variables remain constant. The result was expected because compliance with requirements requires establishing key performance indicators, processes to monitor and control performance, which is part of business result focus (Sukdeo, 2016). The authors in the field of quality management suggested that the success of the quality management systems requires experience employee, who are motivated to support the systems (Foster, 2013). Hence, it was not surprising that employee focus was highly correlated with conformance cost.

5.6.2 Ability of quality management factors to predict failure cost

The findings show a positive relationship (R = 0.475) between the failure cost and the quality management variables (process management, customer focus, business result focus, employee focus, and leadership). The quality management variables explained a total variance of 22.5% of the failure cost. The five quality management variables were identified as the best predictors of failure cost with (F (5; 111) = 6.457 and p = 0.000). Failure cost includes expenses to fix the error, warranty payment and scrapping of material due to non-conformance (Šatanová, et al., 2007; Taidi, 2015). As the quality management system of the organisation matures the failure cost is expected to go down with time (Palikhe, 2013; Xiaofen, 2013; Trehan, et al., 2015). As a result, it was expected that failure cost would be highly associated with quality management factors.

The result identified business result focus (p-value = 0.000) and process management (p-value = 0.043) as highly associated with failure cost. The relationship was such that a unit increase in business result focus led to a 0.356 increase in failure cost when other variables in the model remain constant. Process management was also highly associated with failure cost; the findings show that the unit increase in process management results in an estimated increase of 0.240 in failure cost when other variables remain unchanged. Again, it was expected that getting real-time information on business performance and the establishment of a war room would improve performance and maximise the benefit associated with a reduction of failure cost (Schiffauerova & Thomson, 2006). Creating awareness about processes, procedures and removing barriers to communication are the key elements of creating certainty in the workplace and minimising the room for errors (Lunenburg, 2010). Hence, it was not surprising to find a strong correlation between failure cost and process management in the quality management model.

There are three factors of quality management (customer focus, employee focus, and leadership) which were identified not highly correlated with failure cost. Customer focus had the p-value of 0.366 greater than 0.05, which was expected. Customer focus is about collecting customer requirements and creating processes to ensure customer satisfaction. Employee focus had the p-value of 0.081 higher than 0.05; indicating that employee focus was not highly associated with failure cost. The employee focus was expected to be highly associated with failure cost because the employee focus is about retaining skills, rewarding performance and creating a conducive environment for employees to realise their performance (Jyoti & Murali, 2011; Zhao, 2016). Likewise, leadership was also not highly associated with failure cost in the model with a p-value of 0.076 greater than 0.05. The result was expected because leadership is about creating trust in the workplace, measurement of the action plan and involving people in setting the business objective (Foster, 2013). The items used to measure leadership does not translate to scrapping of material as a result of poor quality and cost related to customer complaints.

5.6.3 Ability of quality management factors to predict the hidden cost

Cheah, et al., (2011) defined hidden cost as expenses which are easy to ignore like underutilisation of resources, delays from the suppliers and the cost of missed opportunity. The hidden cost affects the business performance and it is the function of the quality management system to disclose hidden cost (Chiu, 2002; MijoĀ & MijoĀ, 2015). This section presents the findings on the ability of the quality management factors made up of process management, customer focus, business result focus, employee focus and leadership to predict hidden cost. The findings show a strong positive correlation (R = 0.532) between quality management variables and hidden cost. Quality management variables explained a total variance of 28.3% of the hidden costs. The findings also show that quality management variables were a good predictor of hidden costs (F (5; 111) = 8.770 and p-value = 0.000).

The business result focus and employee focus were identified as the two predictors which were highly associated with hidden costs. The relationship between failure cost and business result focus was statistically significant at p-value less 0.05. The findings show that the unit increase in business result focus lead to 0.414 increments in the benefit associated with hidden costs. Employee focus was also found to be highly associated with hidden costs and the relationship was statistically significant at p-value less 0.05. The result shows that the unit increase in employee focus results in 0.221 of hidden costs when other variables in the model remain unchanged. The result was expected because by retaining the skills and creating an environment that encourages employees to perform to the best of their abilities reduce delays and underutilisation of resources (Evans & Lindsay, 2013; PMI, 2013). Process management; customer focus and leadership were not highly associated with the hidden cost.

5.7. Quality management maturity

Companies today are operating in a very fluid environment; they are forced to adopt global practices and constantly improve the performance to remain in business (Foidl & Felderer, 2015). Quality management gurus invented the concept of quality management maturity as the self-assessment tools for the companies to gauge themselves against the market leaders (Paul, et al., 2008; Baškarada, 2008). Egberonbe, et al., (2017) suggested that quality management maturity assessment can be in the form of descriptive or comparative assessment. The current research used the descriptive approach to assess the quality management maturity of the South African manufacturing industry. Patti, et al., (2001) and Xiaofen (2013) maintained that there is no agreed framework to assess quality management maturity. Hence, the current study depended on the literature to identify the variables to assess quality management maturity and eight constructs were selected to measure the quality management maturity of the South African manufacturing industry.

Patti et al., (2001) suggested that the quality management maturity starts from the adoption of quality tools, having a quality office at an executive level and participate in the quality award programme. The findings (see Figure 26 in section 4.3.2) indicated that South African manufacturing companies viewed ISO 9000 certification as an important component of quality management with 54% of the respondent indicating their companies held the ISO 9000 certificate. The result further shows that the industry has established key performance indicators to improve quality which was confirmed by 47% of the respondents. Only 37% of the respondents confirmed that there is a quality officer at an executive management level. While the other 32% maintained that they have quality improvement training and the use of seven tools of quality management was not very much adopted in the industry, with only 23% of the respondents confirming that they were using seven tools.

The result has shown that the industry was not too committed to a quality management excellence award programme and holding quality improvement seminars. The study results confirmed the findings in Sukdeo (2016), suggesting the South African companies value, quality management certifications but they don’t participate in quality management excellence awards. Table 68 shows the finding of the quality management maturity of the South African manufacturing sector.

Table 68: Quality management maturity of the South African manufacturing sector

Variables	Level 1: Informal Approach	Level 2: Reactive Approach	Level 3: Stable Approach	Level 4: Continual improvement approach	Level 5: World Class
Customer focus				3.667	
Cost of conformance				3.587	
Failure cost			3.432		
Process management			3.416		
Business result focus			3.397		
Employee focus			3.317		
Hidden cost			3.188		
Leadership			3.034		
Overall maturity score			**3.380**		

The quality management systems are designed and implemented to customer satisfaction at the centre (Tummala & Tang, 1996; Foster, 2013). The study findings confirmed the claims from the literature and identified the customer focus as the factor which receives the highest attention in the South African industry at level 4 in the maturity grid. Companies at continuous improvement levels use proactive approaches to collect customer information and in keeping their customers engaged with the company products and services (Foster, 2013). Mehra and Ranganathan (2008), identified a strong relationship between the customer satisfaction and profitability of the organisation. In support Klefsjö, et al. (2008) regarded customer focus as a prerequisite for business excellence. Which means, that although the South African manufacturing industry scored high in customer focus there was room for improvement.

Cost of conformance was also identified to be at level 4 in the quality management maturity grid; which was the second highest area of practice in the South African manufacturing industry. Cost of conformance is widely understood as the total cost of ensuring that the product or service is error-free to reduce the cost of failure cost or any undesirable outcome (Vaxevanidis, et al., 2009; Palikhe, 2013). The cost activities in the cost of conformance include the cost of training, inspections and testing of the product or service (Abdelsalam & Gad, 2009). The result shows that the industry collects and manages the cost related to quality compliance and meeting customer needs.

Other quality management factors were identified to be at level 3 in the quality management grid with the failure cost topping the list. Failure cost is defined as the expense accumulated to fix errors and reimbursing affected parties as the result of product or service failure (Vaxevanidis & Petropoulos, 2008). The study by Plewa, et al., (2016) identified the decrease in failure cost as the quality management system matures. The findings of other authors indicated the need for improvement in failure cost practice for the companies to realise the benefits associated with quality management practice.

The findings show that the South African manufacturing industry adopted a stable approach to process management. Process management is a critical part of quality improvement and identification of the bottlenecks in the system (Freimut, et al., 2005; Foster, 2013). Egberonbe, et al., (2017) maintained that process management is critical in converting business resources into a product or service. The author further suggested that process management integrates people with technology to improve business performance. The result shows that the South African manufacturing industry was not enjoying the benefit of the world-class organisation in process management at level 3.

The result also indicated that the industry was using a stable approach, level 3 in the quality management maturity grid to business result focus. Business result focus is about the establishment of key performance indicators, the establishment of processes to review the past business performance and identification of constraints in achieving the desired result (Foster, 2013; Egberonbe, et al., 2017). The result indicated the need for improvement in business result focus of the South African manufacturing industry to disclose the issues blocking the industry from receiving the desired performance and become a world-class industry.

The study also used employee focus as the measure of quality management maturity. Aletaiby, et al., (2017) defined employee focus as the foundation for total quality management. Mosadeghrad (2014) viewed employees as the internal customers who need to be empowered and aligned with the business objectives to meet the needs of the external customers or clients. The study identified employee focus to be at level 3 in the quality management grid. The employee focus was identified as one of the areas which need attention in the South African manufacturing industry to move to level 5 of the quality management maturity grid.

Hidden cost was found to be one of the areas which were less practiced in the South African manufacturing companies with a mean score of 3.188. The hidden cost is defined as the cost of opportunity lost; the cost of asset utilisation and the cost of delays (Schiffauerova &

Thomson, 2006; Trehan, et al., 2015). Mahmood and Kureshi (2014) maintained that the hidden cost remains hidden because the most used financial system does not have the capability to accommodate the hidden cost. The research findings confirmed the claims from other authors by identifying the hidden costs as less managed cost of quality category in the South African manufacturing industry.

Leadership was one of the quality management factors which were used to assess quality management maturity of the South African manufacturing industry. Leadership is viewed as an important factor in the successful implementation of a quality management system (Osayawe & McAndrew, 2005; Lunenburg, 2010). Leadership is the process of creating trust between employees and management; involving people in setting the business objective as well as monitoring and controlling the action plan (Egberonbe, et al., 2017). The research identified leadership in the South African manufacturing industries to be at level 3 with a lower mean score of 3.034. The result indicated that the manufacturing companies in South Africa need to invest in leadership skill and involve people in setting the business objectives for the sector to move to level 5 in the quality management maturity grid.

The South African manufacturing industry was identified to have the overall maturity score of 3.380 which place the industry in level 3, stable approach. According to Baškarada (2008), the organisation understands the importance of quality and deal with quality issues opened. The founder of quality management maturity grid, Crosby, suggested that at level 3, companies report only 8% of the cost of quality, but the actual cost is about 12% (Patti, et al., 2001; Baškarada, 2008; Rosnah, et al., 2010). The authors suggested that as the organisation improves its quality management the total cost of quality goes down. At the world-class organiation the cost of quality is estimated to be 2,5% of the total revenue. The claim by other authors indicated the need for the South African manufacturing industry to invest in quality improvement and cost of quality practice.

5.8. Benchmarking of quality management

Foster (2013, p. 160) defined benchmarking as the process of learning from others. The process of benchmarking involves the identification of partners, the key performance indicators and the type of data collection methods (Adewunmi, et al., 2015). The research used the online survey platform to collect data required for benchmarking study. The data were collected over a period of 4 months (October 2018 to January 2019). The researchers collected a total of 119 responses in South Africa and 19 from the international responses. The highest percentage of the international responses (90%) come from the United States of America, 5% from Nigeria and 5% from Canada. The respondents were requested to share their views on the five-point Likert scale items and the results were computed using the relative important index. The findings in Table 69 indicated that the South African responses had the lower RII in most areas when compared to the international responses except business result focus and leadership.

Table 69: Summary of benchmarking result

Variables	South Africa (RII %)	Global (RII %)
Leadership	61%	61%
Customer focus	73%	76%
Business result focus	68%	64%
Process Management	68%	77%
Employee focus	66%	77%
Cost of conformance	70%	76%
Failure cost	69%	69%
Hidden cost	63%	68%

Both the South African responses and the international feedback had the same RII of 61% under leadership. Leadership was assessed using three items (item 1; item 3 and item 4) and the South African results had the RII of 56% in both item 1 and Item 3. Item 1 asks the respondent to share their opinions on the statement “Senior management and employees trust each other”. The RII of 56%< 60% indicated that there was no trust between the senior management team and employee in the South Africa manufacturing companies (Onatere-Ubrurhe, 2016). Item 3 ask the respondents “How involved are employees in setting the company's objectives?”; again the RII of 56% indicated that leaders did not involve employees in setting the business objectives. Hence; leadership was identified to be at level 3 in the quality management maturity grid in section 5.7. According to Egberonbe, et al., (2017) leaders have the critical role of aligning employees with the business objective and influencing people to perform to the best of their ability. Patti, et al., (2001) mentioned that leaders should promote a culture of quality improvement and motivate people.

Item 4 (Management measures the effectiveness of the action plans) was found to have the highest RII of 69%, which lifted the average RII score for leadership to 61%. The result shows that leaders were mainly concerned about the result and overlooked the employee involvement and building trust. Under the leadership, the international result had the RII greater than 60%, except item 3 which had the RII of 59%. The findings indicated the problem with employee involvement in setting up the business objectives from both international respondents and South African responses. Sower, et al., (2007) and Kaur (2009) identified leadership, commitment, and involvement as some of the reasons for quality management initiative failure.

The customer focus was found to be the higher area of focus for both South African and international responses. The international responses had the RII of 76% and the South African responses had the RII of 73%. All the five items used to measure customer focus had the RII greater than 60% in both South African and international responses.

On the business result focus, the South African responses had the RII of 68%, which was greater than 64% of the international responses. The RII greater than 60% indicated that the majority of the respondents agreed with the Likert scale items (Onatere-Ubrurhe , 2016). Majority of the South African responses agreed that there were key performance indicators adapted to manage the business performance; and there were displays, indicating real-time business performance.

The process management was assessed using four items (Item 10, item 12, item 13 and item 14). The international result had the RII of 77% and all the items had the RII greater than 70%. The result shows that the international responses regarded the process management as the most important quality management factor in their workplace. The South African responses had the RII of 68%which was less than international RII value.

According to Gul, et al., (2012) the employee is the most critical part of the business success; they need to be aligned, motivated, trained and given authority to do their job. In the current research, employee focus was assessed using three items (Item 15, item 16 and item 19). Again, the international responses had the RII of 77%, which was higher than 66% from South African responses. The results indicated that manufacturing companies had employee focus, but the international responses had more people who agreed to the items compared to South African responses.

ASQ (2016) global state of the quality report indicated that the world-class companies prioritise investment in quality. The report further indicated that world-class companies measure the impact associated with quality improvement. To benchmark, the investment in quality improvement and cost of ensuring that quality is achieved the research used the ten elements of the cost of conformance. The international responses had the RII of 76% of the cost of conformance which was higher than 70% from the South African responses. Both observations indicated that the cost of conformance was an important factor for the respondents more especially the international respondents.

The effectiveness of the quality management system is judged on the ability to reduce errors, scrap rate and service or product recall. Hence, the study assessed the management and reporting of failure cost. The respondents were requested to indicate if they were assessing the cost related to the product or service recall, the cost related to scrap due to poor quality and cost related to design corrections among other items. Both observations had RII greater than 60%. The both result had the RII of 69% in the failure cost category, which indicated the respondents were measuring and reporting the failure cost.

The main goal to assess the cost of quality is to disclose the cost which is normally ignored by the traditional financial report also called hidden cost (Aniza, 2014). The cost items include but not limited to the lost opportunities, utilisation of resources and cost associated with delays (Özkan & Karaibrahimoğlu, 2013). The international responses had the overall RII of 68% under hidden cost with all the items ranging from R = 62% to 73%. The South African responses had the overall RII of 63% with the individual scores ranging from RII = 58% to 68%.

Item 37 had the RII value of 58%, which means that the majority of the respondents disagree with the statement. Item 37 asks the respondents to share their opinion on the statement "There is an automated system to assess the cost related to quality activities" from 'strongly disagree' to 'strongly agree'. The RII of less than 60% indicated that the cost of quality was not automated in the South African manufacturing industry. Nel and Pretorius (2016) designed an automated cost of the quality management system with the aim of helping the industries to standardise the cost of quality reporting and eliminate the risk associated with the manual system.

5.9. Chapter summary

Chapter four presented the analysis and the study results; the main purpose of this chapter was to bring meaning to the findings using the literature and observations. The first portion of the chapter presented the findings on the demographic information, missing data, and validity and reliability on the concept of quality management and cost of quality. The remaining part of the chapter was arranged according to the research objectives.

The chapter discussed the findings on the relationship between process management and cost of conformance, failure cost, and hidden costs. The research identified a high correlation between the cost of conformance, failure cost, and process management. The findings indicated no relationship between hidden cost and process management. The chapter has also presented the findings on the correlation between customer focus and cost of quality categories. The findings indicated the cost of conformance as the only cost of quality category which was highly correlated with the customer focus. The findings did not provide enough evidence to claim the relationship between failure cost category, hidden cost category, and customer focus. The business result focus and employee focus were found to be highly associated with all cost of quality categories. The study found leadership to be correlated with the only cost of conformance category and there was no evidence to claim a correlation between failure cost, hidden cost categories and leadership.

The chapter also discussed the findings of the multiple linear regression model to predict the cost of quality categories and findings on the quality management factors which were highly associated with the cost of quality categories. The findings indicated a strong correlation between the cost of conformance and quality management predictors (process management, customer focus, business result focus, employee focus and leadership). The result identified employee focus and business result as the two factors which were highly associated with the cost of conformance in the quality management model made up of process management, customer focus, business result focus, employee focus and leadership. The quality management model was also identified to be a good predictor of failure cost. Business result focus and process management were found to be highly linked to failure cost categories. The hidden cost category was also found to be highly associated with quality management predictors. The study found the hidden cost to be a function of business result focus and employee focus.

The findings on the quality management maturity of the South African manufacturing industry and the meaning of the benchmarking result were presented in this chapter. The study found customer focus and cost of conformance to be at level 4 in the quality management grid and the other factors were identified to be at level 3. The study used eight factors to benchmark the quality management practice between South African manufacturing companies and other manufacturing companies in the world. The South African responses had lower scores in most cases except in leadership and business result focus. Under leadership, the South African responses and the international responses shared the same overall score. In business result focus the South African responses had the highest RII score compared to the international responses. The next chapter presents the recommendations, conclusions, limitations and further research.

6. CHAPTER 6: SUMMARY OF THE FINDINGS, CONCLUSION, AND RECOMMENDATIONS

6.1 Introduction

Chapter four and Chapter five dealt with the data analysis, presentation of the results and the interpretation of the results. Chapter six provides a link between the research findings and the study objectives introduced in Chapter one. The conclusion, recommendations, and limitations also form part of this chapter.

The study was focused to achieve the following objectives:

a) To derive from the literature the concepts of cost of quality and quality management

b) To explore the relationship between quality management elements and the cost of quality categories in the South African manufacturing sector

c) To explore the ability of the quality management factors to predict the cost of quality categories in the statistical model in the South African manufacturing sector

d) To identify the quality management factors which are highly associated with the cost of quality categories in the statistical model in the South African manufacturing sector

e) To identify the level of quality management maturity in the South African manufacturing industry

f) To benchmark quality management practice between the South African manufacturing industry and international manufacturing sector

The chapter consists of seven sections; section 6.1 introduces the chapter and provides the context. Section 6.2 links the research findings with the research objectives and summarises the findings for each objective. Section 6.3 provides the conclusions on the objectives based on the research findings. Section 6.4 provides the recommendations based on the conclusions and further research. Section 6.5 provides the contribution of the research to the body of knowledge and in practices. Section 6.6 provides the study limitation and followed by the chapter summary in section 6.7.

6.2 Summary of findings

The section provides the summary of the empirical findings and link between the findings and the research objectives. The findings of objective a) were presented in section 6.2.1, section 6.2.2 presented the findings on objective b), section 6.2.3 presented findings on objective c), section 6.2.4 presented the findings on objective d) and the last section 6.2.5 presented the findings on objective e).

6.2.1 The relationship between quality elements and the cost of quality categories

Table 70 shows the summary of the relationship between quality management factors and cost of quality categories.

