THE LIMITATIONS OF THE SOUTH AFRICAN PROCUREMENT POLICIES AND PRACTICES IN RELATION TO CONTRACTOR SELECTION CRITERIA: THE IMPORTANCE OF TECHNICAL QUALIFICATIONS AND EXPERIENCE OF ESTABLISHED CONSTRUCTION COMPANIES

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A thesis submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Doctor of Philosophy

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DECLARATION

I declare that this thesis is my own unaided work. It is being submitted for the Degree of Doctor of Philosophy to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

Fate Tharullo Muzondo

14th day of **April, 2020**

ABSTRACT

In the 2017 budget, the South African government indicated plans to invest over R940 billion in public infrastructure as part of the medium-term strategic framework. This investment indicates future growth in the construction industry. The construction industry also plays a significant role in the creation of employment and in economic growth. To achieve this, the government will most likely be reliant on contractors for the implementation of its plan. In addition, Small, Medium and Micro Enterprises (SMMEs) currently contribute 70 to 80% of employment. Given that another goal of the government is to develop emerging contractors, SMME civil engineering and building contractors will most likely play a significant role in this projected growth. Studies on the skills profiles of CIDB grades 1 to 6 contractors in South Africa, however, have shown that these emerging contractors lack the necessary skills to competently complete infrastructure projects. In developing this theme further, the primary objective of this study was to show that the required skills or competencies include technical qualifications and construction related experience, and that these needs are often neglected when contractors are evaluated as part of the pre-appointment or procurement processes. Furthermore, this thesis proposed that technical skills may be the distinguishing factors between the SMMEs and the larger enterprises. This thesis also argues that competency assessment should form a vital part of procurement practices, especially in relation to the selection of contractors. To demonstrate this, the thesis provided evidence from previous studies of the qualifications and experience of grades 1 to 6 contractors. Empirical data was used to compare these results with the technical competencies of grades 7 to 9 local contractors as well as their international equivalents. Evidence of procurement and contractor selection practices was also collected on these groups of contractors through the analysis of tender documents. This research found that clients generally do not expect grades 1 to 6 contractors to have technical qualifications, and as such, do not evaluate them against these criteria during the selection process. Government agencies procuring grades 7 to 9 contractors, who generally have technical skills, however, seem to hold them to a higher standard. This non-uniformity in the procurement strategies, as this study found, is because construction regulations and policies place the onus of defining contractor selection criteria on the client. This study, therefore recommended that construction related technical competencies be at the forefront of contractor selection criteria, and that policy should take these factors into consideration. Additionally, contractor development programmes should focus on developing these skills in order to reduce SMME contractor failure, and as a result, contribute to the reduction of unemployment in South Africa.

DEDICATION

To my son Joshua, thank you for being the evidence that I can achieve anything through hard work and persistence; without you, this thesis might have been completed a bit sooner. And finally, to the love of my life, my husband, Tapiwa Muzondo; thank you for your patience, wisdom and support. I would not have been able to do this without you. I love you both.

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To **Andrea Gay**, thank you for finding time in the middle of oversighting the whole world to proofread my work. You are a gem.

To the **almighty God**; I have seen that I certainly can do all things through Christ who strengthens me.

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NOMENCLATURE/LIST OF ACRONYMS

∞	Incomplete projects/abandoned projects
ANC	African National Congress
B-BBEE	Broad-Based Black Economic Empowerment
BSc	Bachelor of Science
BTech	Bachelor of Technology
CCT	compulsory competitive tendering
CE	Civil Engineering
CEO	Chief Executive Officer
CDP	Contractor Development Programme
CFO	Chief Financial Officer
CIDB	Construction Industry Development Board
CMG	Contractor Management Guidelines
COGTA	Co-operative Governance and Traditional Affairs
COO	Chief Operating Officer
CSIR	Council for Scientific and Industrial Research
CV	Curriculum Vitae
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
DHA	Department of Home Affairs
DoD	Degree of delay
dti	Department of Trade and Industry
ECDP	Emerging Contractor Development Programme
ECSA	Engineering Council of South Africa
EME	Emerging Micro Enterprises
EPWP	Expanded Public Works Programme
FIDIC	French Institute for International Federation of Consulting Engineers
GB	General Building
GCC	General Conditions of Contract
GEP	Gauteng Enterprise Propeller
ILO	International Labour Organisation
JBCC	Joint Building Contracts Committee

MD	Managing Director
MP	Mpumalanga Province
MSc	Master of Science
NA	not applicable
NCDP	National Contractor Development Programme
NDPW	National Department of Public Works
n.d	no date
NDip	National Diploma
NDP	National Development Plan
NEC3	New Engineering Contract
NHBRC	National Home Builders Registration Council
NURCHA	National Urban Reconstruction and Housing Agency
PhD	Philosophiae Doctor (Doctor of Philosophy)
PPC	Pretoria Portland Cement Company
PPPFA	Preferential Procurement Policy Framework Act No. 5 of 2000
QSE	Qualifying Small Enterprises
R	South African Rand
RSA	Republic of South Africa
RM	Malaysian Ringgit
RoC	Register of Contractors
SA	South Africa
SACPCMP	South African Council for Project and Construction Management Professionals
SAICE	South African Institute of Civil Engineering
SANRAL	South African National Road Agency Limited
SBD	Standard Bid Documents
SCM	Supply chain management
SMME	Small, Medium and Micro Enterprise
UAE	United Arab Emirates
UK	United Kingdom
JV	Joint Venture
ZAR	South African Rand

CHAPTER 1: INTRODUCTION

The construction industry is at the centre of the South African government programmes for job creation and skills development (Martin and Root, 2012). It is also a significant contributor to the country's gross domestic product (Ofori, 2006). In addition, the Small Medium and Micro Enterprise (SMME) sector contributes approximately 70 to 80% of the workforce in South Africa (Gauteng Enterprise Propeller (GEP), 2018), giving evidence to the necessity of these businesses. However, research conducted by the Construction Industry Development Board (CIDB, 2011), Martin and Root (2012), and Muzondo and McCutcheon (2018) on the skills and competencies of CIDB grade 1 to 6 contractors has shown that the performance of emerging contractors in South Africa is cause for concern. These studies have found that the owners and key staff of these SMME contractors lack the technical qualifications and experience necessary to successfully complete civil engineering (CE) and general building (GB) projects.

In a study on the challenges facing SMME contractors in Swaziland, Thwala and Mvubu (2008) highlight that the critical skills required for the success of any business are operational and business skills. Operational skills include technical competencies such as project management, scheduling and ordering, while business skills include aspects such as planning and financial accounting. Emerging contractor companies have been found to lack these business and managerial skills (Thwala and Mvubu 2008; Mofokeng, 2012). Moreover, SMME contractors tend to not employ qualified workers as they find them to be too costly for their businesses, ultimately leading to poor performance (Thwala and Mvubu, 2008).

Ofori (1994) argued that it is the responsibility of the government to develop the construction industry and contractors. According to Ofori (1994, 2018), this could be achieved through institutional building in the form of setting up public agencies, professional bodies and trade associations for the initiation, implementation and monitoring of initiatives to improve the construction industry. The South African government took positive steps in this regard through the CIDB, which was established by Act of Parliament (Act 38 of 2000). The role of the CIDB is to "promote a regulatory and developmental framework that builds construction industry delivery capability for South Africa's social and economic growth" and one that delivers globally competitive standards (CIDB, n.d.-a). Additionally, in order to promote the

economic participation of previously disadvantaged individuals and SMMEs, the South African government also put in place preferential procurement laws in the form of regulations such as the Broad-Based Black Economic Empowerment (B-BBEE) Act 53 of 2003. Furthermore, Regulation 5 of the CIDB Act, introduced in 2004, supports the development of emerging contractors through the use of the 'potentially emerging' status. Contractors that hold the potentially emerging (PE) status are enterprises that are majority black-owned, and financially and managerially controlled by black persons (CIDB, 2014). The PE status allows qualifying contractors to bid for projects that are one grade higher than their registered grade designation. Dlungwana and Rwelamila (2003), Kganyago (2004) and Gillingham (2009) argue, however, that these efforts are predominantly focused on providing emerging contractors opportunities and access into the industry rather than building sustainability and long-term growth. Thwala and Mvubu (2008) add that these measures are not focused on equipping contractors with the required competencies to achieve success. This is further evidenced by data released by the CIDB which showed that the number of new entrants into the construction industry seeking to register with the body still exceeded the number of contractors with a track record (CIDB, 2009).

Through regulatory measures such as the CIDB Act and the B-BBEE Act, as applied in procurement strategies and contractor selection processes, the South African government has been successful in shaping the construction industry to allow for the participation of emerging or SMME contractors. However, the application of these regulations has inadvertently resulted in contractor selection processes not valuing contractor competence and rarely measuring their ability to successfully complete projects (Thwala and Mvubu, 2008).

Noor, Khalfan and Maqsood (2013) investigated that role of procurement practices in the effective implementation of infrastructure projects in Pakistan. The paper highlighted that there is an abundance of literature on project procurement in developed countries, however, not much work has been done in this area for developing countries. This notion is further supported by Saad (2018) who conducted a similar study on public procurement challenges on the South African construction industry, and noted that public procurement practices in the South African context have not been adequately researched. In addition, procurement practices have a direct impact on the successful implementation of infrastructure projects (Noor, Khalfan and Maqsood, 2013). Rwelamila, Talukhaba and Kivaa (2000), in a study on the procurement practices in Africa, suggested that one of the major causes of poor

performance in African construction industries could be attributed to the procurement strategies in use. These strategies are said to not consider all relevant factors, in relation to the selection of the most appropriate entity for the construction of the project, and lead to inconsistent and unpredictable outcomes.

This thesis seeks to investigate the role that government procurement policy, particularly in relation to contractor selection, can play in highlighting the importance of contractor competence, and transforming procurement practices and selection criteria to encourage skills development. This study also drew attention to the importance of technical qualifications and experience to the success of construction companies by profiling large enterprises in South Africa and around the world. Technical qualifications and experience were regarded as indicators of competence.

1.1 Background

The South African CIDB – a public entity – was established by Act of Parliament (CIDB Act 38 of 2000) to, amongst other functions:

- *provide strategic leadership to construction industry stakeholders;*
- *determine and establish best practice that promotes*
  - *improved industry stability, performance, efficiency and effectiveness;*
  - *procurement and delivery management reform;*
  - *improved public sector delivery management*
- *promote best practice through the development and implementation of appropriate programmes and measures aimed at best practice and improved performance of public and private sector clients, contractors and other participants in the construction delivery process;*
- *promote uniform application of policy with regard to the construction industry throughout all spheres of Government.*

The CIDB, thus, is a regulatory and governing body for the South African construction industry. All public bodies are bound by the Construction Industry Regulations of 2004 to only appoint contractors that are registered with the CIDB (CIDB, n.d.-a). These contractors can be found under the CIDB's Register of Contractors (RoC), which can be used by clients as a "macro risk management tool". The CIDB also states that any contractor can register, but

subcontractors and 'labour only' contractors are not required to register. Home builders are regulated by the National Home Builders Registration Council (NHBRC), and thus are exempt from registering under the CIDB RoC. Joint ventures are also exempted, however, each company within the joint venture is required to register. This study focuses on the contractors that are required to register with the CIDB and are active on the CIDB RoC.

1.1.1 CIDB Contractor Registration Criteria

Contractors listed on the CIDB RoC are classified by grade, from 1 to 9, which is a reflection of financial capability, and class of work. They then register using the CIDB contractor registration form for the grade they wish to contract under. There are two such forms; one for Grade 1 contractors, and the other for Grades 2 to 9 contractors; this study will focus on the latter. In order for the form to be considered as complete, contractors must meet the requirements for track record and financial capability for the different grades and classes of work (CIDB, n.d.-a).

Contractor competence in relation to technical skills (qualification and experience) has not been a specified pre-requisite for registration under CIDB RoC. This is considered a limitation within the CIDB registration process and is believed to contribute to the failure of contractors (Mohlala, 2015), which this study sought to investigate in much greater depth.

1.1.2 The CIDB Contractor Registration Form

At the time this research was conducted, the latest CIDB contractor registration form had been last updated in July 2016. Refer to Appendix B for the CIDB registration form.

Contractor grading designations are determined by the respective contractor's financial capability and works capability (CIDB, 2016). Financial capability includes the best turnover from two financial years immediately preceding the application, and the available capital. Works capability is determined by the largest contract undertaken and completed in a particular class of work up to five years prior to the application. Works capability can also be supported by a track record, which includes the following (CIDB, 2016):

- A signed and dated **letter of award** on a letterhead of the client, addressed to the contractor, which includes the tender or service order number and contract amount. This does not include supply of materials, provision of labour and plant hire contracts.
- A signed and dated **certificate of completion** on a letterhead of the client, addressed to the contractor, with the tender or service order number and contract amount.
- A signed and dated **final payment certificate** addressed to the contractor on a client letterhead which indicates the contract value, the tender service order number and all part payments made to the contractor.

The author expected that the requirements for registration would also include the requirement of evidence of experience and qualifications, along with evidence that work was completed to the satisfaction of the client – measures of quality and competence. The RoC would, therefore, have an "in-built" form of evidence of contractor competence that clients would then use for pre-selection. However, this was not the case. As such, other required supporting documents were studied to determine whether or not the CIDB contractor registration requirements took into consideration the skills (competence) of contractors. The supporting documents are (CIDB, 2016):

- Enterprise particulars which includes company registration certificate, financial and tax related records
- Copies of identity documents
- Joint venture agreement (if applicable)
- Transfer records (if applicable)
- Proof of payment of the registration fees

The lack of consideration of contractor technical qualifications and experience, and thus competence, in the CIDB registration process was considered one of the limitations that contribute to the failure of contractors as evidenced by Mohlala (2015). It may be, however, that the onus has been placed on the client to ensure that contractors are competent for the particular contract prior to appointment, thus putting the responsibility of collecting such evidence on the client on a contract to contract basis. As such, being registered with the CIDB is not necessarily a comprehensive indication of a contractor's capability or competence to conduct construction works.

According to the CIDB (2009), the number of new entrants seeking to register with the body exceeds the number of contractors with a track record. There are currently 133 426 grade 1 contractors and a total (grades 1 to 9) of 149 946 CIDB registered contractors. Thus, 89% of the contractors registered are grade 1. A total of 94% of registered contractors are between grades 1 and 3, while only 1.14% are grade 9. There is a great disparity between the numbers that are registered within grades 1 to 3 when compared to those under grades 7 to 9. This research proposed that contractor skills and competencies are at the core of this problem.

1.2 Problem Statement

Infrastructure development, through the construction industry, is one of the key factors that contribute to the GDP of a nation. However, many contractors rarely meet the time, cost, scope and quality requirements of their projects, and therefore, often fail (Poon, 2018). Hanson, Mbachu, and Nkando, 2003; Thwala and Mvubu, 2008; Martin and Root, 2012; and Mofokeng, 2012, in their studies on factors that contribute to contractor failure, found that emerging contractor failure can be attributed to lack of competence. Muzondo and McCutcheon (2018) conducted a similar study on South African contractors, and found that the types of competency elements that contribute to success are the technical qualifications and experience of contractors' key staff. In addition, procurement policies aimed at promoting SMME contractors, through regulations such as the CIDB Act 38 of 2000 and the B-BBEE Act 53 of 2003, are predominantly focused on providing these enterprises access to projects and participation in the market (Dlungwana and Rwelamila, 2003; Kganyago, 2004 and Gillingham, 2009). These policy measures have not been successful in developing contractor skills and competence in the long-term. Moreover, their application has led to procurement strategies not valuing contractor competence and clients rarely measuring the contractors' ability to successfully undertake projects (Thwala and Mvubu, 2008). Procurement strategy can be defined as the process upon which the decision to appoint a contractor is made (Watermeyer, 2014). The result of this decision, if the appropriate criteria are not defined, may lead to the appointment of incompetent service providers and, therefore, project failure. Furthermore, there is a scarcity of research into public procurement practices in the South African construction industry (Rwelamila, Talukhaba and Kivaa, 2000; Noor, Khalfan and Maqsood, 2013; Saad, 2018). In light of this, there is a need to carefully analyse public procurement policy, in relation to contractor selection, in South Africa, in order to establish its potential role in encouraging contractor skills development.

1.3 Aim

The primary objective of this research was to determine the most effective selection criteria for assessing contractor competence and potential performance prior to appointment, and demonstrate the importance of technical qualifications and experience as prerequisites for contractor selection and for contractor success. This research was also aimed at highlighting the need for these criteria to form part of procurement processes and procedures.

1.4 Secondary Objectives

In addition to the aim and primary objective, this research has intended to achieve the following objectives:

- To investigate public procurement practices with regard to contractor selection or appointment in a global context.
- To highlight the limitations in the procurement strategies used in South Africa for public infrastructure or construction projects and their effects on contractor performance.
- To investigate the key elements that are fundamental for the success of a construction company.
- To determine the level and type of expertise present in larger contracting companies in South Africa and around the world.

1.5 Delineations/Scope of study

This research includes both South African and international contractors. The South African contractors under study were all registered with the local CIDB. The international companies were chosen at random and were not limited to a particular country or region. Table 1 shows the grades that contractors can be registered under on the CIDB along with the maximum tender values that they can bid for.

Table 1: Contractor grades with respective contract values

Grade	Previous tender value limit (ZAR)	New proposed tender value limit (ZAR)
1	200 000	300 000
2	650 000	1 000 000
3	2 000 000	3 000 000
4	4 000 000	6 000 000
5	6 500 000	10 000 000
6	13 000 000	20 000 000
7	40 000 000	60 000 000
8	130 000 000	200 000 000
9	No limit	No limit

Source: CIDB (2017)

Data was collected on contractors under CIDB grades 7 to 9 Civil Engineering (CE) and General Building (GB) classes of works, or equivalent. The full list of classes of works can be found in Appendix A. This report also presents data on grades 1 to 6 CE and GB contractors in order to demonstrate key differences in their qualifications and experience when compared to the grades 7 to 9 contractors. Qualifications and experience profiles of grades 1 to 6 South African contractors were presented in order to provide evidence of their lack of relevant qualifications and experience and thus, support the basis of this research.

This research acknowledges that there are other factors that contribute to the success or failure of contractors, as shown by literature (Hanson, Mbachu, and Nkando, 2003; Thwala and Mvubu, 2008; and Mofokeng, 2012), such as finance, business acumen, access to resources and project management. However, this thesis is primarily focused on demonstrating the importance of technical qualifications and experience of contractors.

1.6 Assumptions

This research made some key assumptions largely based on the CIDB, and its regulations, as the construction industry governing body in South Africa. These assumptions relate to the way clients, contractors and other industry players interact.

Assumption 1:

The functions performed by the CIDB, as per the CIDB Act 38 of 2000, include establishing strategic leadership, determining, establishing and promoting best practice, and promoting uniform application of policy in the South African construction industry. In light of this, it was assumed that all construction industry clients and contractors look to the CIDB for guidelines and recommendations in relation to contract and construction management and practices, procurement and contractor selection. As such, it was also assumed that any limitations to the policies, guidelines and recommendations provided by the CIDB for the construction industry of South Africa may translate to limitations in the way clients and contractors administer construction related projects.

Assumption 2:

All South African public sector clients adhere to the CIDB Act and its prescripts, and, only employ contractors that are registered with the CIDB under the CIDB register for all construction projects. Therefore, the population used for South African contractors for this research for the purpose of data collection and analysis was assumed to be representative of the contractors that are hired for construction projects throughout the country.

Assumption 3:

Since the CIDB grades are based on financial capacity and works capability, it can be inferred that contractors that are registered under the higher grades have conducted more projects and have higher financial capacity and revenue. As such, the CIDB grading of contractors was assumed to be an adequate measure and indication of contractor "success" in the comparison between the grouping of grades 1 to 6 and grades 7 to 9 CE and GB contractors.

1.7 Research Premise

This study proposed that the main distinguishing factors between Grades 7 to 9 and Grades 1 to 6 contractors that can be attributed to the experience of the companies in the construction industry, and also the technical qualifications and experience of their key staff. In addition, the key or executive staff of these companies hold qualifications and experience that are related to their specific functions within the companies. It is also premised that public procurement policies do not place importance on these competencies as a measure of potential contractor performance during the contractor selection stage.

1.8 Research Questions

This thesis tile states "*The limitations of the South African procurement policies and practices in relation to contractor selection criteria: The importance of technical qualifications and experience of established construction companies*".

This title was broken into two components; namely 1) the limitations of the South African procurement policies and practices in relation to contractor selection criteria, and 2) the importance of technical qualifications and experience of established construction companies. Table 2 shows the relationship between these two components of the topic with the objectives and research questions that this thesis sought to address.

Table 2: Linkage between research topic, objectives and questions

Objectives	**Research questions**
Topic component 1: *The limitations of the South African procurement policies and practices in relation to contractor selection criteria*	
To investigate public procurement practices with regard to contractor selection or appointment in a global context.	What criteria can be used during the contractor selection stage of procurement in order to effectively assess potential performance and competence and, are technical qualifications and experience important indicators of potential project performance?
To highlight the limitations in the procurement strategies used in South Africa for public infrastructure or construction projects and their effects on contractor performance.	• What key policies drive public procurement and contractor selection strategies in South Africa? • What are some of the key limitations to the policies that drive contractor selection in South Africa?

Objectives	Research questions
Topic component 2: *The importance of technical qualifications and experience of established construction companies*	
• To investigate the key elements that are fundamental for the success of a construction company. • To determine the level and type of expertise present in larger contracting companies in South Africa and around the world.	What are some of the key competency differences between the larger companies (grade 7 to 9 and international companies) and smaller companies (grades 1 to 6) that can be attributed to success?

1.9 Importance of Study

The purpose of this study was to highlight the relationship between contractor attributes and performance by identifying the factors that contribute to contractor performance. The intended outcome is to help clients identify more dependable contractor pre-qualification criteria, and, as a result, improve their procurement and contractor selection strategies and practices. Contractors can use the results of this study to identify the attributes that contribute more significantly to their performance. In addition, organisations such as the CIDB can use the output of this research to focus on the attributes and skills that lead to better performance for the formulation of contractor development programmes. It was also envisaged that the outcome of this research could possibly lead to the revision of procurement policy and procedures.

The unemployment rate in South Africa at just under 28% in 2017 (Bold and Harris, 2018), was fairly high compared to the global average of 5.6% in the same period (ILO, 2018). In addition, contractors form up to 80% of the workforce in South Africa (Gauteng Enterprise Propeller, 2018). As such, this study sought to provide evidence that can be used to contribute to lowering unemployment in South Africa through the development of contractors. This thesis also proposed and provided evidence to show that developing contractor technical skills (education) and experience is related to their success. Therefore, any effort made towards the success of these businesses would consequently result in employment creation. The resultant

creation of jobs would also reduce poverty, which is one of the socio-economic issues that are currently plaguing South Africa.

Many studies have been conducted on emerging contractor failure in South Africa (Hanson, Mbachu, and Nkando, 2003; Thwala and Mvubu, 2008; Martin and Root, 2012; and Mofokeng, 2012). However, this study seeks to contribute new knowledge in the subject of contractor success by presenting some key attributes of larger more established contractors. This thesis also contributes to the creation of knowledge that can be used for procurement practices, and the formulation of associated policies; specifically in the development of more appropriate evaluation criteria that will lead to selection of the most suitable contractors and result in the successful delivery of infrastructure projects.

1.10 Report Structure

This thesis was structured to provide a narrative of how the research premise was established and investigated, and how the processes and information collected lead to the conclusions that were reached. The report structure is outlined in Figure 1 to reflect the flow of this thesis.

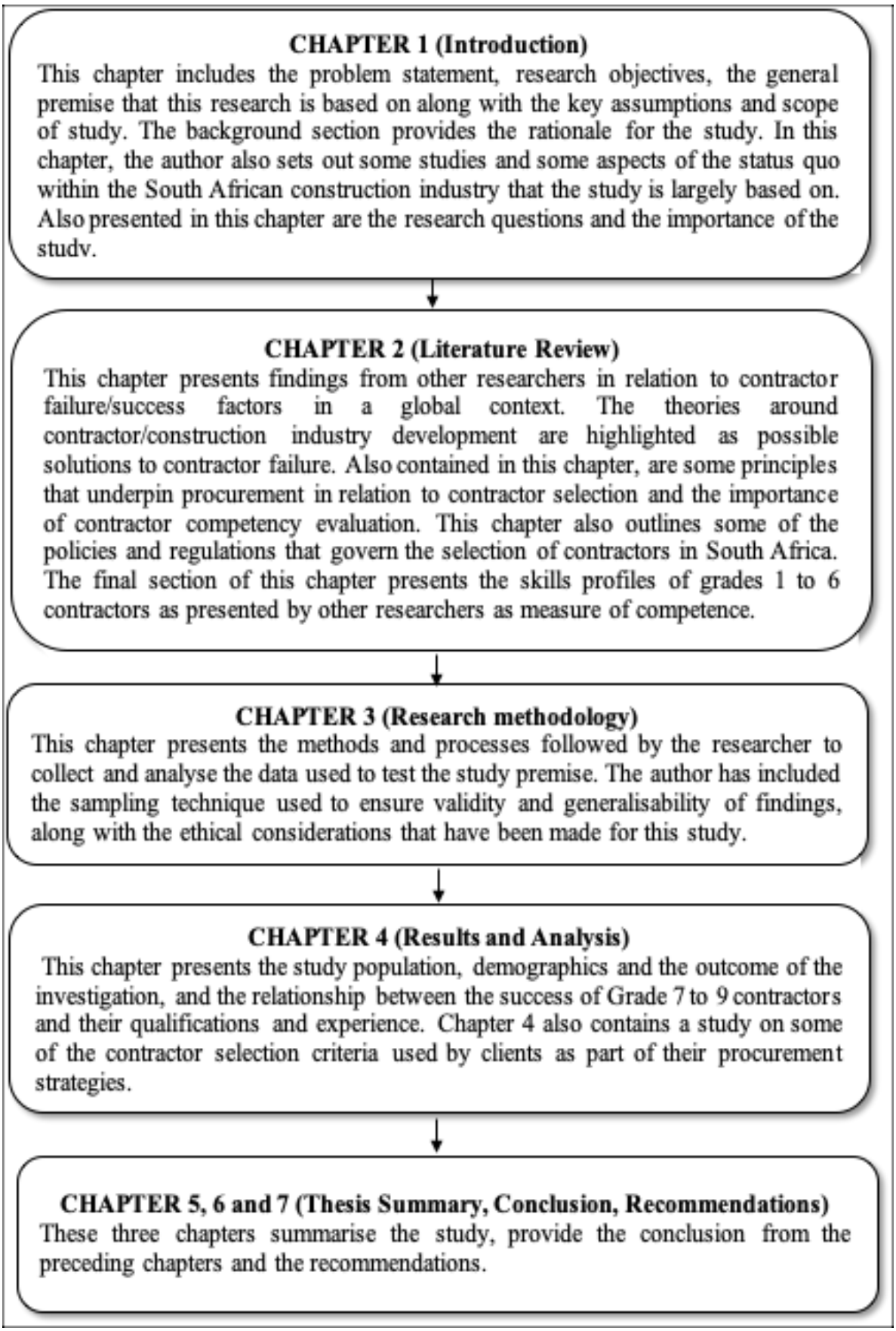


Figure 1: Report Structure

CHAPTER 2: LITERATURE REVIEW

The objective of the literature review was to determine the global principles that underpin contractor procurement in the public sector, with a specific focus on contractor success factors. This chapter, therefore, begins with a summary of global research around the subject of contractor success and draws on local literature to present the South African context. Construction industry development and contractor development principles are presented. Best practice examples are then highlighted as some of the solutions to address contractor failure and establish contractor success. Literature around public procurement strategies, covering the tendering process and contractor selection at an international level was reviewed in order to determine the role of procurement, and the appropriate ways in which contractors are selected for construction projects. To add further insight into the South African context, this chapter includes a historical view of laws and regulations that have led to the current public procurement policies that govern the construction industry and public procurement in the country. This includes aspects of the South African procurement policies which make provision for the selection of contractors with preferential procurement and 'lowest price' focus as opposed to basing selection on technical competence.

This thesis premised that technical qualifications and construction related experience are some of the key elements of contractor success, and that these should be the core of contractor selection criteria during the procurement stage of CE and GB projects. Research has alluded to emerging contractors in South Africa, and other developing countries, lacking the necessary skills and experience (Thwala and Mvubu, 2008; Muzondo and McCutcheon, 2018; Ofori, 2018). As such, this literature review ends off with a summary of three studies by the CIDB (2011), Martin and Root (2012), and Muzondo and McCutcheon (2018), which present the skills profiles of South African CIDB grades 1 to 6 contractors. Furthermore, Muzondo and McCutcheon (2018) also highlight the effect of technical qualifications, or the lack thereof, on contractor performance. This section of the thesis also served as a prelude to the data collection and analysis chapter, which provides an overview of more established contractor companies. Established or larger contractor companies include international companies and South African CIDB grade 7 to 9 contractors.

As such, this chapter covers four major focus areas; namely, 1) contractor success or failure factors; 2) construction industry development (with a key focus on contractor development); 3) procurement practices, policies and strategies; and 4) the skills profiles of CIDB grades 1 to 6 contractors.

2.1 Contractor success factors – A global perspective

Holt (2013) conducted a study in the United Kingdom (UK) which synthesised various literature to present thematic groups of contractor business failure causal factors. The study found that contractor business failure can largely be grouped into internal and external events. Holt (2013) also found that younger and smaller constructions firms are more prone to failure. According to Thornhill and Amit (2003), larger businesses fail due to the inability to adapt to environmental change. Moreover, Myatt (2010), as cited by Holt (2013), suggests that it is not businesses that fail, but the leaders. This is a view that is partly supported by the premise of this thesis that proposed that the qualifications and experience of the construction business leaders can be attributed to the firm's success. Business failure impacts stakeholders who are not limited to the owners, but include policy makers, industrialists, investors, managers and governments (Holt, 2013).

Organisational learning has been suggested to have an impact on the success of businesses as it relates to the company's ability to "maintain or improve performance based on experience" (Holt, 2013). The lack of such experience along with the economic conditions of a country have been found to be some of the most significant causes of business failure (Arslan and Kivrak, 2008). The highly competitive nature of the construction industry, leading to low profit margins, as per Arditi, Koksal, and Kale (2000); Arslan, Tuncan, Birgonul, and Dikmen (2006); Dun and Bradstreet (1986); Enshassi, Al-Hallaq, and Mohamed (2006); Kangari (1988) and Jannadi (1997), may exacerbate the problem of lack of experience as they reduce the chances of contractors acquiring ongoing projects.

An important aspect of running a business is financial management, which can be defined as the judicious use of capital in order to advance business goals (Gitman and Smith, 2010). As such, financial management plays a vital role in the success of any business, and according to Holt (2013), the following financial management elements are most important for construction companies:

- estimating and job costing practices (in agreement with Abidali and Harris (1995); Arslan *et al.* (2006); David and Martin (2003) and Schaufelberger (2003));
- cash flow management (also referred to by Arslan *et al.* (2006); Davidson and Martin (2003); Enshassi, Al-Hallaq, and Mohamed (2006); and Jannadi (1997));
- lack of capital (in agreement with Arditi, Koksal and Kale (2000); Dun and Bradstreet (1986); Enshassi, Al-Hallaq, and Mohamed (2006); and Schaufelberger (2003));
- controlling equipment cost and usage;
- evaluation of annual profits;
- dealing with variation orders; and
- fluctuation in money exchange rates.

The first six of the seven financial management factors above are related to the construction companies themselves and the last one is an external factor. These six factors are also human-related and can be controlled and mitigated in order to reduce the chances of business failure (Holt, 2013). Hence, this thesis argued that part of controlling these human-related factors is to ensure that the key staff of these companies have the necessary skills to minimise the financial and managerial challenges. To demonstrate this, the Results and Analysis chapter of this thesis has shown that the key staff members of the successful construction companies typically include individuals with finance related qualifications and experience. Those skills can be acquired through formal education, and at times, through on-the-job training and other informal avenues.

Thornhill and Amit (2003), who analysed 339 Canadian corporate bankruptcies, proposed that business failure can be attributed to lack of managerial knowledge, especially in smaller firms. Abidali and Harris (1995) listed those managerial skills, with specific reference to construction companies, according to their significance as follows:

- autocratic chief executive;
- the same person as both chief executive and chairman;
- the company board;
- lack of engineering skills;
- lack of a strong financial director;
- defective managerial skills;
- incomplete accountancy system;

- defective bidding system;
- poor marketing skills;
- over-trading; and
- losses in projects.

The lack of a strong financial director is strongly related to financial management and accountancy systems, which Holt (2013) alluded to as well. In addition, financial management, engineering skills, and managerial skills are part of the technical competencies that this thesis found to be present in larger, more successful companies, as per the Results and Analysis chapter. In further support of this, Mahamid (2012) found that the third ranking cause of failure is the lack of experience in contracts, while Dun and Bradstreet (1986) found inexperience to be the second most significant cause of failure. Jannadi (1997) conducted a study on contractors in Saudi Arabia and ranked lack of experience in the type of work and lack of managerial experience as the third and fifth most significant contributing factors to failure, respectively. Enshassi, Al-Hallaq, and Mohamed (2006) also cited lack of experience in the line of work and lack of experience in contracts as two of ten main causes of contractor failure.

Alzahrani and Emsley (2013) identified nine factors that are essential for contractors to be able to successfully complete projects. These factors are safety and quality, past performance, environment, management and technical aspects, resources, organisation, experience, size and types of previous projects, and finance. Four out of the nine factors are related to the technical skills or competencies of contractors as per the study premise. Following a similar theme, a study conducted by Richter (1998) in Germany found that one of the greatest strengths of the German construction labour force was a combination of vocational training and formal qualifications. Richter (1998) thus alluded to the theory that the success of construction companies may also be reliant on the competencies of their key staff in the form of qualifications. In support of this, Wall and Clarke (1996) and Prais and Steedman (1986) found that the primary cause of low productivity in the United Kingdom's (UK) construction industry was the lack of technically qualified contractors.

Thwala and Mvubu (2008), who conducted a study on the challenges facing SMME contractors in Swaziland, and Ofori (2018), who conducted a similar study on the construction industry of Ethiopia, note similar findings as summarised in Table 3.

Table 3: Similarities between Thwala and Mvubu (2008) and Ofori (2018)

Findings by Thwala and Mvubu (2008)	**Corresponding findings by Ofori (2018)**
• Lack of resources • Inability to provide performance bond/security	Lack of institutional support mechanisms for credit facilities, plant and equipment hire
• Inadequate technical and managerial skills • Insufficient knowledge of contract acquisition and management	• Low capacity and capability of local contractors and consultants due to a weak resource base and inadequate experience. • Limited professional development
Lack of continuity in type, scale and proximity of work	Inadequate and erratic work opportunities
Payment delays by government organisations	Financial mismanagement in public and private sectors

Ofori (2018) noted that poor working environments, including low standards of safety and occupational hazards on construction sites, and low quality standards, are part of the most prevalent causes of poor performance in Ethiopia. This is similar to Alzahrani and Emsley (2013) who found that safety and quality were regarded as part of the critical success factors in projects in the UK.

The studies noted above include varied nations, for example Germany, Canada, the UK, Ethiopia and Swaziland, over a wide-ranging period of time; from the 1980s to 2018. This thesis notes, however, that the findings seem to be similar over both geography and time. For example, Thwala and Mvubu (2008), who conducted a study in Swaziland have similar findings to Ofori (2018), who conducted a study a decade later in Ethiopia. One could argue that the challenges in the construction industry do not seem to have changed drastically over time, and that "construction is an industry that is the same everywhere" (Ofori, 2019) and the challenges tend to be similar across the different countries. Even more important to this study, the literature above also reveals that contractor competencies, skills and experience are related to their performance and success.

A study conducted by Debrah and Ofori (2005) on the competencies of construction industry managers in Tanzania notes rather interesting revelations. 'Construction managers' refers to professionals such as engineers, architects and quantity surveyors. In their study, Tanzania is noted as having no shortage of educated construction professionals, but is found lacking in the managerial skills and competencies required to work in a "globalised competitive economy". Debrah and Ofori (2005) found that construction managers require the following skills:

- *construction and project management, including resource management, supervision of works and site management;*
- *communication and information technology for managers, including new and advanced construction technology;*
- *procurement and contract administration, including estimating and costing, risk management, project feasibility/development appraisal, procurement, negotiation, construction law, arbitration and professional ethics; and*
- *general business management, including human resource management, performance management, quality, time and environmental management, financial management, insurance and insolvency issues communication skills, entrepreneurship development, marketing strategies, teamwork and international issues.*

Debrah and Ofori (2005) concluded that qualifications or formal knowledge are essential; a conclusion that is in agreement with the premise that this thesis is based on. Formal qualifications, however, are not sufficient to gain the managerial competencies that are essential for the success of construction enterprises (Debrah and Ofori, 2005). It is argued that practical, on-the-job training is required to achieve this; alluding to the second part of the basis of this thesis, which is the need for experience. Debrah and Ofori (2005) also recommend that larger companies transfer these skills to SMME contractors through arrangements such as subcontracting on large projects. This recommendation also implies that larger companies have the necessary technical and practical competencies – an implication that is in support of the assumptions made in this study. The definition offered by Debrah and Ofori (2005) of the term 'construction managers' also implies that qualified engineers, for instances, should form part of the key staff complement of construction companies; a key factor that is lacking in South African emerging contractor companies (CIDB, 2011; Martin and Root, 2012; Muzondo and McCutcheon, 2018). The government also plays a pivotal role in actively

driving construction industry capacity building through the development and implementation of training strategies.

This thesis also sought to determine whether or not the international research in the area of contractor success differs in any way with the South African context. As such, the next section summarises findings on research conducted on South African contractors and the South African construction industry in relation to contractor performance, failure and success.

2.2 Contractor failure in South Africa – A synopsis

Studies conducted in South Africa on contractor failure and success found that operational competencies such as project management, planning, financial accounting, and business, managerial, technical, entrepreneurial and administrative skills contribute significantly to contractor success (Croswell and McCutcheon, 2001; Thwala and Mvubu, 2008; and Mofokeng, 2012). According to Hanson, Mbachu and Nkando (2003) poor workmanship and contractor incompetence are factors that affect contractor performance in South Africa. The premise of this study was that those competencies include the technical qualifications and experience of the key staff of these contracting businesses.

Bekker and Mashaba (2018) conducted a review on the factors that contributed to construction project failure in the Mpumalanga Department of Agriculture, Rural Development and Environmental Affairs (DARDLEA). The concept of project failure in that study was defined by cost and time overruns, and grouped by the party with the most influence on a particular factor; either the client (DARDLEA), the contractor or the owner (beneficiaries). The top ten key causes of project failure, as found by Bekker and Mashaba (2018) were:

- poor communication,
- lack of monitoring and evaluation,
- lack of client or beneficiary involvement,
- lack of project planning,
- financial difficulties,
- poor project scheduling,
- incomplete project drawings,
- conflict,
- poor technical performance, and

- changing client requirements.

From the ten factors listed above, technical performance can be attributed directly to the contractor and is related to competence. It is interesting that the research by Bekker and Mashaba (2018) found technical competence of the contractor to be the ninth ranking cause of failure. Even more interesting is that, to combat this, Bekker and Mashaba (2018) recommend that "*most employees in the construction projects should demonstrate skills in dealing with construction related work*". What is not clear from this recommendation is;

- which employees does this refer to? Is it the clients engineers who typically plan, design and manage the project, or the employees of the contractor who undertake the physical construction?
- should the skills be 'demonstrated' prior to or during the implementation phase of the project?
- are the skills being referred to in the form of experience, past performance or qualifications?

The factors highlighted by the researchers above are in partial agreement with this study in that they relate to technical competence, however, they do not explicitly demonstrate the relationship between formal qualifications and success.

Time, as evidenced by Bekker and Mashaba (2018), is one of the contract conditions that contractors must adhere to and can also be used as a measure of performance (Alzahrani and Emsley, 2013). This factor also needs to be managed closely in order to ensure project success (Lam and Gale, 2014). According to Tserng, Liao, Tsai, and Chen (2010) and Holt (2013), longer duration projects are more prone to failure as this exposes the contractor to governmental, legislative, inflationary and business cycle impacts. Muzondo and McCutcheon (2018) found that none of the 30 projects that were surveyed in that study had been completed on time. One could argue that the durations stipulated in those projects may have been unrealistic and could have provided an inaccurate measure of the contractors' project performance – a contract issue that Muzondo and McCutcheon (2018) alluded to as well. Therefore, inadequate planning by the client, and as such, improper allocation of time for projects within the contract can also lead to failure. Ofori (2018) also found that ambiguities in contract conditions can cause time and cost overruns.

Another contract condition that could affect the success of the contractor businesses is payment terms. Issues such as delays in payments have been shown to have an adverse effect on SMME success (Thwala and Mvubu, 2008) as this affects the cash flow of the business and, as a result, their ability to take on and complete new projects.

2.3 Construction Industry Development

This section contains literature on construction industry development as a broader subject and then, specifically, the concept of contractor development. It is believed that the subject of construction industry development, and specifically contractor development, can present some strategies to dealing with and lessening the challenges that lead to contractor failure as described in this thesis. Also contained in this section, is a summary of historic findings and recommendations from other research in relation to construction industry development in order to demonstrate the changes and themes over time, if any, across a wider period of time (between 1994 and 2018).

Ofori (2012), in a paper on how to improve the performance of the construction industry in Ghana, defined construction industry development as:

> *"a deliberate and managed process to improve the capacity and effectiveness of the construction industry to meet the national economic demand for building and civil engineering products, and to support sustained national economic and social development objectives."*

According to Ofori (1994) construction industry development typically involves:

- ***materials development*** – this is essentially the promotion and use of locally produced materials through government support by mean of research and development, support of local manufacturers, and the revision of building regulations to permit the use of local materials;
- ***human resource development*** – reduce the skills shortage in the construction industry through training education, training and continuous professional development;
- ***development of contract documents*** – simplifying contract documents that are used for construction projects;
- ***contractor development*** – promoting SMME contractor growth and improving their performance through technical, financial and project support, and training; and

- ***technology development*** – "development of medium-level construction techniques, and the related equipment and tools for labour-intensive constructions and upgrading of conventional technologies to improve productivity".

Materials development, human resources development, and contractor development allude to the lack of resources and lack of skilled and experienced personnel (contractor competence), which have been covered in the previous sections of this chapter as some of the factors that cause contractor failure. In relation to contract documents, this study focuses on the processes, policies and procedures that lead to the contract development stage. This is the procurement and contractor selection stage of CE and GB public sector projects; a phase which, as this thesis proposes, can be used to ensure that appropriately competent contractors are awarded contracts.

Ofori (1994) outlines how institutional building in the form of setting up public agencies, professional bodies and trade associations for the initiation, implementation and monitoring of initiatives helps to improve the construction industry. Upgrading and expansion of micro-enterprises and cooperatives (informal sector development) has also been cited as a component of construction industry development. This thesis, however, focuses on contractors that are registered with the CIDB and formal sector international companies, and their skills and experience, and therefore, does not cover the informal sectors nor areas such as technology development and transfer. The author proposes that the challenges that affect contractor success, especially in the case of emerging contractors, can be alleviated by structured, centralised and country-specific construction industry development. A possible approach could be the formulation of contractor development programmes that are targeted at bridging some of the identified gaps such as skills, competencies and capabilities (Dapaah, Thwala and Musonda, 2017) – a subject that is covered in the next section of this thesis.

Ofori (1994) noted that many researchers have inferred that construction industry development is a long-term solution that may take up to a generation for developing countries to implement and see results. Singapore made significant progress in this area between 1960 and 1993 (Ofori, 1994). The efforts made by Singapore are presented in Table 4. Singapore's measures and results are an example of the achievements that can be made with the appropriate "*set of country-specific, frequently fine-tuned policies centrally administered and monitored, and supported by incentives and assistance schemes*" (Ofori, 1994).

Table 4: Measures adopted to develop the construction industry in Singapore (1960-l993)

Measures	**Remarks**
Broad policy • construction recognised as an important sector of the economy; • initiation of nations construction industry studies; • counter-cyclic spending to support the industry on recessionary periods; • setting up of a central construction industry development agency (the Construction Industry Development Board of Singapore); • continuous monitoring of the industry; and • continuous fine-tuning of macro and construction-related policies.	• Efforts were made to upgrade the construction industry and improve its productivity in line with economywide strategies. • Industry needs were promptly addressed through medium-term programmes based on comprehensive studies.
Technology development • loans and tax incentives for acquisition of equipment; • promotion of, and grants for, research and development (R&D); • open-door policy towards foreign firms, but with support for technology transfer through joint ventures; • advisory services on 'strategic' technologies; • promotion of use of information technology; and • quality development schemes.	• Technology development was pursued to relieve labour scarcity and reduce reliance on foreign workers. • Industry highly mechanised, utilizing prefabrication and industrialised construction techniques. However, the predominance of small, lowly • Capitalised family-owned contracting firms persisted. • The industry also invested little in R&D.
Human resource development • restriction on the employment of foreign workers;	• Construction related careers were unpopular, as such the industry relied on

Measures	Remarks
• setting up of training centres; • trade testing and certification; • contractual requirement for employment of professionals and certified skilled workers; • enforcement of labour and worker-welfare; and • laws and regulations.	foreign workers. Therefore, not all training places were taken up. • The industry relied on labour subcontracting, despite clear undesirable consequences.
Business development • central registration of public contractors with upgrading based on asset holdings and performance; • promotion and support of export of services with grants and technical personnel; and • provision of local business information and overseas market intelligence.	• Registration of contractors was not mandatory, but sought after. • Foreign contractors and consultants still dominated large-project segment of industry. • Service export performance progressively increased.
Institutions and associations • lobbying of government; and • continuous professional development.	• Relatively strong professional and trade bodies which have influenced the institution of initiatives for the industry. However, there is little cross-profession development activity and much rivalry.

Source: Ofori (1994)

One of the measures that the construction industry of Singapore took to develop construction industry personnel was to place a contractual requirement that stipulated that human resources are required to be professionally qualified or skilled in order to bid for projects. This is in agreement with this study which premised that part of the success factors of contractors are the technical skills of their key staff, and that this should form an integral part of the procurement and contractor selection process.

One of the recommendations by Ofori (1994) was that common academic courses for construction professionals be developed covering engineering basics and that graduates of such courses would then form skilled contractors. In addition, exceptional students could continue on to post-graduate qualifications and undertake more complex projects. Furthermore, construction development agencies, in partnership with tertiary institutions and professional bodies, in developing countries were recommended to provide continuous development programmes for construction professionals, which would be made mandatory for all practitioners (Ofori, 1994). This is in agreement with this study which premised that the development of contractor skills through technical training and education would improve the performance of contractors and, as a result, grow the construction industry.

In a paper on improving the construction industry of South Africa, Ofori, Hindle and Hugo (1996) recommended that the country adopts innovative procurement arrangements and contract administration strategies to create jobs for the unemployed population. Because of this South Africa-specific issue (high unemployment rate), the recommendation made was primarily focused on creating employment, as opposed to the skills development focused recommendation that Ofori (1994) made two years earlier in relation to developing countries. The differences between these recommendations were not necessarily a reflection of progress in the construction industry over the two years or the state of construction industry personnel in South Africa in terms of education. Ofori, Hindle and Hugo (1996) acknowledged that the South African context was slightly different from other developing countries at the time. The main differences were in relation to the country's political climate at the time, with strategies geared at recovering from previous sanctions that had been place on the country which resulted in limited trade. Over half of the country's workforce was unemployed at that time. Interestingly, Ofori, Hindle and Hugo (1996) also state that the country had highly skilled architecture and engineering professionals, but also had a high proportion of unskilled working age population. As such, the recommendations made in that study were slightly different to those of the study in Ofori (1994).

In a study that discusses the formation of a set of indicators for measuring and evaluation construction industry development in developing countries, Ofori (2001) notes that, even though this area is well researched, the results of the recommendations that have been made and implemented over the years "have been disappointing and the problems persist". Materials development, and the education and upskilling of construction industry personnel at all levels

have also remained as part of the core focuses of construction industry development in developing countries (Ofori, 2001). Ofori (2001) had also evolved recommendations to highlight to the need to measure the impact and progress of these development efforts. For example, human resource development can be evaluated and measured against the number of qualified professionals, technicians, and skilled labourers compared to the number of unskilled personnel in the industry. Materials development can be measured as the change in imports of construction materials, plant and labour.

According to Debrah and Ofori (2001) the CIDB of Singapore defines a skilled worker as one who has the ability to:

- *"interpret project drawings;*
- *understand written instructions;*
- *use tools and equipment;*
- *produce work of acceptable quality and accuracy; (e) complete his job with minimum wastage of materials;*
- *complete the assigned task within the given time;*
- *work with minimal supervision; and,*
- *observe safety practices and procedures."*

Debrah and Ofori (2001) add that it is the role of the government and each respective nation's dedicated construction industry development body, as recommended by Ofori (1994), to develop such skills within construction industry personnel. These bodies are responsible for identifying the skills shortages and other challenges facing contractors within the industry, and providing the necessary development frameworks and programmes to bridge the gaps (Debrah and Ofori, 2001). In light of this, Ofori (2018) presents some best practice examples, summarised on Table 5 in relation to construction industry development, specifically with regard to policy and efforts by various governments.

Table 5: Construction Industry Development – Best Practice

Country and agency	**Best practice components**
Singapore *Building and Construction*	• the government has had a good understanding of the construction industry, its key features and its needs, as well as its potential for introducing desirable changes in the whole

Country and agency	Best practice components
Authority (BCA) (formed as CIDB in 1984 and then BCA in 1999)	economy. This was achieved through pump-priming public sector investment, taking measures to restrain excessive increases in the price of real estate, or postponing projects to reduce pressure on the industry's capacity • effective construction industry development with policies, an agency, and enforcement framework • an effective policy formulation, awareness building, implementation and feedback review • setting of targets for the industry and providing guidance, as well as offering of incentives to the construction industry to upgrade its resources and practices to meet the targets. Incentives offered for practices such as mechanisation and application of information and communication technology (ICT) • application of successively advanced levels of ICT and encouraging, supporting and, if necessary, compelling the industry to apply it in the most advantageous way. For example, it has been compulsory to submit proposals for development in Building Information Modelling (BIM) format since 2015
Malaysia *Malaysia CIDB (formed in 1994)*	• regulations that provide for a levy on projects above a certain monetary value, which provides sustainable funding for construction industry development. This enables the industry development agency to obtain the funds it needs for its executive activities from this resource • a systematic periodic review of industry development programmes. For example, the Construction Industry Masterplan 2006-2015 was replaced by the Construction Industry Transformation Programme 2016-2020
South Africa *CIDB (established in the year 2000)*	• an annual event, the National Stakeholder Forum, where the industry gets the opportunity to meet with the Minister of

Country and agency	Best practice components
	Public Works and discuss matters that affect the development of the construction industry • a State of the Industry study every two years. This comprehensive study provides the basis for policy measures and business practice, as well as research • Selection of Board members – each appointed on merit, not as a representative of stakeholders • the CIDB is peer reviewed by an international panel every five years.

Source: Ofori (2018)

In more recent work on construction industry development in developing countries, Ofori (2018) maintains that the establishment of a dedicated national statutory body to manage and coordinate construction industry development, and the formulation of policy to provide direction are important aspects. Rwelamila (2002) penned an article on the establishment of the South African CIDB. The article refers to the National Department of Public Works (NDPW) Green Paper produced in 1997 as a result of consultations with various stakeholders on developing a construction industry policy. The Green Paper highlighted the government's belief in utilising small businesses to create new industry capacity, and achieve economic and redistributive targets (Rwelamila, 2002). In setting out the benefits, the Green Paper highlighted that;

- *small businesses can be powerful generators of income and employment opportunities since they generally use less capital investment per unit of output than larger enterprises,*
- *small businesses can be more competitive than larger firms on certain types of small, disparate and geographically dispersed projects, and*
- *their relatively low entry barriers in terms of skills (technical and managerial) and capital requirements provide an entry point for historically disadvantaged persons.*

All three points speak to the competitive advantage that SMMEs bring to the construction industry and how they can be leveraged to contribute significantly to the economy. However, the last two points are also indicative of the inherent obstacles that the CIDB faces in encouraging growth and sustainability in emerging contractor businesses. The low barriers to

entry allow technically low skilled contractors exposure to the market. However, if there are no strategies to upskill the SMME contractors, their business may end up failing (Muzondo and McCutcheon, 2018). One of the objectives of this thesis is to highlight the need for upskilling contractors in the technical area. Secondly, given that one of the advantages of emerging contractors is in competing for small projects, the experience that the SMMEs gain over time may also be limited to small projects. The emerging contractors may, therefore, struggle to pick up the competencies and practices that the more established contractors develop while delivering larger more complex projects.

Another theme that Ofori has maintained over time is the general principles that underpin construction industry development which involve the development of resources, supporting local industry in relation to materials, research and development, institutional building and technology development (Ofori, 1994; Ofori, Hindle and Hugo, 1996; Ofori, 2001; Debrah and Ofori, 2001; and Ofori, 2018).

According to Ofori (2018), new areas of interest in relation to construction industry development polices include affordability, life cycle value for money, employment creation, stakeholder satisfaction, and sustainable development. In addition, future considerations will most likely include technology and innovation, professionalism, value creation and the development of local enterprises. This study argues that the development of local enterprises should also focus on building technical skills and competency.

2.3.1 Contractor Development

The Construction Industry Development Board (CIDB) of Singapore was formed in 1984 and took over the Construction Industry Training Institute (CITI), formerly known as the Construction Industry Training Centre (CITC). This was in a bid to reduce Singapore's reliance on foreign construction workers and develop a local workforce for the industry (Debrah and Ofori, 2001). The function of the CITI was to provide training for construction workers and supervisors, and inculcate quality and productivity awareness. The CITI was also set up as a centre for upgrading the skills of construction personnel, and offers basic and advanced trade skill training for both local and foreign workers (Debrah and Ofori, 2001). Debrah and Ofori (2001) wrote a paper which examined the links between the skills

development strategies offered by the Singaporean government through the CIDB and how these have improved the productivity of the country's construction industry. According to Debrah and Ofori (2001), the approach of the programmes involved training new entrants to be semi-skilled, further developing workers who are already skilled to ensure high quality performance, and providing skilled and qualified contractors, site engineers and supervisors, and foremen to train workers. Table 6 shows some of the initiatives undertaken by the government of Singapore to develop the skills of contractor business through their workers.

Table 6: Singapore construction industry skills development initiatives

Initiative	**Description**
National Construction Trade Test programme	• Introduced in ***1984*** to certify the skills standards of construction tradesmen. • Only the individuals who pass the trades test are classified as skilled workers.
The National Certificate in Construction Supervision (NCCS)	• Introduced in ***1987*** by the Singaporean CIDB in collaboration with CITI, Singapore Contractors Association Ltd (SCAL), Ngee Ann Polytechnic and the then Ministry of Labour. • Aimed at improving the skills standards and quality of site supervisors and clerks who lacked formal education, but had relevant experience.
Workers Certification Scheme	• Introduced by Housing and Development Board (HDB) in ***1988***. • Requirement for contractors to specify the proportions of skilled workers for each project.
Joint Industry Scheme	• Introduced in ***May 1989***. • The scheme encourages collaborative training offerings by the Singaporean CIDB and private companies.