Table 70: Summary of the relationship between quality management and CoQ factors

Factors	Cost of conformance	Failure cost	Hidden cost
Process Management	✓	✓	✕
Customer focus	✓	✕	✕
Business result focus	✓	✓	✓
Employee focus	✓	✓	✓
Leadership	✓	✕	✕

✓ There is a correlation
✕ There is no correlation

Cost of conformance category was found to be linked to all quality management factors, which confirmed that the cost of conformance is a total of ensuring the achievement to requirement. The failure cost category was associated with three quality management factors which are process management, business result focus, and employee focus. The study did not identify the relationship between customer focus, leadership, and failure cost category. The hidden cost category was identified to be associated with quality management factors which are business result focus and employee focus. The study did not identify the relationship process management, customer focus, leadership, and hidden costs.

6.2.2 The ability of quality management factors to predict the cost of quality categories

Table 71 shows that the quality management factors (process management, customer focus, business result focus, employee focus, and leadership) were found to be the best predictors of the cost of quality categories.

Table 71: Ability of quality management factors to predict cost of quality

Cost of quality categories	Correlation (R)	R Square	F Distribution
Cost of conformance	0.544	0.296	(F (5; 111) = 9.329 and p-value = 0.000)
Failure cost	0.475	0.225	(F (5; 111) = 6.457 and p-value = 0.000)
Hidden cost	0.532	0.283	(F (5; 111) = 8.770 and p-value = 0.000)
Predictors: Process management, Customer focus, Business result focus, Employee focus, Leadership			

The study found a strong relationship (R = 0.544) between quality management factors and cost of conformance. The findings indicated that the quality management factors explained a total variance of 29.6% of the cost of conformance. The five quality management factors were identified as the best predictors of the cost of conformance (F (5; 111) = 9.329 and p =0.000).

The findings also indicated a strong relationship (R = 0.475) between failure cost category and quality management factors (process management, customer focus, business result focus, employee focus, and leadership). The findings indicated that the five quality management factors explained a total variance of 22.5% on failure cost. The quality management factors were identified as the best predictors of failure cost category (F (5; 111) = 6.457 and p = 0.000).

The study further found hidden cost category to be highly associated (R = 0.532) with quality management factors. The quality management factors explained a total variance of 28.3% of the hidden costs. The quality management factors were found to be the best predictors of hidden costs (F (5; 111) = 8.770 and p-value = 0.000).

6.2.3 The quality management factors associated with the CoQ categories in the model

Table 72 provides the summary of quality management factors which were identified as the best predictors for each of the CoQ categories in the multiple linear regression model.

Table 72: Quality management factors highly associated with each CoQ categories

Factors	Cost of conformance	Failure cost	Hidden cost
Process Management		✓✓	
Customer focus			
Business result focus	✓✓	✓✓	✓✓
Employee focus	✓✓		✓✓
Leadership			

✓✓ Highly correlated with the outcome variable

The study found business result focus and employee focus to be the best predictors of the cost of conformance in the multiple linear regression model. The findings show that the unit increase in the business result focus led to a 0.245 increase in the cost of conformance when other variables remain constant. The findings indicated that the unit increase in the employee focus also leads to 0.258 increase in the cost of conformance when other variables remain constant in the model.

The study found process management and business result focus as two quality management factors which were mainly responsible for failure cost category. The findings indicated that the unit increase in business result focus lead to a 0.35 increase in the benefits of associated failure cost when other variables remain constant. The findings further show that the unit increase in process management lead to a 0.240 increase in the benefits associated with failure cost when other variables remain constant.

The study identified business result focus and employee focus as the main quality management factors which were highly associated with the hidden cost category. The findings show that the unit increase in the business result focus leads to 0.414 increase in the benefit associated with hidden costs. According to the research findings, the unit increase in the employee focus leads to 0.221 increase in the hidden cost.

The research further identifies business result focus as the most important quality management factor in the cost of quality. The business result focus has identified to be highly associated with all cost of quality categories. The employee focus was found to be associated with the second majority of two categories of cost of quality (hidden cost and cost of conformance). The process management was identified to be highly linked with failure cost. Customer focus and leadership were not highly associated with any cost of the quality category.

6.2.4 Quality management maturity in the South African manufacturing industry

The research found ISO 9000 certification to be the leading quality management initiative in the South African manufacturing companies. Second on the list was the establishment of measurement for quality improvement, which was followed by the appointment of the quality officer at the executive management level. The respondents also indicated that they had quality improvement training programmes. The research found that quality improvement seminar; the winning of the quality management excellence award and the use of quality management tools were not popular in the South African manufacturing industry.

The research found the customer focus and cost of conformance to be the high area of focus in the South African manufacturing industry at level 4. Other factors were found to be at level 3 with leadership and hidden costs at the lower end of the list. The overall maturity level of the South African manufacturing industry was found to be at level 3.

6.2.5 Benchmark quality management practice

The research used eight factors (Leadership, customer focus, business result focus, process management, employee focus, cost of conformance, failure cost and hidden costs) to compare quality management practice between South Africa and international participants. Under the leadership factor, the South African result share the same score (RII= 61%) with international responses. Under customer focus, the international responses had a higher score (RII =76%) and the South African responses had the RII of 73%. In business result focus South Africa had the highest score (RII= 68%) compared to international responses with RII of 64%. In process management, the international responses were found to have the RII of 77% more than 68% from South Africa. Under the employee focus, the international community had more focus employees than the South African manufacturing industry with the RII of 77% bigger than 66% from South Africa.

The research also used three categories of cost of quality (Cost of conformance, failure cost, and hidden costs) as key performance indicators for benchmarking purpose. The research found that the result of the international responses was higher than the South African responses. Under the cost of conformance category, the international responses had a higher RII value of 76% and South Africa had 70%. In the failure cost category, the international responses had the RII of 69 % and South Africa had 69%. Under hidden cost, the international responses also had a higher score of 68% and South Africa had 63%.

6.3 Conclusion

This section presents the conclusions derived from the research result and findings. The conclusion is presented in a logical fashion following the research objectives.

6.3.1 The relationship between quality management and CoQ factors

The study findings indicated that there is a positive relationship between some quality management factors and cost of quality categories. This confirms the claims from other authors suggesting that the cost of quality can be used as a measure for quality improvement (Sower and Quarles, 2003; Kaur, 2009; Mahmood and Kureshi, 2014). The research found the cost of conformance to be positively associated with all the quality management factors adopted in this research. This confirms that the cost of conformance categories is a summation of all cost required to meet the objectives.

The research found the failure cost category to be related to the process management, business result focus, and employee focus. This implies the three quality management factors are responsible for generating errors which result in failure cost. The study did not find enough evidence to relate the customer focus and the leadership to failure cost. Hence, the research team concluded that customer focus and leadership were not directly responsible for the failure cost category. This also implies that if the organisation is using failure cost as the measure of quality management, it will not be able to pick up customer focus and leadership.

The research found a hidden cost category to be generated by two quality management factors (business result focus and employee focus). This indicates that the companies which do not have established key performance indicators, war rooms to discuss performance and have no clue on what influences the business result is likely to have a high hidden cost. This is similar to the company which does not retain the skilled employees and which does not create an environment that encourages employees to perform to the best of their abilities. As the key performance indicator hidden cost category may not be able to pick up other quality management factors except employee focus and business result focus.

6.3.2 The ability of quality management factors to predict CoQ categories

The research used five quality management factors to predict the cost of quality categories in the multiple linear regression model. The findings indicated a high relationship (R =0.544) between the cost of conformance and quality management. The findings indicated that the five quality management factors explained the total variance of 29.6% of the cost of conformance. The quality management factors were found to be the best predictors of the cost of conformance. Hence, companies interested in understanding their cost of conformance can use the investments in the five quality management factors to predict the cost of conformance values.

The failure cost category was also found to be highly associated (R = 0.475) with quality management factors. The quality management factors explained the total variance of 22.5% of failure cost. The research found the five quality management factors to be better predictors of failure cost. This implies that the five quality management factors can be used to combat failure cost.

The hidden cost was also found to be highly associated (R = 0.532) with quality management factors. The quality management factors explained the total variance of 28.3% of the hidden costs. The quality management factors were also found to be the best predictors of hidden cost. This implies by investing in quality management the company will be able to disclose a portion of the hidden cost associated with the day to day running of the business.

6.3.3 Quality management factors highly associated with CoQ in a model

The research found business result focus and employee focus to be the two quality management factors which were highly associated with the cost of conformance. The research found that the unit increase business result focus lead to 0.245 increase in the cost of conformance when other variables remain constant in the model. Furthermore, the findings indicated an increase of 0.258 in the cost of conformance for every unit increase in the employee focus when other variables remain constant. This implies that business result focus and employee focus should take priority if the company is investing in the cost of conformance without ignoring other quality management factors.

The findings also identified process management and business result focus as the two main generators of failure cost. The findings indicated that the unit increase in the business result focus leads to 0.35 improvements to failure cost. Likewise, the findings show that the unit increase in process management let to 0.240 improvements in the failure cost. This means that for the companies who want to reduce the errors leading to failure cost; they should give more attention to process management and business result focus.

Again, the findings identified business result focus and employee focus as the main factors associated with the hidden cost category in the multiple linear regression model. The findings show that the unit increase in business result focus lead to 0.414 improvements in the hidden cost when other variables remain constant in the model. Similar to employee focus the unit increase in the employee focus was found to result in 0.221 improvements in the hidden cost when other variables remain constant. This implies that for the organisation to disclose the hidden costs the priority should go to business result focus and employee focus. The research further identified business result focus as the most important quality management factor in the CoQ because it was highly associated with all categories. The second important factor was employee focus which was identified to be highly associated with two cost of quality categories. The last important quality management factor was process management, which was identified to be highly associated with failure cost category.

6.3.4 Quality management maturity

The research used eight factors (process management, customer focus, business result focus, employee focus, leadership, cost of conformance, failure cost and hidden costs) to assess the quality management maturity of the South African manufacturing industry. The findings identified customer focus and cost of conformance to be at level 4. This implies that the South African manufacturing companies were highly concerned about their customers and the cost of achieving the requirement. The findings further confirmed that the two factors are regarded as the foundation of the quality management systems and the existence of business (Cheah, et al., 2011; Trehan, et al., 2015; Moschidis, et al., 2016).

Six factors (process management, business result focus, employee focus, leadership, failure cost, and hidden costs) were identified to be in level 3. This research found process management, business result focus, and employees to be highly related to failure cost and hidden cost. Kaur (2009) suggested that the cost of quality does not provide improvement, but the quality improvement system does. This implies that the companies need to improve the focus on process management, business result focus, employee focus, and leadership to improve the failure cost and disclose the hidden cost associated with quality activates. The overall quality management of the manufacturing industry in South Africa was found to be in level 3. This means that the companies need to improve to level 5 to enjoy the benefit of low cost of quality and benefits of the world-class organisation.

6.3.5 Benchmarking quality management practice

The research collected empirical data using online survey platform Survey Monkey and the survey was distributed in the South African and in the international community. The industry bodies, practitioners and scholars provided the support to reach the target population. The respondents were requested to share their opinions on the quality management practice of the five-point Likert scale items. The result was analysed using relative importance index (RII), the score 60% and more indicated that the item is practised and it is regarded as important.

The research used eight factors to benchmark quality management practice between South Africa and international manufacturing companies. The eight factors include leadership, customer focus, business result focus, process management, employee focus, cost of conformance, failure cost, and hidden costs. Leadership consists of three observed items (item 1, item 3 and item 4) please refer to Table 87 on page 324. The South African responses had the RII of 56% in item 1. This implies that the majority of the respondents believed that there is no trust between senior management and employees in the South African manufacturing industry. The South African responses also had the RII of 56% in item 3. Again the means that the majority of the respondents believed that senior management does not involve employees in setting the company's objectives which could also be linked to trust issues. Item 4 receives the highest RII of 69%, which means senior management measure the effectiveness of the action plans. Item 4 boosted the overall leadership score from the South African responses to RII= 61%.

In item 1 the international responses had the RII of 62%. This implies that from the international community there is some level of trust between senior management and employees. The international responses had the RII of 59% in item 3, 61% in item 4 and the overall score of 61%. This implies that the involvement of employees in setting the company's objectives is not the issue facing South Africa, but it is an issue which needs to be dealt with globally. Joseph Juran and Edward Deming emphasise that management should build trust and remove barriers to communications (Landesberg, 1999). In support, Crosby suggested that employees should be encouraged to share with their managers the issues preventing them from achieving their task without fear (Foster, 2013).

Customer focus had five observed items (Item 5, item 6, item 7, item 8, and item 9) and the South African responses had the RII ranging from 67% to 77% and had the overall RII score of 73% for customer focus. This implies that the South Africa manufacturing industry was practicing all the items designed to measure customer focus. The international result also had RII ranging from 68% to 83% and the overall RII score of 76% under customer focus. This implies that customer focus is an important component of quality management in the manufacturing industry.

The business result had four items (item 40, item 41, item 43 and item 44), the South African responses had the RII result ranging from 65% to 74% and the overall RII score of 68%. Again, this implies that the South African manufacturing companies practised all the items which were designed to measure business result focus. The international responses had RII scores ranging from 61% to 68% and the overall RII score of 64%. The result shows that the South African manufacturing companies were paying more attention to the business result focus compared to the international respondents.

Process management was measured using four observed variables, the South African responses had the RII ranging from 66% to 71% and the overall score of 68%. The international responses had the RII scores ranging from 73% to 80% and the overall score of 77%. This implies that the international respondents were more focused on process management compared to the South African participants.

Employee focus consists of three observed items (item 15, item 16, and item 19), the South African responses had the RII ranging 65% to 68% and the overall score of 66%. The international responses had RII ranging from 75% to 80% and the overall score of 77%. This implies that the international respondents prioritised employees more than the South African manufacturing industry.

Cost of conformance consists of four items, the South African responses had the RII ranging from 66% to 75% and overall RII score of 70%. The international responses had RII ranging from 73% to 78%, which the overall RII score of 76%. This implies a cost of conformance is regarded as the important factor both locally and internationally.

Failure cost had five observed items (item 32 to item 34), the South African responses had the RII ranging 67% to 70% with the overall RII score of 69%. The international responses had the RII score ranging from 67% to 72% and the overall RII score of 69%. This implies that the manufacturing industry is managing failure cost.

The hidden cost had also four observed items (item 36 to item 39), the South African responses had the RII ranging from 58% to 68% with the overall RII score of 63 %. Item 37 had the RII of 58%, which was less than 60% and this implies that the South African manufacturing industry had no automated system to assess the cost related to quality activities. The international responses had the RII score ranging from 62% to 74% and overall RII score of 68%. The result indicated that the international respondents were more concerned about hidden costs compared to the South African participants.

Overall, the South African responses scored below the international responses in six factors (customer focus, process management, employee focus, cost of conformance, failure cost and hidden costs). In the leadership category, the South African responses had the same RII score as the international respondents. In business result focus the South African responses had the highest RII scored. The benchmarking result confirmed the need for the South African manufacturing companies to improve their quality management system to align to the international companies.

6.4 Recommendations

The previous section dealt with the conclusion based on the research findings and this section provides the recommendations based on the conclusion and the research findings. The recommendation of future work is also presented in this section.

6.4.1 Recommendations on the research findings

The manufacturing industry is facing the challenges to constantly search for better and affordable ways of meeting customer demands. The literature suggested the cost of quality as the measure of a quality improvement effort. In the study by Sower and Quarles, (2003) and Sower, et al. (2007) the respondents pointed out a number of reasons why they were not using the cost of quality. Some of the reasons include the lack of understanding on how to track the quality, cost; lack of management support and some suggested that there was no benefit in assessing such cost.

This research found the cost of conformance to be correlated with all quality management factors used in this research with business result focus and employee being the main factors associated with the cost of conformance. Hence, it is recommended that before the organisation adopts the cost of quality as an improvement tool, the organisation should first define the key performance indicators with the involvement of employees. The organisation should identify the type of skills, knowledge, and processes required to meet the required outcomes and establish war rooms to discuss performance. Throughout the process, management should provide the resource, guidance and support the system. The organisation should monitor the cost of conformance and make it visible with the business result.

The research found the failure cost category to be related to process management, business result focus, and employee focus. The process management and business research focus were identified to be highly associated with failure cost. It is recommended that the South African manufacturing companies use failure cost as the measure of employee focus, business result focus and process management. The research further recommends process management and business result focus as the point of focus to reduce failure cost. It is not recommended for the companies to use failure cost category to measure the effectiveness of leadership and customer focus since the research did provide sufficient evidence to claim the relationship between these factors.

The research found the hidden cost category to be linked to two quality management factors (business result focus and employee focus). It is recommended that the companies use hidden costs as the measure of business result focus and employee focus. The companies should also focus on the two quality management factors to disclose the hidden cost associated with quality management practice. The research did not find enough evidence to claim the hidden relationship between cost and three quality management factors (process management; customer focus leadership). Hence, it is not recommended for the companies to use the hidden cost of measure process management; customer focus and leadership.

The research identified quality management factors as the best predictors of the cost of quality categories. Based on the ability of the quality management factors in predicting the cost of quality categories, it is recommended that the companies estimate the expected cost of quality based on their investment in quality improvement. The management should assess the realised benefit and compare with the estimated benefit and identify the reasons for deviation, if there is any deviation.

The research found the overall quality management maturity practice based on the assessed factors to be at level 3 in the quality management maturity grid. It is recommended that the manufacturing companies in South Africa implement quality improvement programmes to improve the quality management maturity of the industry. Some of the recommended strategies and methods for quality improvement include benchmarking; attending quality management seminars and participation in quality management award programmes.

The benchmarking result identified leadership as one of the factors pulling the quality management score of the South African manufacturing companies down. The research found that there is a lack of trust between senior management and employees and the management does not involve employees in setting business objectives. It is recommended that senior management build trust between management and employees. The senior management should also involve employees in setting up business objectives and share the business strategy. The benchmarking result also identified the lack of automation of the cost of quality. It is recommended that the companies automate and standardise the quality of quality programmes.

6.4.2 Recommendations for future research

During the literature review, the research found that there is more than one framework used by industries to assess and advance quality management; different framework uses different factors. Similar to the cost of quality practice; there are different models in the literature to assess the cost of quality. Hence, the research does not claim to have exhausted the relationship between quality management factors and the cost of quality categories. However, the companies who want to use cost of quality as the measure of quality management performance can use Figure 66 as a guideline. The dotted line shows the existence of the relationship between two factors and the solid line shows that the factors are highly associated in such that they are responsible for generating each other.

The research identified the positive correlation between quality management factors and cost of quality categories. Cost of conformance was found to be correlated to all quality management factors, but employee focus and the business result focus were the main generators of cost of conformance. The companies should prioritise investment in process measurement, maintenance or calibrations, quality training and qualification of the product suppliers, the items for cost of conformance. According to the research finding this will lead to better business result focus and employee focus. The success of cost of conformance need senior management and employee to trust each other, the leaders should also involve employees in planning and setting the business goals. The business should also place the customer at the centre of quality management initiatives.