Initiative	Description
	• Covers trade testing and allows private firms to design their own courses and on-the-job training programmes. • The CIDB provided professional guidance in the development of training curricula, trainers, equipment and training facilities. • The CIDB tests and certifies the skills of the participants upon completion of the courses.
Trade Test Familiarisation Course	• Introduced by CITI ***around 1994 and 1995*** as a preparation course for the National Construction Trade Test. • Provided information on the nature of the test, assessment criteria, and examples of good and bad workmanship.
Singapore List of Trade Subcontractors (SLOTS)	• ***Since 1995***, only contractors accredited by the SLOTS and employing a minimum of 10% of skilled workers can undertake public sector projects. • Plan to increase these requirements to a ratio on one-is-to-three between skilled and unskilled workers by 2025.
Certificate in Interior Finishing Coordination; Certificate in Building Measurement; and Certificate in Precast Concrete Construction Supervision	• Launched by the Singaporean CIDB in ***1996*** to improve the skills and competencies of construction supervisors.

Source: Adapted from Debrah and Ofori (2001)

Through these skills development initiative, the Singaporean CIDB had managed to double the number of skilled construction workers from 6% in 1993 to 12% in 1995, and further increased to 14% in 1997 (Debrah and Ofori, 2001). The public sector of Singapore soon

followed suit in having skilled construction workers. Some government organisations began requiring contractors to specify the number of skilled workers under their employ from as early as 1988, with the government planning to progressively raise the requirement to one skilled worker for every three unskilled labourers by 2025 (Debrah and Ofori, 2001). The government of Singapore had made efforts to develop contractor businesses and increase industry-wide performance by implementing skills development initiatives and policy reform. This is evidence that, the success of contractors is closely related to the technical skills and competencies of their staff. In further support of this notion, Debrah and Ofori (2001) add that, in future, preference will be given to contractors and subcontractors who have upgraded their skills. These strategies and policies were not without limitations. Contractors who subcontract for labour from project to project, and not necessarily employ permanent labourers, were not motivated to invest in training their workers and continued to employ foreign labourers who are both unskilled and cheaper to hire. Debrah and Ofori (2001) further recommend that in order for skills development programmes of this nature to work, certification that will retain currency over time should be given and contractors should be encouraged to return from time to time to update their skills and keep up with changes in technology.

Ofori and Lean (2001) note that Singaporean contractors had grown between the 1980s and the beginning of the twenty-first century; citing the role that the government has played (as highlighted by Ofori, 1994; Debrah and Ofori, 2001; Ofori, 2018) was key.

In South Africa, the NDPW first introduced contractor development programmes (CDPs) as early as 1995 with the objective of developing the expertise and managerial skills of construction companies owned by Previously Disadvantaged Individuals (PDI) to allow them to compete with larger construction companies (Dapaah, Thwala and Musonda, 2017). Provincial government organisations in South Africa have since formulated their own CDPs with predominantly the same objectives as those of the NDPW.

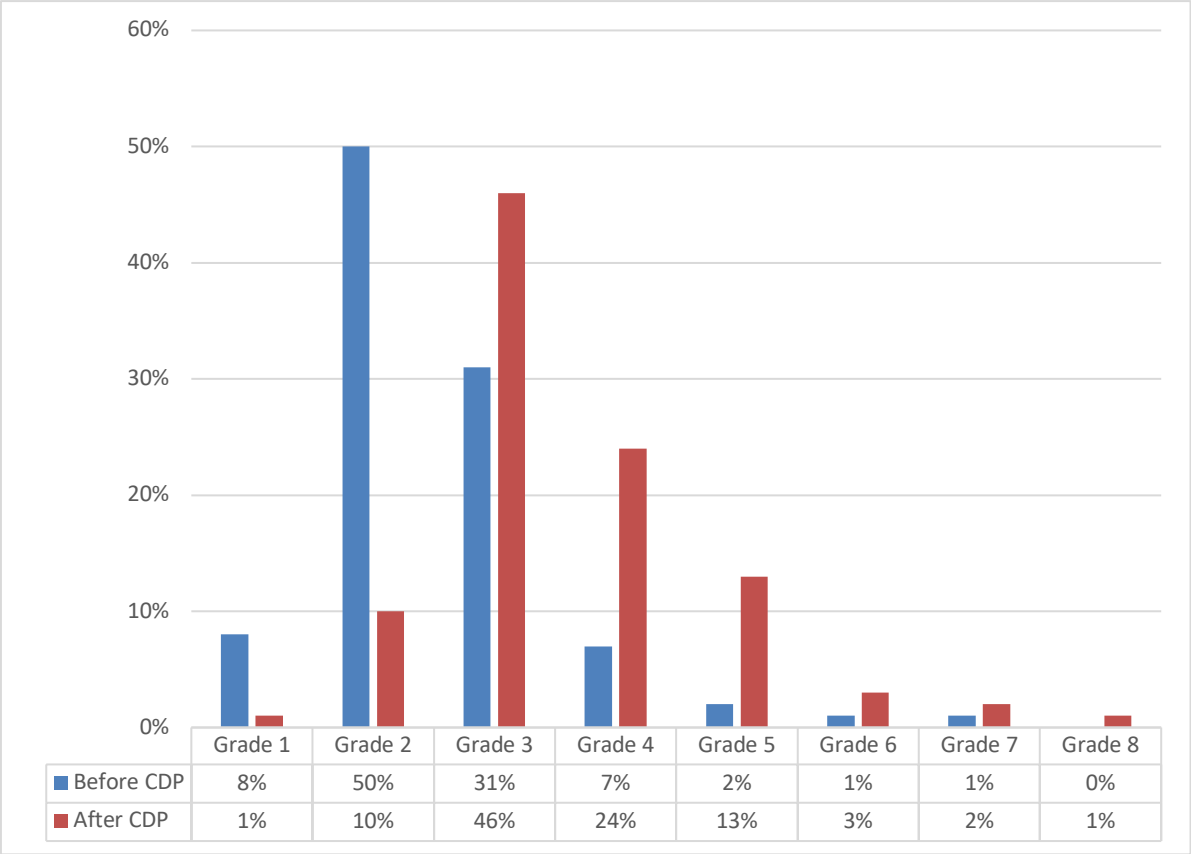
Dapaah, Thwala and Musonda (2017) conducted a study to investigate the effectiveness of CDPs in South Africa. The study involved interviews with consultants and CIDB grades 1 to 7 contractors. Dapaah, Thwala and Musonda (2017) noted that, although some researchers have highlighted some positive outcomes of CDPs (Söderbaum, 2001; Mojapelo, Rakale and Gertzen, 2001; and McCutcheon and Parkins, 2002), there has been limited research on the

effectiveness of CDPs and their impact on end users, that is contractors and clients (Jacquet, 2002; and Dapaah, Thwala and Musonda, 2017). The findings from the study conducted by Dapaah, Thwala and Musonda (2017) revealed the following in relation to the effectiveness of contractor development programmes:

- ***Managerial skills***: There was no significant improvement in the SMME contactors management skills in relation to their knowledge of estimating and tendering, project planning, marketing, and contract and claims administration. These findings are consistent with similar studies by Mbachu and Nkado (2006), Smallwood (2010), and Ntuli and Allopi (2013) who found that emerging contractors lack managerial skills.
- ***Contractor CIDB registration upgrades***: Participation in CDPs had resulted in some contractor upgrades from one CIDB grade to a level higher as evidenced in Figure 2. The number of grades 1 and 2 contractors had decreased after participation in CDPs, while the number of grades 3 to 7 contractors increased and 1% moved to grade 8. Dapaah, Thwala and Musonda (2017) noted, however, that a below positive average response was received when contractors were asked if the completion of CDPs resulted in business growth and assisted them in acquiring consistent work flow. Additionally, emerging contractors or contracting companies that are owned by PDIs hold "potentially emerging" status in the CIDB which allows them to bid for contracts that are a grade higher than their registration. This allows potentially emerging contractors to use such projects as future evidence for progression. Therefore, it may be that contractors who indicated an upgrade in their CIDB registration may not have necessarily done so as a result of CDPs, and could attribute the 'growth' to their potentially emerging status and its benefits. As such, Dapaah, Thwala and Musonda (2017) conclude that CDPs did not necessarily result in contractor upgrades.
- ***Participation of PDI-owned contractors in the construction industry***: The survey showed that most of the PDI-owned contractors were of the view that CDPs had resulted in an increase in their participation in the construction industry. Dapaah, Thwala and Musonda (2017) note, however, that one of the main challenges for emerging contractors in the construction industry is access to funding, and the study did not find any evidence that CDPs gave financial institutions more confidence to assist PDIs.
- ***Contractor satisfaction***: Contractors were found to be moderately satisfied with CDPs. One of the recommendations made by contractors is for needs assessments to

be conducted as part of CDPs prior to training to identify their unique needs and experiences of individual contractors. Contractors were of the view that the standardised or generalised approaches to CDPs do not take into account their unique needs and therefore, make the programmes less effective.

- ***Contractor performance improvement (consultants' perspective)***: The consultants interviewed unanimously agreed that CDPs should include ongoing mentorship of contractors. This is consistent with the recommendation made by Croswell and McCutcheon (2001) in their study on small contractor development and employment.
- ***Mentorship***: Contractors seemed to agree that mentorship should form part of all CDPs and that it should be compulsory and continuous rather than optional and short-term. The onus is placed on contractors to pay for mentorship, and since lack of funding has been identified as a major challenge for emerging contractor, Dapaah, Thwala and Musonda (2017) recommend that mentorship should be subsidised by the government. This is a recommendation that is consistent with the other authors such as Seth (2004), and Enshassi and Shaath (2007) who conducted studies on training and development of contractors in Lesotho and Palestine, respectively, and argued that successful CDPs are those that have been subsidised by government entities, foreign aid or other organisations.



	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Before CDP	8%	50%	31%	7%	2%	1%	1%	0%
After CDP	1%	10%	46%	24%	13%	3%	2%	1%

Figure 2: CIDB grading before and after CDPs (Dapaah, Thwala and Musonda, 2017)

Dapaah, Thwala and Musonda (2017) have noted some interesting findings and have recommended that CDPs be subsidised, have a well-defined training model, defined entry and exit criteria with contractor performance evaluation considerations, as well as continuous mentorship by appropriately qualified mentors. However, the findings of the study by Dapaah, Thwala and Musonda (2017) are not explicit on the types of competencies that are required for contractors to be able to compete with larger contracting companies, aside from managerial skills.

Ofori (1989, 1994, 2012, 2018) advocates for central coordinating bodies in each country to direct, formulate, govern, and implement measures for construction industry development. The South African government has been successful with this recommendation by mandating the CIDB in the year 2001. The South African construction industry, however, still experiences a number of challenges with contractor performance. These challenges are regarding both contractor business and project performance. This thesis proposed that one of the main issues that can be attributed to the lack of development in the construction industry

of South Africa, and therefore, the failure of contractors, is the shortage of technical skills within SMME contractors. The CIDB and the NDPW have made efforts to develop these skills through CDPs as highlighted by Dapaah, Thwala and Musonda (2017). One significant difference between these initiatives and those of the Singaporean CIDB is in that the Singaporean government followed its skills development initiatives with some policy reform requiring industry to employ contractors who were trained and certified as skilled (Debrah and Ofori, 2001). The government of Singapore was also active in providing support to training providers and private firms in the form of training facilities, equipment and curricula. In this capacity, the government plays a pivotal role in developing the construction industry along with its practitioners in order to grow the industry and improve productivity. The over-arching result being the creation of jobs, developing lasting high-quality infrastructure and growing the economy.

The following section is a summary of the recommendations that the South African CIDB has made in order to help contractors in the growth, management and development of their businesses. These guidelines serve as a form of training or contractor development module that has been made available by the CIDB in the public domain.

2.3.2 CIDB Contractor Management Guidelines

The CIDB, in collaboration with Pretoria Portland Cement (PPC) and the National Urban Reconstruction and Housing Agency (NURCHA), have released a series of Contractor Management Guidelines (CMG 101) as a resource for contractors on various aspects of managing a construction business. There are three sections to these guidelines; the principles of each are covered in this section.

2.3.2.1 CMG 101 Section 1 – Principles of establishing a construction business

This module of the CMG 101 covers business management principles such as income and expenditure, and profits and losses. Also listed are the resources required to run a construction company, which are labour, equipment, plant, materials and money (CIDB, n.d.-b). According to these guidelines, the attributes of a successful contractor are:

- A motivated workforce for high levels of productivity
- Client satisfaction along with respect for customers, clients and competitors
- Compliance with statutory requirements including on-time payment of taxes

- On-time payment of suppliers and creditors
- Management skills, which include marketing, pricing, setting targets, procurement, effective planning, and management of time and resources

From the attributes listed above, it can be assumed that, according to the CMG 101, a successful contractor requires business management skills and not necessarily the technical skills required to undertake a construction project. In addition, Section 1 of the CMG 101 does not expect or recommend that contractors have permanent employees who are technically skilled and have tertiary education. For instance, in a "design and build" project, contractors appoint a consultant to carry out the design, while in a "design by employer" project, the client appoints the consultant (CIDB, n.d.-b). The guidelines also list the types of professionals that make up a project team who are qualified and skilled, and are registered with professional bodies such as the Engineering Council of South Africa (ECSA) in the case of engineers; none of which are expected to be the contractor themselves or be part of the labour force of the contractor. It may be argued, however, that it makes business sense for contractors to opt against employing technically qualified or skilled permanent personnel (for example engineers, quantity surveyors, architects and project managers), since the most common types of projects are "design by employer" contracts where the contractor is only appointed after the designs have been carried out (CIDB, n.d.-b; Emuze and Matete, 2016).

This thesis, however, sought to prove that these technical skills are required for contractors to competently carry out CE and GB projects, and for them to grow and progress to CIDB grades 7 to 9.

2.3.2.2 CMG 101 Section 2 – Principles of operating a construction business

In addition to the principles set out in Section 1 of the CMG 101, Section 2 of the guidelines also recommends that contractors "choose which sector they wish to operate in"; private, public or both (CIDB, n.d.-c). According to the guidelines "*there is no point in spending enormous amounts of time, cost and effort in setting up a business or in submitting a tender for work in a market where there is an oversupply of construction businesses competing for work or in a market where a client is likely to prefer to do business with a better-known construction business*." This is in partial agreement with other literature which attributes contractor failure to the highly competitive nature of the construction industry (Thwala and

Mvubu, 2008; Thwala and Phaladi, 2009; and Patel, Yadav and Pathak, 2016). This study also noted that Section 2 of the CMG 101 does not provide any insight on the reasons clients would prefer "to do business with a better-known construction business". This may be because these 'better-known' companies have a proven track record, which may be related to the experience of these companies.

This research also demonstrated that the high competition is concentrated in the lower grades, as evidenced by the decreasing number of contractors from one grade to the next, and the considerably low number of contractors in Grades 7 to 9 (the exact statistics and proportions are shown in Chapter 4 of this thesis). As such, the author argued that the CIDB should rather strive to encourage small to medium sized contractors to progress through to the higher grades. This should start from establishing the distinguishing factors between these two groups of contractors, which this study seeks to prove is mainly technical qualifications and experience.

2.3.2.3 CMG 101 Section 3 – Principles of executing a construction project

Section 3 of the CMG 101 covers the general principles involved in executing construction projects. These include understanding the forms of contract used in the South African public sector, which the CIDB requires all public entities to use, and these are:

- The French Initials for International Federation of Consulting Engineers (FIDIC), 1999
- The General Conditions of Contract (GCC), 2004 or 2010
- The Joint Building Contracts Committee (JBCC) Series 2000 (Principal Building Agreement and Minor Works Agreement)
- The New Engineering Contract (NEC3)

These specify the terms of communication, project timelines, payment conditions, insurance, termination conditions, and dispute resolution, amongst others. The module also outlines the general principles associated with the management of time, resources and quality, and health and safety throughout the project lifecycle.

Although these guidelines do not specify or recommend any qualifications or experience required to carry out a construction contract, the guidelines provided in the three CMG 101 modules are essential for the successful completion of any construction project. On the other

hand, other literature such as Thwala and Mvubu (2008), Thwala and Phaladi (2009), and Holt (2013) found that small to medium sized contractors have a high failure rate, and Muzondo and McCutcheon (2018) has attributed this failure to lack of technical skills. It was, therefore, of great interest for this research to determine whether the CIDB CMG may have omitted two very significant success factors – qualifications and experience.

Debrah and Ofori (2001) highlighted that the construction policies in Singapore have been adapted from as early as 1988 to specify that only contractors that have been trained and certified through the various contractor development programmes offered by the government can be contracted for projects. This is a demonstration of how the government does not only take action to offer such programmes, but can also encourage contractors to seek training and skills development through procurement policy reform. The result of this includes ensuring that the construction industry is equipped with competent implementers of infrastructure projects who are more likely to complete project on time, to cost and at the correct quality standards.

In light of this, the following section highlights some of the procurement practices and procedures developed around the world and are to used select competent contractors as well as encourage contractors to seek out skills development.

2.4 The role of Procurement Practices and Procedures in Contractor Success

According to Ofori (2018), inefficient and non-transparent procurement systems, cumbersome and costly contracting procedures, and the lack of standardised contract conditions and processes are some of the main challenges impeding construction industry development in developing countries such as Ethiopia and India. This section provides an overview of some international research on the subject of public procurement and the appropriate selection of contractors. This thesis also set out to investigate whether these procurement processes, principles and strategies take into account contractor competence and how they affect contractor success.

2.4.1 Procurement Strategies for Public Infrastructure Projects

According to Preuss (2009) the public sector has the responsibility of providing various services which contribute to sustainability, the impacts of which include economic development. This can be achieved through sustainable supply chain management (SCM), which, according to Carter and Rogers (2008:368), is defined as:

> "*the strategic, transparent integration and achievement of an organisation's social, environmental, and economic goals in the systemic coordination of key interorganizational business processes for improving the long-term economic performance of the individual company and its supply chains.*"

This can be achieved through appropriate procurement strategies targeted at appointing service providers that are aligned to project and organisational goals. Watermeyer (2014) defines procurement strategy as the process that pertains to the choices made in determining what is to be delivered through a particular contract and the procurement and contracting arrangements. In a study conducted on the construction industry of the UK, Lam and Gale (2014) state that government bodies are the facilitators of industry best practice with regard to procurement practices. As such, their procurement process and strategies, specifically with regard to the selection of contractors should be aimed at success. The selection of appropriate contractors through clearly defined procurement strategies provides a good basis for ensuring successful project implementation. The result of this could be the reduction in time delays, scope creep and unproductive costs (Watermeyer, 2014), which can be used as indicators of project performance (Turner, 1999; Harrison and Lock, 2004; and Cheung, Suen and Cheung, 2004). Watermeyer (2014) adds that the implementation of an effective procurement strategy that realizes the aforementioned benefits would require a culture change.

According to Flyvbjerg, Bruzelius and Rothengatter (2003) optimism bias, which is "the human mind's cognitive bias in presenting the future in a positive light", and strategic misrepresentation, which is "behaviour that deliberately underestimates costs and overestimates benefits for strategic advantage usually in response to incentives during the budget process", have been cited as the root causes for lack of project success. Optimism bias and strategic misinterpretation can be most prominent in or limited to the planning process where a decision to implement a particular project is made (Flyvbjerg Bruzelius and Rothengatter, 2003). This decision process also relates to the quality of information that

informs the decision or the quality of information upon which the decision is made (Watermeyer, 2014). Therefore, the information gathered during the planning stage in relation to the implementation of a particular project, including the appointment of contractors, is crucial for the success of the project. In light of this, it is thus, important to answer the question; "what action or strategies can government institutions take to ensure project success during the decision making stage?" The answer to this question begins with establishing and effectively implementing a well-defined procurement strategy with appropriate contractor selection criteria.

2.4.2 The Tendering Process

The most commonly used pre-selection procedures include open tendering, selective or restricted tendering, pre-qualification, and negotiation (Hatush and Skitmore, 1998; Palaneeswaran and Kumaraswamy, 2001). Open tendering is a process where any contractor can bid and all bids are evaluated, after which the "optimal" bid is awarded the contract (Nieto-Morote and Ruz-Vila, 2012). Another method is selective or restricted tendering which is suitable for construction contracts that involve special expertise or high technology (Nieto-Morote and Ruz-Vila, 2012). In the restricted or selective tendering criteria, only the contractors who fulfil the special requirements of the particular contract can bid. Lastly, a negotiation procedure is used when the contract is too complex, there is an emergency situation or when no application is made for the aforementioned criteria (Nieto-Morote and Ruz-Vila, 2012).

Selecting contractors predominantly on the lowest price is very common, however, it exposes the client to poor performance and low quality outputs (Nieto-Morote and Ruz-Vila, 2012; Tao and Kumaraswamy, 2012). According to Zavadskas and Vilutienė (2006) a process to evaluate prospective contractors' ability to complete a project satisfactorily before they are admitted into the bidding process will minimise risks and failures and potentially enhance the performance level of contractors. Over and above this, Patel, Yadav and Pathak (2016), in a study conducted in India, recommended that construction contracts be awarded to contractors with experience in the field.

In the UK, the government of Margaret Thatcher introduced compulsory competitive tendering (CCT) in the 1980s in order to improve procurement efficiency (Preuss, 2009). This

was a policy that required public bodies to allow private sector entities to bid for the delivery of goods and services in competition with any internal provision by those public organisations themselves (Scott and Matthias, 2017). While the Tony Blair and Gordon Brown governments continued with the theme of efficiency, some modifications were made. The CCT was replaced when the Local Government Act of 1999 introduced the notion of "Best Value" as a performance management framework aimed at improving service delivery (Preuss, 2009). The UK government now focuses greatly on increased efficiency rather than exclusively on financial savings (Preuss, 2009). Furthermore, the European Court of Justice ruled that 'the most economically advantageous' tender should be evaluated against environmental and social criteria, as long as they do not violate the principle of non-discrimination among European Union member states (Preuss, 2009). This provides evidence that tenders should not be evaluated solely, or predominantly, on financial value.

As such, government organisations around the world have employed strategies such as preferential public procurement which will allow them to appoint local service providers in order to achieve sustainable SCM. For example, one county council in the North of England found that local suppliers re-spend 76% of the income generated from local government contracts within the region, while external suppliers only spend 36% (Preuss, 2009). Nevertheless, this study proposed that, in addition to preference, procurement strategies should also include an evaluation of competence. This, however, may require policy reform to ensure uniformity across all government bodies' procurement strategies and, more specifically, contractor selection criteria.

2.4.2.1 Contractor pre-qualification and selection

According to Nieto-Morote and Ruz-Vila (2012) the pre-qualification process is where contractors are screened in order to establish the capabilities to successfully carry out the contract. Thus, this process needs to be carefully planned out and all the criteria to be used should be to ensure project success.

All projects have inherent cost, time, safety, scope and quality objectives, for this reason, the most commonly used pre-qualification criteria include the following aspects (Nieto-Morote and Ruz-Vila, 2012):

1. **Technical capacity**

   The contractor must demonstrate that they have the technical capacity to perform the activities of the specific project for which they are seeking the pre-qualification.

2. **Experience**

   The contractor must demonstrate their participation in other previous projects, especially if they are similar to the project that will be executed.

3. **Management capability**

   The contractor must demonstrate that they are capable of planning, organizing and controlling a project.

4. **Financial stability**

   The client must reach an informed opinion regarding the overall financial position and capability of contractor.

5. **Past performance**

   Considering the past performance of each contractor, the project manager will have a higher or lower degree of confidence in the possible contractors regarding the quality, time and cost control requirements.

6. **Past relationship**

   The client must collect and analyse information about the contractor's past relationship with other entities which participate in the construction activities.

7. **Reputation**

   The project manager must have an overall estimation or opinion about how good the contractor is.

8. **Occupational health and safety**

   To encourage contactors to establish and maintain effective systems to manage the risks to the health and safety of their employees, arising from the nature of the work.

Although all projects also have some element of uniqueness, these criteria can be expanded into sub-criteria that can be generalised, as shown in Table 7. It is important to note that this list is not exhaustive and can be more elaborate since the sub-criteria mainly depend on the nature of each project.

Table 7: Main criteria and sub-criteria for contractor pre-qualification

Criteria	Sub-criteria
Technical capacity	1. Qualifications of staff 2. Experience of staff 3. Innovative method 4. Labour and equipment
Experience	1. Type of past project completed 2. Size of project completed 3. Number of projects completed 4. Experience in local area
Management ability	1. Organisational culture 2. Management knowledge 3. Quality management system
Past performance	1. Quality level of projects performance 2. Projects completed on time 3. Projects completed on budget
Past relationships	1. Relationship with subcontractors 2. Client satisfaction 3. Relationship with suppliers
Reputation	1. Past failures in completed projects 2. Number of years in construction 3. Claims and litigation
Financial stability	1. Financial soundness 2. Credit rating 3. Liquidity
Occupational health and safety	1. Management safety accountability 2. Safety performance

Source: Nieto-Morote and Ruz-Vila (2012)

As evidenced in Table 7, the criteria proposed by Nieto-Morote and Ruz-Vila (2012) are predominantly focused on the skills, competencies and experience of key staff of contracting companies, and the experience and past performance of the companies. These findings are not only in agreement with the study premise in that qualifications and experience are important factors of selection; Nieto-Morote and Ruz-Vila (2012) also add an element of evaluating client satisfaction and reputation. These criteria add an element of evaluating and measuring past performance as a predictor of future performance.

After the evaluation of contractors in the pre-qualification stage, contractors are then compared accordingly to select the most appropriate one for the project. According to Nieto-Morote and Ruz-Vila (2012) the selection of an appropriate contractor is essential to the success of any construction project. In support of this, Ofori (2018) found that the lack of standardisation in contractor evaluation criteria was one of the main contributing factors to poor construction industry performance in India.

The South African government has used procurement policies to drive the procurement of particular groups of contractors in order to ensure their participation in the economy. These policies have influenced the way industry practitioners select contractors for their projects. The next section begins with a brief history on the rationale behind the policies and highlights some aspects of their influence on the construction industry of South Africa.

2.5 Construction Industry Laws and Regulations

This section provides the background and rationale for some of the current procurement policies in effect in the South African construction industry. The policies included in this section are not exhaustive in terms of the policies that are related to the South African construction industry, however, these are the policies that the author felt were most relevant to the study.

2.5.1 Background to Current Laws and Regulations

In the Republic of South Africa (RSA), non-white nationals were disadvantaged by law during the apartheid era, from 1948 to the early 1990s. These groups actually constituted a majority of the population. The minority, white Afrikaners, governed the country since the National

Party came into power in 1948, making apartheid a law. During this era, laws such as the Group Areas Act of 1950 and the Separate Amenities Act of 1953, which separated the non-white groups and left them deprived, were passed (Tummala, 2002). This was in addition to the Natives Land Act of 1913 which restricted natives (black people) from leasing, buying or occupying particular land in SA, effectively segregating black people (Feinberg, 1993).

In addition, the Bantu Education Act of 1953, where the education of black people was controlled by the government, ensured that graduating black learners could only participate below a particular level in the workforce. This also ensured that non-white South Africans were limited to being cheap and exploitable labour (Moore, 2016) in a white run economy. This is also evidenced by the Bantu Builders Act of 1951 and the Bantu Labour Act of 1964, which essentially ensured that black workers did not perform any skilled work in urban areas. In essence, these laws ensured that non-whites were at a disadvantage; unable to access the same education offered to their white counterparts, resulting in lack of skills for the former racial group. These disadvantages caused a 'knock-on effect' that has had intergenerational impacts post-apartheid. This study, in fact, proposes that this lack of proper education and work experience resulted in inadequate income and, therefore, lack of capital for previously disadvantaged individuals to be able to start their own businesses.

The 1994 democratically elected government called for a new and equal South Africa that promoted equity and non-discrimination. As such, a new Constitution was adopted in 1996 that "*recognises the injustices of our past*" and "*believes that South Africa belongs to all who live in it, united in our diversity*". The Constitution of the Republic of South Africa (1996) sought to, amongst other goals, "*heal the divisions of the past and establish a society in which government is based on the will of the people and every citizen is equally protected by the law.*" Chapter 2 (Bill of rights), Section 9(3) adds "*the state may not unfairly discriminate directly or indirectly against anyone on one or more grounds, including race, gender, sex, pregnancy, marital status, ethnic or social origin, colour, sexual orientation, age, disability, religion, conscience, belief, culture, language and birth.*" – promoting equality. While firmly believing in an equal SA for all, the Constitution also recognises that, in order to 'right the wrongs' of the past, "fair discrimination" is permissible – forming a basis for affirmative action.

The South African government also recognised that individuals of previously disadvantaged groups were not equally represented in public administration; Chapter 10 of the Constitution states "*public administration must be broadly representative of the South African people, with employment and personnel management practices based on ability, objectivity, fairness, and the need to redress the imbalances of the past to achieve broad representation*" – a mandate which was furthered by the Employment Equity Act 55 of 1998. The main objectives of the Act were to:

- "*Promote the constitutional right of equality and exercise true democracy;*
- *Eliminate unfair discrimination in employment;*
- *Ensure the implementation of employment equity to redress the effects of discrimination;*
- *Achieve a diverse workforce broadly representative of our people;*
- *Promote economic development and efficiency in the workforce; and*
- *Give effect to the obligations of the Republic as a manner of the International Labour Organisation*"

As such, the Act had two purposes; to promote "*equal opportunities and fair treatment in employment through the elimination of unfair discrimination"* and to implement *"affirmative action measures to redress the disadvantages in employment experienced by designated groups, in order to ensure their equitable representation in all occupational categories and levels in the workforce.*"

Another act that resulted from the mandate to ensure equity in employment is the Promotion of Equality and Prevention of Unfair Discrimination Act of 2000. Employers now have the responsibility to identify any barriers to employment of previously discriminated individuals and prepare employment equity plans to address and remove such barriers (Tummala, 2002). They are also expected to make efforts to train individuals of these 'designated groups' in order to retain and develop them. This form of preferential treatment is to allow for representation in all occupational categories and levels in the workforce. It should be noted that preferential treatment is extended to suitably qualified individuals that belong to the designated groups (non-whites), however, "such suitability may be a product of formal qualifications, prior learning, relevant experience" (Tummala, 2002:8), or a person's capability of acquiring, within reasonable time, the ability to do the job.

Taking this history into account, Section 217 of the SA Constitution makes allowance for organs of state to implement procurement policies that allow for preference in order to protect and advance previously disadvantaged individuals – affirmative action. This has led to the Preferential Procurement Policy Framework Act No 5 of 2000 (PPPFA) and later on, the Broad-based Black Economic Empowerment Act No 53 of 2003 (B-BBEE). These acts are used in the procurement of contractors in SA. Furthermore, the B-BBEE Act forms a significant part of the selection of contractors. Affirmative action, the PPPFA and B-BBEE are further discussed in the subsections below.

2.5.2 Affirmative Action (Preferential Procurement)

According to Tummala (2002) those who are in support of affirmative action base their arguments on four criteria. The first is compensatory justice which implies that all damage done by historical discrimination against any group or ethnicity either from custom and tradition or through deliberate public policy, should be undone and the affected groups should be duly compensated (Tummala, 2002). The second criterion being distributive justice where it is argued that equal opportunity and access to all are required in order to achieve just distribution of social goods and wealth. Social utility, the third criterion, emphasises that all individuals in society have something to contribute and that society is better off when all people are able to participate. The fourth criterion is the concept of responsiveness which suggests that in order for public service to become more responsive to the needs of all, the service personnel need to be more diverse and representative of all segments of the particular society or community.

The arguments against affirmative action are based on the following views (Tummala, 2002):

- Efforts made to favour groups that were previously discriminated, in order to 'right the wrong' of the injustices, perpetuates reverse discrimination
- Preference should be given to the particular individuals who actually experienced discrimination rather than the entire group that the individuals are part of. The argument is that other individuals in the group may have not been affected by the impacts of the discrimination, and may be successful and well-off.
- Any form of preference contradicts the political philosophy of individualism which demands less governance and minimal interference with an individual's entrepreneurial spirit.

- Preference has not been a time bound remedy, and tends to be characterised with entitlement instead.
- Efforts to better represent all groups through preference may result in the appointment of inefficient and incompetent individuals, resulting in poor service to clients.
- Individuals who benefit from affirmative action tend to use preference as a tool to intimidate administrators, making it difficult to make disciplinary decisions against the individuals.
- Affirmative action "treats some more equally than others", which effectively negates the principle of equality which it is seeking to enhance.

The SA government instituted affirmative action through the PPPFA and the B-BBEE acts, among other acts and regulations, as discussed below.

2.5.2.1 The PPPFA

The PPPFA No 5 of 2000 was formulated to give effect to Section 217(3) of the Constitution of South Africa which stipulates that national legislation should provide "*a framework for the implementation of the procurement policy contemplated in section 217(2) of the Constitution; and to provide for matters connected therewith*" (RSA, 2000a). The implementation guide for the PPPFA also states that government institutions should make provisions "*identify procurement opportunities to advance designated groups and apply pre-qualification criteria for this purpose*" in the procurement and tender planning stage (RSA, 2017). Pre-qualification, which is a part of contractor selection, is used to advance businesses owned by previously disadvantaged individuals. The RSA (2017) stipulates that the pre-qualification criteria should consider B-BBEE status level, Emerging Micro Enterprises (EME) or Qualifying Small Enterprises (QSE) that are at least 51% owned by the following specific groups:

- black people;
- black youth;
- black women;
- black people with disabilities;
- black people living in rural or under developed areas;
- black-owned cooperatives; and
- black people who are military veterans.

Tenders are evaluated on the following (RSA, 2017):

- Pre-qualification criteria;
- Evaluation of mandatory criteria which include standard bid documents (SBD forms), the bidders financial standing, and the bidders tax clearance status, among others;
- Evaluation of locally produced material and content (where applicable);
- Functionality evaluation (where applicable); and
- Evaluation with regard to the 80/20 or 90/10 preference point system.

The PPPFA implementation guide also recommends that the functionality criteria may include the service provider's contract related experience, quality of methodology, qualifications of contractor's key personnel and transfer of knowledge. This is but a recommendation and is not mandatory to use or even include in the functionality evaluation in tender documents. In addition, the CIDB (n.d.-b) states that this is at the discretion of the client – an aspect that this study has considered to be a limitation. In fact, this study, in Chapter 4, went on to show that this limitation has led to clients evaluating contractors differently and some not including an evaluation of competence at all. This puts clients at the risk of employing contractors who neither have the required qualifications nor experience to perform the required work.

The tendering process and evaluation criteria along with scoring systems are further discussed in Chapter 4, while the B-BBEE principles are discussed in sub-section 2.5.2.2 below.

2.5.2.2 The B-BBEE Act

As highlighted above, non-white individuals were unable to participate in the South African economy during the apartheid government. In order to ensure equality, as per the Constitution, and ensure redress for the past imbalances, the democratically elected African National Congress (ANC) government formulated the Broad-Based Black Economic Empowerment (B-BBEE) Act 53 of 2003. The objectives of the B-BBEE Act are to "*facilitate broad-based black empowerment by:*

- *promoting economic transformation in order to enable meaningful participation of black people in the economy;*
- *achieving a substantial change in the racial composition of ownership and management structures and in the skilled occupations of existing and new enterprises;*

- *increasing the extent to which communities, workers, cooperatives and other collective enterprises own and manage existing and new enterprises and increasing their access to economic activities, infrastructure and skills training;*
- *increasing the extent to which black women own and manage existing and new enterprises, and increasing their access to economic activities, infrastructure and skills training;*
- *promoting investment programmes that lead to broad-based and meaningful participation in the economy by black people in order to achieve sustainable development and general prosperity;*
- *empowering rural and local communities by enabling access to economic activities, land, infrastructure, ownership and skills; and*
- *promoting access to finance for black economic empowerment."*

From the objectives above, the main focus of the B-BBEE Act is on empowering black people through provision of infrastructure, skills training, ownership and finance. What this act does not explicitly cover is the development of black individuals or businesses through education, which is what this group of people was deprived of by the apartheid laws that the act is meant to rectify. This study argued that this act, instead, has resulted in public sector clients using the B-BBEE and price as the predominant factors for contractor selection without great consideration of contractor competence (qualifications and experience).

2.5.3 The CIDB Act

The CIDB Act No 38 of 2000 was formulated to "*provide for the establishment of the Construction Industry Development Board; to implement an integrated strategy for the reconstruction, growth and development of the construction industry and to provide for matters connected therewith*" (RSA, 2000b). The objectives of which are to:

- *promote the contribution of the construction industry in meeting national construction demand and in advancing—*
    - *national, social and economic development objectives;*
    - *industry performance, efficiency and competitiveness; and*
    - *improved value to clients;*
- *provide strategic leadership to construction industry stakeholders to stimulate sustainable growth, reform and improvement of the construction sector;*

- *determine and establish best practice that promotes—*
    - *improved industry stability;*
    - *improved industry performance, efficiency and effectiveness;*
    - *procurement and delivery management reform;*
    - *improved public sector delivery management;*
    - *national social and economic objectives, including—*
        - *growth of the emerging sector;*
        - *labour absorption in the construction industry;*
        - *improved labour relations; and*
        - *positive safety, health and environmental outcomes;*
    - *human resource development in the construction industry;*
- *promote best practice through the development and implementation of appropriate programmes and measures aimed at best practice and improved performance of public and private sector clients, contractors and other participants in the construction delivery process;*
- *promote uniform application of policy with regard to the construction industry throughout all spheres of Government;*
- *promote, establish or endorse—*
    - *uniform standards; and*
    - *ethical standards,*

  that regulate the actions, practices and procedures of parties engaged in construction contracts;
- *promote sustainable growth of the construction industry and the participation of the emerging sector therein;*
- *promote appropriate research on any matter related to the construction industry and its development;*
- *implement policy on construction industry development;*
- *advise the Minister on policy and programmes which impact on construction industry growth and development; and*
- *promote any other related objective.*

The CIDB, therefore, seeks to facilitate growth in the South African construction industry while, similar to the PPPFA and the B-BBEE act, also promoting transformation in relation to previously disadvantaged individuals or businesses. However, also similar to the

aforementioned acts, the CIDB Act is not explicit about the need to promote formal education in order to ensure that emerging contractors' competencies are at par with the more established companies and international standards. It is also important to mention that the more established companies are predominantly owned by individuals that are not classified as previously disadvantage, and therefore, may have had the opportunity to attain relevant qualifications afforded to them by the apartheid government. In addition, the CIDB, in the January 2018 Construction Monitor, found that "the state of transformation is not representative of the demographics of South Africa" and that the state of transformation decreases with the increase in CIDB grade and company size (CIDB, 2018-a). This is partly in support of the author's notion that the CIDB Act has limitations, and thus, its implementation may also have a contributory effect on the success of contractors.

The PPPFA of SA, based on Section 217 of the Constitution, on the other hand, requires government organisations to formulate procurement strategies that allow for competitive tendering and the principles of best value. In addition to this, the SA government also requires public bodies to ensure that their procurement strategies allow for preference within the pre-qualification stage of the tendering process in the form of the B-BBEE as highlighted in this chapter. This, however, does not place much emphasis on the development of skills nor their evaluation within the procurement process.

This study, along with Muzondo and McCutcheon (2018), argued that, in addition to the socio-economic factors that the PPPFA and that B-BBEE acts are seeking to address, contractor competence should also be evaluated as part of the pre-qualification stage of the tendering process.

2.6 Contractor Competence: The Qualifications and Experience of Grade 1 to 6 CE and GB Contractors

This literature review has revealed that contractors are faced with a number of challenges, some of which are directly related to their skills and experience (Abidali and Harris, 1995; Thornhill and Amit, 2003; Enshassi, Al-Hallaq, and Mohamed, 2006; Thwala and Mvubu, 2008; Mahamid, 2012; Holt, 2013; Bekker and Mashaba, 2018). Kikwasi (2011) conducted a study evaluating the availability of skills in the construction industry of Tanzania. The study was conducted through the administration of interviews and questionnaires on contractors as

employers of labourers in Dar es Salaam. Kikwasi (2011). The study found that most contractors rarely evaluate the competence and training background of their staff, and rely on informally trained personnel. This has led to low quality outputs and poor workmanship in Tanzanian construction projects.

Rwelamila and Ssegawa (2014), who conducted a study on project failure in the Southern African Development Community (SADC) region, highlighted that there is a strong relationship between lack of project competence and project failure. This is in agreement with the study conducted by Muzondo and McCutcheon (2018) on the relationship between contractor technical qualifications and experience, and their project performance. Additionally, Rwelamila and Ssegawa (2014) add that literature widely agrees that the factors leading to competence are multifaceted. However, the four major contributing factors are knowledge acquisition, skills, experience and continuous professional development, as shown in Figure 3.

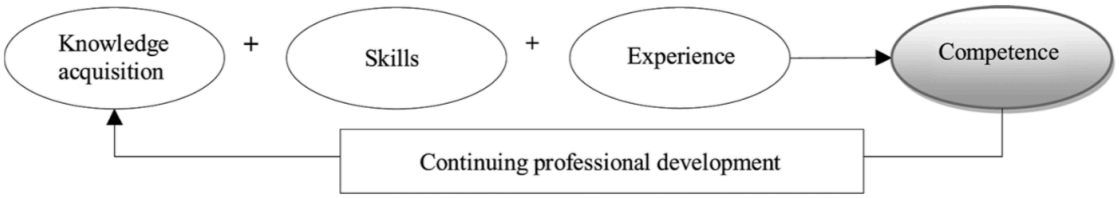


Figure 3: Factors leading to the achievement of competence (Rwelamila and Ssegawa (2014)

Crawford (2005) wrote a paper focused on project competence for managing internal organisational processes and investigated the linkages between project competence and organisational performance. The work by Crawford (2005) was motivated by the shift in organisations to adopting project management approaches for managing their internal work processes. As shown on Figure 4, Crawford (2005) proposed that competence leads to better project performance, and therefore, business performance; a notion that is in agreement with Muzondo and McCutcheon (2018), and forms a basis for this thesis.

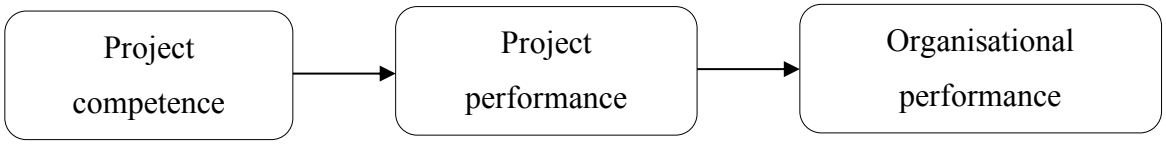


Figure 4: Relationship between competence and organisational performance (Crawford, 2005)

In light of the aforementioned theories and findings, this sub-section consists of a summary of three studies authored by the CIDB (2011), Martin and Root (2012) and Muzondo and McCutcheon (2018). These studies show the qualifications and experience of grades 1 to 6 contractors in South Africa, with Muzondo and McCutcheon (2018) proceeding to show the relationship between these qualifications and experience with project performance. This section also serves as a prelude to the data collection and analysis chapter where the findings on the competencies of larger construction companies are presented.

2.6.1 CIDB Contractor Skills Survey (2011)

The CIDB conducted a study in 2011 of the skills of owners and key personnel of CE and GB contractors from grades 2 to 6. The results of the skills survey were obtained from 595 companies with the information collected for key personnel undertaking the following duties within their respective enterprises:

- Owner/Director;
- Manager/Professional (typically construction project manager);
- Supervisor; and
- Technician/Artisan.

Table 8 shows the qualifications of the contractors in the study as a percentage of the total sample. The study found that in the lower grades, a higher proportion of the key staff did not have any technical or construction related qualifications, or any qualifications at all. In general, a higher percentage of the key staff in the lower grades undertook trade tests, and the lower functions (supervisor to technician or artisan) showed a higher percentage of trade qualifications. This may be attributed to the fact that trade tests are taken by individuals that undertake artisanal functions rather than those that are in managerial positions, similar to foreman qualifications. Artisans include bricklayers, tilers, plasterers, carpenters, electricians, mechanics, sheetmetal workers, welders, and fitters (Kaoma and Muya, 2016).

Table 8: Contractor educational profile

Grade	Position	Higher Educational Qualifications				
		None/other	Trade test	Foreman Certificate	National Diploma	BTech or higher
5 and 6	Owner/Director	45%	4%	6%	29%	17%
2 to 4	Owner/Director	65%	5%	4%	19%	8%
5 and 6	Manager/Professional	39%	1%	8%	31%	20%
2 to 4	Manager/Professional	47%	6%	5%	26%	17%
5 and 6	Supervisor	46%	10%	8%	33%	3%
2 to 4	Supervisor	59%	10%	13%	16%	3%
5 and 6	Technical/Artisan	30%	22%	26%	22%	0%
2 to 4	Technical/Artisan	27%	29%	2%	37%	5%

Source: CIDB (2011)

It is of concern to note that only 17% of Grades 5 and 6 owners or directors fall under the Bachelor of Technology (BTech) qualification or higher qualification band compared to the 45% that have no technical qualifications or any formal qualification at all. Grades 2 to 4 contractor data shows a much grimmer picture with only 8% of the owners or directors with BTech or higher qualification and 65% with no formal technical qualifications. It was however, expected that owners or directors and managers would have BTech or higher qualifications than artisans and supervisors. The survey also found that there is a higher percentage of grade 5 and 6 managers, and owners or directors that fall under the BTech or higher qualification band than grade 2 to 4 individuals in the same positions.

It is rather interesting that, in general, more artisans have some form of technical qualification than owners or directors. For example, only 27% of grades 2 to 4 artisans have no technical qualifications compared to the 65% of corresponding owners or directors.

Table 9 shows the proportion of contractors by the number of years of experience in the construction industry.

Table 9: Contractor experience profile

Grade	Position	Experience in the construction industry (Years)					
		< 5	6 to 10	11 to 20	21 to 30	31 to 40	>40
5 and 6	Owner/Director	9%	29%	32%	15%	12%	4%
2 to 4	Owner/Director	34%	33%	15%	9%	5%	3%
5 and 6	Manager/Professional	9%	35%	33%	13%	9%	1%
2 to 4	Manager/Professional	23%	32%	19%	18%	4%	3%
5 and 6	Supervisor	28%	25%	30%	18%	0%	0%
2 to 4	Supervisor	32%	21%	18%	15%	13%	2%
5 and 6	Technical/Artisan	40%	24%	20%	16%	0%	0%
2 to 4	Technical/Artisan	38%	33%	10%	8%	8%	3%

Source: CIDB (2011)

It can be seen from Table 9 above that grades 5 and 6 owners or directors generally have more experience than grades 2 to 4 owners or directors. The survey also found that a large proportion of the artisans and supervisors have less than 11 years' experience in the construction industry. From this, one can conclude that individuals with higher positions have more experience in the industry. It is assumed that as the years of experience increase, some staff get promoted to higher positions within the companies; placing a higher percentage of artisans on the lower experience level than owners or directors.

The study also found that the higher the position within the company, the higher the qualification level. What can also be concluded from the study is that, in general, staff in grades 2 to 4 companies have lower qualifications than those in grade 5 and 6 companies. That is, qualification level increases with the progression in CIDB grade.

According to the CIDB survey, 12% of grades 2 to 4 contractors do not possess technical qualifications and have less than 5 years of experience, while 60% have over 5 years of experience and no technical qualifications (CIDB, 2011). Grade 5 and 6 contractors with no qualifications and less than five years' experience make up 9% of the sample, while those with no technical qualifications and more than 5 years' experience make up 45% (CIDB, 2011).

This is evidence that most individuals with no formal technical qualifications supplement the deficit with vast experience in the construction industry and grade 5 and 6 contractors have more technical experience than grades 2 to 4 contractors. Therefore, where technical qualifications are lacking, experience can be used as another form of training.

2.6.2 Martin and Root (2012)

A survey was conducted where 528 CE contractors were randomly selected from across South Africa with the aim of profiling these contractors with regard to training and experience. The study included contractors registered under grades 1 to 4 of the CIDB and, at the time of study a total of 2638 contractors were registered under the grade and class of work under study (Martin and Root, 2012). Questionnaires were sent to the 528 contractors with 264 forming the total number of valid respondents. The number of respondents by grade may be found in Table 10. The study focused specifically on the owners or managers of the contractor companies.

Table 10: Breakdown of responses by grade - Martin and Root

Grade	Responses	Proportion of total responses
1	194	73.5%
2	37	14.0%
3	14	5.3%
4	19	7.2%
Total	264	100%

Source: Martin and Root (2012)

Below is a summary of the findings regarding the qualifications and experience of the owners of these companies along with the experience of the companies themselves in the construction industry. Figure 5 shows the educational background of the owners of the 264 companies.

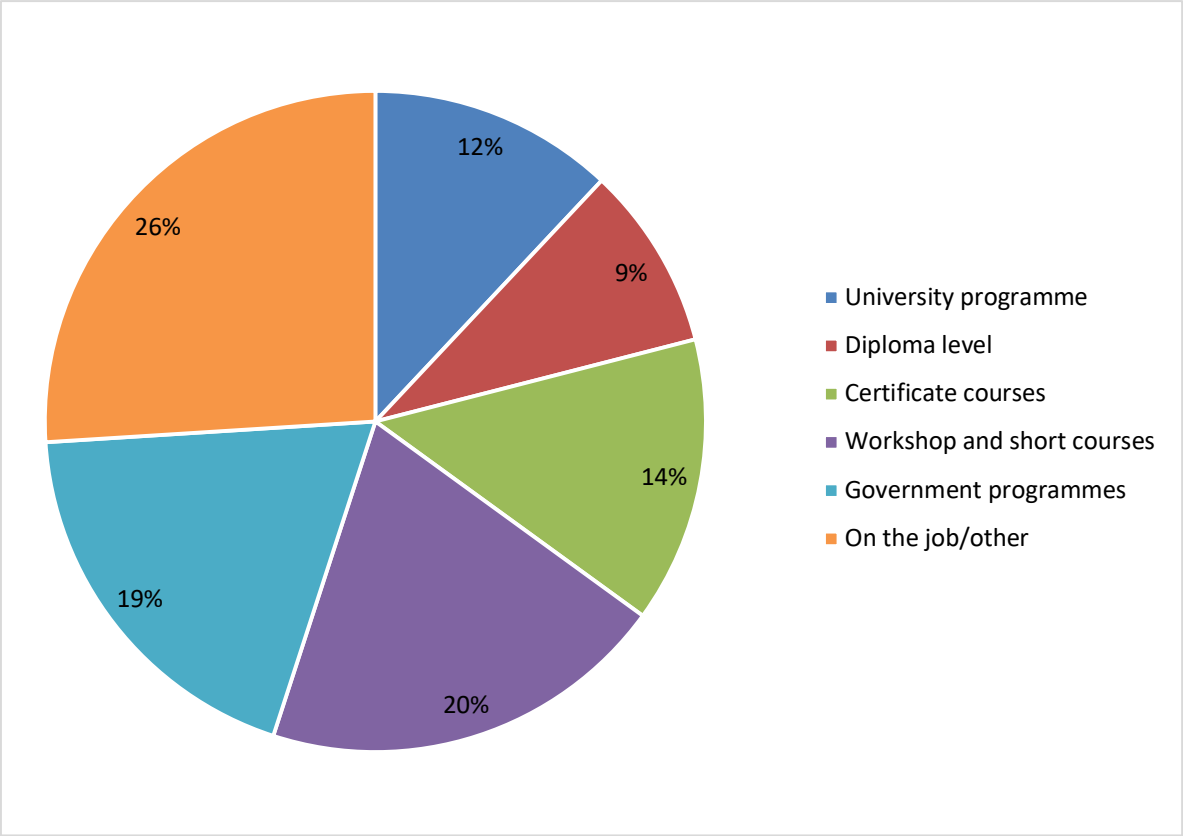


Figure 5: Profile of training received (Martin and Root, 2012)

Martin and Root (2012) found that the highest level of qualifications was a bachelor's degree, and a total of 55% of the respondents had no formal training in the construction industry. More than a quarter of the respondents (26%) had received on the job training or no training at all. Some contractors (19%) received training from government programmes; these included programmes such as the Artisan Development Programme and the Contractor Learnership Programme offered through the Expanded Public Works Programme (EPWP). It should be noted, however, that, according to the CIDB, contractor development programmes have not been as successful as anticipated (Parliamentary Monitoring Group, 2015).

Similar to the findings of the CIDB survey, most contractors fall under the lower qualification levels with only 12% possessing university qualifications. This evidence alone cannot be used to conclude on the competence of the contractors under this study. Martin and Root (2012) also assessed the experience factor, as illustrated in Figure 6.

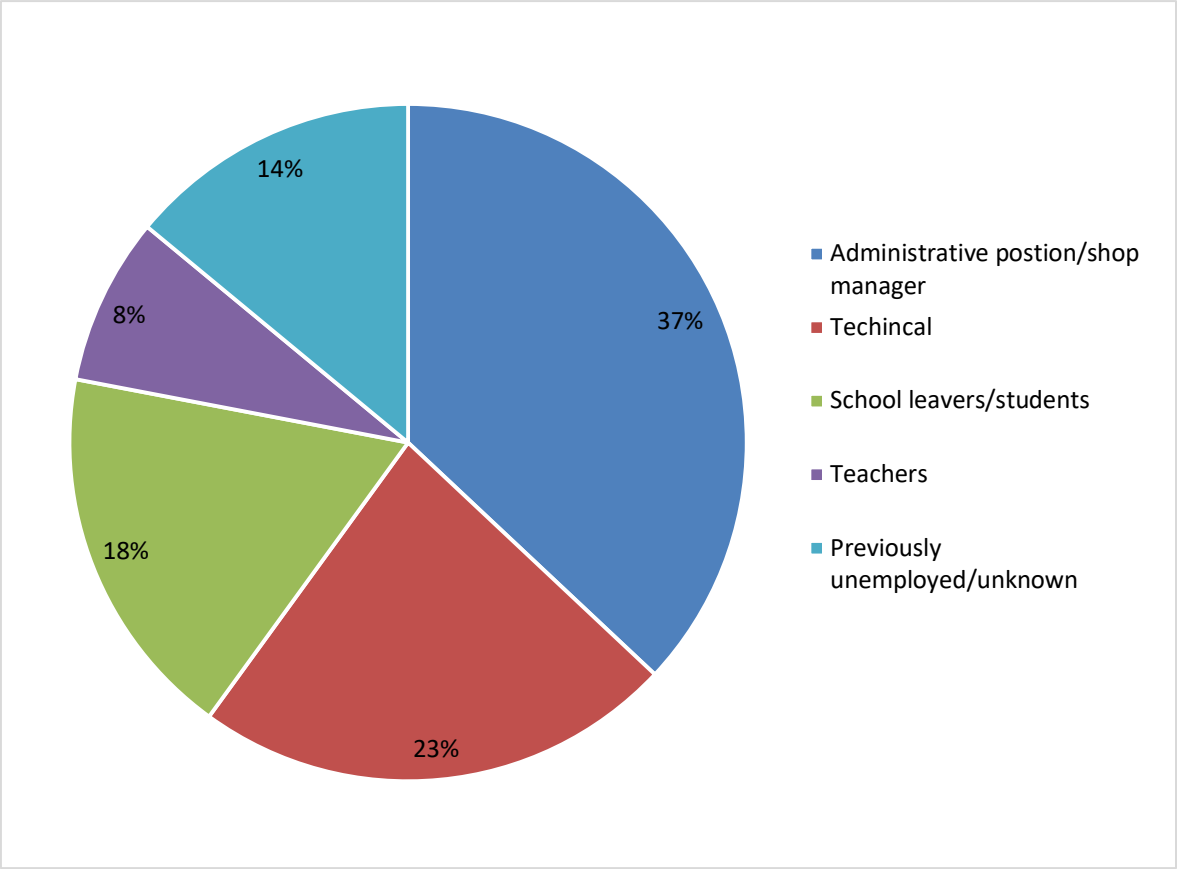


Figure 6: Personal employment background (Martin and Root, 2012)

According to the study, 23% of the contractors had prior technical experience while 37% held administrative or shop manager positions. According to Martin and Root (2012) these results reflect that many of the respondents were not entrepreneurs and relied mainly on their own managerial competence and creative opportunism.