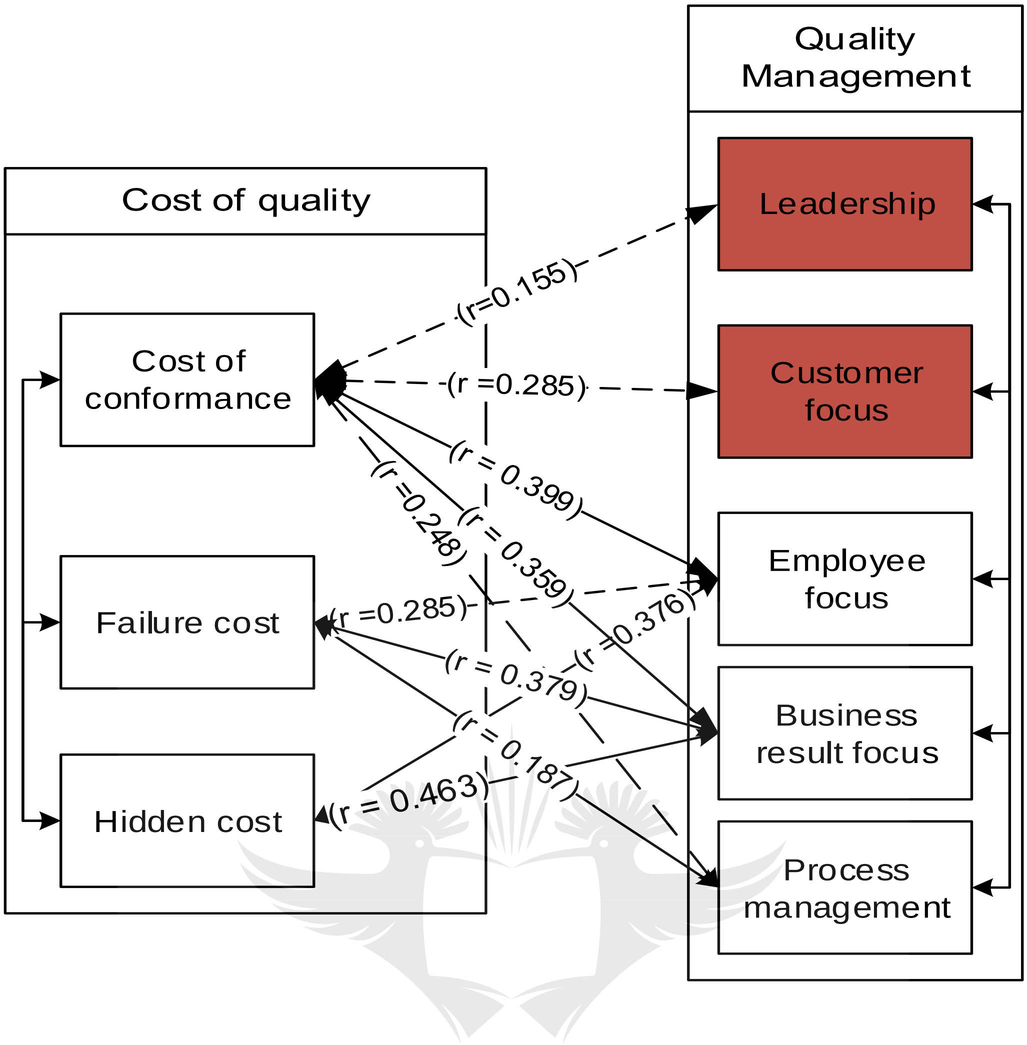

Figure 66: Relationship between cost of quality and quality management factors

The failure cost was found to be correlated to employee focus, business result focus and process management. The research finds business result focus and process management as the generators of failure cost. The research identified employee focus and business result focus as the only factors of quality management associated and responsible for the generation of hidden cost. The result shows that customer focus and leadership were not responsible for the generation of cost of quality. Hence, it is recommended that the companies should identify their cost of quality before adopting the framework in Figure 66; channel the effort in employee focus, business result focus, process management and observe the trends. The organisation should constantly monitor the progress and adjust the plans for quality improvement as more information becomes available and the quality management system of the organisation becomes matured. The failure cost and hidden or opportunity cost should go down over the period of time.

The research used eight factors to assess the quality management maturity of South African manufacturing companies. The quality management practice of the industry was identified to be at level 3 in the quality management maturity grid. This research did not attempt to understand the challenges preventing the companies from moving to level 5 in the grid. Hence, it is recommended that future research involves more quality management factors and identify the reasons blocking the companies to move to the world-class quality management group.

The literature has shown that quality management practice changes with time and technology advancement. Moreover, the manufacturing companies are preparing themselves for Industry 4.0. It is recommended that future research should investigate how Industry 4.0 will influence quality management and the cost of quality practice in the South African manufacturing industry.

6.5 Contribution

The practitioners and scholars in the field of quality management are promoting cost of quality as the measure of the quality management system. Others attempted to identify the reasons why companies do not use the cost of quality. The scholars found the positive correlation between quality management maturity of the organisation and the cost of quality practice. The author on the current research did not find the study, which provide reliable and validated quality management and the cost of quality concept structures of the South African manufacturing industry. The research did not also find the work detailing the relationship between quality management factors and cost of quality categories, especially in the South African manufacturing sector. This research contributed by providing a reliable, validated quality management and cost of quality concepts, structures from South African manufacturing industry. The research further provides the details on which quality management factors are related to each cost of quality category. The information can be used by other researchers who want to advance the quality management and cost of quality studies in the South African manufacturing industry and companies to channel their efforts in the implementation of cost of quality.

The author on the current research also did not identify the study which attempts to disclose the quality management maturity of the South African manufacturing companies. The research contributed by disclosing the quality management maturity of the South African manufacturing companies and pointed out the areas of improvement. This will help the companies to pinpoint the areas of improvement and strive to move to the next level of quality management maturity grid.

6.6 Limitations

The first limitation of the research is in connection with the study settings, the research only explored the relationship between quality management factors and cost of quality categories using the data collected in South Africa. As a result, the research findings cannot be generalised worldwide.

The second limitation relates to the sampling frame, the research did not find a list of South African manufacturing companies and international manufacturing companies to claim the sample representation. The research depends on the snowball sampling method which is associated with partisanship. To mitigate the risk associated with snowball sampling, the research uses different industry bodies and sources to identify the population of interest. As a result, the respondents from South Africa come from almost all the provinces. On the international respondents the research only receive 19 responses. Hence the result cannot be generalised, the research only discussed and recommended based on the observations, not the entire population.

6.7 Chapter summary

This chapter provides a summary of the findings in relation to the research objectives. The conclusions derived from the findings are presented in this chapter. The chapter further discussed the recommendations based on the findings and the recommendations for further research. The last two sections of the chapter discussed the research contribution and limitations.

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APPENDIX A: SURVEY QUESTIONNAIRE

A.1 Survey Cover Letter

Dear Sir/Madam

I am a doctoral student at the University of Johannesburg and researching my Doctor of Philosophy (Ph.D.) Degree in Engineering Management. I am conducting a benchmarking study to compare quality management maturity among global companies operating in South Africa.

The data collected for the study will not be used for any marketing or similar activities. The data will be used for academic purposes only and in line with the University of Johannesburg's code of ethics. All the necessary care will be taken to protect the information of the businesses participating in this study. No company details or report will be published without the owner's agreement. Confidentiality and anonymity of the data will be respected and maintained at all times

I would appreciate if you would kindly complete the following questionnaire. The questionnaire would take approximately ten (10) minutes to complete. You have the opportunity to request a summary of the results of the study if so desired.

Thank you for your co-operation.

Yours sincerely

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A.2 Section A: General information

The section is trying to collect general information about your company. Please select the one answer of your choice from the list or complete the blanks.

1.1 How would you describe the demographic operation of the company?

☐ In a single country ☐ In different countries ☐ Other (Please specify)…..

1.2 How would you describe your company?

☐ Manufacturing ☐ Service ☐ Construction or assembling

1.3 How would you label your level of awareness about the statements below in your organisation?

Table 73: Quality management participation adapted (Patti, et al., 2001; Moschidis, et al., 2016; Garza-Reyes, 2018)

Items	Not at all aware	Slightly aware	Somewhat aware	Moderately aware	Extremely Aware
	[1]	[2]	[3]	[4]	[5]
The organisation applies the statistical process control					
The organisation has set-up quality department					
The organisation has implemented a cultural change programme					
The organisation has a quality officer at an executive management level					
The organisation has embarked in business processes improvement					
The organisation has established measurement of quality improvement					
The organisation uses seven quality control tools to improve quality					
The organisation has not implemented six sigma process					
The organisation has quality improvement seminars					

Items	Not at all aware	Slightly aware	Somewhat aware	Moderately aware	Extremely Aware
	[1]	[2]	[3]	[4]	[5]
The organisation has initiated quality improvement training					
The organisation held the ISO 9000					
The organisation has won quality management excellence award					
The organisation has won industry excellence awards					

A.3 Section B: Quality management

The section attempts to collect your views about your organisation, please select the answer which best describes your observations.

i) Customer focus

In this section, we are looking for your opinion on customer focus within your organisation. Please select your level of agreement or disagreement with the statements in the table below:

Table 74: Customer focus adapted from (Khataie & Bulgak, 2013; Narasimhan, 2013; Sukdeo, 2016)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The customer requirements are solicited through market research					
The customer feedbacks are collected from multiple sources of information					
Business processes do not allow customer involvement during product or service design					
The customer need plays a critical role in the product or service design					
The business cannot cope with ever-changing customer needs					
There are transparent processes for the customers to log the complaints					
The customer is continuously engaged in the resolution of the complaint					

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The customer complaints take priority in everyday gatherings					
The customer receives a detailed response on the complaints with the reason(s) lead to the error and the prevention plan					
The customer feedback provides the means for improvement on product or service quality					

ii) Process Management

In this section, we are looking for your opinion of process management with your organisation. Please select your level of agreement or disagreement with the statements in the table below:

Table 75: Process management adapted from (Garza-Reyes, 2018)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The workflows are clearly visible in the workplace					
Access to standard operating procedures requires special authorisation					
The process variation is one of the key performance indicators					
Continues improvement is embedded in process improvement					
The processes are designed to allow top down, bottom up, and lateral communication					
There are regular training to create awareness on the business processes					
The process is created as and when there is a need for change					
The process owner does not have to be an executive manager or somebody senior in the organisation					

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation recognises that the effective implementation of a quality system requires cultural change					
The effectiveness of business processes depends on an individual's experience					

iii) Employee focus

In this section, we are looking for your opinion on employee focus within your organisation. Please select your level of agreement or disagreement with the statements in the table below:

Table 76: Employee focus adapted from (ASQ, 2016; Sukdeo, 2016)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
Employees prefer to remain with the organisation rather than work elsewhere.					
Non-management employees are not involved in making decisions which outline the future of the organisation					
Innovation is only entertained if it is from experienced staff members					
The organisation creates an environment that encourages employees to perform to the best of their abilities					
Employees are the main obstacles to change					
I have benefited from the business professional development programme					
There is a commitment from the business to recognize top performance					
There is no system in place to facilitate the reward and recognition					
The management use punishment to correct poor performance					
People hide their mistakes for fear of losing their jobs					

iv) Leadership

In this section, we are looking for your opinion on leadership within your organisation. Please select your level of agreement or disagreement with the statements in the table below:

Table 77: Leadership adapted from (Sower, et al., 2007; Egberonbe, et al., 2017)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
Leadership motivates employees to improve the quality of products or service continuously					
Senior management set out objectives for managers and employees					
Paycheque is the only motivation to work for this organisation					
The management use anger or frown to express themselves					
Action plans are measured for efficiency and effectiveness					
Initial enthusiasm after implementing a quality management system does not disappear over time					
There is a restricted flow of information between senior management and the staff					
Trust and openness is the least of the problems within the organisation					
Management uses selective listing strategy to take suggestions					
Business vision and values appear in all business communications.					

v) Result Focus

In this section, we are looking for your opinion on the result focus within your organisation. Please select your level of agreement or disagreement with the statements in the table below:

Table 78: Result focus Adopted from adapted from (Kedem, 2004; ASQ, 2016; Sukdeo, 2016)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely

	[1]	[2]	[3]	[4]	[5]
Management hides existence of poor performance in their sections					
There are a range of key performance indicators adapted to manage the business performance					
There are war rooms to discuss performance					
Some reports are difficult to understand					
There are active quality volunteers to deal with quality issues in all department					
Information about quality defects is communicated to everybody in the organisation					
There are visuals which show real-time business performance					
The result also indicates external factors affecting business performance like political unrest					
The is a clear understanding of what influence the business result					
The business performance is affected by the customers who do not understand the business product or service					

vi) Measurements and knowledge management

In this section, we are looking for your opinion on analysis and knowledge management within your organisation. Please select your level of agreement or disagreement with the statements in the table below:

Table 79: Measurement and knowledge management Adopted from (Besterfield, 2003; PMI, 2013; Foster, 2013; Sukdeo, 2016)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation has made an acceptable investment in quality education and training					
The momentum of improvement initiatives is easy to sustain					
The organisation does not have the quality management champions among senior management members					

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
There is infrastructure for handling quality data					
The reporting system is mainly dependent on the individual's preference					
Quality tools and techniques are implemented to create competitive advantage					
Quality practice only react to non-compliance					
The organisations have conducted benchmarking studies to improve the quality management system					
The organisation heavily use tools like quality control, mistake proofing, failure mode, and effect analysis to improve quality					
Knowledge is mainly stored in individual's computers					

vii) Supplier Development

In this section, we are looking for your opinion on supplier development within your organisation. Please select your level of agreement or disagreement with the statements in the table below:

Table 80: Supplier development adapted from (Wagne, 2006; Foster, 2013)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation evaluates suppliers' cost performance in an ad-hoc manner					
The organisation has a training programme for suppliers					
The organisation does not evaluate the influence of supplier performance deficiencies on the business performance					
The organisation transfers staff resources to support suppliers					
The business survives by searching for the alternative source of supply depending on the need at hand					

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation provides financial support to suppliers					
There is a budget for supplier education and training programme					
The organisation communicates strategic targets to crucial suppliers					
The organisation placed critical suppliers on sites					
The organisation gives financial support to suppliers in their market entry effort					

A.4 Section C: Cost of quality

i) Prevention Costs element

In this section, we are looking for your opinion on Prevention Costs with your organisation. Please select your level of agreement or disagreement with the statements in the table below:

Table 81: Preventive cost assessment adapted from (Tsai, 1998; Kaur, 2009; Aniza, 2014)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation reports on cost related to marketing research activities					
The organisation reports on cost related to document review					
The organisation does not report on cost related to design support activities					
The organisation assesses the cost related to supplier review					
The organisation does not report cost related to quality planning					
The organisation knows how much is spent on quality training					
The organisation assesses quality administrative expenses					
The organisation does not assess the cost related to quality audit systems					

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation reports on cost related to quality improvement activities					
The organisation assesses the cost related to product or service design					

ii) Appraisal Cost

In this section, we are looking for your opinion on Appraisal Costs. Please select your level of agreement or disagreement with the statements in the table below:

Table 82: Appraisal cost Adapted from (Kaur, 2009; Aniza, 2014)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation assesses the cost related to product or service inspection					
The organisation assesses the cost related to product or service testing					
The organisation does not know how much is spent on commissioning the products or service					
The organisation assesses the cost of testing materials					
The organisation assesses the cost related to process control measurement					
The organisation does not assess the cost related to field performance evaluation					
The organisation assesses the cost of maintenance and calibrations					
The organisation assesses the depreciation on the test and measurement equipment					
The organisation assesses the cost related to the test set-up for inspections					
The organisation assesses the cost related to the qualification of the product supplier					

iii) Internal Failure Costs element

In this section, we are looking for your opinion on Internal Failure Costs. Please select your level of agreement or disagreement with the statements in the table below:

Table 83: Internal failure cost adapted (Kaur, 2009; Aniza, 2014; Cermakova and Bris, 2017)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation assesses the cost related to design corrections					
The cost of rework due to design changes are visible in the financial report					
The cost of scrap due to design changes also appears in the financial report					
The organisation has the system to collect the cost of rejected orders					
The organisation assesses the cost related to uncontrolled material losses					
The organisation does not have the system in place to collect cost related to fault investigations					
The organisation has the system in place to collect cost related material review and corrective actions.					
The organisation collected the cost related to re-inspection and retest					
The organisation assesses the cost of rework by suppliers on the rejected order					

iv) External Failure Costs elements

In this section, we are looking for your opinion on Internal Failure. Please select your level of agreement or disagreement with the statements in the table below:

Table 84: External failure cost adapted (Kaur, 2009; Aniza, 2014; Cermakova and Bris, 2017)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation assesses the cost of returned goods					

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation has the system to collect the cost of recalling service or product					
The organisation has the systems in place to collect the cost of warranty claims					
The organisation does not collect the cost related to liabilities dues to product or service failure					
The organisation has the system in place to collect and assess the cost of penalties due to product or service failure					
The organisation collects the data related to the loss of sales due to product or service failure					
The organisation collect cost related to product or service replacement					

v) Hidden Cost

In this section, we are looking for your opinion on the following cost element. Please select your level of agreement or disagreement with the statements in the table below: Table 85: Hidden cost adapted from (Özkan and Karaibrahimoğlu, 2013; Cermakova and Bris, 2017)

Items	I Disagree Completely	Disagree	I Neither Agree nor Disagree	I Agree	I Agree Completely
	[1]	[2]	[3]	[4]	[5]
The organisation assesses the price associated with loss of income					
The company is not concerned about the price related to organisational reputation					
There is a system in place to estimate the price of resource utilisation					
We do not know how much we are spending on maintaining the stock levels					
We know how much we are spending on non-value adding enterprise activities					
We do not recognise how much we are spending on the value-adding activities					

Items	I Disagree Completely [1]	Disagree [2]	I Neither Agree nor Disagree [3]	I Agree [4]	I Agree Completely [5]
There is an automated system to assess the cost related to quality activities					
The company has the system in place to trace the cost of delays from one branch to another.					
The corporation has no system in place to estimate the cost related to delays from the suppliers					
The employer has the system in place to assess the cost related to the process overall performance					

A.5 Amended Questionnaires

The first set of questionnaires was given to six volunteers to do face validation. Three of the volunteers come from the University of Johannesburg, two were working on getting their doctoral degrees in the field of quality management and one has a doctoral degree in the field of study. Two were industry experts; who were quality managers, who also did their master's degree with the University of Johannesburg. The survey questionnaire was distributed to the volunteers using the SurveyMonkey. The team was requested to review the questionnaire and comment. The volunteers were given one week to review the questions. The volunteers complained that the survey was too long (18 minutes); suggested that the questionnaire should include rating and multiple choice questions and some of the items were regarded as irrelevant. After receiving the feedback, researcher met with the study leaders to review the comments and decide on the required changes. The subsection reflected the changes which resulted from the face validation process and suggestions from the team.

Section A: Demographic

1. General information

The section is trying to collect general information about you and your company. Please select the one answer of your choice from the list.

1.1 Which of the following best describes your current job level?

Title	Code
1.1.1. Executive/ Executive /C-level	1
1.1.2. Senior Manager	2
1.1.3. Middle management	3
1.1.4. Intermediate	4
1.1.5. Entry level	5
1.1.8. Other (specify)	8

1.2 How would you describe your current age group?

Age group	Code
1.2.1. Younger than 20	1
1.2.2. 20-25	2
1.2.3. 26-30	3
1.2.4. 31-35	4
1.2.5. 36-40	5
1.2.6. 41-45	6
1.2.7. 46-50	7
1.2.8. Older than 50	8

1.3 What is your highest qualification?

Qualification	Code
1.3.1. Less than Grade 12	1
1.3.2. Grade 12 (Matric, Std 10)	2
1.3.3. Post Matric Diploma Or Certificate	3
1.3.4. Baccalaureate Degree (s)	4
1.3.5. Post-graduate Degree (s)	5
1.3.6. Other	

1.4 How long have you been in the industry?

Years of experience	Code
1.4.1. Less than one year	1
1.4.2. 1-5 years	2
1.4.3. 6-10 years	3
1.4.4. 11-15 years	4
1.4.5. 16-20 years	5
1.4.6. More than 20 years	6

1.5 In what province do you work?

Province	Code
1.5.1. Gauteng	1
1.5.2. KwaZulu-Natal	2
1.5.3. Eastern Cape	3
1.5.4. Western Cape	4
1.5.5. Mpumalanga	5
1.5.6. Free State	6
1.5.7. North West	7
1.5.8. Northern Cape	8
1.5.9. Limpopo	9

1.6 Which of the following best describes the principal industry of your organisations?

This question was used to exclude people who do not fall within the target group

Industry	Code
1.6.1. Advertising and Marketing	1
1.6.2. Agriculture	2
1.6.3. Airlines and Aerospace (including Defence)	3
1.6.4. Automotive sales	4
1.6.5. Business Support and Logistics	5
1.6.6. Construction, Machinery, and Homes	6
1.6.7. Education	7
1.6.8. Entertainment and Leisure	8
1.6.9. Finance and Financial Services	9
1.6.10. Food and Beverages	10
1.6.11. Government	11
1.6.12. Healthcare and Pharmaceuticals	12
1.6.13. I am currently not employed	13
1.6.14. Insurance	14
1.6.15. Manufacturing	15
1.6.16. Nonprofit	16
1.6.17. Real Estate	17
1.6.18. Retail and Consumer Durables	18
1.6.19. Telecommunications, Technology, Internet and Electronics	19
1.6.20. Transportation and Delivery	20
1.6.21. Utilities, Energy, and Extraction	21

1.7 In your opinion, which of the following is applicable to your company? The organisation….?

Items	Not at all aware	Slightly aware	Somewhat aware	Moderately aware	Extremely Aware
	[1]	[2]	[3]	[4]	[5]
1.7.1. Has a quality officer at an executive management level					
1.7.2. Has established measurement of quality improvement					
1.7.3. Uses seven quality control instruments to improve quality					
1.7.4. Holds quality improvement seminars					
1.7.5. Has quality improvement training					
1.7.6. Held the ISO 9000					
1.7.7. Has won a quality management excellence award					

Section B – Quality Management

This section attempts to collect your views about your organisation, please select the answer which best describes your observations.