Table 11 shows the number of years the companies had been in operation at the time that this research was conducted. This was used as a measure of company experience. A total of 112 out of the 264 (42%) companies had been in operation for a maximum of two years at the time of the survey, with 97% of the companies being in operation for less than 12 years at the time. This was evidence that many of the companies could be classified as 'micro to medium enterprises' and were in the 'existence' stage (Martin and Root, 2012).

Table 11: Age of company

Age of company (years)	Responses	Percentage	Cumulative percentage
0 to 2	112	42.4%	42.4%
3 to 5	99	37.5%	79.9%
6 to 8	34	12.9%	92.8%
9 to 11	11	4.2%	97.0%
12 to 14	2	0.8%	97.7%
15 and older	6	2.3%	100%
Total	**264**	**100.0%**	

Source: Martin and Root (2012)

In conclusion, almost all grade 1 to 4 contractors are 'small' companies and have not been in operation for more than 15 years. The 'existence' stage is generally the first stage of business growth and is generally "concerned with garnering customers and delivering the product or service contracted for" (Lewis and Churchill, 1983).

2.6.3 Muzondo and McCutcheon (2018)

Muzondo and McCutcheon (2018) conducted research on the technical qualifications and experience of emerging contractors in the Mpumalanga Province of South Africa in 2015. Similar to the CIDB skills survey, the study covered grades 2 to 6 GB and CE contractors who undertook 30 public infrastructure projects between 2011 and 2013. Figure 7 shows the qualification profile of the contractors.

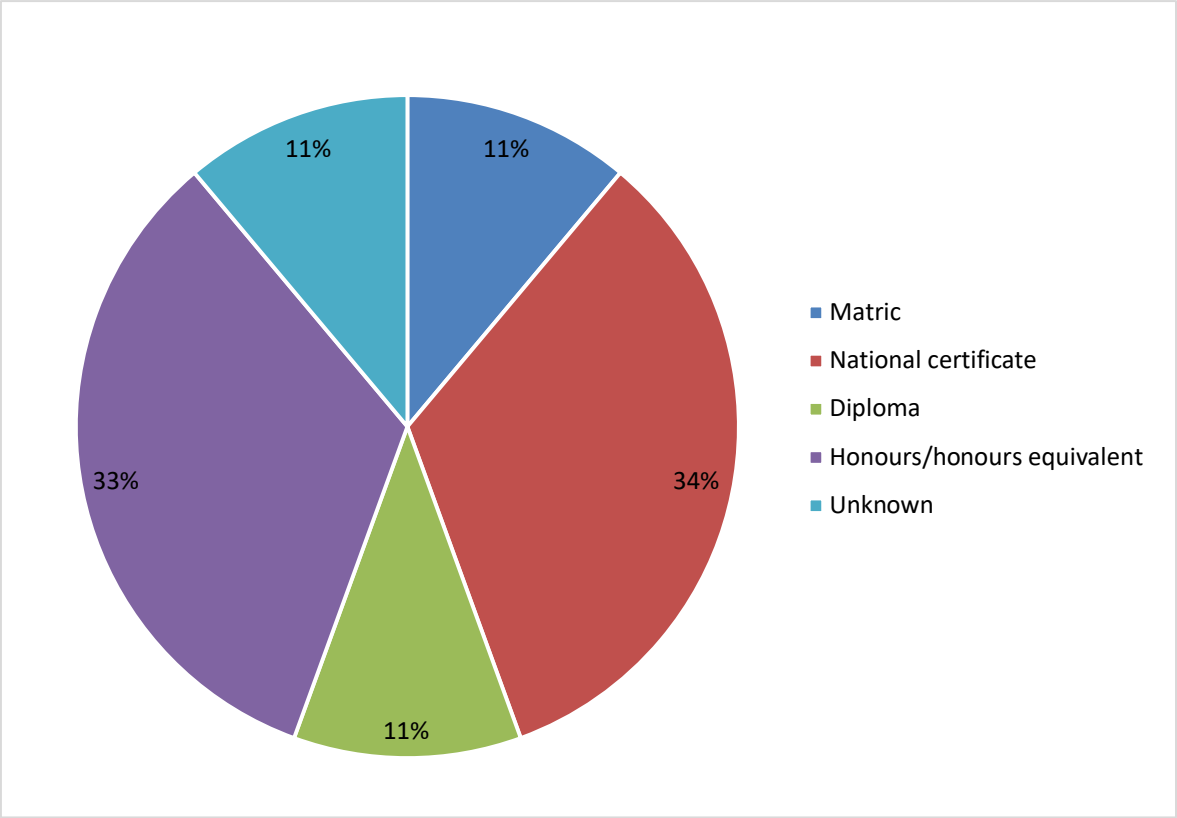


Figure 7: Percentage of contractors to their qualification bands (Muzondo and McCutcheon, 2018)

Muzondo and McCutcheon (2018) found that 33% of the contractors had honours level degrees while a total of 56% had lower than diploma level qualification or no qualifications at all. This is considerably different to the figures presented by Martin and Root (2012) at 12%. It should be noted though, that the study by Martin and Root is more representative of the contractors registered with the CIDB as it covers a larger sample.

Muzondo and McCutcheon (2018) proceeded to investigate the types of qualifications obtained by the contractors under study, shown on Figure 8.

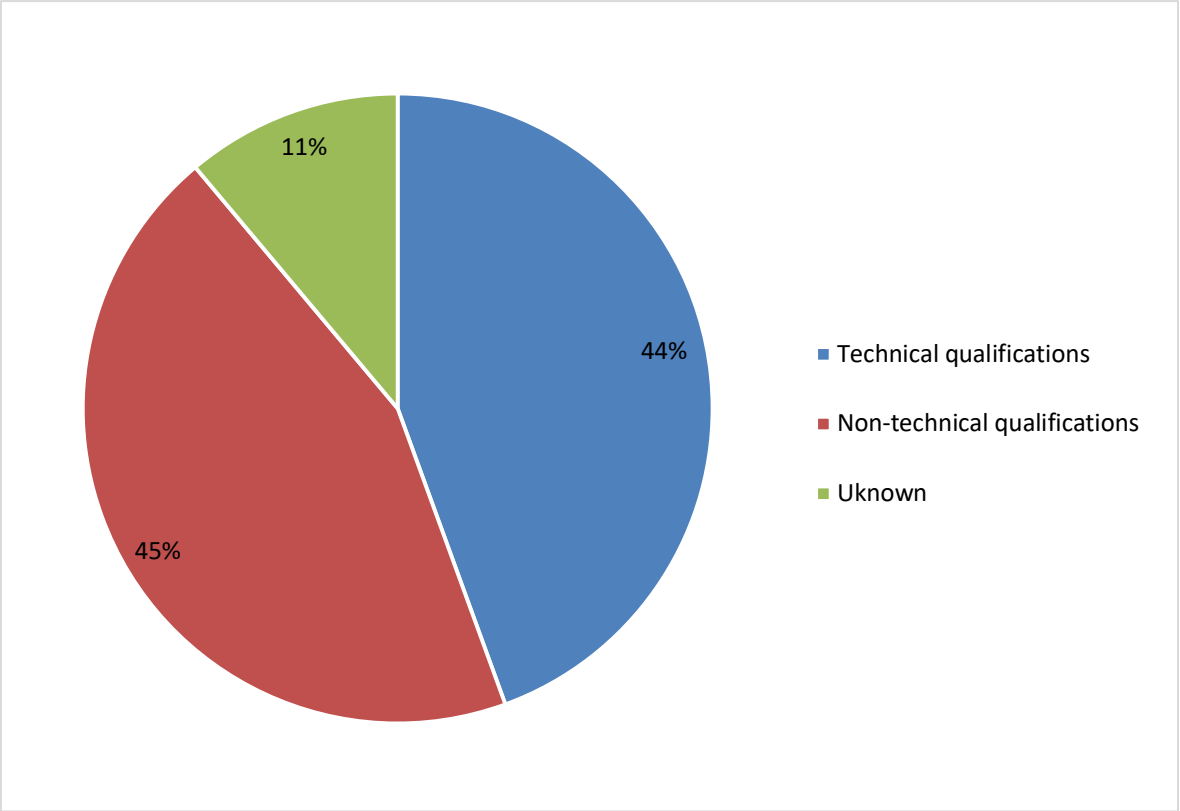


Figure 8: Proportion of technical qualifications to non-technical qualifications (Muzondo and McCutcheon, 2018)

According to Muzondo and McCutcheon (2018) the technical or construction related qualifications were found to be in the areas of civil engineering, agricultural engineering, quantity surveying, instrumentation engineering and construction. The non-technical and non-construction related qualifications were in education, information technology, mobile phone repair, public and PC application (Muzondo and McCutcheon, 2018).

Figure 9 shows the percentage of contractors with construction related experience prior to starting their contracting companies in comparison with those with non-construction related experience. Over half of the contractors, 56%, worked in non-construction related fields prior to starting their construction companies, while 33% had construction related experience. This is similar to the findings of Martin and Root (2012) who found that 23% of the contractors had 'technical' or construction related experience and the rest were either teachers, school leavers or students, shop managers or unemployed prior to their entry into the construction industry.

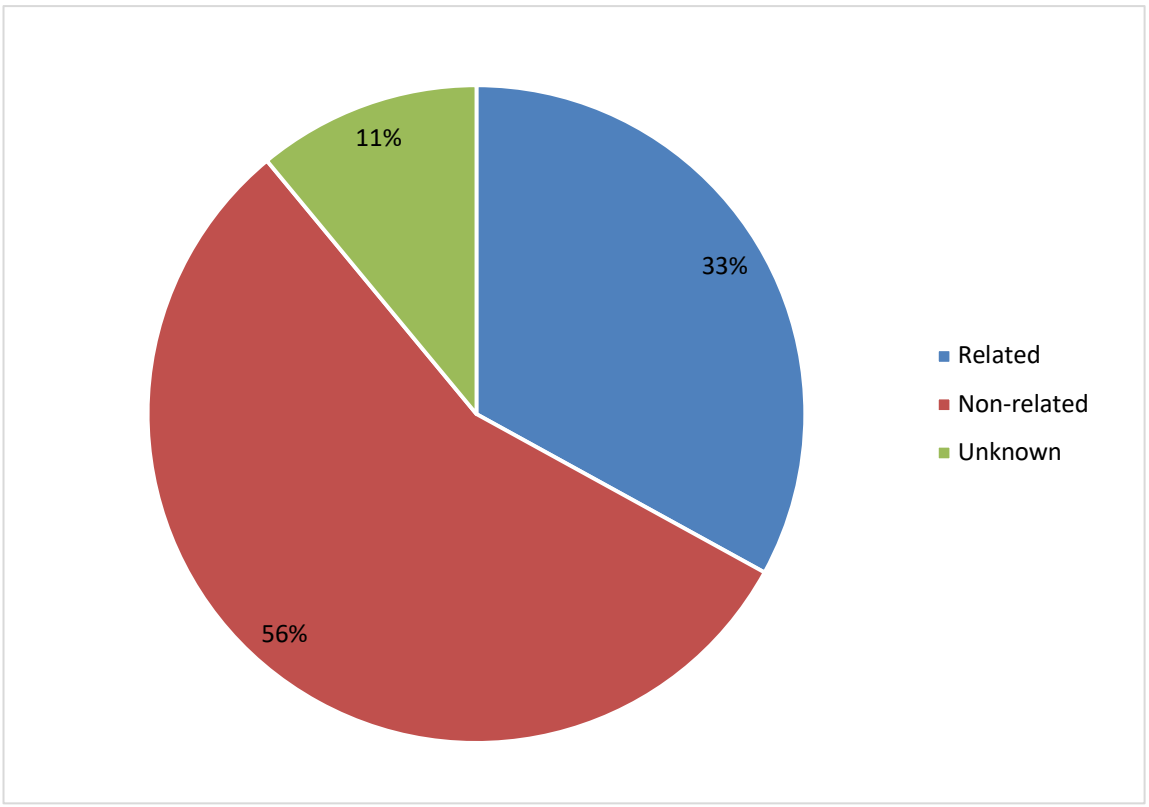


Figure 9: Proportion of contractors with construction related experience (Muzondo and McCutcheon, 2018)

Not only did Muzondo and McCutcheon (2018) show similar findings to the CIDB skills survey of 2011 and the research conducted by Martin and Root (2012), but also demonstrated the relationship between technical qualifications and project performance.

In order to comparatively quantify project performance, Muzondo and McCutcheon (2018) developed the degree of delay (DoD) formula which is the measure of the time taken to complete a particular project over the specified construction period, expressed as a percentage, as follows:

$$\text{Degree of delay} = \frac{actual\ construction\ period\ -specified\ construction\ period}{specified\ construction\ period} \times 100$$

$$= \frac{time\ overrun}{specified\ construction\ period} \times 100$$

For example, the DoD for a 3 month project that took 6 months to complete is:

$$= \frac{6-3}{3} \times 100$$

$$= 100\ \%$$

Projects that were abandoned or remain incomplete were assigned a DoD value of '∞'.

Figure 10 shows the relationship between project performance and qualification type (technical versus non-technical).

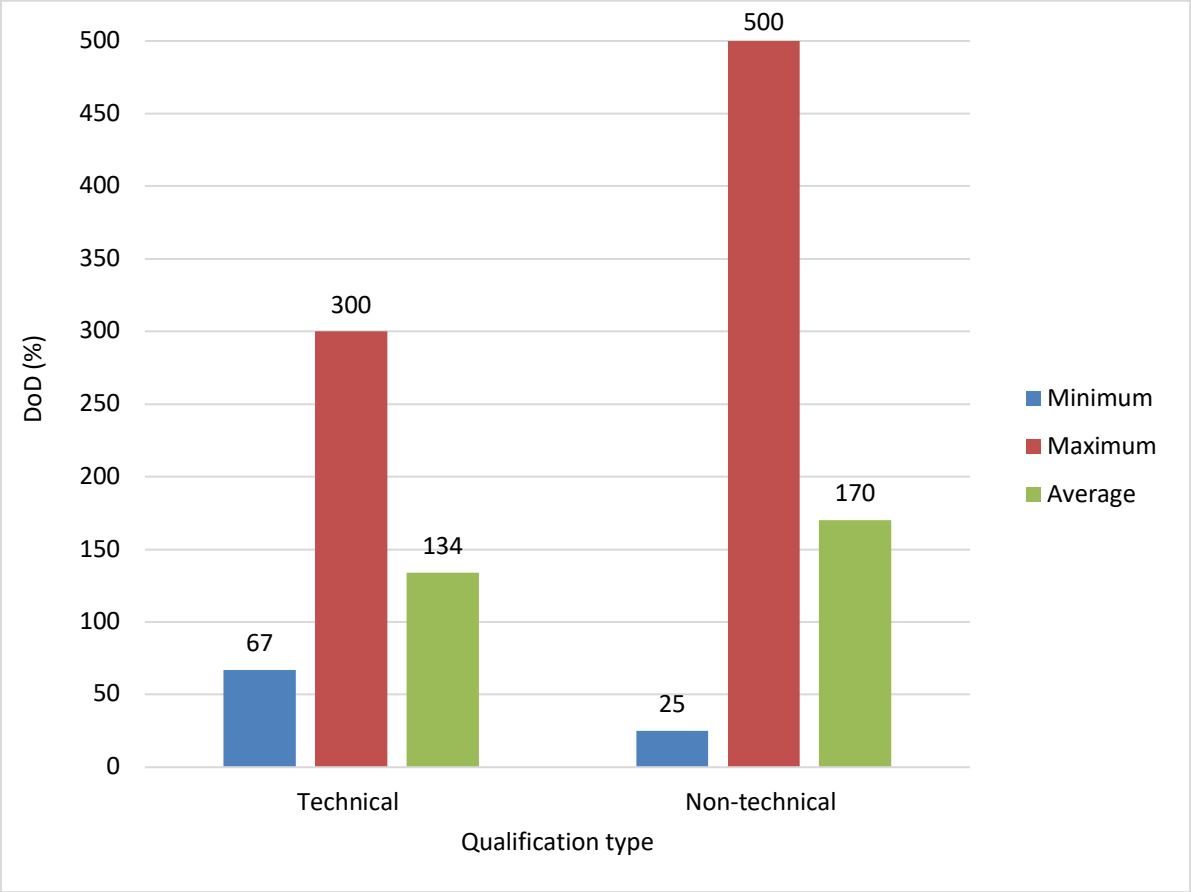


Figure 10: Relationship between project performance and qualification type (Muzondo and McCutcheon, 2018)

On average, contractors with technical or construction related qualifications perform better in projects than those with non-technical qualifications. Muzondo and McCutcheon (2018) also found that contractors with non-technical qualifications also had incomplete or abandoned projects while, even though none of the projects were completed on time, contractors with technical qualifications completed all their projects. To give an even clearer picture, Muzondo and McCutcheon (2018) also investigated the relationship between qualification level and project performance (Figure 11).

Contractors with honours level qualifications had the lowest DoD and, at worst, took twice the specified time to complete projects. On the other end, contractors with matric level qualifications reported incomplete projects, maximum DoD of ∞, and a minimum of 400.

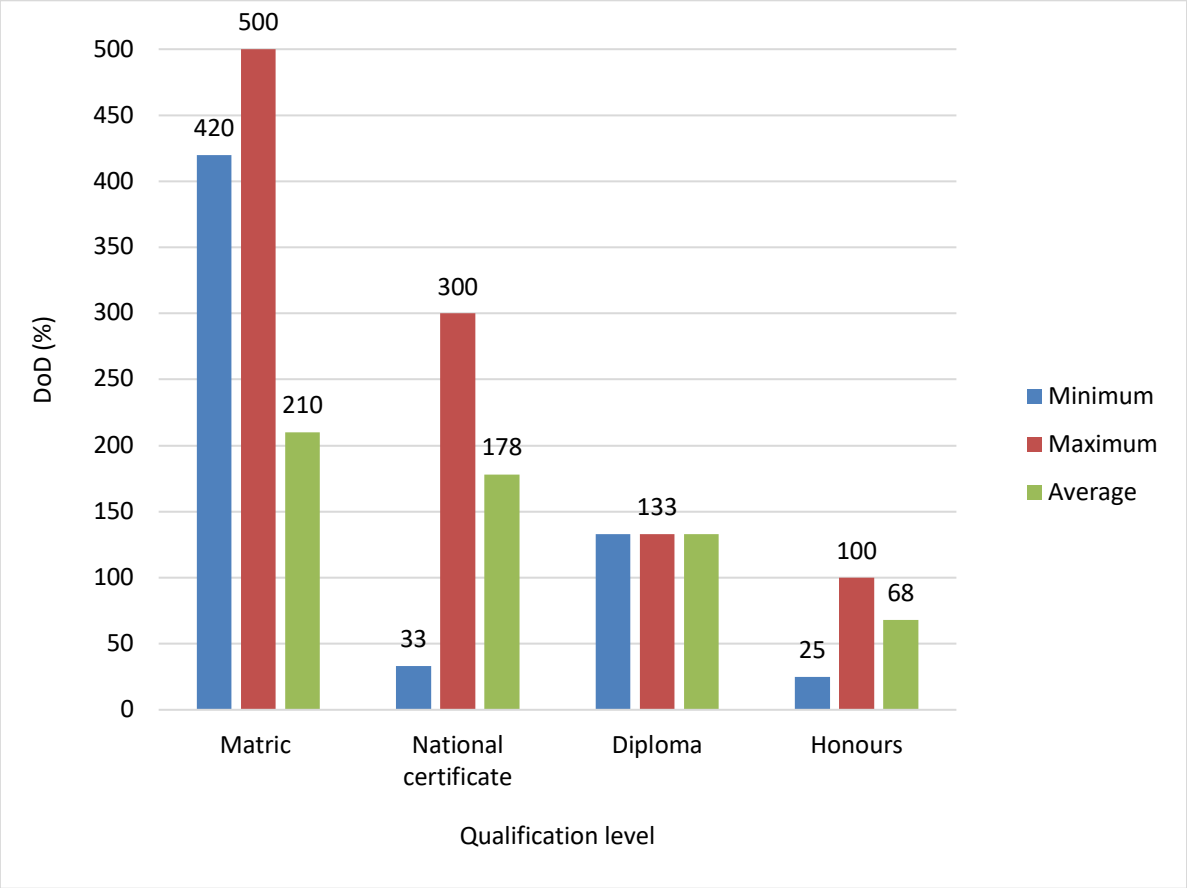


Figure 11: Relationship between project performance and qualification level (Muzondo and McCutcheon, 2018)

In general, the results showed that the higher the qualification level, the lower the DoD. Therefore, contractors with higher education were more likely to show better project performance.

When analysing Figure 10 and Figure 11 together, Muzondo and McCutcheon (2018) observed that the minimum DoD recorded was from a project completed by a contractor with non-technical qualifications. Muzondo and McCutcheon (2018) further discovered that that contractor had an honours level degree and concluded that, where qualifications are non-technical, the level of qualification is also important and contributes to good project performance.

Analysis of the type of experience or personal background also showed similar results (refer to Figure 12).

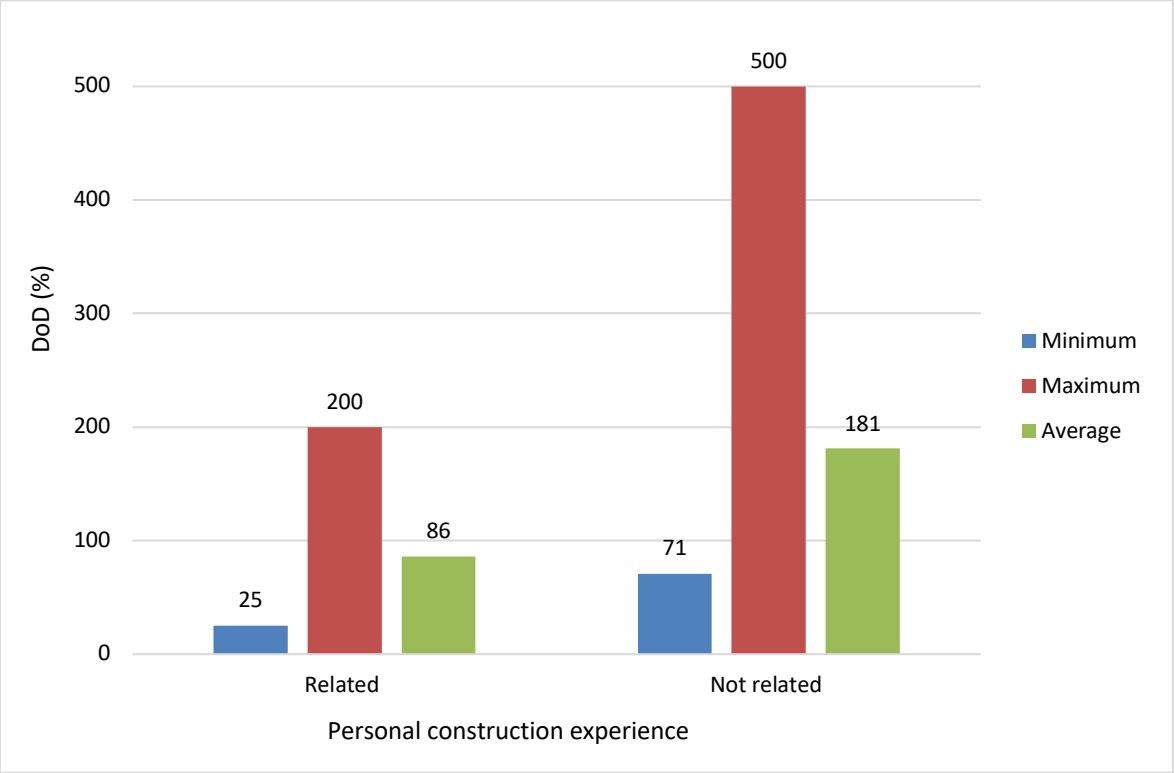


Figure 12: Relationship between personal experience and project performance (Muzondo and McCutcheon, 2018)

On the three statistical measures; minimum, maximum and average, contractors with construction related experience had the lowest DoD. Thus, contractors with construction related personal experience prior to becoming contractors were more likely to perform better than those who did not. Another measure of experience that Muzondo and McCutcheon (2018) used was the number of projects conducted by the companies prior to the study – company experience (see Figure 13).

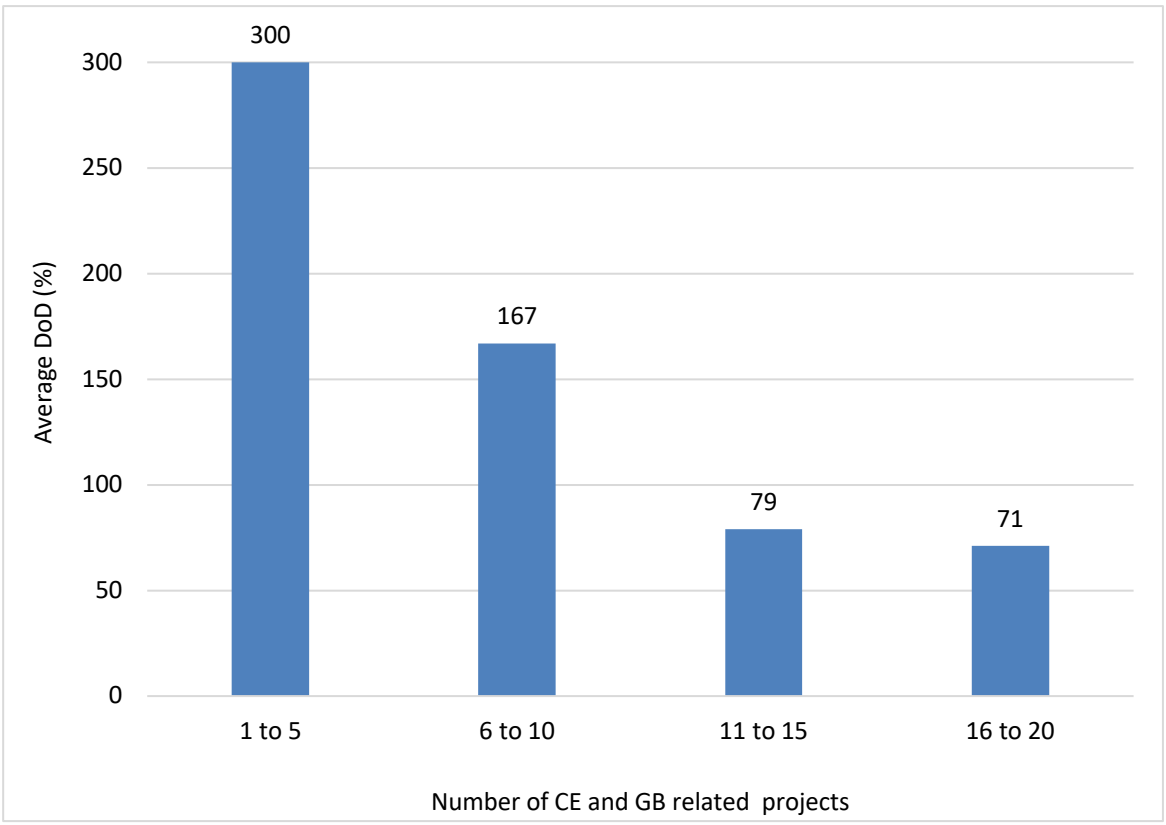


Figure 13: Relationship between number of projects and project performance (Muzondo and McCutcheon, 2018)

The results shown in Figure 13 provide evidence that contractors that have conducted more civil engineering and general building related projects showed better performance. Muzondo and McCutcheon (2018) argued that the number of projects conducted by contractors could reliably be used as a measure of performance. This was based on the premise that experience has been gained from each project and its activities, and this, in turn, resulted in improved competence from one project to the next. As such, the age of the company, as presented by Martin and Root (2012) could be used as a measure of company experience; that is assuming that the longer the company remained active in the construction industry, the more projects they undertook. Muzondo and McCutcheon (2018), however, showed that it was not necessarily the age of the company that could be used as a measure of competence, but the number of projects conducted by the companies (refer to Figure 14).