2. Customer focus

In this section, we require your opinion on customer focus within your organisation. Kindly select your level of agreement or disagreement with the statements in the table below:

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	[1]	[2]	[3]	[4]	[5]
The customer requirements are solicited through market research					
Business processes allow customer involvement during product or service design					
There are processes for the customers to log the complaints					
The customer complaints take priority					

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	[1]	[2]	[3]	[4]	[5]
The customer feedback provide the means for improvement on product or service quality					

3. Process Management

In this section, we require your opinion of process management within your organisation. Kindly select your level of agreement or disagreement with the statements in the table below:

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	[1]	[2]	[3]	[4]	[5]
The workflows are clearly visible in the workplace					
Access to standard operating procedures requires special authorisation					
The process variation is one of the key performance indicators					
The processes are designed to allow a good level of communication					
There are regular training to create awareness of the business processes					

4. Employee focus

4.1. In my organisation, employees prefer to remain with the organisation rather than work elsewhere.

Answer choices	Code
Strongly Disagree	1
Disagree	2
Neither agree nor disagree	3
Agree	4
Strongly Disagree	5

4.2. The organisation, I am working for creates an environment that encourages employees to perform to the best of their abilities

Answer choices	Code
Strongly Disagree	1

Disagree	2
Neither agree nor disagree	3
Agree	4
Strongly Disagree	5

4.3. In your organisation, do individuals hide their mistakes in fear of losing their jobs?

Answer choices	Code
Never	1
Rarely	2
Sometimes	3
Usually	4
Always	5

4.4. Management within my organisation recognizes strong job performance.

Answer choices	**Code**
Never	1
Rarely	2
Sometimes	3
Usually	4
Always	5

5. Leadership

5.1. How involved are employees in setting the company's objectives?

Answer choices	**Code**
Not at all involved	1
Slightly involved	2
Moderately involved	3
Very involved	4
Extremely involved	5

5.2. Management measure the effectiveness of the action plans

Answer choices	**Code**
Never	1
Rarely	2
Sometimes	3
Usually	4
Always	5

5.3. Leadership motivates employees to improve the quality of products or services

Answer choices	**Code**
Strongly Disagree	1
Disagree	2

Answer choices	Code
Neutral	3
Agree	4
Strongly Disagree	5

5.4. Senior management and employees trust each other

Answer choices	Code
Strongly Disagree	1
Disagree	2
Neither agree nor disagree	3
Agree	4
Strongly Disagree	5

5.5. Please select the level of familiarity with your reward and recognition system

Answer choices	Code
Not at all familiar	1
Not so familiar	2
Somewhat familiar	3
Very familiar	4
Extremely familiar	5

6. Result Focus

In this section, we are looking for your opinion of the result focus. Please select your level of agreement or disagreement with the statements in the table below:

Items	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
	[1]	**[2]**	**[3]**	**[4]**	**[5]**
There are key performance indicators adapted to manage the business performance					
There are war rooms to discuss performance					
There are active quality volunteers to deal with quality issues in all departments					
There are visuals which show real-time business performance					
There is a clear understanding of what influences the business results					

Section C- Cost of quality

7. Prevention Costs element

In this section, we are looking for your opinion on Prevention Costs. Please select your level of agreement or disagreement with the statements in the table below:

The organisation reports the cost related to ….	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	[1]	[2]	[3]	[4]	[5]
Marketing research activities					
Document review					
Supplier review					
Quality planning					
Quality training					
Product or service design					

8. Appraisal Cost

In this section, we are looking for your opinion on Appraisal Costs. Please select your level of agreement or disagreement with the statements in the table below: The organisation assesses the cost related to the ….

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	[1]	[2]	[3]	[4]	[5]
Product or service inspection					
Product or service testing					
Materials testing					
Process control or measurement					
Maintenance or calibrations					
Depreciation of equipment					
Qualification of the product supplier					

9. Failure Costs element

4.11 The organisation assesses the cost related to product or service recall

Answer choices	Code
Strongly Disagree	1
Disagree	2
Neither agree nor disagree	3
Agree	4
Strongly Disagree	5

4.12 The organisation assesses the cost related to material or stock losses

Answer choices	Code
Strongly Disagree	1
Disagree	2
Neither agree nor disagree	3
Agree	4
Strongly Disagree	5

4.13 The organisation assesses the cost related to re-inspection and retest

Answer choices	Code
Strongly Disagree	1
Disagree	2
Neither agree nor disagree	3
Agree	4
Strongly Disagree	5

4.14 The organisation assesses the cost related to scrap due to poor quality

Answer choices	Code
Never	1
Rarely	2
Sometimes	3
Usually	4
Always	5

4.15 The organisation assesses the cost related to design corrections

Answer choices	Code
Never	1
Rarely	2
Sometimes	3
Usually	4
Always	5

In this section, we are looking for your opinion on Internal Failure Costs. Please select your level of agreement or disagreement with the statements in the table below:

The organisation assesses the cost related to ….	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	[1]	[2]	[3]	[4]	[5]
Design corrections					
Rework due to design					
Scrap due to poor quality					
Rejected orders					
Uncontrolled material losses					
Re-inspection and retest					

10. Hidden Cost

In this section, we are looking for your opinion on the following cost element. Please select your level of agreement or disagreement with the statements in the table below:

Items	Strongly disagree [1]	Disagree [2]	Neutral [3]	Agree [4]	Strongly agree [5]
The organisation assesses the price associated with loss of income					
There is a system in place to estimate the price of resource utilisation					
There is an automated system to assess the cost related to quality activities					
The company has a system in place to trace the cost of delays from one branch to another.					
The corporation has a system in place to estimate the cost related to delays from the suppliers					

APPENDIX B: DATA CLEANSING

B.1 Missing Data Analysis

Table 86 shows the details of the missing data per question. This information is important in the identification of questions with the high number of missing data. Question 20, 21, 22, 23, and 24 had the highest number of missing values, and the items assess the concept of result focus in South African's manufacturing industries. The high number of missing values indicate that people are not comfortable to disclose information about their result and associated management strategies.

Table 86: Univariate statistics of missing data

Question	N	Mean	Std. Deviation	Missing		No. of Extremes	
				Count	Percent	Low	High
Q1	119	2.82	1.017	0	.0	0	0
Q2	119	3.50	1.127	0	.0	9	0
Q3	119	2.82	.974	0	.0	0	2
Q4	119	3.47	1.111	0	.0	8	0
Q5	118	3.35	.964	1	.8	6	0
Q6	118	3.58	.937	1	.8	4	0
Q7	119	3.84	.974	0	.0	4	0
Q8	119	3.78	.922	0	.0	1	0
Q9	119	3.78	.967	0	.0	2	0
Q40	119	3.72	.901	0	.0	4	0
Q41	119	3.28	.929	0	.0	5	0
Q42	119	2.84	1.033	0	.0	0	6
Q43	119	3.24	1.079	0	.0	8	0
Q44	119	3.35	1.022	0	.0	7	0
Q10	117	3.45	1.021	2	1.7	4	0
Q11	118	2.86	1.142	1	.8	0	0
Q12	117	3.35	.884	2	1.7	3	0
Q13	119	3.56	.908	0	.0	4	0
Q14	119	3.31	1.110	0	.0	9	0
Q15	118	3.25	1.141	1	.8	11	0
Q16	118	3.39	1.070	1	.8	9	0
Q17	118	3.57	.938	1	.8	1	0
Q18	119	3.03	.982	0	.0	9	0
Q19	118	3.31	1.092	1	.8	9	0
Q20	113	3.76	1.037	6	5.0	9	0
Q21	114	3.69	1.006	5	4.2	9	0
Q22	116	3.59	1.112	3	2.5	14	0
Q23	116	3.76	1.084	3	2.5	11	0
Q24	115	3.57	1.101	4	3.4	13	0
Q25	119	3.28	.991	0	.0	6	0
Q26	119	3.59	.951	0	.0	3	0
Q27	119	3.48	.982	0	.0	3	0
Q28	119	3.59	.960	0	.0	3	0
Q29	119	3.67	.940	0	.0	2	0
Q30	119	3.35	.979	0	.0	6	0

Question	N	Mean	Std. Deviation	Missing		No. of Extremes	
				Count	Percent	Low	High
Q31	119	3.50	1.024	0	.0	6	0
Q32	119	3.37	.919	0	.0	4	0
Q33	119	3.48	1.048	0	.0	4	0
Q34	119	3.45	1.015	0	.0	1	0
Q35	119	3.32	.991	0	.0	7	0
Q36	119	3.41	.906	0	.0	2	0
Q37	119	2.91	1.058	0	.0	0	0
Q38	119	3.11	1.056	0	.0	0	0
Q39	119	3.19	1.044	0	.0	8	0
a. A number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).							

B.2 Little's MCAR test

According to Van Ness *et al*., (2007), the Little's test the assumption that missingness is completely at random. When the p-value is less than 0.05 the assumption is rejected, and the alternative suggestion that the data is not missing at random is accepted (Madden *et al*., 2017). The research Little's shows that the data is randomly missing and both multiple imputations and expected maximisation can be used to replace the missing data (Roni, 2014). The current study opted for expected maximisation as the strategy to deal with missing data.

- Little's MCAR test: Chi-Square = 479.346, DF = 453, Sig. =.189
- The P-value > 0.05 shows that data is randomly missing

B.3 Item labeling

Table 87: Item labelling

Label	Description
Item 1	Senior management and employees trust each other (Trust)
Item 2	Leadership motivates employees to improve the quality of products or services (motivation)
Item 3	How involved are employees in setting the company's objectives? (involvement)
Item 4	Management measure the effectiveness of the action plans (measurement)
Item 5	The customer requirements are solicited through market research
Item 6	Business processes allow customer involvement during product or service design
Item 7	There are processes for the customers to log the complaints
Item 8	The customer complaints take priority
Item 9	The customer feedback provide the means for improvement on product or service quality

Label	Description
Item 10	The workflows are clearly visible in the workplace
Item 11	Access to standard operating procedures requires special authorisation
Item 12	The process variation is one of the key performance indicators
Item 13	The processes are designed to allow a good level of communication
Item 14	There is regular training to create awareness of the business processes
Item 15	In my organisation, employees prefer to remain with the organisation rather than work elsewhere. (Loyalty)
Item 16	The organisation, I am working for creates an environment that encourages employees to perform to the best of their abilities (Encouragement)
Item 17	Please select the level of familiarity with your reward and recognition system (Reward and recognition)
Item 18	In your organisation, do individuals hide their mistakes in fear of losing their jobs? (Fear)
Item 19	Management within my organisation recognizes strong job performance.(Performance)
Item 20	Marketing research activities
Item 21	Product or service inspection
Item 22	Document review
Item 23	Materials testing
Item 24	Supplier review
Item 25	Process control or measurement
Item 26	Quality planning
Item 27	Maintenance or calibrations
Item 28	Quality training
Item 29	Qualification of the product supplier
Item 30	The organisation assesses the cost related to product or service recall
Item 31	The organisation assesses the cost related to material or stock losses
Item 32	The organisation assesses the cost related to re-inspection and retest
Item 33	The organisation assesses the cost related to scrap due to poor quality
Item 34	The organisation assesses the cost related to design corrections
Item 35	The organisation assesses the price associated with loss of income
Item 36	There is a system in place to estimate the price of resource utilization
Item 37	There is an automated system to assess the cost related to quality activities
Item 38	The company has a system in place to trace the cost of delays from one branch to another.
Item 39	The corporation has a system in place to estimate the cost related to delays from the suppliers
Item 40	There are key performance indicators adapted to manage the business performance
Item 41	There are war rooms to discuss performance
Item 42	There are active quality volunteers to deal with quality issues in all departments
Item 43	There are displays, indicating real-time business performance
Item 44	There is a clear understanding of what influences the business results

APPENDIX C: QUALITY MANAGEMENT RESULT

C.1 Leadership reliability before EFA (Theoritical framework)

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
0,683	0,684	4

Inter-Item Correlation Matrix				
	Trust	Motivation	Involvement	Measurement
Trust	1,000	0,231	0,256	0,559
Motivation	0,231	1,000	0,280	0,309
Involvement	0,256	0,280	1,000	0,474
Measurement	0,559	0,309	0,474	1,000

C.2 Customer focus Reliability before EFA (Theoritical framework)

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
0,815	0,814	5

Inter-Item Correlation Matrix					
	The customer requirements are solicited through market research	Business processes allow customer involvement during product or service design	There are processes for the customers to log the complaints	The customer complaints take priority	The customer feedback provides the means for improvement on product or service quality
The customer requirements are solicited through market research	1,000	0,481	0,527	0,359	0,490
Business processes allow customer involvement during product or service design	0,481	1,000	0,376	0,336	0,368
There are processes for the customers	0,527	0,376	1,000	0,554	0,574

Inter-Item Correlation Matrix					
	The customer requirements are solicited through market research	**Business processes allow customer involvement during product or service design**	**There are processes for the customers to log the complaints**	**The customer complaints take priority**	**The customer feedback provides the means for improvement on product or service quality**
to log the complaints					
The customer complaints take priority	0,359	0,336	0,554	1,000	0,604
The customer feedback provides the means for improvement on product or service quality	0,490	0,368	0,574	0,604	1,000

C.3 Process management Reliability before EFA (Theoritical framework)

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardised Items**	**No. of Items**
0,756	0,771	5

Inter-Item Correlation Matrix					
	The workflows are clearly visible in the workplace	**Access to standard operating procedures requires special authorisation**	**The process variation is one of the key performance indicators**	**The processes are designed to allow a good level of communication**	**There are regular training to create awareness of the business processes**
The workflows are clearly visible in the workplace	1,000	0,205	0,363	0,684	0,541
Access to standard operating procedures requires special authorisation	0,205	1,000	0,309	0,175	0,101
The process variation is one of the key performance indicators	0,363	0,309	1,000	0,562	0,455

Inter-Item Correlation Matrix					
	The workflows are clearly visible in the workplace	Access to standard operating procedures requires special authorisation	The process variation is one of the key performance indicators	The processes are designed to allow a good level of communication	There are regular training to create awareness of the business processes
The processes are designed to allow a good level of communication	0,684	0,175	0,562	1,000	0,634
There are regular training to create awareness of the business processes	0,541	0,101	0,455	0,634	1,000

C.4 Employee focus Reliability before EFA (Theoritical framework)

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
0,639	0,631	5

Inter-Item Correlation Matrix					
	Loyalty	Encouragement	Reward and recognition	Fear	Performance
Loyalty	1,000	0,520	0,151	0,130	0,361
Encouragement	0,520	1,000	0,118	0,127	0,575
Reward and recognition	0,151	0,118	1,000	0,200	0,167
Fear	0,130	0,127	0,200	1,000	0,202
Performance	0,361	0,575	0,167	0,202	1,000

C.5 Business result focus Reliability before EFA (Theoritical framework)

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
0,794	0,794	5

Inter-Item Correlation Matrix					
	There are key performance indicators adapted to manage the business performance	**There are war rooms to discuss performance**	**There are active quality volunteers to deal with quality issues in all departments**	**There are displays, indicating real-time business performance**	**There is a clear understanding of what influences the business results**
There are key performance indicators adapted to manage the business performance	1,000	0,467	0,225	0,520	0,616
There are war rooms to discuss performance	0,467	1,000	0,334	0,571	0,410
There are active quality volunteers to deal with quality issues in all departments	0,225	0,334	1,000	0,257	0,225
There are displays, indicating real-time business performance	0,520	0,571	0,257	1,000	0,729
There is a clear understanding of what influences the business results	0,616	0,410	0,225	0,729	1,000

C.6 Quality Management Exploratory Factor Analysis

Table 88: Quality Management item labeling

Latent variables	Label	Description
Process management (F1)	Item 12	The process variation is one of the key performance indicators
	Item 14	There is regular training to create awareness of the business processes
	Item 10	The workflows are clearly visible in the workplace
	Item 13	The processes are designed to allow a good level of communication
Customer focus (F2)	Item 5	The customer requirements are solicited through market research
	Item 8	The customer complaints take priority
	Item 6	Business processes allow customer involvement during product or service design
	Item 9	The customer feedback provides the means for improvement on product or service quality

Latent variables	Label	Description
	Item 7	There are processes for the customers to log the complaints
Business result focus (F3)	Item 41	There are war rooms to discuss performance
	Item 40	There are key performance indicators adapted to manage the business performance
	Item 43	There are displays, indicating real-time business performance
	Item 44	There is a clear understanding of what influences the business results
Employee focus (F4)	Item 15	Loyalty
	Item 19	Performance
	Item 16	Encouragement
Leadership (F5)	Item 3	Involvement
	Item 1	Trust
	Item 4	Measurement
F 6 and Redundant item	Item 2	Motivation
	Item 42	There are active quality volunteers to deal with quality issues in all departments

C.7 Total variance explained (Quality Management)

Table 89: Total variance explained for quality management

Total Variance Explained							
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.240	24.951	24.951	4.827	22.984	22.984	3.765
2	2.906	13.838	38.790	2.445	11.641	34.626	3.646
3	1.665	7.928	46.718	1.228	5.847	40.472	2.423
4	1.608	7.658	54.376	1.147	5.463	45.935	2.042
5	1.186	5.648	60.023	.815	3.880	49.815	3.261
6	1.081	5.146	65.170	.581	2.769	52.584	.639
7	.953	4.540	69.709				
8	.830	3.952	73.662				
9	.708	3.369	77.031				
10	.675	3.214	80.246				
11	.576	2.743	82.989				
12	.558	2.658	85.647				
13	.472	2.246	87.892				
14	.447	2.130	90.022				
15	.419	1.996	92.019				
16	.358	1.705	93.724				

Total Variance Explained							
Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
17	.342	1.629	95.353				
18	.298	1.419	96.772				
19	.266	1.269	98.041				
20	.220	1.047	99.088				
21	.191	.912	100.000				
Extraction Method: Principal Axis Factoring.							
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.							

C.8 Pattern Matrix for Quality Management

Table 90: Pattern matrix for quality management

Label	Description	F 1	F 2	F 3	F 4	F 5	F 6
Item 12	The process variation is one of the key performance indicators	0,601					
Item 14	There is regular training to create awareness of the business processes	0,741					
Item 10	The workflows are clearly visible in the workplace	0,770					
Item 13	The processes are designed to allow a good level of communication	0,924					
Item 5	The customer requirements are solicited through market research		0,642				-0,396
Item 8	The customer complaints take priority		0,681				0,454
Item 6	Business processes allow customer involvement during product or service design		0,698				
Item 9	The customer feedback provides the means for improvement on product or service quality		0,707				
Item 7	There are processes for the customers to log the complaints		0,717				
Item 41	There are war rooms to discuss performance			0,564			
Item 40	There are key performance indicators adapted to manage the business performance			0,601			
Item 43	There are displays, indicating real-time business performance			0,767			
Item 44	There is a clear understanding of what influences the business results			0,769			
Item 15	Loyalty				0,599		
Item 19	Performance				0,611		
Item 16	Encouragement				0,872		
Item 3	Involvement					0,379	

Label	Description	F 1	F 2	F 3	F 4	F 5	F 6
Item 1	Trust					0,521	
Item 4	Measurement					1,039	
Item 2	Motivation						0,338
Item 42	There are active quality volunteers to deal with quality issues in all departments						
	Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalisation.						
	a. Rotation converged in 6 iterations.						

C.9 Process Management (Factor 1) reliability after EFA

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
0.821	0.824	4

Inter-Item Correlation Matrix				
	The workflows are clearly visible in the workplace	**The process variation is one of the key performance indicators**	**The processes are designed to allow a good level of communication**	**There are regular training to create awareness of the business processes**
The workflows are clearly visible in the workplace	1.000	0.368	0.674	0.555
The process variation is one of the key performance indicators	0.368	1.000	0.564	0.458
The processes are designed to allow a good level of communication	0.674	0.564	1.000	0.615
There is regular training to create awareness of the business processes	0.555	0.458	0.615	1.000

Item-Total Statistics					
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
The workflows are clearly visible in the workplace	10.22	5.855	0.641	0.488	0.776
The process variation is one of the key performance indicators	10.32	6.824	0.534	0.340	0.821
The processes are designed to allow a good level of communication	10.10	5.831	0.771	0.605	0.720

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
There is regular training to create awareness of the business processes	10.35	5.420	0.654	0.434	0.774

C.10 Customer focus (Factor 2) reliability after EFA

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
0.815	0.814	5

Inter-Item Correlation Matrix					
	The customer requirements are solicited through market research	Business processes allow customer involvement during product or service design	There are processes for the customers to log the complaints	The customer complaints take priority	The customer feedback provide the means for improvement on product or service quality
The customer requirements are solicited through market research	1.000	0.483	0.527	0.360	0.489
Business processes allow customer involvement during product or service design	0.483	1.000	0.379	0.341	0.372
There are processes for the customers to log the complaints	0.527	0.379	1.000	0.546	0.565
The customer complaints take priority	0.360	0.341	0.546	1.000	0.611
The customer feedback provides the means for improvement on product or service quality	0.489	0.372	0.565	0.611	1.000

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
The customer requirements are solicited through market research	14.99	8.688	0.600	0.402	0.780
Business processes allow customer involvement during product or service design	14.75	9.321	0.494	0.274	0.810
There are processes for the customers to log the complaints	14.50	8.335	0.661	0.457	0.761
The customer complaints take priority	14.56	8.860	0.600	0.439	0.780
The customer feedback provides the means for improvement on product or service quality	14.56	8.334	0.669	0.488	0.759

C.11 Business result focus (F3) reliability after EFA

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
0.773	0.771	4

Inter-Item Correlation Matrix				
	There are key performance indicators adapted to manage the business performance	There are war rooms to discuss performance	There are displays, indicating real-time business performance	There is a clear understanding of what influences the business results
There are key performance indicators adapted to manage the business performance	1.000	0.366	0.381	0.540
There are war rooms to discuss performance	0.366	1.000	0.475	0.360
There are displays, indicating real-time business performance	0.381	0.475	1.000	0.624
There is a clear understanding of what influences the business results	0.540	0.360	0.624	1.000

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
There are key performance indicators adapted to manage the business performance	9.87	6.083	0.528	0.325	0.743
There are war rooms to discuss performance	10.31	6.131	0.489	0.266	0.761
There are displays, indicating real-time business performance	10.35	5.010	0.635	0.461	0.686
There is a clear understanding of what influences the business results	10.24	5.148	0.658	0.495	0.672

C.12 Employee focus (F4) reliability after EFA

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
0.737	0.739	3

Inter-Item Correlation Matrix			
	Loyalty	Encouragement	Performance
Loyalty	1.000	0.520	0.361
Encouragement	0.520	1.000	0.575
Performance	0.361	0.575	1.000

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Loyalty	6.70	3.650	0.496	0.276	0.730
Encouragement	6.56	3.366	0.663	0.443	0.530
Performance	6.64	3.689	0.533	0.336	0.683

C.13 Leadership (F5) reliability after EFA

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
0.697	0.693	3

Inter-Item Correlation Matrix			
	Trust	Involvement	Measurement
Trust	1.000	0.256	0.558
Involvement	0.256	1.000	0.473
Measurement	0.558	0.473	1.000

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Trust	6.29	3.206	0.486	0.311	0.638
Involvement	6.29	3.528	0.418	0.224	0.714
Measurement	5.63	2.489	0.651	0.428	0.408

C.14 Model Fit Indices for Quality Management

Result (Default model) (After modification or removal of item 11)

Minimum was achieved
Chi-square = 167,01
Degrees of freedom = 142
Probability level = ,07

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	48	167,01	142	,07	1,18
Saturated model	190	,00	0		
Independence model	19	895,90	171	,00	5,24

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	,06	,88	,84	,66
Saturated model	,00	1,00		
Independence model	,25	,44	,38	,40

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	,81	,78	,97	,96	,97

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Saturated model	1,00		1,00		1,00
Independence model	,00	,00	,00	,00	,00

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	,83	,68	,80
Saturated model	,00	,00	,00
Independence model	1,00	,00	,00

NCP

Model	NCP	LO 90	HI 90
Default model	25,01	,00	61,41
Saturated model	,00	,00	,00
Independence model	724,90	634,97	822,35

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	1,42	,21	,00	,52
Saturated model	,00	,00	,00	,00
Independence model	7,59	6,14	5,38	6,97

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	,04	,00	,06	,78
Independence model	,19	,18	,20	,00

AIC

Model	AIC	BCC	BIC	CAIC
Default model	263,01	282,60	396,41	444,41
Saturated model	380,00	457,55	908,03	1098,03
Independence model	933,90	941,66	986,71	1005,71

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	2,23	2,02	2,54	2,39
Saturated model	3,22	3,22	3,22	3,88
Independence model	7,91	7,15	8,74	7,98

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	121	131
Independence model	27	29

APPENDIX D: COST OF QUALITY RESULT

D.1 Appraisal Cost Reliability Before EFA (Theoritical framework)

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardised Items**	**No. of Items**
0.865	0.866	5

Inter-Item Correlation Matrix					
	Product or service inspection	**Materials testing**	**Process control or measurement**	**Maintenance or calibrations**	**Qualification of the product supplier**
Product or service inspection	1.000	.570	.462	.654	.465
Materials testing	.570	1.000	.525	.582	.604
Process control or measurement	.462	.525	1.000	.567	.682
Maintenance or calibrations	.654	.582	.567	1.000	.521
Qualification of the product supplier	.465	.604	.682	.521	1.000

D.2 Preventive Cost Reliability Before EFA (Theoritical framework)

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardised Items**	**No. of Items**
.889	.890	5

Inter-Item Correlation Matrix					
	Marketing research activities	**Document review**	**Supplier review**	**Quality planning**	**Quality training**
Marketing research activities	1.000	.554	.629	.602	.462
Document review	.554	1.000	.730	.759	.587
Supplier review	.629	.730	1.000	.616	.530
Quality planning	.602	.759	.616	1.000	.704
Quality training	.462	.587	.530	.704	1.000

D.3 Failure Cost Reliability Before EFA (Theoritical framework)

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardised Items**	**No. of Items**
0.878	0.879	5

Inter-Item Correlation Matrix					
	The organisation assesses the cost related to product or service recall	**The organisation assesses the cost related to material or stock losses**	**The organisation assesses the cost related to re-inspection and retest**	**The organisation assesses the cost related to scrap due to poor quality**	**The organisation assesses the cost related to design corrections**
The organisation assesses the cost related to product or service recall	1.000	.615	.663	.453	.477
The organisation assesses the cost related to material or stock losses	.615	1.000	.682	.570	.520
The organisation assesses the cost related to re-inspection and retest	.663	.682	1.000	.606	.554
The organisation assesses the cost related to scrap due to poor quality	.453	.570	.606	1.000	.782
The organisation assesses the cost related to design corrections	.477	.520	.554	.782	1.000

D.4 Hidden Cost Reliability Before EFA (Theoritical framework)

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardised Items**	**No. of Items**
0.864	0.864	5

Inter-Item Correlation Matrix					
	The organisation assessed the price associated with loss of income	**There is a system in place to estimate the price of resource utilization**	**There is an automated system to assess the cost related to quality activities**	**The company has a system in place to trace the cost of delays from one branch to another.**	**The corporation has a system in place to estimate the cost related to delays from the suppliers**
The organisation assessed the price associated with loss of income	1.000	.475	.417	.574	.472
There is a system in place to estimate the price of resource utilisation	.475	1.000	.474	.626	.659
There is an automated system to assess the cost related to quality activities	.417	.474	1.000	.609	.577
The company has a system in place to trace the cost of delays from one branch to another.	.574	.626	.609	1.000	.719
The corporation has a system in place to estimate the cost related to delays from the suppliers	.472	.659	.577	.719	1.000

D.5 Cost of Quality Exploratory Factor analysis

Table 91: Cost of quality item labeling

Latent variables	Label	Description
Cost of conformance (F1)	Item 20	Marketing research activities
	Item 21	Product or service inspection
	Item 22	Document review
	Item 23	Materials testing
	Item 24	Supplier review
	Item 25	Process control or measurement
	Item 26	Quality planning
	Item 27	Maintenance or calibrations
	Item 28	Quality training
	Item 29	Qualification of the product supplier
Failure cost (F2)	Item 30	The organisation assesses the cost related to product or service recall
	Item 31	The organisation assesses the cost related to material or stock losses
	Item 32	The organisation assesses the cost related to re-inspection and retest
	Item 33	The organisation assesses the cost related to scrap due to poor quality
	Item 34	The organisation assesses the cost related to design corrections
Hidden cost	Item 35	The organisation assesses the price associated with loss of income
	Item 36	There is a system in place to estimate the price of resource utilization

Latent variables	Label	Description
	Item 37	There is an automated system to assess the cost related to quality activities
	Item 38	The company has a system in place to trace the cost of delays from one branch to another.
	Item 39	The corporation has a system in place to estimate the cost related to delays from the suppliers

D.6 Total variance explained (Cost of Quality)

Table 92: Total variance explained by the cost of quality factors

Total Variance Explained							
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	8.804	44.019	44.019	8.382	41.912	41.912	7.282
2	1.958	9.788	53.807	1.545	7.724	49.636	5.673
3	1.803	9.017	62.824	1.399	6.993	56.629	5.398
4	.991	4.954	67.777				
5	.800	3.998	71.775				
6	.726	3.630	75.405				
7	.685	3.426	78.831				
8	.635	3.174	82.005				
9	.535	2.677	84.682				
10	.468	2.341	87.023				
11	.451	2.257	89.280				
12	.402	2.011	91.291				
13	.382	1.908	93.199				
14	.295	1.476	94.674				
15	.239	1.196	95.871				
16	.227	1.137	97.007				
17	.204	1.022	98.029				
18	.155	.773	98.803				
19	.141	.703	99.506				
20	.099	.494	100.000				
Extraction Method: Principal Axis Factoring.							
a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.							

D.7 Pattern Matrix For The Cost of Quality

Table 93: Pattern matrix for the cost of quality

Label	Descriptions	F1	F2	F3
Item 20	Product or service inspection	.725		
Item 21	Materials testing	.529		
Item 22	Process control or measurement	.570		
Item 23	Maintenance or calibrations	.667		
Item 24	Qualification of the product supplier	.615		
Item 25	Marketing research activities	.641		
Item 26	Document review	.748		

Label	Descriptions	F1	F2	F3
Item 27	Supplier review	.730		
Item 28	Quality planning	.931		
Item 29	Quality training	.698		
Item 30	The organisation assesses the cost related to product or service recall		.716	
Item 31	The organisation assesses the cost related to material or stock losses		.680	
Item 32	The organisation assesses the cost related to re-inspection and retest		.819	
Item 33	The organisation assesses the cost related to scrap due to poor quality		.750	
Item 34	The organisation assesses the cost related to design corrections		.622	
Item 35	The organisation assesses the price associated with loss of income			.550
Item 36	There is a system in place to estimate the price of resource utilization			.708
Item 37	There is an automated system to assess the cost related to quality activities			.459
Item 38	The company has a system in place to trace the cost of delays from one branch to another.			.891
Item 39	The corporation has a system in place to estimate the cost related to delays from the suppliers			.753

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

D.8 Cost of Conformance (F1) Reliability After EFA

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
.913	.914	10

Inter-Item Correlation Matrix

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Product or service inspection (A)	1,000	0,572	0,455	0,654	0,463	0,415	0,497	0,421	0,529	0,436
Materials testing (B)	0,572	1,000	0,519	0,585	0,606	0,416	0,325	0,455	0,454	0,459
Process control or measurement (C)	0,455	0,519	1,000	0,612	0,676	0,404	0,534	0,509	0,563	0,498
Maintenance or calibrations (D)	0,654	0,585	0,612	1,000	0,540	0,420	0,426	0,465	0,543	0,482
Qualification of the product supplier (E)	0,463	0,606	0,676	0,540	1,000	0,455	0,393	0,505	0,560	0,489
Marketing research activities (F)	0,415	0,416	0,404	0,420	0,455	1,000	0,560	0,657	0,613	0,471
Document review (G)	0,497	0,325	0,534	0,426	0,393	0,560	1,000	0,728	0,737	0,586
Supplier review (H)	0,421	0,455	0,509	0,465	0,505	0,657	0,728	1,000	0,601	0,536
Quality planning (I)	0,529	0,454	0,563	0,543	0,560	0,613	0,737	0,601	1,000	0,712
Quality training (J)	0,436	0,459	0,498	0,482	0,489	0,471	0,586	0,536	0,712	1,000

D.9 The Failure Cost Reliability After EFA

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	No. of Items
.878	.879	5

Inter-Item Correlation Matrix					
	The organisation assesses the cost related to product or service recall	**The organisation assesses the cost related to material or stock losses**	**The organisation assesses the cost related to re-inspection and retest**	**The organisation assesses the cost related to scrap due to poor quality**	**The organisation assesses the cost related to design corrections**
The organisation assesses the cost related to product or service recall	1.000	.615	.663	.453	.477
The organisation assesses the cost related to material or stock losses	.615	1.000	.682	.570	.520
The organisation assesses the cost related to re-inspection and retest	.663	.682	1.000	.606	.554
The organisation assesses the cost related to scrap due to poor quality	.453	.570	.606	1.000	.782
The organisation assesses the cost related to design corrections	.477	.520	.554	.782	1.000

D.10 Hidden Cost Reliability After EFA

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standardised Items**	**No. of Items**
.864	.864	5

Inter-Item Correlation Matrix					
	The organisation assessed the price associated with loss of income	**There is a system in place to estimate the price of resource utilisation**	**There is an automated system to assess the cost related to quality activities**	**The company has a system in place to trace the cost of delays from one branch to another.**	**The corporation has a system in place to estimate the cost related to delays from the suppliers**
The organisation assessed the price associated with loss of income	1.000	.475	.417	.574	.472
There is a system in place to estimate the price of resource utilisation	.475	1.000	.474	.626	.659

Inter-Item Correlation Matrix					
	The organisation assessed the price associated with loss of income	**There is a system in place to estimate the price of resource utilisation**	**There is an automated system to assess the cost related to quality activities**	**The company has a system in place to trace the cost of delays from one branch to another.**	**The corporation has a system in place to estimate the cost related to delays from the suppliers**
There is an automated system to assess the cost related to quality activities	.417	.474	1.000	.609	.577
The company has a system in place to trace the cost of delays from one branch to another.	.574	.626	.609	1.000	.719
The corporation has a system in place to estimate the cost related to delays from the suppliers	.472	.659	.577	.719	1.000

D.11 SEM for the cost of quality based on theoritical frame work

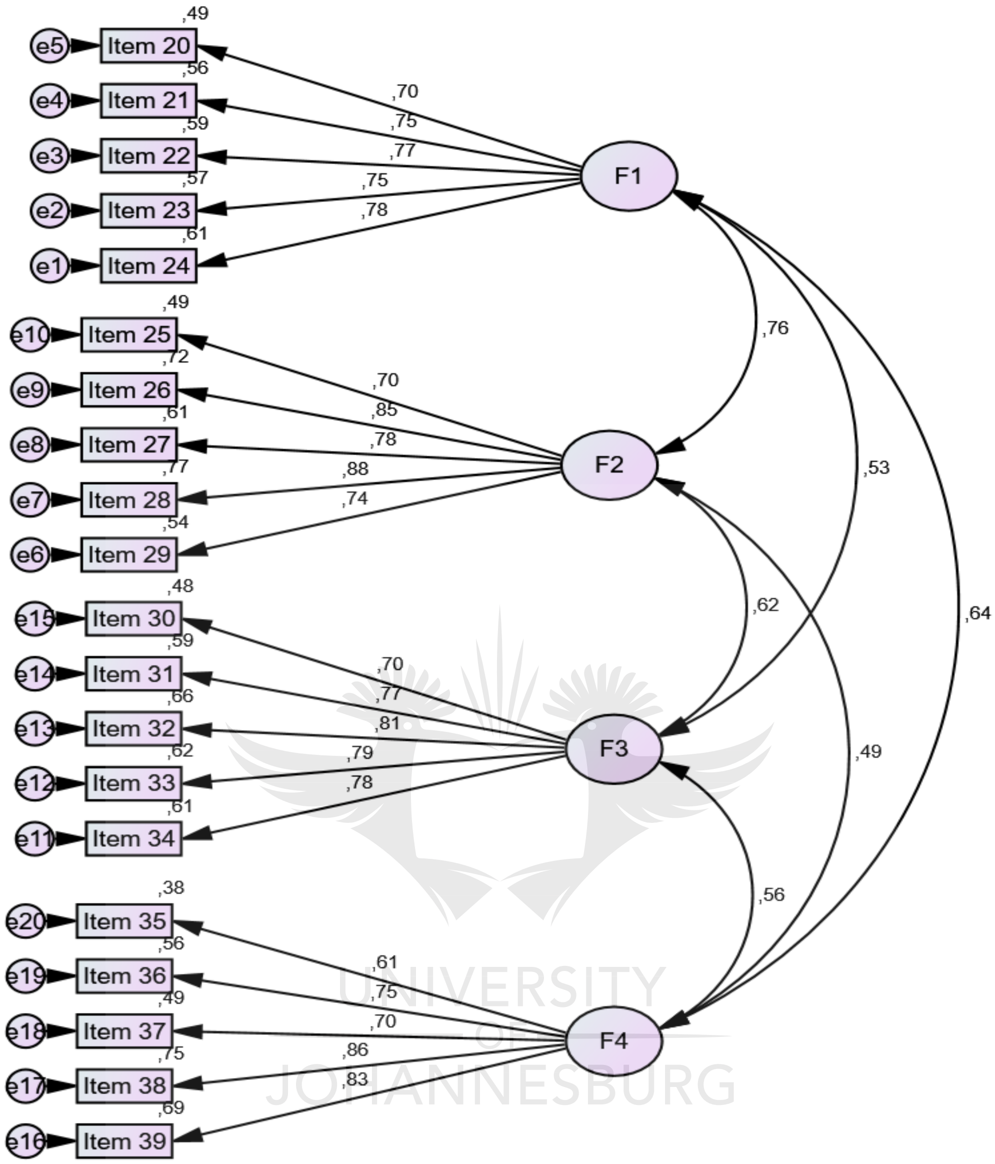

Figure 67: SEM for a CoQ theoretical framework

Figure 67 shows the SEM of the CoQ theoretical framework, all the observed variable had the good factor loading (ʎ > 0.6) to their respective latent variable. However the results indicated a high correlation (r = 0.79) between F1 and F 2 which means that the two factors were measuring the same thing – hence, the model was not accepted for further analysis

D.12 Cost of Quality SEM Model fit Indices based on EFA framework

Model fit indices for EFA model: The result (Default model)

Minimum was achieved

Chi-square = 401,846

Degrees of freedom = 167

Probability level = ,000

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	43	401,846	167	,000	2,406
Saturated model	210	,000	0		
Independence model	20	1636,602	190	,000	8,614

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	,074	,750	,685	,596
Saturated model	,000	1,000		
Independence model	,409	,227	,145	,205

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	,754	,721	,840	,815	,838
Saturated model	1,000		1,000		1,000
Independence model	,000	,000	,000	,000	,000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	,879	,663	,736
Saturated model	,000	,000	,000
Independence model	1,000	,000	,000

NCP

Model	NCP	LO 90	HI 90
Default model	234,846	179,960	297,435
Saturated model	,000	,000	,000
Independence model	1446,602	1321,107	1579,523

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	3,405	1,990	1,525	2,521
Saturated model	,000	,000	,000	,000
Independence model	13,870	12,259	11,196	13,386

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	,109	,096	,123	,000
Independence model	,254	,243	,265	,000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	487,846	506,465	607,349	650,349
Saturated model	420,000	510,928	1003,616	1213,616
Independence model	1676,602	1685,261	1732,184	1752,184

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	4,134	3,669	4,665	4,292
Saturated model	3,559	3,559	3,559	4,330
Independence model	14,208	13,145	15,335	14,282

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	59	63
Independence model	17	18