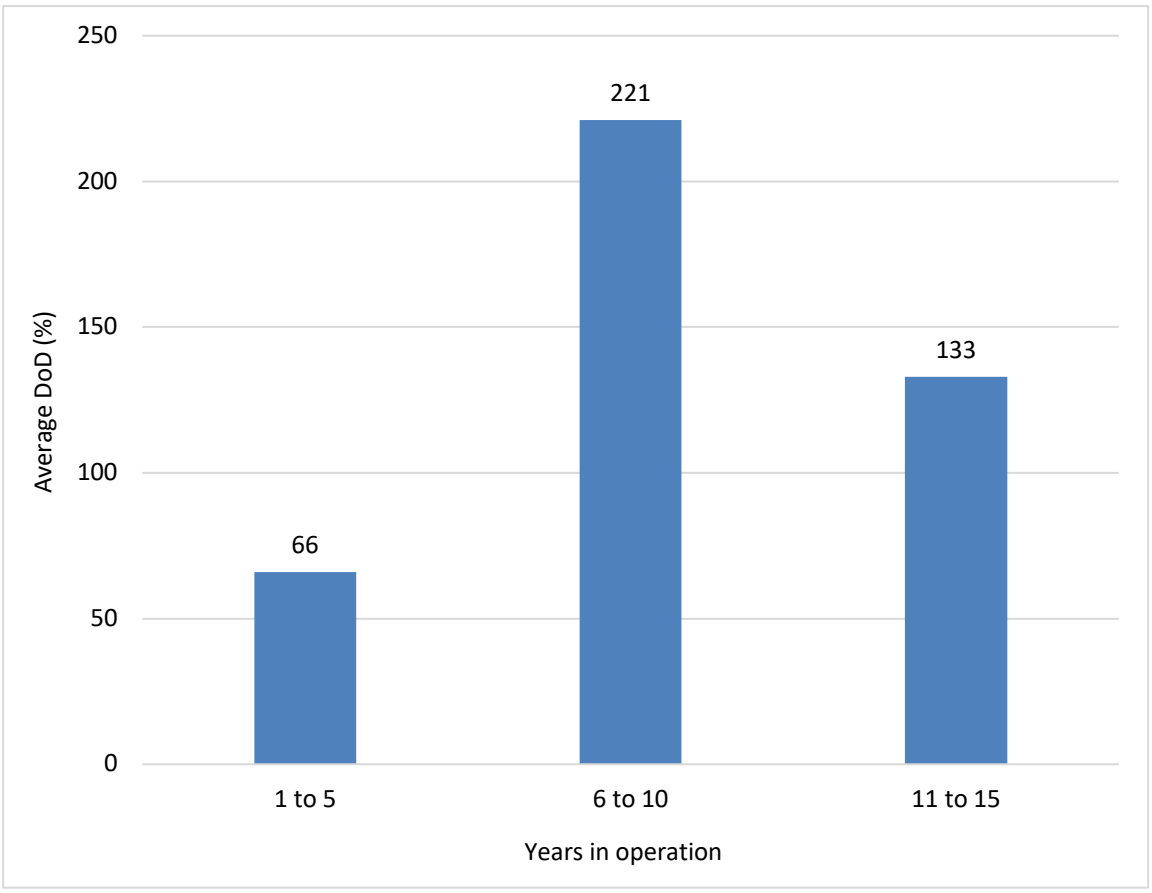


Figure 14: Relationship between age of company and project performance (Muzondo and McCutcheon, 2018)

The data shown in Figure 14 aligns with Martin and Root (2012) who found that most of the grade 2 to 6 companies have been in operation for less than 16 years. Secondly, what these results also show is that there is no linear relationship between the age of the company and project performance. Muzondo and McCutcheon (2018) further explained that this was because the companies that had low DoDs had conducted more projects than those with high DoDs. However, as mentioned above, it is expected that, when using a more general population and a larger sample, companies that have been in operation for longer periods most probably have conducted more projects.

2.7 Summary

This literature review has highlighted a range of contractor failure factors, attributing them to various factors in the construction industry in a global context. Some of the most prominent factors around the world and in South Africa can be classified as contractors competence issues. These issues include lack of formal training and qualifications, lack of experience, lack

of business knowledge and skills, and poor project planning and management. Other factors in the context of developing countries such as South Africa included the lack of access to finances and new technology. These factors, or a combination thereof, have led to a reliance on foreign expertise, in the case of developing countries. This literature review has shown, however, that one of the effective ways of dealing reducing some of these challenges is construction industry development, which is the responsibility of the government through a centralised construction industry regulatory body; the CIDB in the case of South Africa.

This chapter has also described the key historical events that form the basis of the objectives that the current policies governing the construction industry of South Africa are aimed at achieving. The study shows that the policies have made great progress in giving previously disadvantaged individuals or SMMEs access to projects and the ability to participate in the economy. However, the policies have somewhat neglected the much needed skills development and competency building aspects.

Clients also play a significant role in ensuring contractor success, especially in relation to their procurement strategies. They have a responsibility to ensure that contractors are selected not only for diversity, preference and transformation purposes, but also in terms of competence and ability to successfully carry out CE and GB projects. Policy makers, however, also play a pivotal role in ensuring that procurement policies are adequate in creating an industry that promotes contractor development in relation to competence and that this competence is adequately measured by implementing agents.

This thesis highlights that, in addition to Muzondo and McCutcheon (2018) showing evidence that none of the 30 projects surveyed had been completed on time; Ofori (1994) cites two studies conducted in India of nearly 500 construction projects which showed that 65% of them experienced time overruns. This is an alarming finding in that two studies that are 24 years apart have identified similar issues in relation to contractor performance. As such, this study is of the notion that the focus of many studies has neglected the root causes of contractor failure, which, according to this research and supported by Ofori (1994), is related to the technical background of contractors. These findings require attention by policy makers and public-sector implementing agents to ensure that efforts around developing contractors and improving contractor performance are appropriately directed and designed. One such measure could be in educating and training contractors in order to improve competence (Ofori, 1994;

Muzondo and McCutcheon, 2018) and ensuring that technical evaluation forms part of contractor selection criteria (Nieto-Morote and Ruz-Vila, 2012).

It can be said from the results of the research conducted above, that grades 1 to 6 South African contractors are in the existence stage and are mainly focused on acquiring contracts; they are unable to contribute to the country's economy on a large scale. Furthermore, most of the key staff of these construction companies have less than a diploma level of education coupled with non-technical experience. One positive finding was that the staff members that occupied higher positions, for example managers, owners and directors, had a higher level of qualifications.

It was also expected that lower level positions would be occupied by individuals with more artisanal qualifications such as trade tests, foreman certificates, short courses, national certificates and government programmes. In addition, the individuals that occupy lower level positions, for example, site supervisors, foremen and artisans have less experience than those that hold higher positions within the company. However, it may also be that the longer individuals remain in one company, the more likely they are to be promoted to higher level roles.

The results have also shown that contractors with technical or construction related qualifications and/or experience are more likely to perform well in projects. Where qualifications are non-technical, the qualification level is also important to performance. Interestingly, company age cannot be used in isolation as a measure of competence; the number of relevant projects conducted by the company is also important. This research, however, assumed that companies that have been active in the industry for longer are more likely to have conducted more projects, and as such, are more experienced.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Research Design

Muzondo and McCutcheon (2018) argued that there is very little research done on the qualifications and experience of contractors, and their performance. That study then went on to demonstrate that CIDB grades 2 to 6 CE and GB contractors generally did not have the necessary technical qualifications and experience required for construction projects and for the success of their businesses. These findings were also in agreement with the studies conducted by the CIDB (2011), and Martin and Root (2015) who also found that grades 1 to 6 contractors (SMMEs) generally lacked these technical skills and competencies. Taking this into consideration, this study sought to demonstrate that the "success" of grades 7 to 9 and international contractors can be attributed to their qualifications and experience. In addition, these competencies form part of the distinguishing factors between the SMME contractors and the larger enterprises. In order to compare the findings from literature on SMME contractors, this study also collected empirical data on the larger more established contractors (CIDB grade 7 to 9 and international companies) to investigate their level technical qualifications and experience.

Crawford (2005) argued that project competence leads to better project performance and ultimately, business performance. That is, contractors with the appropriate technical competencies perform better from project to project, and have a higher chance for business success. Rwelamila and Ssegawa (2014) add that competence is gained through formal education, skills and experience. This thesis was, therefore, also aimed at demonstrating that, in order for clients to achieve project performance, contractor selection criteria should evaluate contractor competence during the procurement process. Furthermore, Dlungwana and Rwelamila (2003), Kganyago (2004) and Gillingham (2009) argue that, one of the limitations of the procurement strategies and policies in the South African construction industry is that they are predominantly focused on providing previously marginalised groups with access to the industry and aiding their participation in the economy. The application of these policies has led to clients not focusing enough on determining whether contractors are technically qualified for the projects they are bidding for and, ultimately, appointed for. As such, the literature review demonstrated that there are limitations to the current public procurement strategies and policies in South Africa. Additionally, this study collected and

evaluated tender documents, as empirical data, to explore how these procurement practices are applied by public sector clients.

In a book detailing the different types of research methodologies used in various fields, Kothari (2004) states that research with a purpose of describing the state of affairs as the presently exist is termed "descriptive research". In descriptive research, a researcher seeks to evaluate the causes of a particular problem, situation or phenomenon, and has no control over the variables. This thesis, was therefore, regarded as a descriptive type of study as it sought to;

- demonstrate contractor failure or success factors – achieved through literature review (Chapter 2),
- establish the limitations in public procurement policies and strategies in the South African construction industry with regard to contractor selection – achieved through literature review (Chapter 2),
- show the competency profiles of grades 1 to 6 contractors in South Africa – achieved through literature review (Chapter 2 as a prelude to Chapter 4),
- evidence the skills and experience of larger contractors (grades 7 to 9 and international companies) as one of the major factors of success and indicator of competence – achieved through empirical data collection and analysis (Chapter 4), and
- evaluate the types of selection criteria that public sector clients use in South Africa and whether they take into consideration contractor competence – achieved through empirical data collection and analysis (Chapter 4).

Empirical research is described as a study that is data-based, focused on coming up with conclusions that can be verified through observation or experiment (Kothari, 2004). It is concerned with testing a theory and envisaged conclusion or hypothesis that the researcher begins with and then designs tests to explore the theory. This study premise stated:

> *This study proposed that the main distinguishing factors between Grades 7 to 9 and Grades 1 to 6 contractors that can be attributed to the experience of the companies in the construction industry, and also the technical qualifications and experience of their key staff. In addition, the key or executive staff of these companies hold qualifications and experience that are related to their specific functions within the companies. It is also premised that public procurement policies do not place importance on these competencies as a measure of potential contractor performance during the contractor selection stage.*

Empirical data was collected to evidence the qualifications and experience of grade 7 to 9 and international contractors. Tender documents were also collected as part of the empirical data used to evaluate the contractor selection criteria that are used by public sector clients as part of their procurement practices. Further detail on the resources used for this study is presented in sub-section 3.4 below.

A mixed method approach was used in order to explore and test the study premise, and achieve the objective highlighted in this study. A mixed method study can be defined as the collection and analysis of both qualitative and quantitative data (Creswell, Plano Clark, Gutmann and Hanson, 2003). Qualitative data sources include the observation of participants (through techniques such as interviews and questionnaires), documents and text, the researcher's impressions and reactions (Myers and Avison, 2002). Thus, qualitative data sources were used for this research, as documents such as contractor business and personal profiles, tender documents, and policy documents we used to collect data for analysis. The type of data that was extracted from the qualitative sources include aspects such as the qualifications of contractors and the contractor selection criteria that public sector clients use to evaluate and appoint contractors when conducting procurement processes. However, the research method and the method used to analyse the data and draw conclusions were predominantly quantitative in nature. Qualitative research can be defined as "the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect" (Sukamolson, 2007). This type of research method uses empirical data to test a hypothesis and answer predefined questions (Cohen, Manion and Morrison, 2002). In this thesis, the researcher sought to test the study premise and answer research questions that were presented in Chapter 1. The quantitative method was chosen for this study as it allows for objectivity, generalisability and reliability (Sukamolson, 2007). Validity and reliability are discussed in sub-section 3.3 below.

This research followed a positivist philosophy, where the researcher sought facts and quantifiable data on the qualifications and experience of larger contracting companies, along with contractor selection criteria used by public sector clients to evaluate and appoint contractors. Positivism, which finds its origin in the social sciences dating back to the 19th century, is concerned with finding facts about or causes of phenomena as opposed to

understanding the subjective views, states or perspectives of individuals (Taylor, Bogdan and DeVault, 2015).

This study was also classified as survey research which, according to Sukamolson (2007) is a type of quantitative research. Survey research uses scientific sampling techniques to measure the characteristics of a particular population through statistical means (Sukamolson, 2007). For instance, in order to answer the research question that states "*What are some of the key differences between larger companies (grade 7 to 9 and international companies) and smaller companies (grades 1 to 6) that can be attributed to success?*", the author compared the proportion of larger companies with relevant technical qualifications to the qualifications statistics as presented by the CIDB (2011), Martin and Root (2012), and Muzondo and McCutcheon (2018). The sampling technique used for this study is outlined in sub-section 3.2.

3.2 Sampling

Martin and Root (2012) conducted a similar study on grades 1 to 4 CIDB registered companies. This study followed a similar sampling method to analyse the data collected on grades 7 to 9 contractors. Similarly, a stratified random sampling technique was used for this study. This sampling technique involves the division of a population into sub-populations known as strata (Lohr, 2019) with common characteristics. In this study, the contractors 149,946 contractors registered under the CIDB RoC were divided into two groups – grades 1 to 6 forming one group and grades 7 to 9 forming the other. The groups of contractors that were of interest were those that were registered under the CE and GB classes of works. The larger companies (CIDB grades 7 to 9) sub-population under study based on the assumption that they are well-established and 'successful' as described in Chapter 1. As such, the study population in this thesis was made up of the 1329 grade 7 to 9 CE and GB contractors who, at the time that the data was collected in March 2018, were registered with the CIDB. Since the study also sought to evaluate the technical competencies of international companies, of which the total population was not known, a random sample of 201 international civil engineering companies was studies through web searches and publicly available data and personal profiles. The data resources are detailed in sub-section 3.4. Therefore, the total number of "successful" companies in the study totalled 1530 (which is 1329 CIDB grade 7 to

9 CE and GB contractors plus 201 international contractors who conduct similar types of works).

It is recommended that the sample size equals 20% of the study population for the survey to be representative of the population (Airasian and Gay, 2003; Martin and Root, 2012; Mills and Gay, 2019). Since it was not practical or feasible to determine the population of the international companies, representativeness was only sought for the CIDB grade 7 to 9 CE and GB contractors. As such, the required sample size for that group was 266 contractors.

The researcher randomly selected a total of 500 companies with the anticipation that a 100% responsiveness for the survey would not be achieved. The qualifications and experience data for the larger contracting companies, as described in sub-section 3.4, was collected through sources such as company websites, news articles, records of interviews from third party sources, professional profiles, email and telephone calls. The data for all the international companies was collected through company websites and online professional profiles. Information was then found for a total of 370 companies consisting of 52 (14%) grade 7, 155 (42%) grade 8, 68 (18%) grade 9, and 95 (26%) international contracting companies. There was a total of 275 South African companies. Therefore, the study was considered to be representative with regard to South African CIDB grades 7 to 9 CE and GB contractors.

In the case of the international companies, it was not feasible to determine the total number of CE and GB tender documents that were available at the time this research was conducted. Therefore, a random sample of 114 tender documents was collected and analysed in order to explore the types of selection criteria used by public sector clients to appoint contractors as part of their procurement practices. The South African tender documents were mainly collected from the central government tender database and the websites of other government organisations around the country. Some of the tender documents were acquired by email to employees of some government organisations who have access to such documents. The tender documents comprised both open and closed bids. The international tender documents were obtained solely through publicly available websites. A number of ethical considerations had to be made as tender documents form part of legal contracts. The considerations were outlined on sub-section 3.5. A total of 91 tender documents contained the information required; that is, contractor evaluation criteria, and formed the responsive documents for this study. Of the 91 tender documents, 63 (55%) were targeted at grades 1 to 6 contractors, while 28 (25%)

were for grades 7 to 9 contractors and 23 (20%) were international civil engineering based tenders.

3.3 Validity, Reliability and Generalisability

A study is considered reliable when the same results can be reproduced or repeated using a different sample with the same instrument and still produce the same outcome (Mohamad, Sulaiman, Sern, and Salleh, 2015). The data collection methods, as described in sub-section 3.2 and the resources used, as described in sub-section 3.4, can be replicated with a different sample and it is expected that similar results and conclusions would be reached. This research, therefore, is regarded as reliable. In addition, the sources of data, even when they were secondary and were from third parties, can be traced back to the contractor companies themselves. This was so in the case of the technical qualifications and experience data. The data collected on the evaluation of tender documents by clients was collected from tender documents that were produced to form part of legally binding contracts. Therefore, this research, the data collection instruments and resources, and the results thereof, were also considered to be reliable.

Internal validity is defined as the trustworthiness and credibility of the research, whether or not it allows the researcher to draw conclusions, or whether or not the instrument measured what it was intended to (Joppe, 2000; and Mohamad *et al*., 2015). As such, this study was regarded as being internally valid. External validity, on the other hand, is a measure of how generalisable and transferable the research instrument and results are (Hignett, 2005).

Since the population of international companies was unknown, generalisability was only sought for the South African larger contracting entities. To determine generalisability, Cochran's formula for small populations was used (Israel, 1992):

$$n = \frac{n_o}{1 + \frac{(n_o - 1)}{N}}$$

where:

n = required sample size;

N = population size;

$n_o = \frac{Z^2 pq}{e^2}$ = samples size for large populations;

Z = z-score which is obtained from Table 12;

p = estimated proportion of an attribute that is present in the population;

q = 1 – p; and

e = margin of error or desired level of precision.

Table 12: z-score values for different confidence levels

Desired Confidence Level	z-score
80%	1.28
85%	1.44
90%	1.65
95%	1.96
99%	2.58

Source: SurveyMonkey (2018)

In a paper on organisational research sample size calculations for survey research, Bartlett, Kotrlik and Higgins (2001) state the a 5% margin of error is sufficient. In a paper summarising the use of confidence intervals, Hazra (2017) notes that many a 95% confidence interval is often used in medical studies, however, a 90% confidence interval is acceptable for studies such as bioequivalence testing. According to Chernick and Labudde (2009) the most commonly used confidence intervals range from 90 to 99% to achieve reliability. Since this study does not involve human testing and the results will not be used for medical reasons, a confidence level of 90% was deemed sufficient. This means if the research procedure were repeated, "there is a 90% probability that the calculated confidence interval from some future experiment encompasses the true value of the population parameter" (Cox and Hinkley, 1974).

With a population of 1329, a margin of error of 5%, a z-score of 1.65, and a p-value of 0.5, the required sample size to achieve generalisability was calculated to be 224. This study collected responsive data for 275 South African CE and GB contractors, making this study generalisable, and therefore, externally valid. It was not practically possible to determine the population or required sample size for the international companies, as such, validity was not tested for the international companies.

3.4 Equipment and Resources

The first part of the data collection for this study was a literature review which included sources such as academic journals, research reports, dissertations, books, articles, and electronic media. A literature review can be described as a way of collecting and synthesising previous research, and creates a basis for advancing knowledge and facilitating theory development (Snyder, 2019). In a paper discussing literature review as a research method, Snyder (2019) adds that a literature review can be used to address research questions. The review of literature conducted in this thesis sought to establish global and local views of the success factors of contracting companies. A study on procurement practices was done through literature in order to determine the criteria used in the construction industry for the selection of contractors. This study found that, in order to appropriately appoint service providers for the physical implementation of infrastructure; clients require contractor selection criteria that evaluate contractor competence to inform appointment decisions. A historical study was also done in order to trace the origin and rationale behind the laws and regulations currently governing the construction industry and how contractors are appointed within the South African procurement process. The main focus of this study included policies such as the PPPFA, the CIDB regulations and practices, and the B-BBEE Act along with tendering practices.

Previous research findings on the failure factors affecting contractors in South Africa and around the world were reviewed in Chapter 2. Some of the most common factors, both internationally and locally, were in relation to contractor competence (technical skills and experience) as demonstrated by researchers such as Richter (1998), Wall and Clarke (1996), Ofori (2018) at a global level, and Croswell and McCutcheon (2001), Thwala and Mvubu (2008) and Mofokeng (2012) in the case of South Africa. To further demonstrate this, a summary of three studies that were conducted by CIDB (2011), Martin and Root (2012) and Muzondo and McCutcheon (2018) was compiled as a prelude to Chapter 4. The source of these three studies was an electronic library database containing peer reviewed academic journals, the CIDB publications and the South African Institute of Civil Engineering (SAICE) academic journal. This secondary data provides a summary of the qualifications and experience of grades 1 to 6 CIDB registered contractors' key staff, along with the experience of the companies themselves.

As previously highlighted in this chapter, the empirical data on the qualifications and experience of South African contractors was collected from sources such as company websites, news articles, records of interviews from third party sources, professional profiles, email and telephone calls. The data for the sample of 201 international companies was collected through company websites and online professional profiles, which resulted in a responsive dataset of 95 international companies. The 114 tender documents that were analysed in order to determine the selection criteria used by clients for the procurement of CE and GB contractors was obtained from government databases and websites, and directly from some government organisations.

3.5 Ethical Considerations

This research acquired contractor technical skills and competence data, and executive members' job titles without the use of the names of the individuals or the companies. The names of the individuals and of the companies were treated confidentially and were not included in this thesis. Only the researcher has access to the names of the companies and their executive teams, along with information on which qualifications and experience profiles belong to which contractors or individuals. In addition, some of the information gathered was found on company websites and online archives of interviews; this information was, therefore, regarded as public knowledge. Therefore, no ethical clearance was required for the collection, handling, analysis and presentation of contractor qualifications and experience data that this research was largely based on.

In relation to the data collected on the pre-selection of contractors by clients; some of the tender documents were collected from a number of public body websites, and therefore, also constitute public knowledge and some directly from the clients involved. The tender documents did not contain any contractor or bidder information and the only parts of the documents that were pertinent to this study were the pre-qualification and evaluation sections of the documents as set out by the various clients, and not the details of the clients and the contractors involved. Furthermore, none of the tender documents that were analysed contained any information pertaining to the contractors' tender submissions and which contractors were appointed. As such, no ethical clearance was required for the collection, handling, analysis and presentation of tender document evaluation data.

CHAPTER 4: RESULTS AND ANALYSIS

This chapter has been separated into three major sections; the first contains a brief summary of the profiles of all contractors registered under the CIDB.

The second section contains empirical data on the technical qualifications and experience of SA CIDB grades 7 to 9 CE and GB, and international contractors. This was done to compare these factors in relation to the aforementioned group of contractors to the same data for grades 1 to 6 contractors as presented in Chapter 2 (Literature Review). The second objective was to test the study premise that alludes to qualifications and experience as being the distinguishing factors between the two groups of contractors. This population was not only limited to South African contractors, but also includes international companies in order to demonstrate best practices in a global context.

The third section contains data on the procurement strategies used by clients in relation to the evaluation of contractor competence for CE and GB projects, more specifically in the public sector.

4.1 CIDB register of Contractors

There was a total of 149 946 contractors registered under the CIDB for all grades and classes of works at the time this thesis was concluded. Figure 15 shows the total number of contractors according to three categories of grade. Figure 16 shows the proportion of contractors by grade as a percentage of the total number of contractors registered under the CIDB.

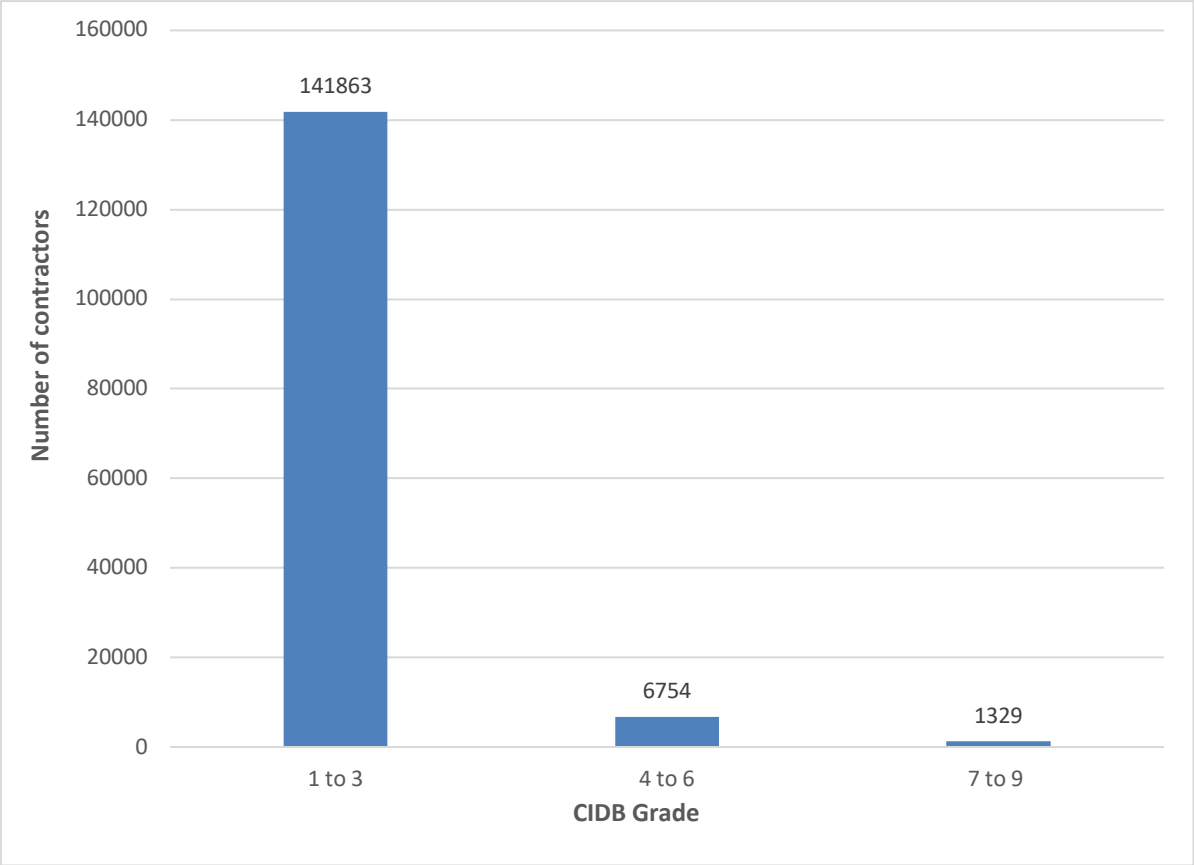


Figure 15: Number of contractors registered under the CIDB by Grade

A total of 133 426 (88.98%) of the contractors were Grade 1, while a low 211 (0.14%) were registered under Grade 9. Contractor grades were divided into three categories; 1 to 3, 4 to 6 and 7 to 9. It was found that grades 1 to 3 contractors account for 94% of the contractors registered under the CIDB, compared to the 1% contribution by grades 7 to 9 (refer to Figure 16).