D.13 CoQ structure from EFA result

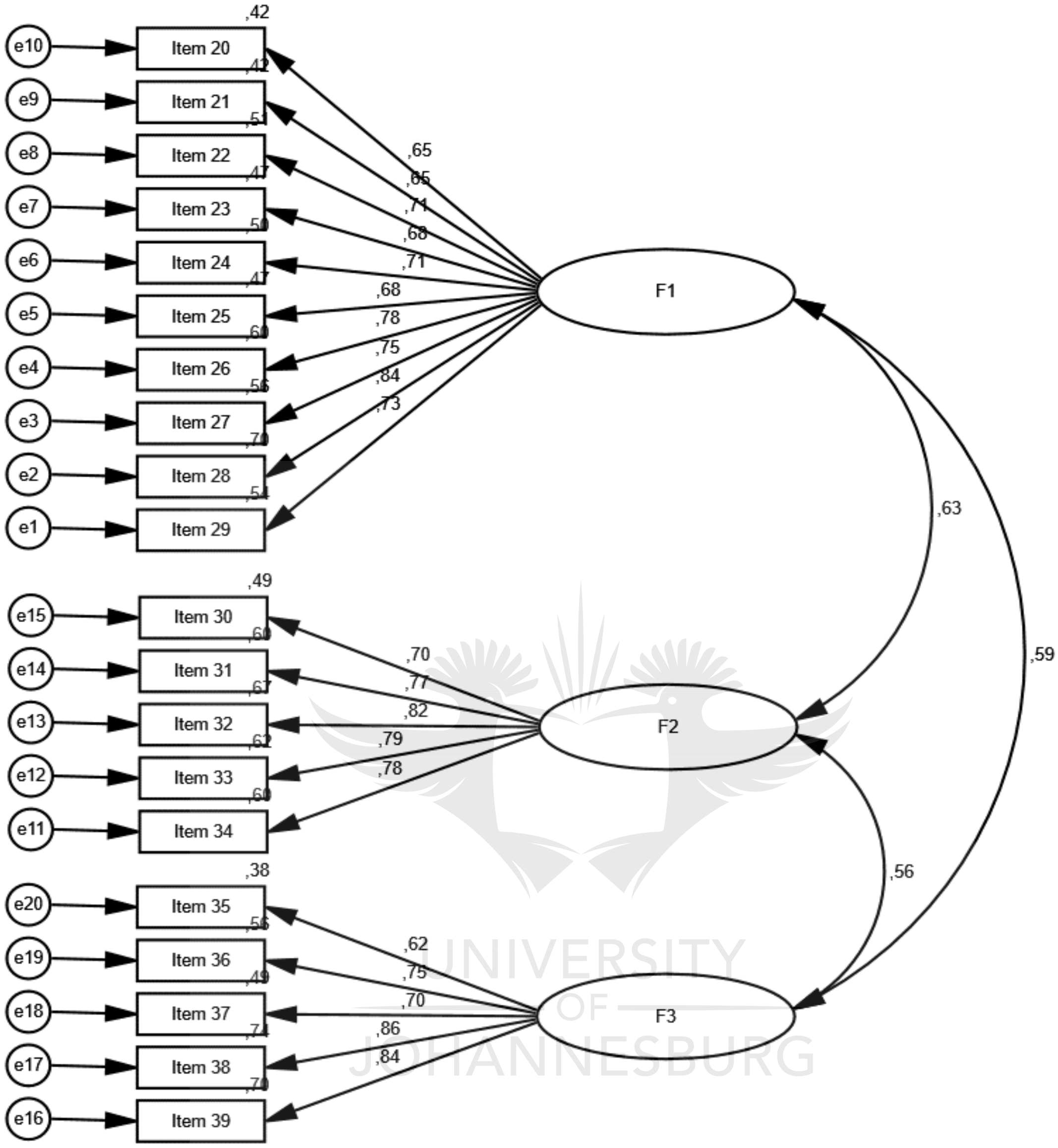

Figure 68: Cost of quality SEM based on EFA result

Figure 68 shows the cost of quality, structure from EFA result. The results show that the items were loaded well (factor loading > 0.6) to their respective factors. The latent factors were also moderately correlated (R <0.7) but the model fit indices were not within the acceptable range. The model fit indices were improved by systematically removing the items which had the lowest factor loading and observe the model fit indices. As a result nine items were removed, which led to the improvement of the model and the result is presented in the next section. Table 94 shows the reliability and validity of the EFA and the result shows that the EFA analysis had both validity and reliability.

Table 94: Construct validity and reliability of cost of quality (EFA)

Latent variables	Cronbach's Alpha after CFA	Convergent validity AVE ≥ 0.5	Discriminant validity AVE > MSV
Cost of conformance (F1)	0.91 (N = 10)	0.5 = 0.5	0.5 > 0.4
Failure cost (F2)	0.88 (N= 5)	0.6 >0.5	0.6> 0.4
Hidden cost (F3)	0.86 (N = 5)	0.6 > 0.5	0.6 > 0.3

D.14 Cost of Quality SEM Model based on CFA framework

Model fit indices for final model (CFA): The result (Default model)

Minimum was achieved

Chi-square = 74,481

Degrees of freedom = 41

Probability level =0, 001

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	25	74,481	41	,001	1,817
Saturated model	66	,000	0		
Independence model	11	747,590	55	,000	13,593

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	,060	,901	,840	,559
Saturated model	,000	1,000		
Independence model	,407	,328	,194	,274

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	,900	,866	,953	,935	,952
Saturated model	1,000		1,000		1,000
Independence model	,000	,000	,000	,000	,000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	,745	,671	,709
Saturated model	,000	,000	,000
Independence model	1,000	,000	,000

NCP

Model	NCP	LO 90	HI 90
Default model	33,481	13,138	61,655
Saturated model	,000	,000	,000
Independence model	692,590	607,990	784,623

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	,631	,284	,111	,522
Saturated model	,000	,000	,000	,000
Independence model	6,336	5,869	5,152	6,649

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	,083	,052	,113	,041
Independence model	,327	,306	,348	,000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	124,481	130,141	193,959	218,959
Saturated model	132,000	146,943	315,422	381,422
Independence model	769,590	772,081	800,161	811,161

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	1,055	,883	1,294	1,103
Saturated model	1,119	1,119	1,119	1,245
Independence model	6,522	5,805	7,302	6,543

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	91	103
Independence model	12	13

APPENDIX E: TESTING OF ASSUMPTIONS

E.1 Correlation analysis assumptions

According to Gogtay and Thatte (2017) it is important to check the presence of linear relationship between dependent and independent variables before the researcher performs the Pearson correlation. The main purpose of this section is to check the assumption that there is a linear relationship between quality management factors and cost of quality factors. The result in Figure 69 shows that there is a linear relationship between process management and cost of conformance. The relationship is such that an increase in cost of conformance results in an increase of 0.239 in process management and 2.77 is the interception point between x and y based on the equation $Y = \beta_1 + \beta_2 X + \varepsilon$ (Equation 8). R squared in the variance of the dependent variable explained by independent variable and in this case cost of conformance explains 6.16 % of the process management. The correlation between process management and cost of conformance is $\sqrt{R^2}$ which (R = 0.248) indicating the presence of the linear relationship between process management and cost of conformance.

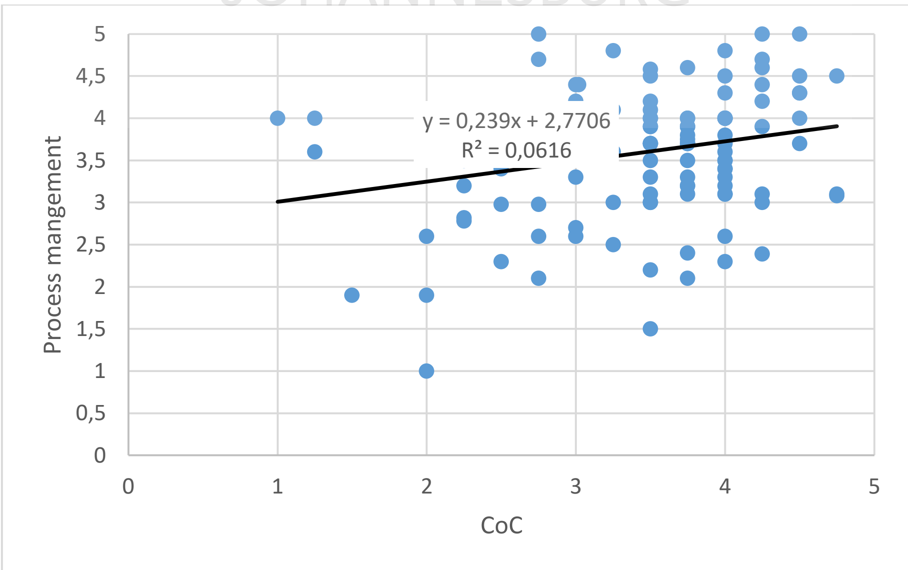

Figure 69: Linear correlation between Process management and cost of conformance

Figure 70 shows the scatter plot between process management and failure cost. The result shows an increase in the failure cost led to a direct increase of 0.1928 in process management. Failure cost explains a total 3.48% (R^2 = 0.0348) of the process management. The two variables had the correlation coefficient of R = 0.187($\sqrt{R^2}$). The result also shows that there is a linear relationship between process management and failure cost.

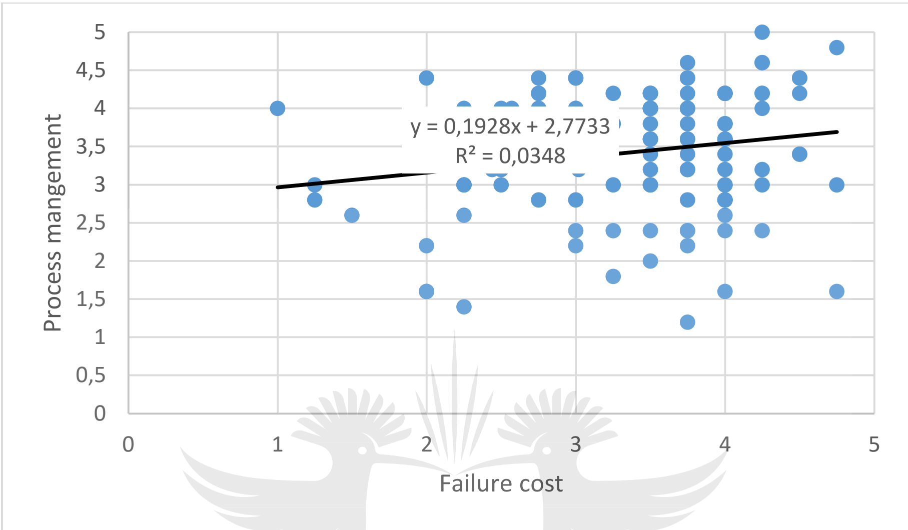

Figure 70: Linear correlation between Process management and failure cost

Figure 71 shows the scatter plot between process management and hidden costs and the result shows the weak relationship between process management and hidden cost. The relationship was such that an increase in hidden cost led to an increase of 0.091 to process management. Hidden cost explained only 0.78% of the total variance in process management. The two factors had a weak correlation of R = 0.09 which was too close to zero.

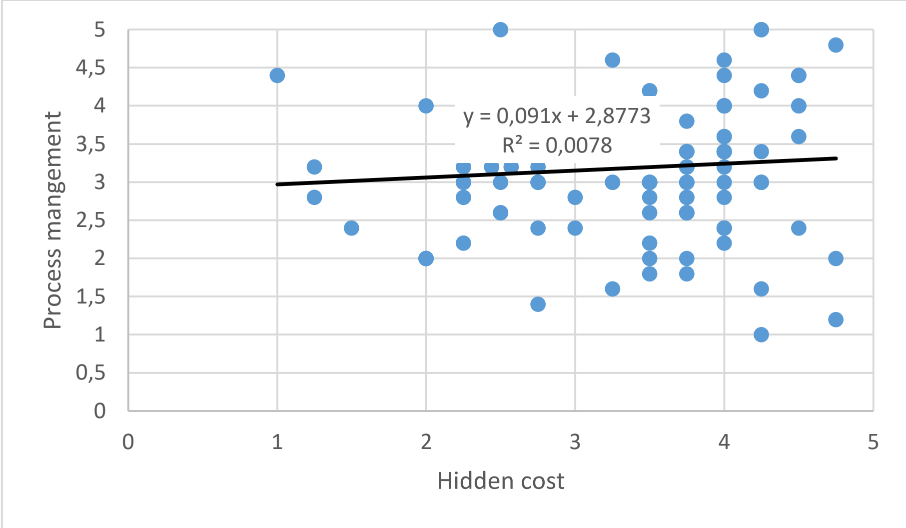

Figure 71: Linear correlation between process management and hidden cost

Figure 72 indicates the relationship between customer focus and cost of conformance.

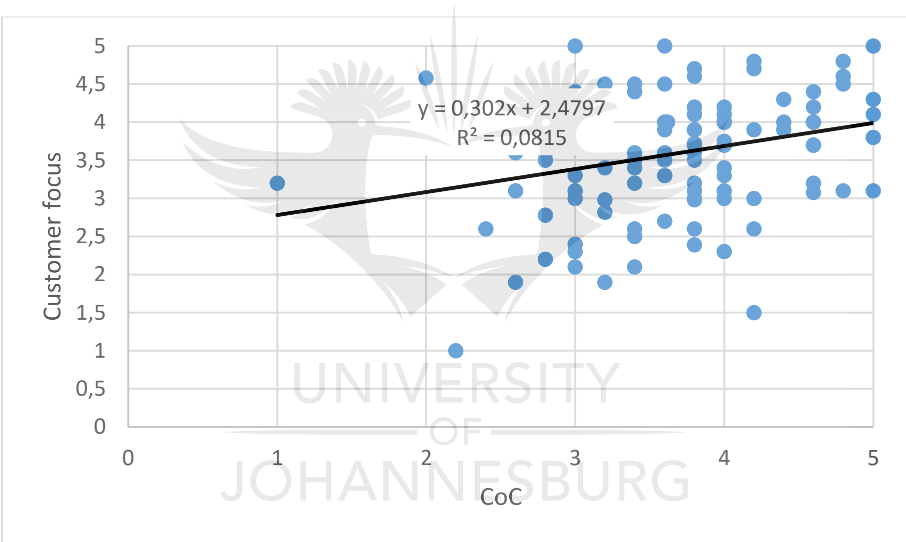

Figure 72: Linear correlation between customer focus and cost of conformance

The result shows the positive relationship between the two factors, the relationship was in such that the unit increase in cost of conformance lead to an increase of 0.302 of customer focus. The cost of conformance explained a total variance of 8.15% of customer focus and the two had the correlation of R = 0.29. The result shows that there is a linear relationship between customer focus and cost of conformance.

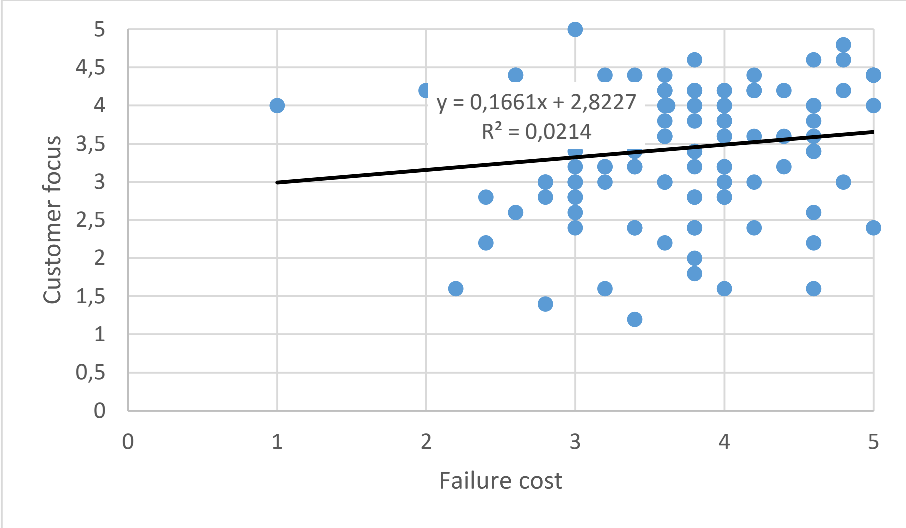

Figure 73: Linear correlation between customer focus and failure cost

Figure 73 shows the relationship between customer focus and failure cost and the result shows a positive relationship between customer focus and failure cost, the relationship was such that the unit increase in failure cost led to a 0.1661 increase in the customer focus. Failure cost explained 2.14% of the customer focus and the two variables had the weak correlation of R = 0.15 which is $\sqrt{R^2}$.

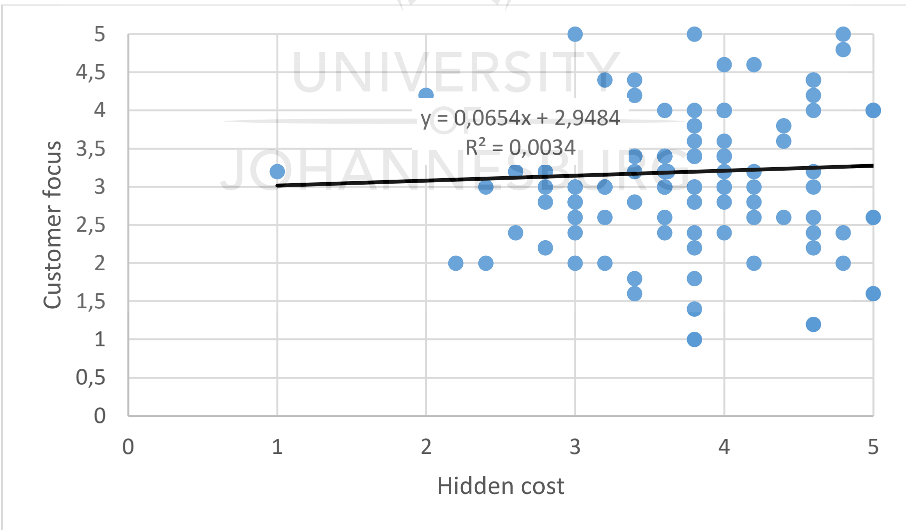

Figure 74: Linear correlation between customer focus and hidden cost

Figure 74 shows the relationship between customer focus and hidden cost. The relationship between the two factors was such that the unit increase in hidden cost leads an increase of 0.065 to customer focus. The hidden cost explained a total variance of 0.34% of customer focus and the two variables had the weak correlation of R = 0.06 which was too close to zero.

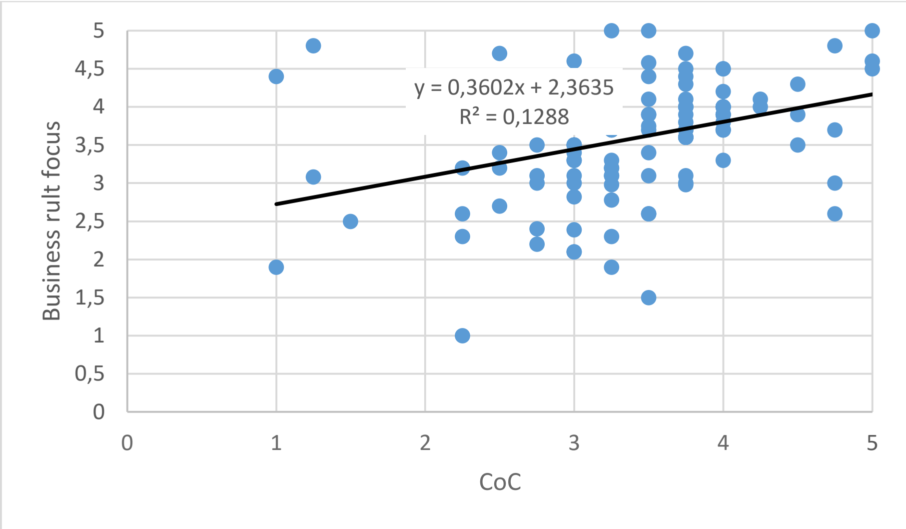

Figure 75: Linear correlation between business result focus and cost of conformance

Figure 75 shows the linear correlation between business result focus and cost of conformance and the relationship is such that the unit increase cost of conformance led to a 0.3602 increase in the business result focus. The cost of conformance explained the total variance of 12.88% of business result focus and the two variables had the strong positive correlation of 0.35.

Figure 76 shows the linear correlation between business result focus and failure cost and the result shows the two variables had the strong positive correlation of R = 0.38 which is $\sqrt{0.1438}$ and failure cost explained a total variance of 14.38% of business result focus. The result shows that the unit increase in failure cost lead to an increase of 0.408 in business result focus.