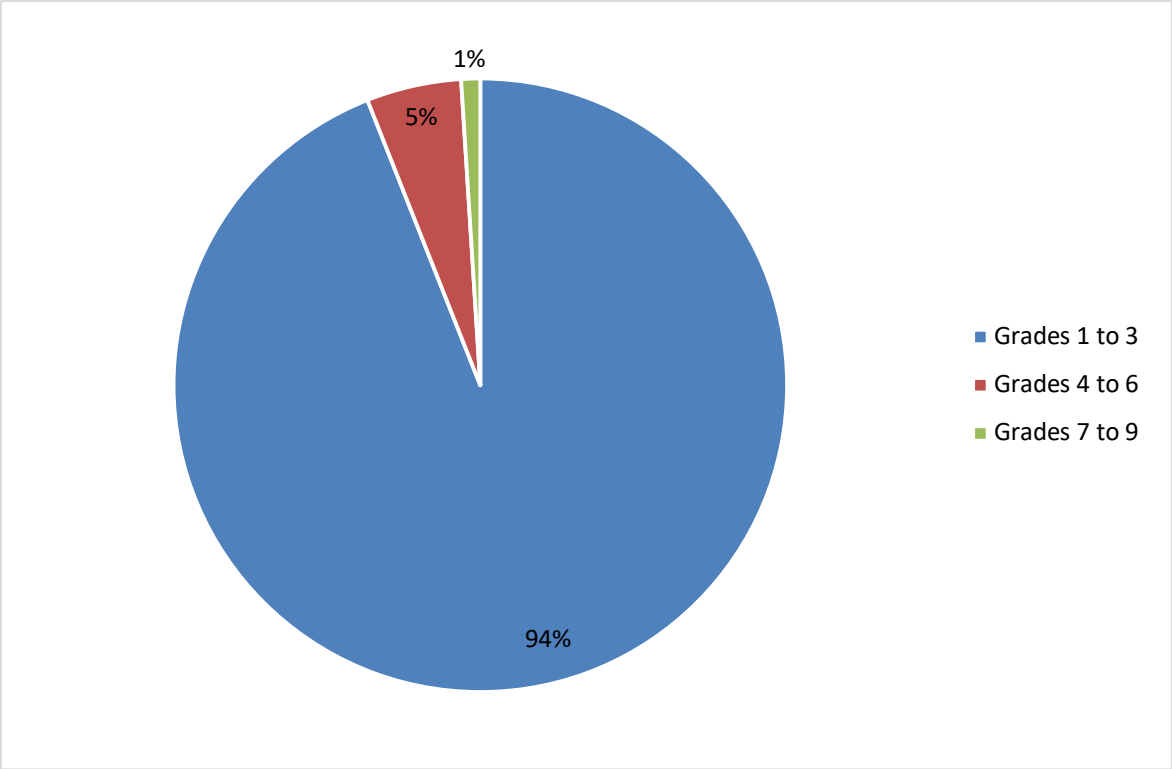


Figure 16: Proportion of contractors by grade

It is of concern that a majority of the contractors are within grades 1 to 3, and grades 7 to 9 contractors are the minority. Since the general idea is seemingly that contractors can progress from Grade 1 to Grade 9, it is evident that that progression has not happened. The numbers further show that contractor development has not achieved its goals to ensure that emerging contractors can significantly contribute to the economy of the country; not while 94% of them cannot bid for tenders that are higher than R3 million as per Table 1.

Table 13 shows how many contractors were registered under the two classes of works that this study is focused on; CE and GB.

Table 13: Number of contractors by class of works

Civil Engineering (CE)		**General Building (GB)**	
Number	Percentage	Number	Percentage
36002	24%	68485	46%

One of the mandates of the CIDB is to facilitate transformation in the construction industry, however, according to the Construction Monitor that was published by the CIDB in January 2018, this has not happened in the higher level grades to the same degree as the lower grades.

In evidence of this, Table 14 shows the numbers of companies that are at least 51% black- and woman-owned.

Table 14: Ownership profiles by grade

Grade	**51%+ Black-ownership**		**51%+ Woman-ownership**	
	Number	Percentage	Number	Percentage
2 to 4	8002	94%	2768	32%
5 & 6	2274	84%	805	30%
7 & 8	1012	70%	389	28%
9	58	37%	41	26%
Total	**11346**	**88%**	**4013**	**31%**

Source: CIDB (2018-a)

A total of 88% of the CIDB RoC is made up of contracting businesses that are at least 51% black-owned. This is evidence of transformation in terms of ownership by previously disadvantaged individuals; an achievement in terms of the B-BBEE. In light of this, the author would like to draw attention to three factors; 1) in Chapter 2, the author argued that part of the legacy of the apartheid government was that non-white individuals were left without proper education. The result of this was unlimited work opportunities and the inability to generate capital for business; 2) in Chapter 4, this study found that the qualification levels of grades 7 to 9 contractors are generally higher than those of grades 1 to 6; and 3) the percentage of contracting businesses with at 51% black-ownership decreases with the increase in grade. As such, one can argue that the low number of black-owned contracting businesses in the grade 9 category may no longer be an affirmative action issue, and that, the skills may be the distinguishing factor. Transformation progress in relation to woman-ownership was found to be even less positive with 31% of the CIDB registered companies having at least 51% woman-ownership.

Table 15 shows the percentage of companies that are at least 51% black- or woman-owned as a percentage of the number of contractors within those classes. For example, 75% of all grade 7 and 8 CE companies were at least 51% black-owned, and 32% of grade 9GB companies were at least 51% woman-owned.

Table 15: Ownership profiles by class of works

Grade	51%+ Black-ownership		51%+ Woman-ownership	
	CE	GB	CE	GB
2 to 4	96%	96%	34%	33%
5 & 6	88%	91%	29%	34%
7 & 8	75%	79%	27%	38%
9	40%	56%	29%	32%

Source: CIDB (2018-a)

As part of transformation and representation of black-owned contractors in the construction industry, the CIDB's vision is for 90% of public sector contracts to be awarded to companies that are at least 51% black-owned (CIDB, 2018-a). Figure 17 shows the percentage of government contracts that were awarded to companies that are at least 51% black or woman owned for the period between the first quarter of 2015 and fourth quarter of 2017.

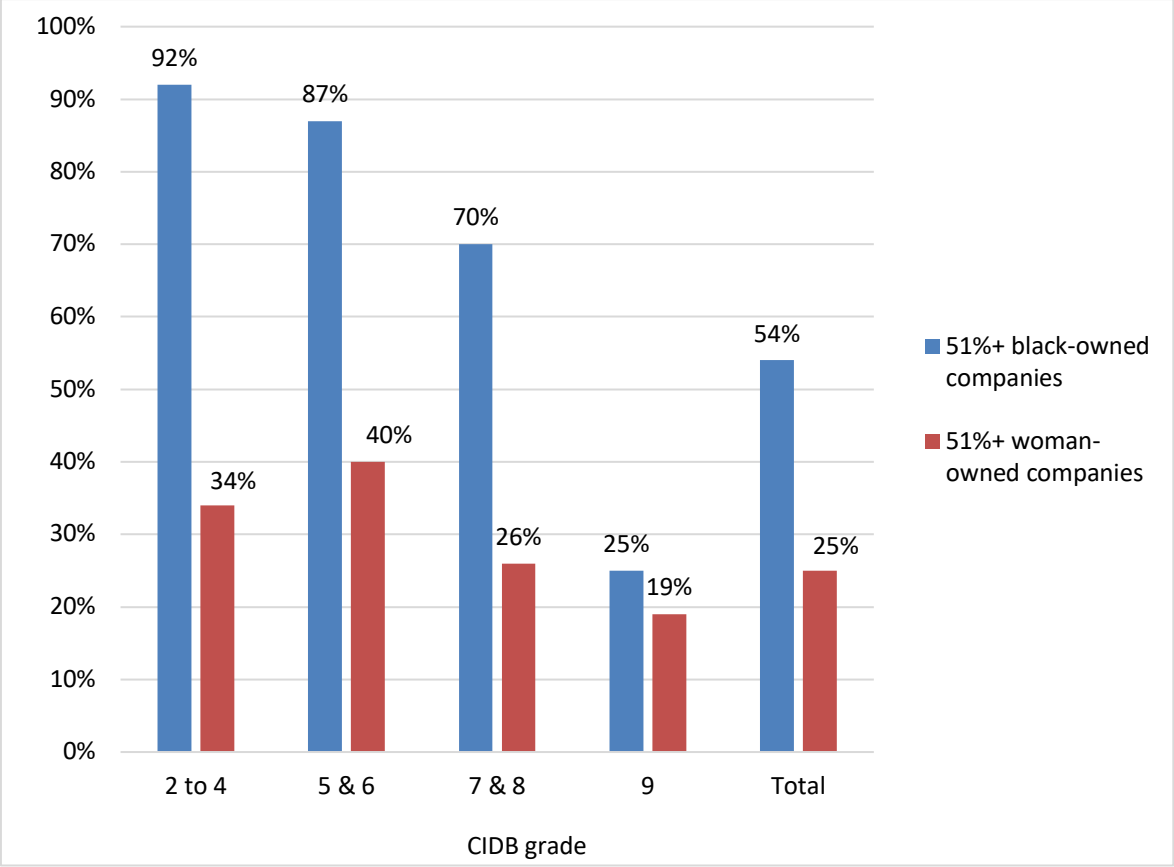


Figure 17: Public sector contracts awarded to 51%+ black- or women-owned companies between 2015Q1 and 2017Q4 (CIDB, 2018-a)

The CIDB is admittedly not meeting its target (CIDB, 2018-a) with a total of only 54% of contracts awarded to black-owned business and just under half of that, 25%, was awarded to woman-owned companies. It was noted, however, that most government contracts between 2015Q1 and 2017Q4 were awarded to black-owned companies between grade 2 and 6, but this may merely be a reflection of the high number of such businesses in those grades. This is also more evidence that there is a low representation of black and women ownership in the higher grades, and contractors who make up the majority of the lower grades are not progressing to the higher grades.

The next sub-section contains the results and analysis collected on the qualifications and experience of grade 7 to 9 CE and GB contractors along with randomly selected international companies.

4.2 Grade 7 to 9 (CE and GB) and International Contractors Qualifications and Experience

This section of the data collection and analysis chapter focuses on grades 7 to 9 CE and GB contractors, and international contractors of similar classes of works. Data on the qualifications and experience of this group of contractors has been presented as a comparison to the data presented in Chapter 2 on grades 1 to 6 contractors. Table 16 shows the number of contractors registered under grades 7 to 9 designations by class of works and as a percentage of the total number of contractors (149 946) registered under the CIDB.

Table 16: Number of grades 7 to 9 CE and GB contractors

CIDB Grade	Number	Percentage of all CIDB contractors
7CE	653	0.44%
7GB	515	0.34%
8CE	241	0.16%
8GB	200	0.13%
9CE	98	0.07%
9GB	62	0.04%
Total	**1329**	**1.18%**

As mentioned earlier, it should be noted that the sum of 1329 is the total number of CE and GB contractors registered under grades 7, 8 and 9, excluding contractors that have been registered under both CE and GB classes of work within the same grade.

In support of the data previously presented on transformation as per CIDB (2018-a), and the notion of this study, it is evident, by the low number of contractors in these three grades, that progression and growth within the industry has not been advancing as expected. This section sought to determine whether or not technical qualifications and experience may be contributing factors to this "barrier" to progression.

4.2.1 Study population

Qualifications and experience data was collected on a total of 370 contractors in the proportions indicated on Table 17. The table also contains the fractions of contractors as a proportion of the total population. For example, international companies account for 26% of the 370 contractors while grade 7 contractors make up 14%. The last column of Table 17 contains the proportions of contractors as a percentage of the total number of CE plus GB by grade. For instance, the 52 grade 7 contractors add up to 5% of all CE plus GB grade 7 contractors registered under the CIDB. The international companies have been excluded – represented as not applicable (NA) – from this column as they are not registered under the CIDB. The sum of 19% represents the sum of grades 7, 8 and 9 contractors as a percentage of all CE plus GB CIDB contractors in those three grades.

Table 17: Number of contractors in the study sample

Contractor group	**Number**	**Percentage of survey population**	**Percentage of CE and GB contractors within the grade**
Grade 7	52	14%	5%
Grade 8	155	42%	39%
Grade 9	68	18%	56%
International companies	95	26%	NA
Total	**370**	**100%**	**19%**

The role titles of the contractors' key staff were not identical for all the companies in this study. For example, some of the companies did not have a Chief Executive Officer (CEO), but had a Managing Director (MD). Therefore, the qualifications and experience of contractors' key staff were categorised into four groups for uniformity and comparison purposes. The groups are as follows:

- Chief Executive Officers (CEO), Managing Directors (MD) or founders – from here on referred to as company heads;
- Chief Operating Officer (COO) or Head of Engineering or construction – from here on referred to as technical heads; and
- Chief Financial Officer (CFO) or Financial Director – from here on referred to as financial heads.

Only one of the titles in each of the categories was selected and preference was given to the CEOs, COOs and CFOs. In cases where the preferred role titles were unavailable, the next titles within the category were used. For example, MD would be used first before founder should the title of CEO not exist in the company. Likewise with Head of Engineering and/or Construction in relation to COO, and Financial Director to CFO.

4.2.2 Qualifications of key staff

The study premise was that the executive teams of grade 7 to 9 and international companies have role related qualifications. Hence sections 4.2.2.1 to 4.2.2.3 contain the results of the analysis of such qualifications in order to draw conclusions on the study premise.

Furthermore, Muzondo and McCutcheon (2018) provided evidence that not only were technical qualifications important for the performance and success of contractors, but also the qualification level – regardless of whether or not those qualificators were technical in nature. Thus, this study also evaluated the qualification levels of grades 7 to 9 and international companies. Unlike the grades 1 to 6 contractors, most of the grades 7 to 9 and international contractors' key staff held qualifications higher than matric (grade 12). Thus, the lowest qualification level assessed was vocational training, which includes apprenticeships, and the highest level was doctoral degrees.

The staff heading up the contracting companies and those heading their respective technical operations were envisaged to have engineering or construction related qualifications in order to fall under the CE and GB CIDB classes of works as per the study delineation. These qualifications were classified as being technical. This study, therefore, sought to prove that the company heads and the technical heads hold technical qualifications. The technical qualification fields that were considered in this study include engineering, quantity surveying, construction and project management, and building studies.

The financial heads of the companies in this study were anticipated to hold financial or business related qualifications. These include areas such as commerce, economics, finance and business administration qualifications. The evaluation of the qualifications of the financial heads was, therefore, conducted according to these fields.

4.2.2.1 Qualifications of CEOs, MDs or founders

This study premised that the more established companies, grades 7 to 9 and international contractors, would be led by individuals with post-matric qualifications, and that their qualifications would be higher than those of grades 1 to 6 contractors. Figure 18 shows the proportions of contractors according to their level of qualifications.

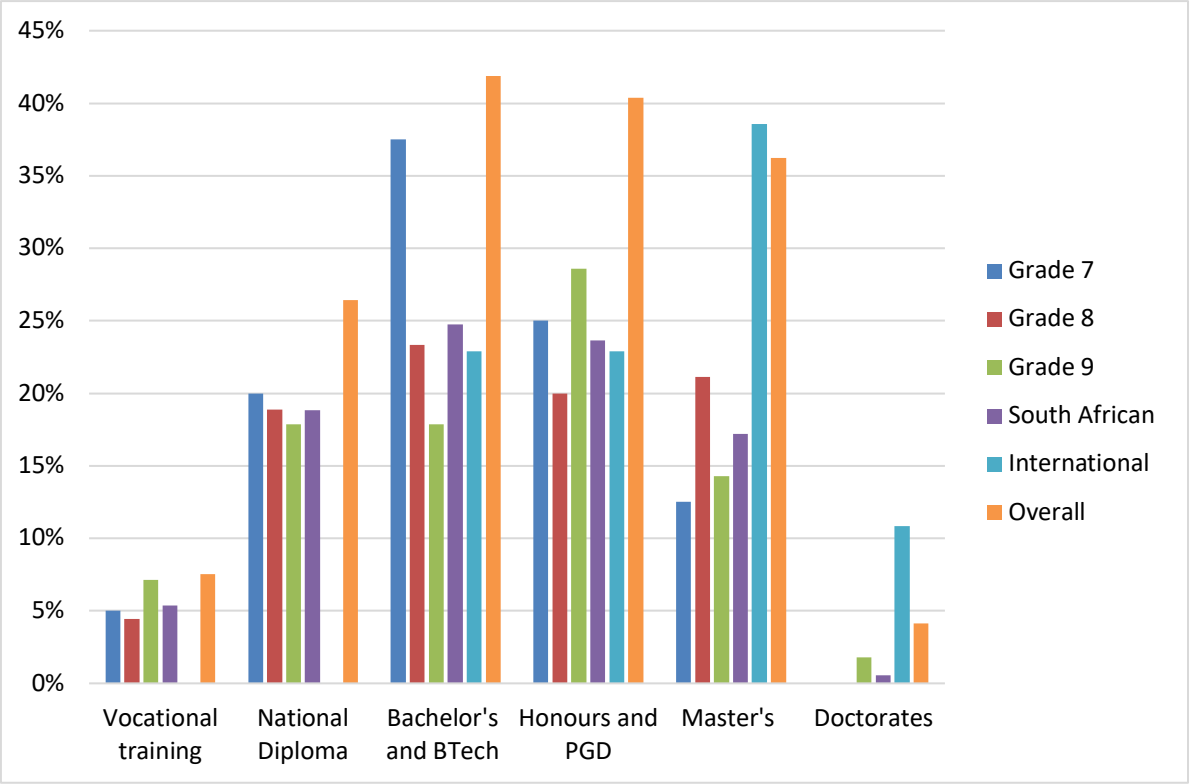


Figure 18: Qualification levels of CEOs/MDs/founders

This study found that, in general, the highest proportion of grades 7 to 9 contractors company heads hold bachelor's degrees at 42%. Most of the international company heads were found to have at least a master's level of qualifications and none had qualifications lower than a bachelor's degree. Even though the percentages of company heads with doctoral degrees is considerably lower, it may still be said that the more established companies hold higher qualifications than grade 1 to 6 contractors. This has been supported by Muzondo and McCutcheon (2018) who found that the highest qualifications held by grades 2 to 6 contractors' company leads were honours degrees. Martin and Root (2012) also found that only 21% of the grades 2 to 6 contractors held diploma to university programme qualifications.

This evidence is in support of the study premise that international and grades 7 to 9 contractors hold higher qualifications than grades 1 to 6 contractors. In conjunction with Muzondo and McCutcheon (2018) who found that contractors with higher qualifications perform better than those with lower qualifications, it may be said that the more established contractors' success can be attributed to their levels of qualifications.

Figure 19 demonstrates the types of qualifications held by grades 7 to 9 and international contractors' company heads. The qualifications types were divided into two bands; technical and business related as previously defined.

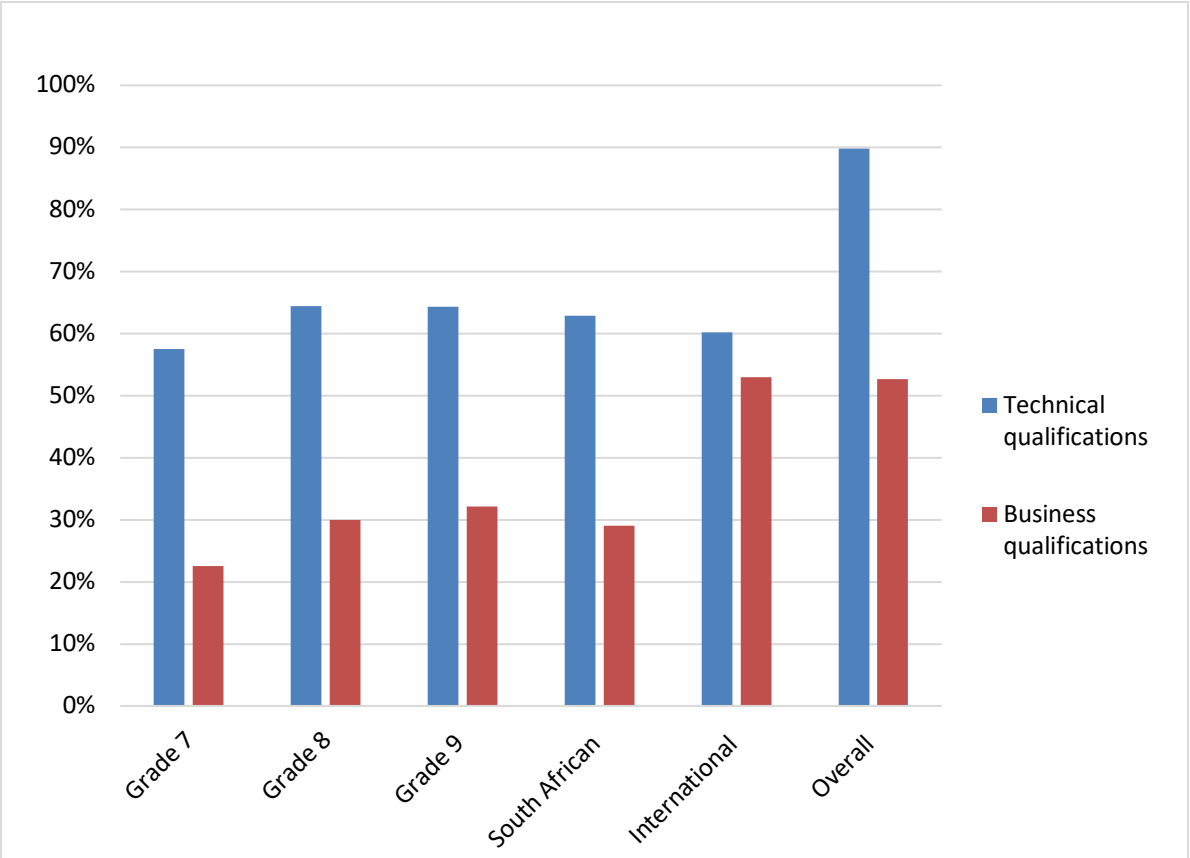


Figure 19: CEOs/MDs/founders' qualification types

As expected, the majority (90%) of the company heads for each of the four categories of contractors were found to have construction and engineering related qualifications. This is also in agreement with Muzondo and McCutcheon (2018) who found that a majority, even though lower at 56%, of the owners of grades 2 to 6 contractors hold construction and engineering related qualifications. The proportions of both technical and business related qualifications also increases from one grade to the next, with international companies having the highest percentages. This study also found that a majority, 53%, of the company heads of the 370 companies had business related qualifications, mostly over and above their technical qualifications.

4.2.2.2 Qualifications of COO, heads of engineering or construction

Similar to the company heads of grades 7 to 9 and international companies, most of their technical heads also hold qualifications that are higher than national diploma level (refer to Figure 20). More of the international companies' technical heads were found to have post-graduate degrees than the grades 7 to 9 equivalent. It was interesting to see that none of the South African technical heads had doctoral degrees, in fact, the highest proportion of the South African technical heads lies in the national diploma level.

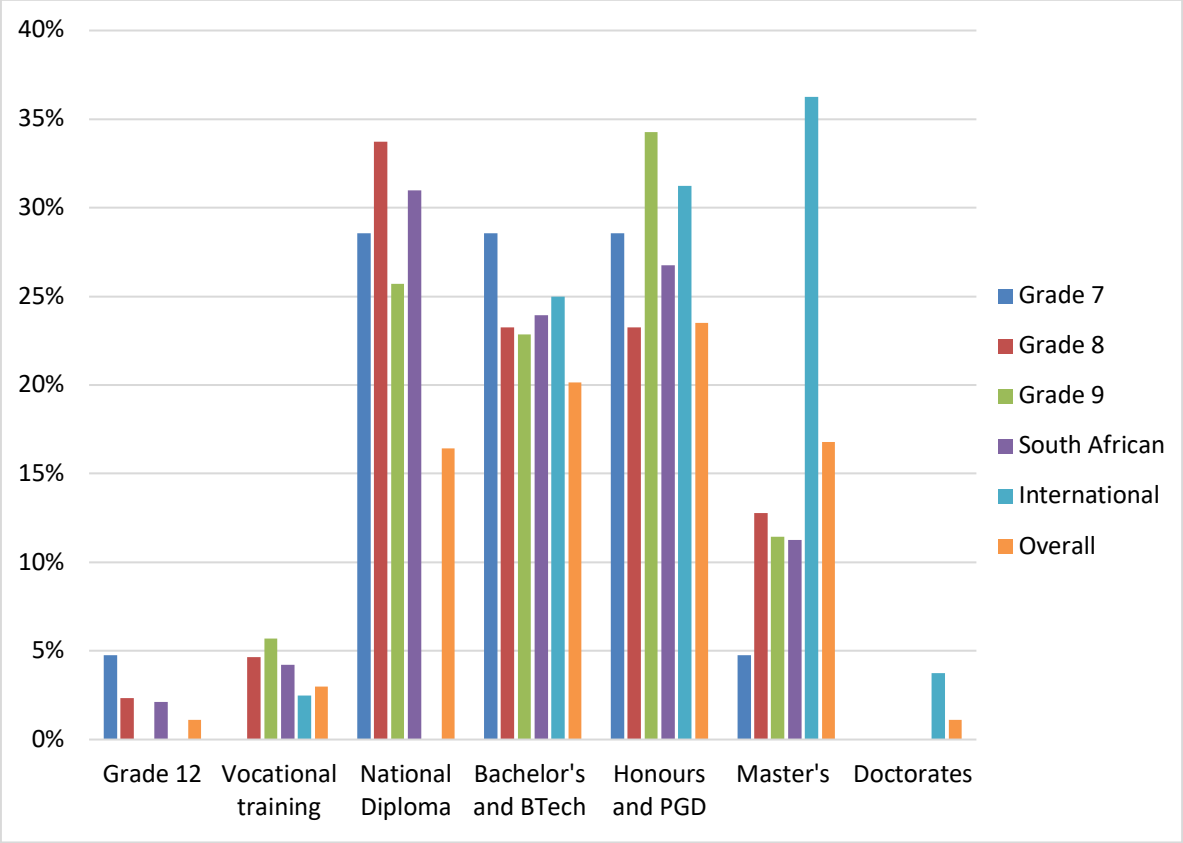


Figure 20: Qualification levels of COOs/technical heads

The percentages, on average, were found to increase from one qualification level to the next, from matric to honours level. For example, there are more technical heads with honours and post-graduate diplomas than those with bachelor's degrees. The CIDB (2011), however, found that the 48% technical leads, described as project manager or professionals, in the grades 2 to 6 companies held qualifications that were lower than national diploma level. In addition, a majority, at 58%, of the grades 2 to 4 technical heads were found to hold qualifications that were lower than national diploma level, with the greatest proportions having no qualifications at all (refer to Table 8).

The technical heads of grades 7 to 9 and international construction companies were also expected to hold technical qualifications as they are mainly responsible for overseeing construction and engineering works. This was found to be the case for the 370 companies that formed the study sample as seen on Figure 21, with an average of 10% also having business qualifications. This research also found that the number of technical heads with CE and GB related qualifications increased from one grade to the next among the South African contractors. This provides evidence to support the notion that the key staff of the more established companies have role related qualifications – a notion which was further tested with company financial heads on sub-section 4.2.2.3.