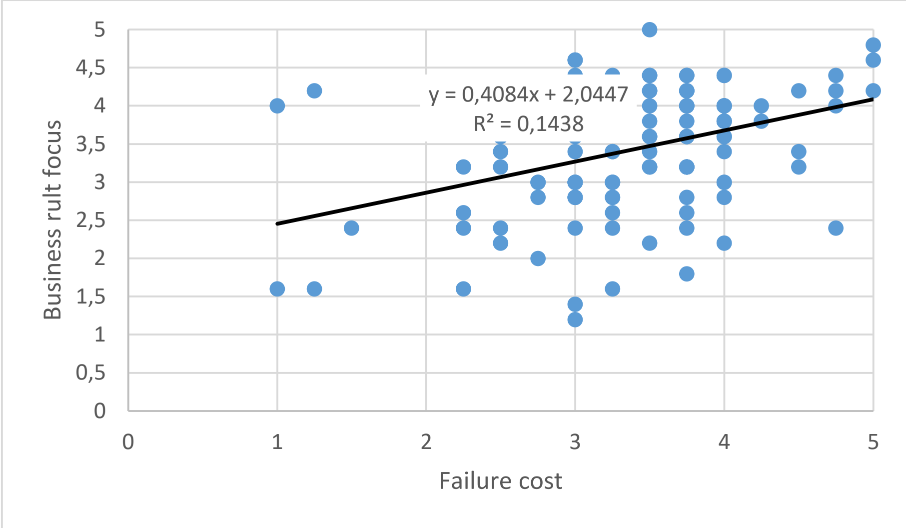

Figure 76: Linear correlation between business result focus and failure cost

Figure 77 indicates the linear relationship between business result focus and hidden cost. The result shows a strong positive correlation between the two variables (R =0.46). The relationship was such that the unit increase in hidden cost led to 0.497 with the business result focus. The hidden cost explained a total variance of 21.46% of the business result focus.

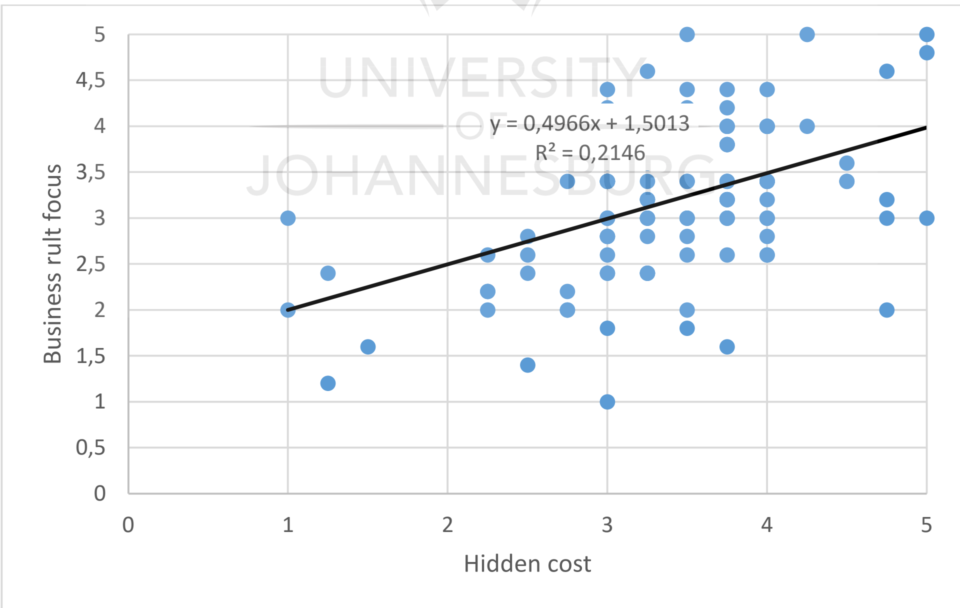

Figure 77: Linear correlation between business result focus and hidden cost

Figure 78 indicates the linear correlation in the scatter plot between employee focus and cost of conformance and result shows that the two variables were highly correlated (R =0.399). The correlation was such that the unit increase in cost of conformance led to a 0.343 increase in the employee focus. The cost of conformance explained a total variance of 15.92% of the employee focus.

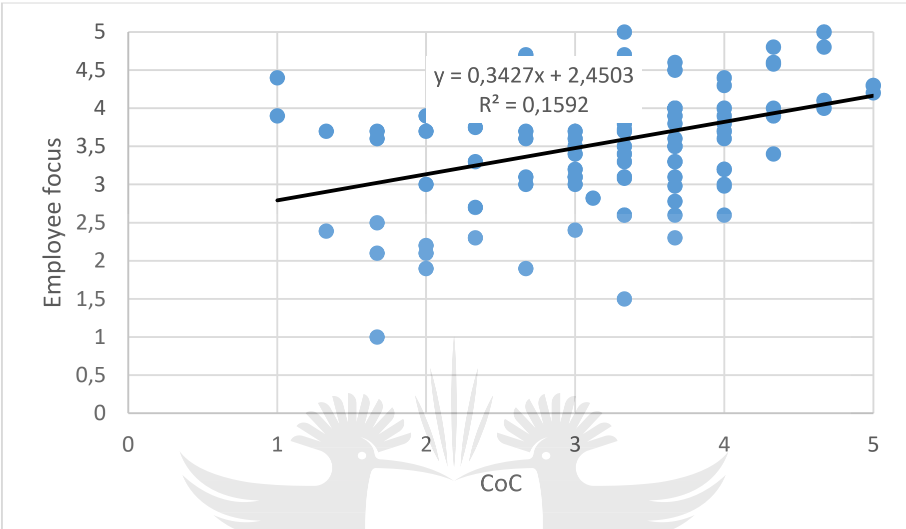

Figure 78: Linear correlation between employee focus and cost of conformance

Figure 79 shows the scatter plot indicating the linear relationship between employee focus and failure cost.

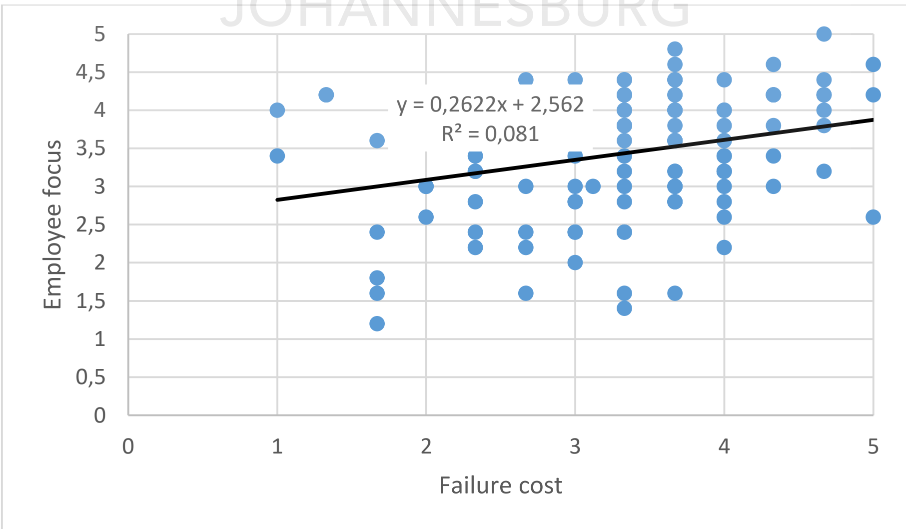

Figure 79: Linear correlation between employee focus and failure cost

The result shows that the two variables had the linear relationship (R = 0.28) and failure cost explained the total variance of 8.1% in the employee focus. The relationship was such that the unit increase in failure cost led to an increase of 0.262 in the employee focus.

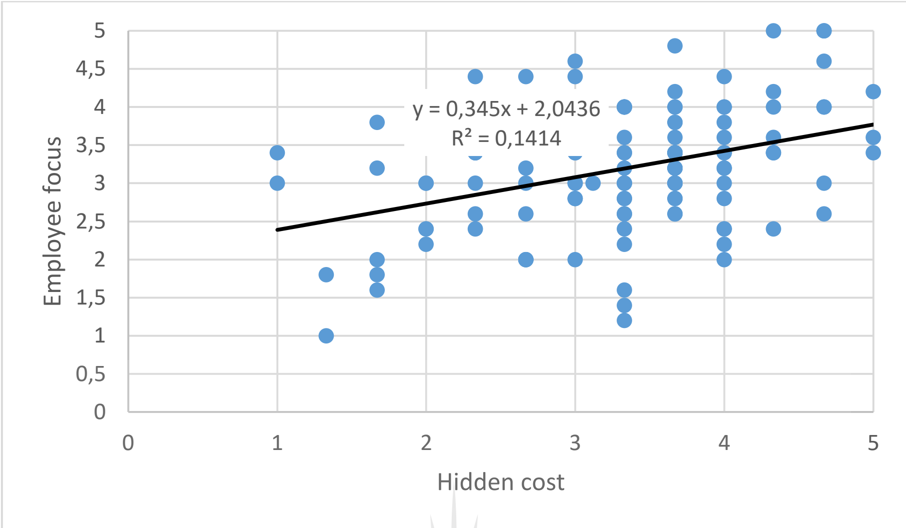

Figure 80: Linear correlation between employee focus and hidden cost

Figure 80 shows the linear relationship between employee focus and hidden costs in the scatter plot diagram. The result shows that the unit increase in hidden cost led to a 0.345 increase in employee focus. The hidden cost explained a total variance of 14.14% of the employee focus and the two factors had the Pearson correlation of R = 0.376.

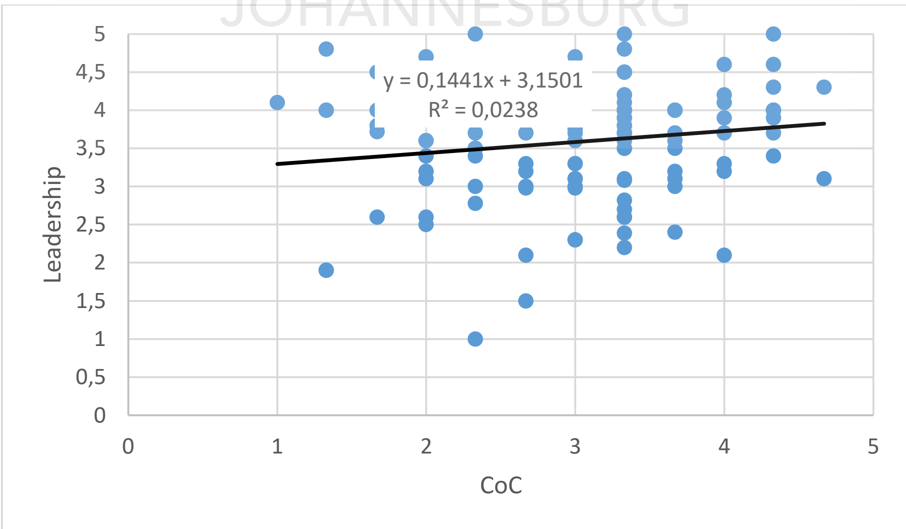

Figure 81: Linear correlation between leadership and cost of conformance

Figure 81 shows the linear relationship between cost of conformance and leadership. The result shows a weak correlation (R= 0.15) between the two variables. The relationship was such that the unit increase in cost of conformance led to a 0.1441 increase in the leadership and the cost of conformance explained 2.38% of leadership.

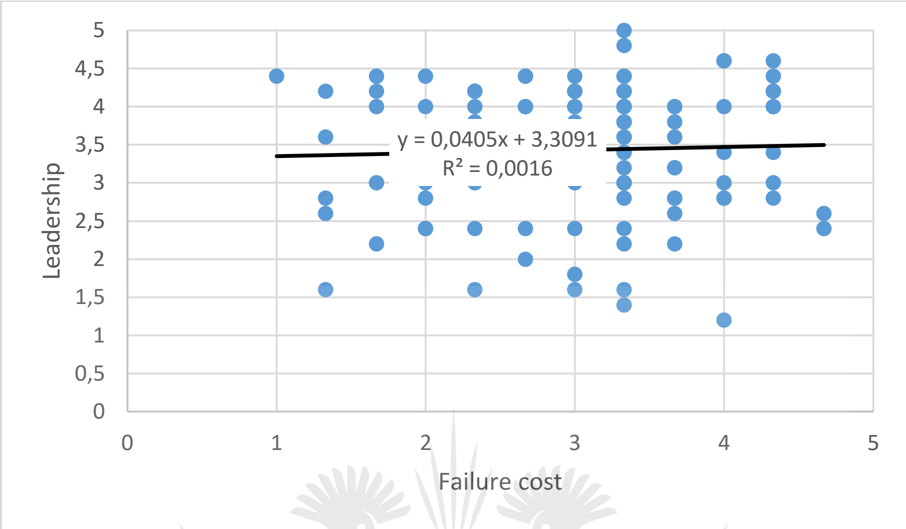

Figure 82: Linear correlation between leadership and failure cost

Figure 82 shows the relationship between leadership and failure cost in the scatter plot. The result shows a very weak correlation (R = 0.04) between two variables. The failure cost only explained a total variance of 0.16% of leadership. The unit increase in failure cost only leads to 0.041 increase in the leadership.

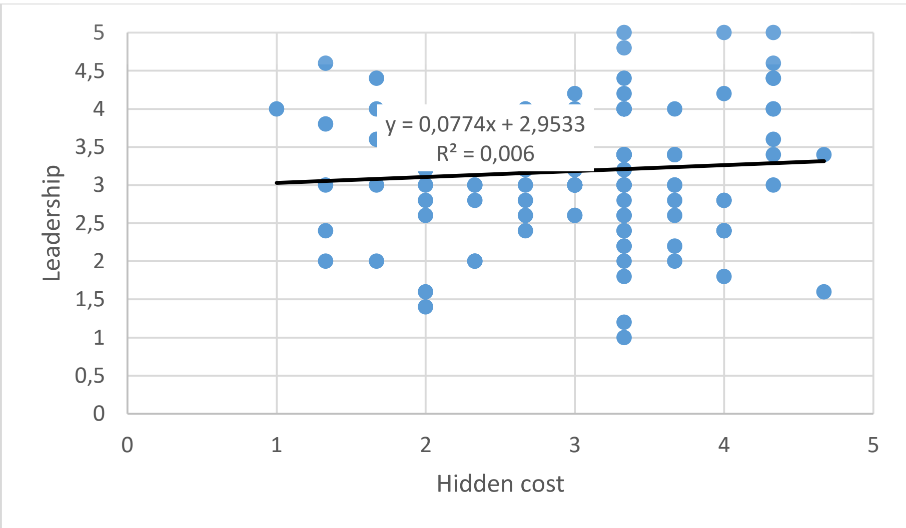

Figure 83: Linear correlation between leadership and hidden cost

Figure 83 indicates the linear correlation between leadership and hidden costs and the result shows a very weak correlation (R = 0.08) between the two variables. The hidden cost explained the total variance of 0.6% of leadership. The relationship was such that the unit increase in hidden cost led to an increase of 0.077 leadership.

E.2 Identification of outliers

Figure 84 shows that all the variables had outlines, but they are within the acceptable range, SPSS uses the star sign to indicate the outlines which are out of the range.

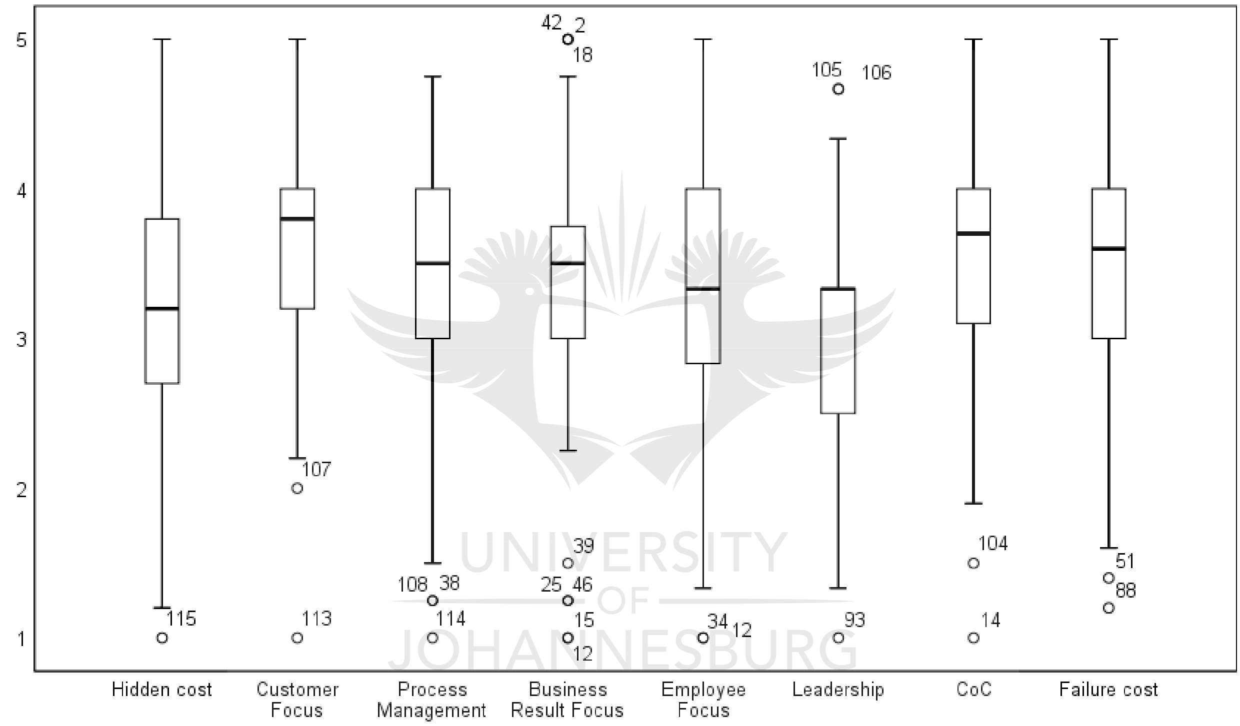

Figure 84: Identification of outlier

E.3 Multiple Linear Regression Assumptions

Table 95: Correlation between the cost of conformance and quality management

Correlations							
		CoC	F1	F2	F3	F4	F5
Pearson Correlation	CoC	1.000	.248	.285	.359	.399	.155
	F1	.248	1.000	.436	.064	.066	.473
	F2	.285	.436	1.000	.097	.053	.463
	F3	.359	.064	.097	1.000	.320	.160
	F4	.399	.066	.053	.320	1.000	.058
	F5.1	.155	.473	.463	.160	.058	1.000
Sig. (1-tailed)	CoC	.	.003	.001	.000	.000	.046
	F1	.003	.	.000	.243	.237	.000
	F2	.001	.000	.	.147	.283	.000
	F3	.000	.243	.147	.	.000	.041

Correlations							
		CoC	F1	F2	F3	F4	F5
	F4	.000	.237	.283	.000	.	.264
	F5	.046	.000	.000	.041	.264	.

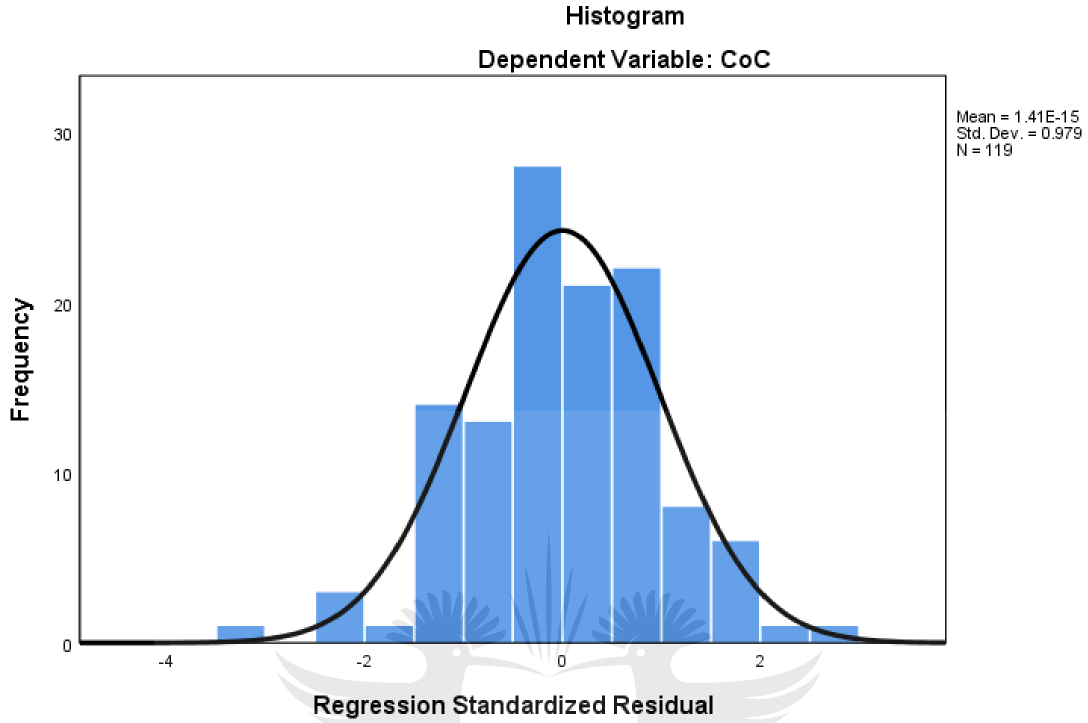

Figure 85: Histogram of regression standardised residuals (Cost of Conformance)

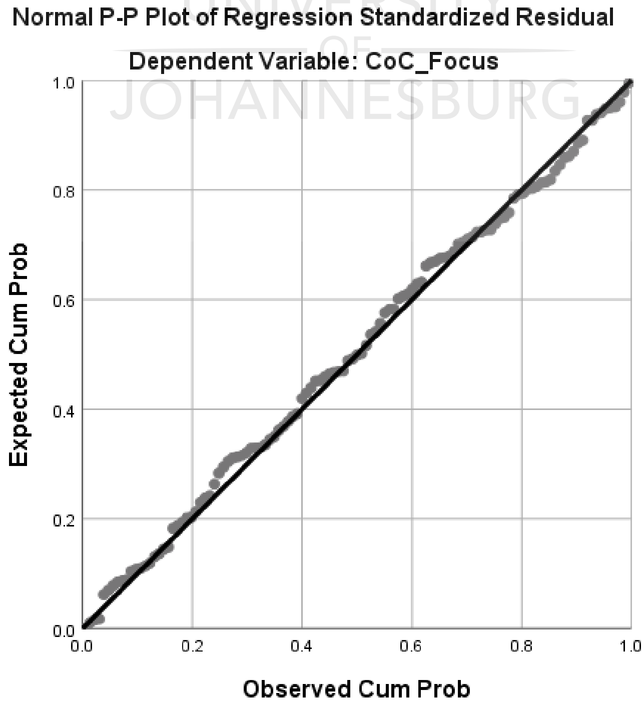

Figure 86: Normal P-P plot of regression standardised residual (Cost conformance)

Correlations							
		Failure cost	F1	F2	F3	F4	F5
Pearson Correlation	Failure cost	1.000	.187	.146	.379	.285	.041
	F1	.187	1.000	.436	.064	.066	.473
	F2	.146	.436	1.000	.097	.053	.463
	F3	.379	.064	.097	1.000	.320	.160
	F4	.285	.066	.053	.320	1.000	.058
	F5	.041	.473	.463	.160	.058	1.000
Sig. (1-tailed)	Failure cost	.	.021	.056	.000	.001	.330
	F1	.021	.	.000	.243	.237	.000
	F2	.056	.000	.	.147	.283	.000
	F3	.000	.243	.147	.	.000	.041
	F4	.001	.237	.283	.000	.	.264
	F5	.330	.000	.000	.041	.264	.

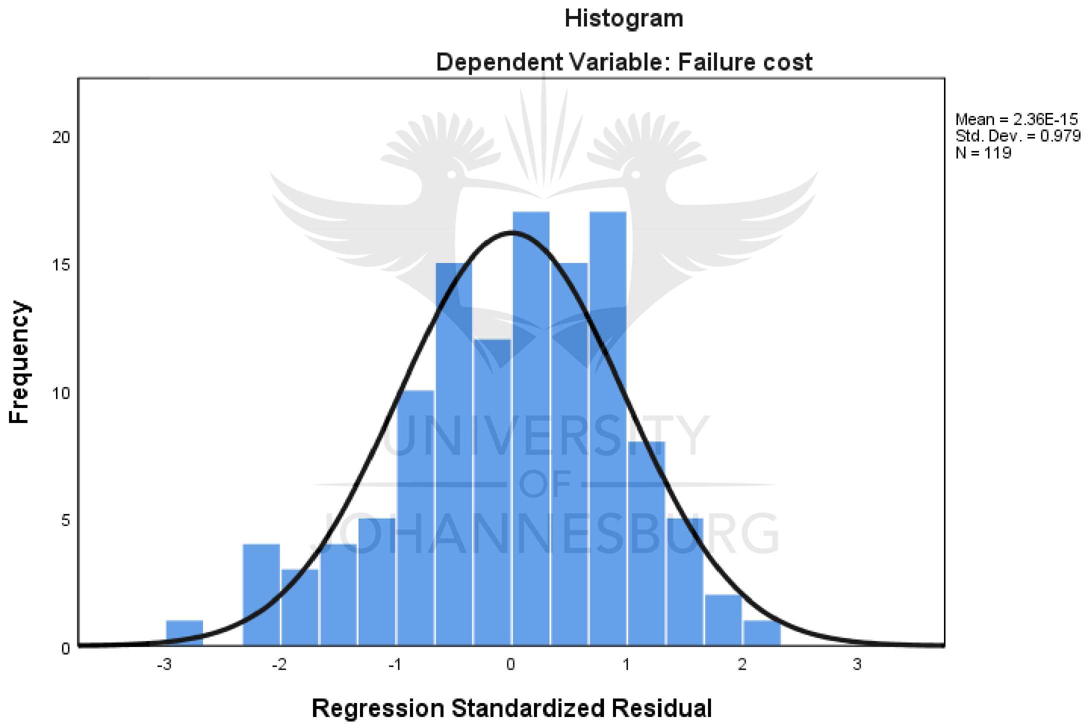

Figure 87: Histogram of regression standardised residuals (Failure cost)

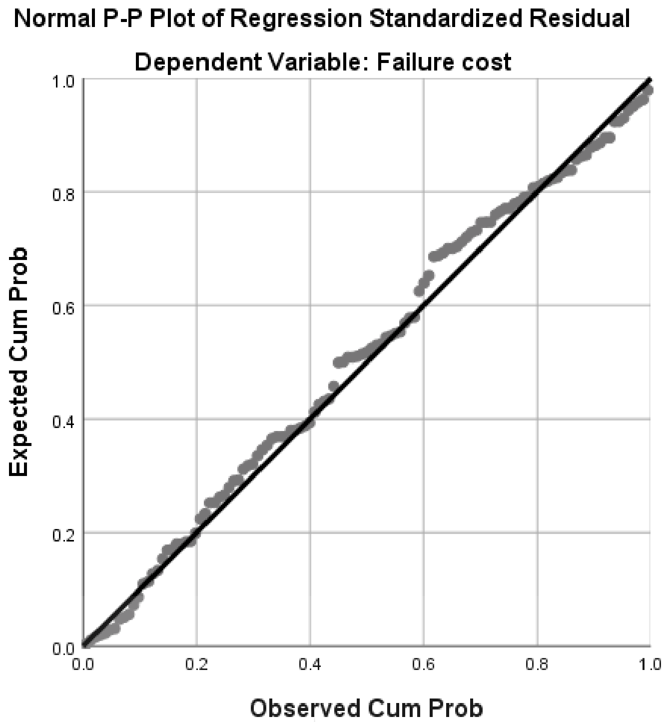

Figure 88: Normal P-P plot of regression standardised residual (Failure cost)

Correlations							
		Hidden cost	F1	F2	F3	F4	F5
Pearson Correlation	Hidden cost	1.000	.088	.058	.463	.376	.078
	F1	.088	1.000	.436	.064	.066	.473
	F2	.058	.436	1.000	.097	.053	.463
	F3	.463	.064	.097	1.000	.320	.160
	F4	.376	.066	.053	.320	1.000	.058
	F5	.078	.473	.463	.160	.058	1.000
Sig. (1-tailed)	Hidden cost	.	.169	.266	.000	.000	.200
	F1	.169	.	.000	.243	.237	.000
	F2	.266	.000	.	.147	.283	.000
	F3	.000	.243	.147	.	.000	.041
	F4	.000	.237	.283	.000	.	.264
	F5	.200	.000	.000	.041	.264	.

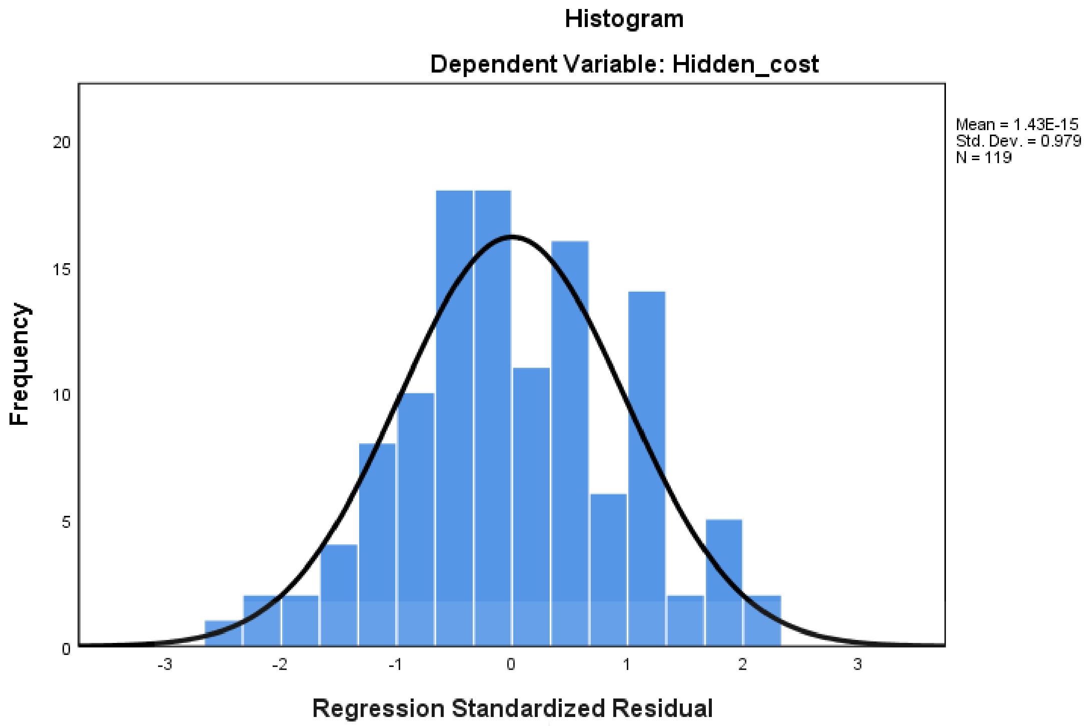

Figure 89: Histogram of regression standardised residuals (Hidden cost)

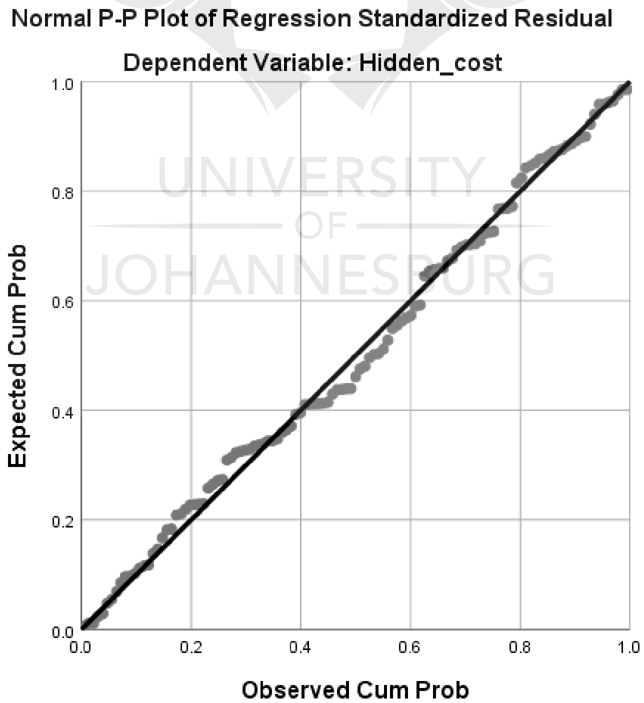

Figure 90: Normal P-P plot of regression standardised residual (Hidden cost)

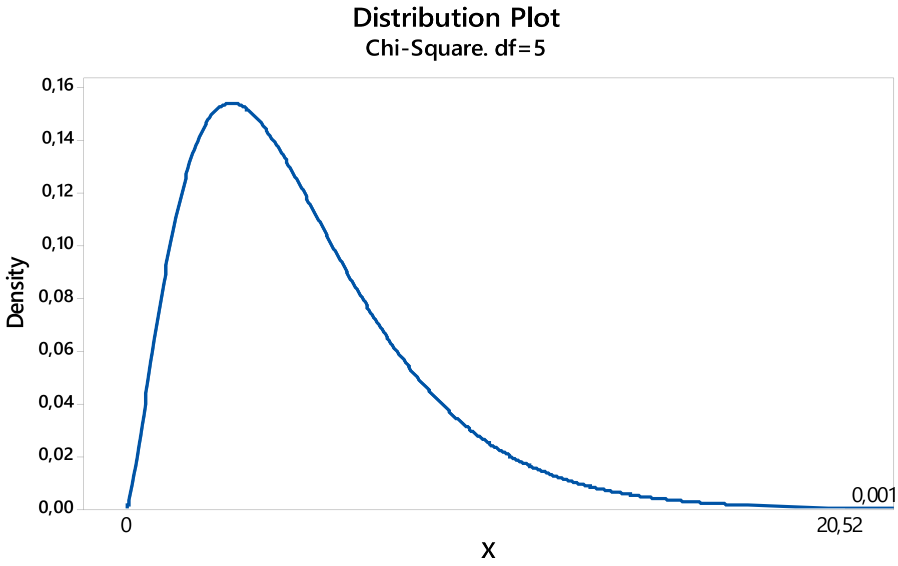

Figure 91: Critical chi-squared value (Df = 5)

Table 96: Residual statistics first round

Residuals Statistics					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.7140	4.1324	3.1882	.42739	119
Std. Predicted Value	-3.449	2.209	.000	1.000	119
Standard Error of Predicted Value	.078	.336	.151	.049	119
Adjusted Predicted Value	1.4928	4.2165	3.1853	.42945	119
Residual	-1.73860	1.54858	.00000	.69374	119
Std. Residual	-2.452	2.184	.000	.979	119
Stud. Residual	-2.519	2.236	.002	1.010	119
Deleted Residual	-1.83407	1.62197	.00292	.73977	119
Stud. Deleted Residual	-2.581	2.277	.002	1.019	119
Mahal. Distance	.441	25.525	4.958	4.206	119
Cook's Distance	.000	.151	.011	.022	119
Centred Leverage Value	.004	.216	.042	.036	119
a. Dependent Variable: Hidden cost					

Table 97: Residual statistics second round

Residuals Statistics					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.7607	4.1006	3.1780	.43012	118
Std. Predicted Value	-3.295	2.145	.000	1.000	118

Standard Error of Predicted Value	.078	.306	.151	.048	118
Adjusted Predicted Value	1.5452	4.1700	3.1771	.43148	118
Residual	-1.67602	1.57421	.00000	.68698	118
Std. Residual	-2.387	2.242	.000	.978	118
Stud. Residual	-2.470	2.281	.001	1.008	118
Deleted Residual	-1.79495	1.62950	.00082	.73008	118
Stud. Deleted Residual	-2.529	2.325	.000	1.017	118
Mahal. Distance	.457	21.265	4.958	3.950	118
Cook's Distance	.000	.106	.011	.019	118
Centred Leverage Value	.004	.182	.042	.034	118
a. Dependent Variable: Hidden cost					

Table 98: Residuals statistics third round

Residuals Statistics					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.7484	4.0976	3.1778	.43316	117
Std. Predicted Value	-3.300	2.124	.000	1.000	117
Standard Error of Predicted Value	.079	.272	.153	.046	117
Adjusted Predicted Value	1.5287	4.1704	3.1762	.43414	117
Residual	-1.68089	1.57582	.00000	.68918	117
Std. Residual	-2.386	2.237	.000	.978	117
Stud. Residual	-2.469	2.276	.001	1.009	117
Deleted Residual	-1.80054	1.63120	.00163	.73346	117
Stud. Deleted Residual	-2.529	2.320	.001	1.018	117
Mahal. Distance	.451	16.336	4.957	3.748	117
Cook's Distance	.000	.109	.011	.019	117
Centred Leverage Value	.004	.141	.043	.032	117
a. Dependent Variable: Hidden cost					

APPENDIX F: BENCHMARKING BETWEEN QUALITY MANAGEMENT

F.1 South African Result

Table 99: Relative importance index (RII) for South African observations

Variables		1	2	3	4	5	N	∑f	RII
Leadership	Item 1	15	26	47	28	3	119	335	56%
	Item 3	15	22	54	26	2	119	335	56%
	Item 4	8	13	34	43	21	119	413	69%
									61%
Customer focus	Item 5	6	12	46	44	11	119	399	67%
	Item 6	4	9	35	55	16	119	427	72%
	Item 7	4	7	22	57	29	119	457	77%
	Item 8	1	10	30	51	27	119	450	76%
	Item 9	2	11	26	52	28	119	450	76%
									73%
Business result focus	Item 40	4	3	36	55	21	119	443	74%
	Item 41	5	15	50	40	9	119	390	66%
	Item 43	8	21	38	39	13	119	385	65%
	Item 44	7	11	50	35	16	119	399	67%
									68%
Process Management	Item 10	4	21	25	56	13	119	410	69%
	Item 12	3	16	44	49	7	119	398	67%
	Item 13	4	11	29	64	11	119	424	71%
	Item 14	9	20	28	49	13	119	394	66%
									68%
Employee focus	Item 15	11	16	40	36	16	119	387	65%
	Item 16	9	14	30	54	12	119	403	68%
	Item 19	9	17	34	46	13	119	394	66%
									66%
Cost of conformance	Item 25	6	17	45	40	11	119	390	66%
	Item 27	3	18	32	51	15	119	414	70%
	Item 28	3	15	26	59	16	119	427	72%
	Item 29	2	12	30	54	21	119	437	73%
									70%
Failure cost	Item 32	4	17	36	55	7	119	401	67%
	Item 33	4	16	40	37	22	119	414	70%
	Item 34	1	22	39	36	21	119	411	69%
									69%
Hidden cost	Item 36	2	17	41	48	11	119	406	68%
	Item 37	10	33	43	24	9	119	346	58%
	Item 38	8	26	40	35	10	119	370	62%
	Item 39	8	21	40	40	10	119	380	64%
									63%

F.2 International Result

Table 100: Relative importance index (RII) for international observations

Variables	Label	1	2	3	4	5	N	∑f	Global
Leadership	Item 1	2	4	7	2	4	19	59	62%
	Item 3	3	5	4	4	3	19	56	59%
	Item 4	2	3	10	0	4	19	58	61%
									61%
Customer focus	Item 5	0	4	5	5	5	19	68	72%
	Item 6	0	4	7	4	4	19	65	68%
	Item 7	1	3	0	8	7	19	74	78%
	Item 8	0	1	4	5	9	19	79	83%
	Item 9	1	0	6	4	8	19	75	79%
									76%
Business result focus	Item 40	3	2	3	8	3	19	63	66%
	Item 41	1	3	6	4	4	18	61	68%
	Item 43	2	2	8	5	1	18	55	61%
	Item 44	1	3	9	5	1	19	59	62%
									64%
Process Management	Item 10	1	0	4	7	7	19	76	80%
	Item 12	1	2	5	6	5	19	69	73%
	Item 13	0	2	3	9	5	19	74	78%
	Item 14	1	2	2	7	7	19	74	78%
									77%
Employee focus	Item 15	0	2	5	6	6	19	73	77%
	Item 16	1	1	2	8	7	19	76	80%
	Item 19	1	2	4	6	6	19	71	75%
									77%
Cost of conformance	Item 25	0	1	8	7	3	19	69	73%
	Item 27	1	1	5	4	8	19	74	78%
	Item 28	2	1	3	4	9	19	74	78%
	Item 29	1	1	5	6	6	19	72	76%
									76%
Failure cost	Item 32	0	4	6	5	4	19	66	69%
	Item 33	1	3	7	4	4	19	64	67%
	Item 34	1	1	6	8	3	19	68	72%
									69%
Hidden cost	Item 36	1	3	4	6	5	19	68	72%
	Item 37	2	4	6	4	3	19	59	62%
	Item 38	0	2	7	6	4	19	69	73%
	Item 39	2	3	6	5	3	19	61	64%
									68%