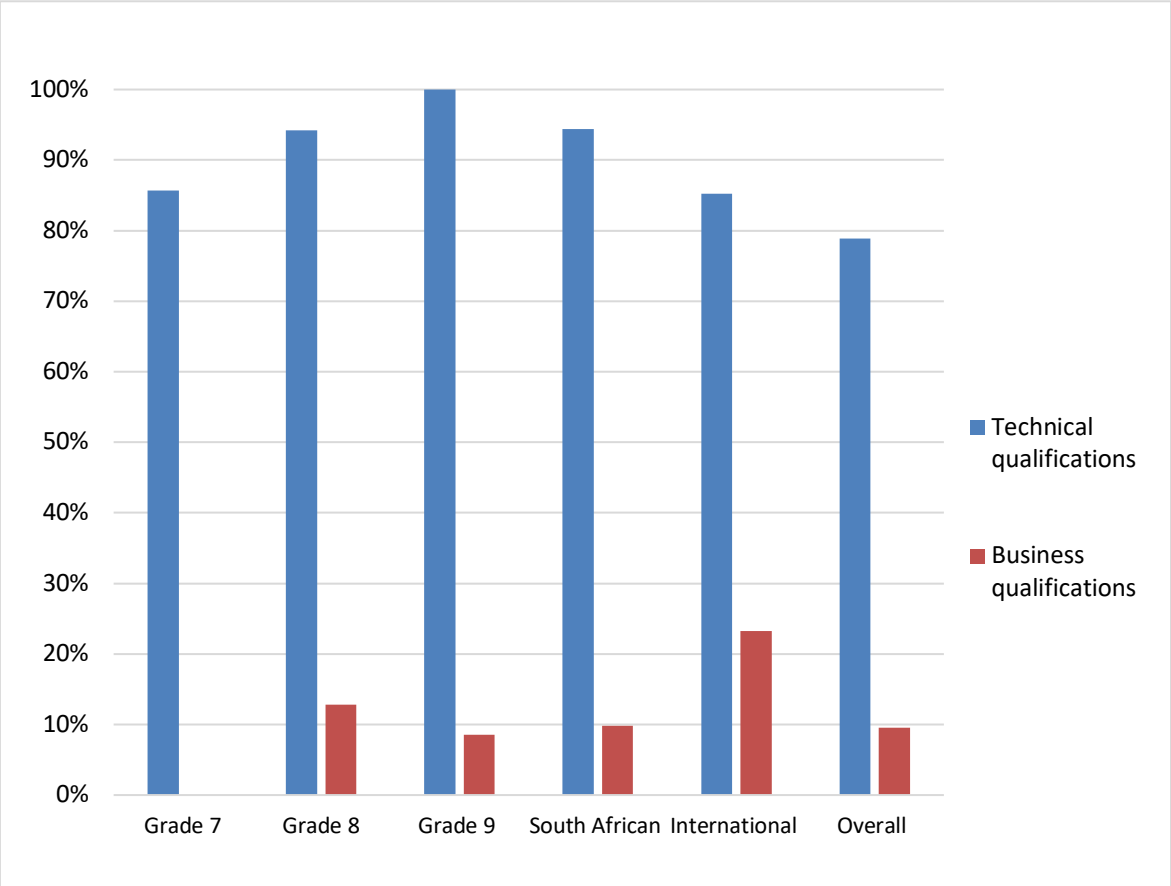


Figure 21: COO/technical heads' qualification types

The international companies had a lower percentage of technical heads with role related qualifications, however, they also had the highest percentage of technical heads with business related qualifications. It also seems that, as per the study premise, it is standard across the board for technical heads to have CE and GB related qualifications.

4.2.2.3 Qualifications of financial heads

Figure 22 contains a summary of the percentages of individuals holding executive positions responsible for finance in the grades 7 to 9 and international construction companies. Most of the grade 7 financial heads were found to have bachelor's degrees while most of the grade 9 contractors had honours level qualifications. In addition, a higher number of financial heads in these companies have been found to have higher level qualifications. This is more evidence that, as initially suggested by Muzondo and McCutcheon (2018), qualifications levels increase from one grade to the next, and the key staff of grades 7 to 9 contractors hold higher qualifications than those of grades 1 to 6.

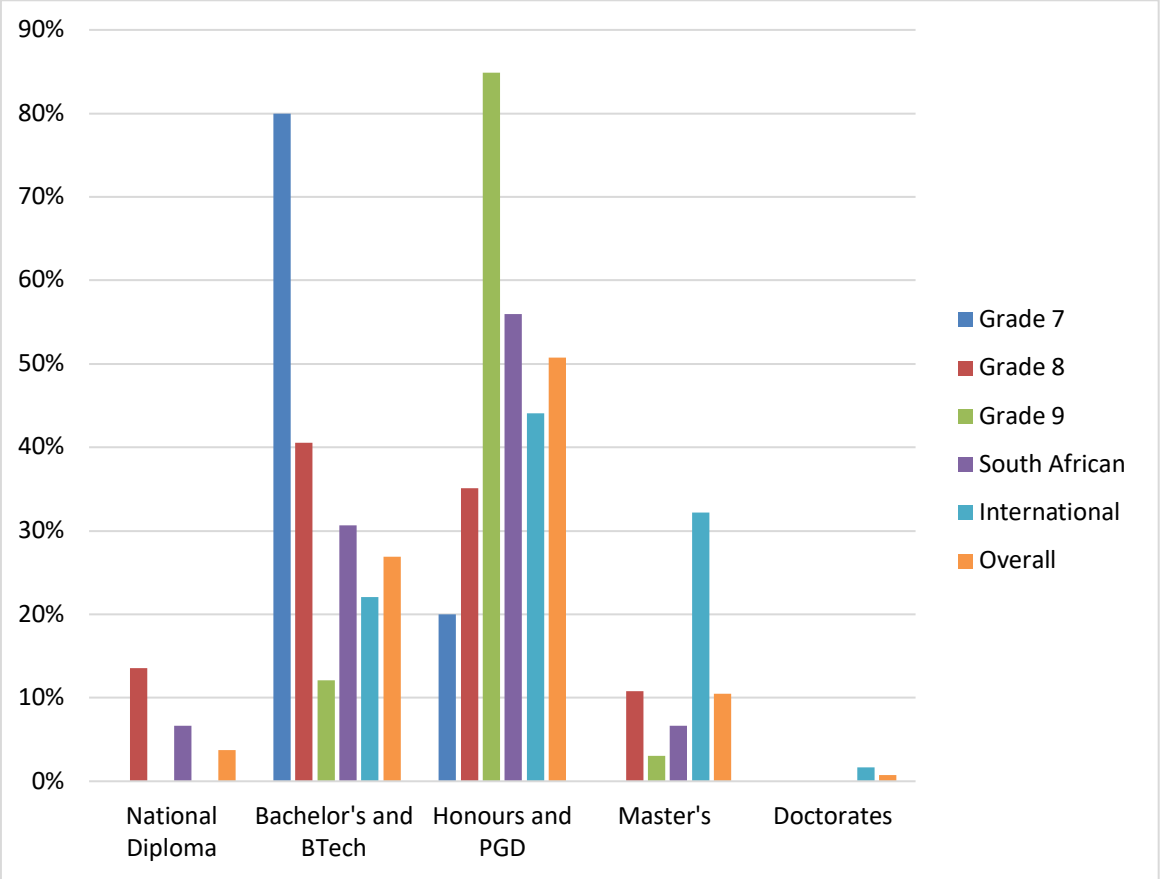


Figure 22: Qualification levels of CFOs/financial directors

Similar to the findings for technical heads, the types of qualifications held by the financial heads of the more established contractors are also role related as seen in Figure 23. The proportions presented in the figure also increased from grade 7 to grade 9, showing that one can expect more grade 9 financial heads to have role specific qualifications than the grade 7 counterparts. This is more evidence that the success of the more established contractors can

also be attributed to the qualifications of their key staff, and that those qualifications need to be role specific.

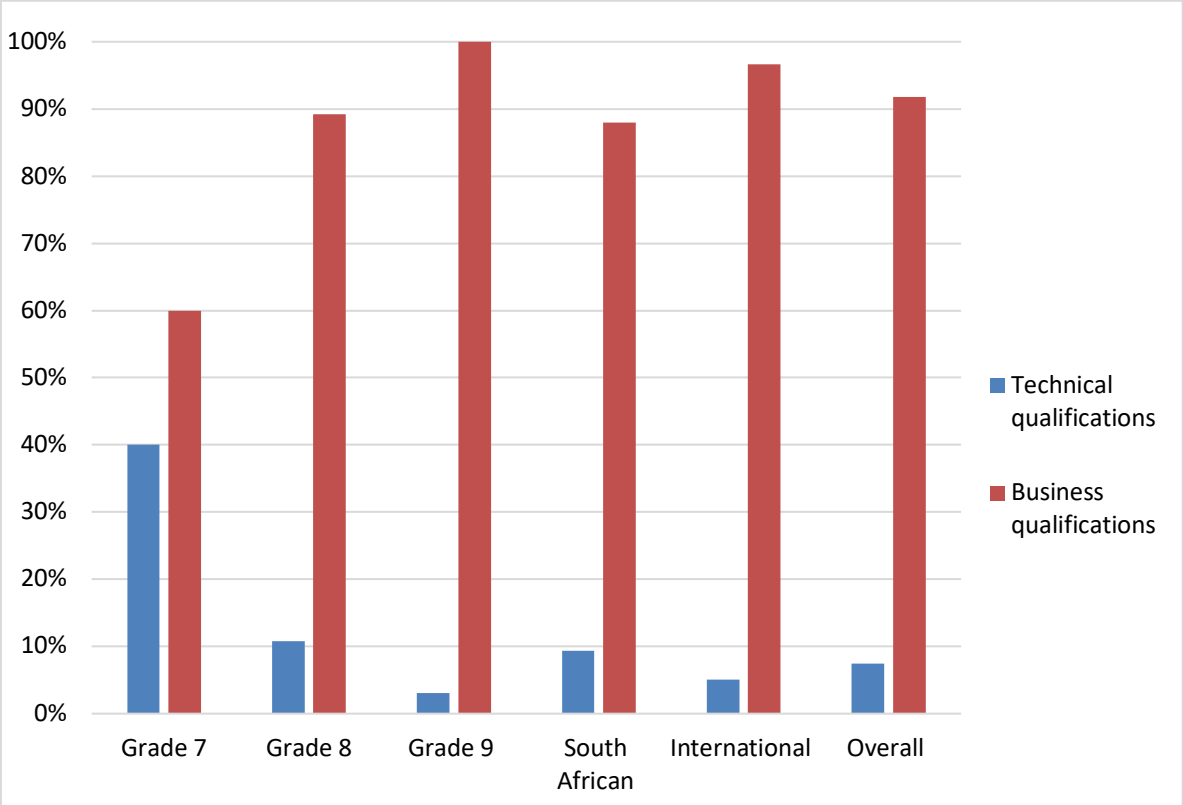


Figure 23: CFO/financial directors' qualification types

4.2.3 Experience of key staff

Part of the primary objective of this research was to assess the types and levels (in years) of experience the key staff of the more established companies have. The experience profiles were also divided into the same groups as the profiles of the qualifications.

The idea was to determine how many years of experience the company heads and technical heads would typically have in the construction or engineering industry, and how many years of experience the financial heads have in the finance or business related roles.

4.2.3.1 Experience of CEOs, MDs or founders

Sub-section 4.2.3.1 contains an analysis of the number of years of experience that the company heads in this study had in the CE and GB related industries. The summary of these experience profiles is presented on Figure 24.

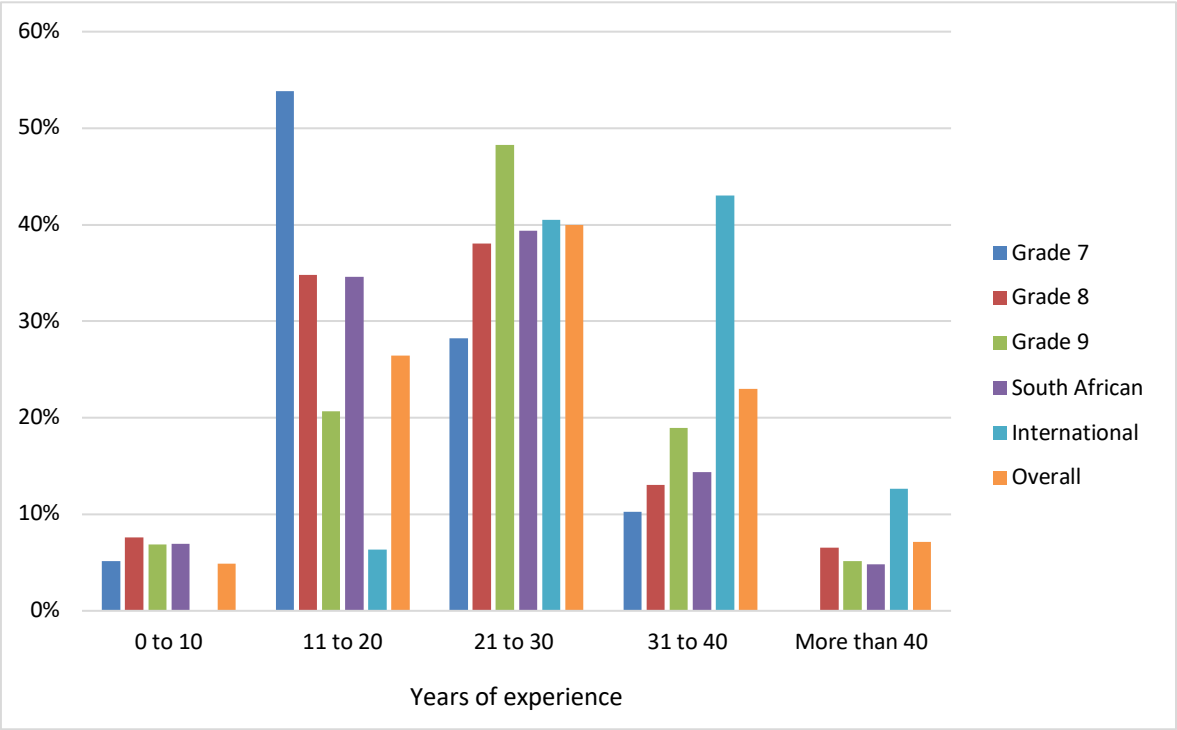


Figure 24: CEOs/MD/founders' number of years of experience

The majority of grade 7 company heads were found to have between 11 and 20 years of experience in the construction industry, while the highest proportions for grade 8 and 9 was in the 21 to 30 years range. On average, the 21 to 30 years' experience range has the highest percentage for all South African, grades 7 to 9, company heads. The highest percentage for international companies lies in the 31 to 40 year range. Therefore, grade 8 and 9 company heads have worked longer than grade 7 company heads, and the international company heads have more experience than their South African counterparts.

Overall, the highest proportion, at 40%, for company heads' experience was within the 21 to 30 year range. The CIDB (2011) found that grade 2 to 6 contracting company owners had, on average, a lower number of years of construction industry experience, as the highest proportions were in the 11 to 20 year and less than five year ranges for grade 5 to 6 and grade 2 to 4 contractors, respectively.

4.2.3.2 Experience of COO, heads of engineering or construction

This study also expected the technical heads of the grades 7 to 9 and international companies to have engineering and general building (construction) related experience, and thus they were evaluated accordingly as presented in Figure 25.

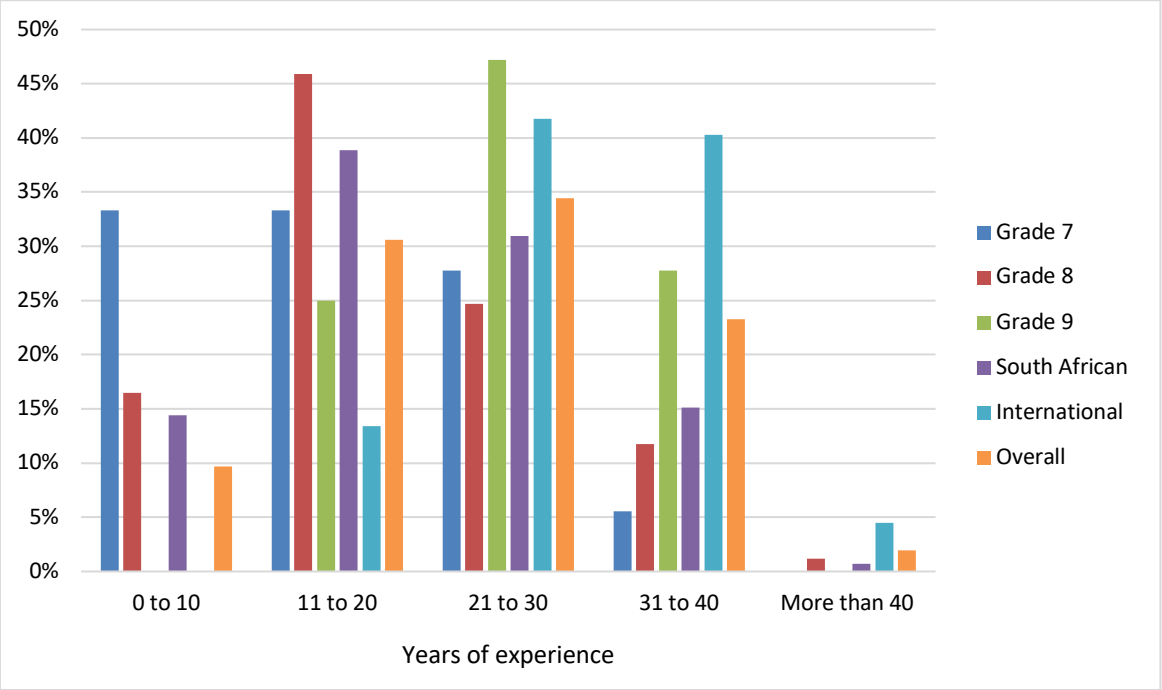


Figure 25: COO/heads of engineering or construction number of years of experience

On average, the highest proportion, at 34%, was within the 21 to 30 years' experience range for both the South African and international companies – a similar result to the experience of the company heads.

A sum of 66% of the grade 7 technical heads had up to 20 years of experience in the construction industry, equally spilt between the 0 to 10 year and 11 to 20 year ranges. The highest single percentages for the grade 8, 9 and international companies were in the 11 to 20, 21 to 30 and 31 to 40 year ranges, respectively. From this, it can be said that technical leads of higher CIDB grade designations would typically fall under the higher end of the scale in terms of the number of years of experience in the construction industry.

4.2.3.3 Experience of financial heads

Figure 26 below is a summary of the experience profiles of the financial heads of the more established construction companies. Since part of the study premise is that the key staff of these companies have experience in industries that are related to their job function, the financial heads were evaluated based on their finance and/or business related experience.

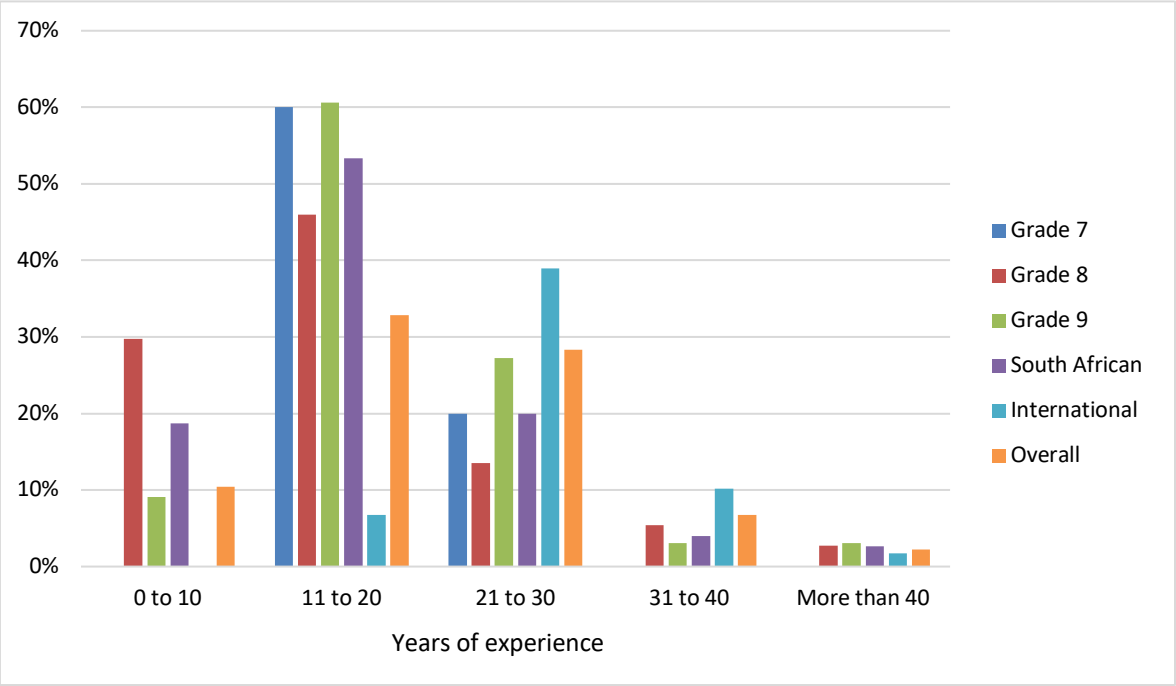


Figure 26: CFO/financial directors' number of years of experience

A majority, 53%, of the South African contractors' financial heads have served in finance related roles for 11 to 20 years. On the other hand, the highest percentage, 39%, for the international companies was in the 21 to 30 year range. Overall, 71% of the financial heads of the 370 companies that formed the study sample have worked in role related posts for a maximum of 30 years.

4.2.4 Company experience

Martin and Root (2012) found that 97.7% of the grades 1 to 4 contracting companies had been in operation for a maximum of 15 years, and concluded that this group of contractors was in the existence stage, and therefore, less established. Adding to this, Muzondo and McCutcheon (2018) also found that the grades 2 to 6 contractors sampled were in operation for no more than 15 years. In this study, however, the researcher found that some of the bigger companies

had been in operation for over 120 years (refer to Figure 27). A total of 70% of these more South African established companies had existed for up to 40 years. Moreover, 91% of these companies have been operating for up to 100 years. When considering the conclusion drawn by Martin and Root (2012) about the grades 1 to 4 contractors, it can be said that the international companies along with the grades 7 to 9 contractors are more experienced and, therefore, more established.

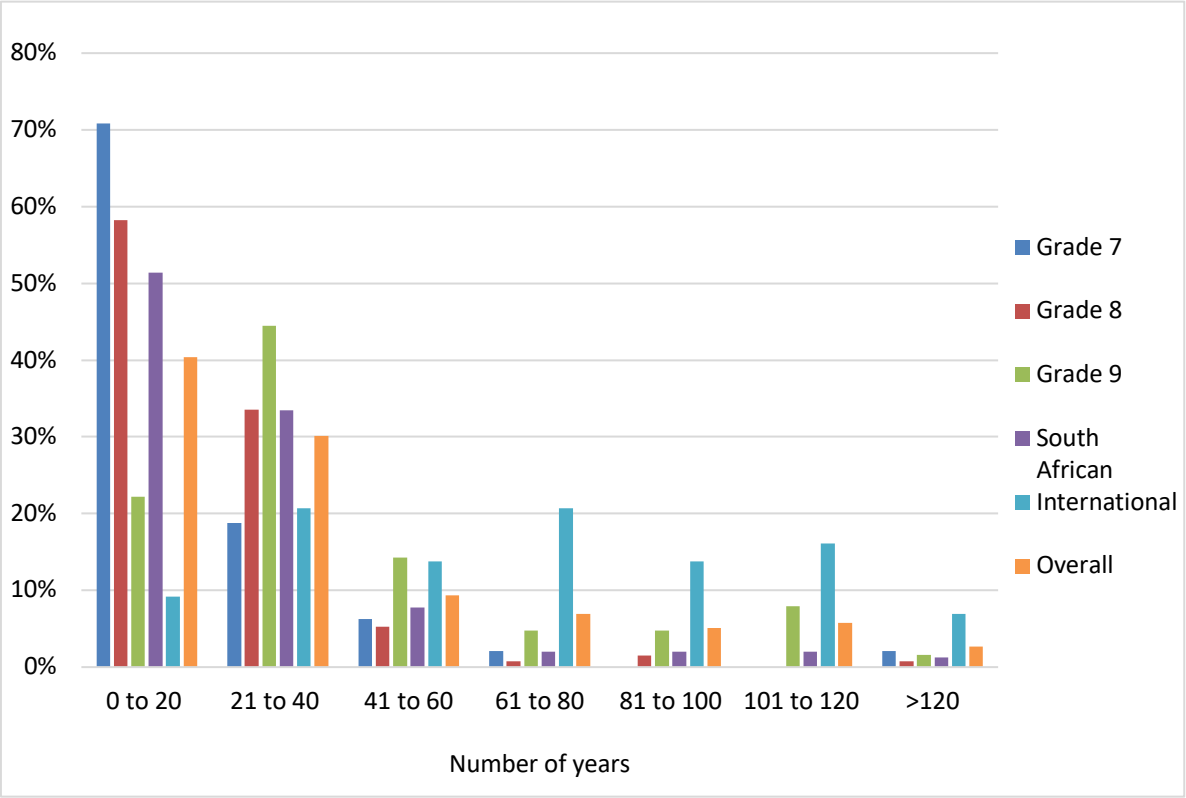


Figure 27: Company experience (years in operation)

A majority of the grade 7 and 8 contractors, 71% and 58%, respectively, have been in operation for up to 20 years, while there was a higher number of grade 9 contractors that have been in operation for up to 40 years. In fact, a total of 85% of the grade 9 contractors have been in the construction industry for up to 80 years, with 52% falling between 21 and 80 years. Table 18 shows the least possible majority for the ranges presented on Figure 27. That is, the range where more than a 50% proportion would be found by adding the percentage on Figure 26 from one range to the next until a sum greater than 50% is obtained. For examples, the least possible range majority for the grade 9 was the sum of 22% (at the 0 to 20 year range) and 44% (at the 21 to 40 year range) to obtain 66% at 0 to 40 years of experience.

Table 18: Least possible range majority for years of experience by grade

Contractor group	Least possible majority for range (%)	Experience range (years)
Grade 7	71%	0 to 20 years
Grade 8	58%	0 to 20 years
Grade 9	66%	0 to 40 years
International	65%	0 to 80 years
Overall	**70%**	**0 to 40 years**

It may be concluded, therefore, that contractor experience, in terms of the number of years that the companies have been in operation, increases with the increase in CIDB grade designation. Furthermore, the international companies are more experienced than the grade 7, 8 and 9 companies.

One could argue, in the case of South Africa, that since a large number of the grades 7 to 9 companies have been in existence since long before 1994, they may be have benefited from the apartheid government and, therefore, may be largely owned by white nationals. This would also be in support of the evidence in this study that showed that the key staff of these companies are also more educated; a privilege that the pre-1994 government afforded to white South Africans. Moreover, the CIDB also states that transformation within the industry has not yet been achieved, since the target of a minimum of 90% of the construction industry being 90% black-owned has not yet been reached (CIDB, 2018-a). However, the CIDB has also provided evidence to show that, even though only 37% of the grade 9 contractors are at 51% black-owned, 70% of the grade 7 and 8 companies are at least 51% black owned. In addition to this, approximately 85 to 90% of grades 7 to 9 contractors are fully compliant with industry standards, with a minimum B-BBEE level contribution of 4 (CIDB 2018-a). Therefore, it could be said that the success of these companies can be attributed to the experience and qualifications of their key staff, along with the overall experience of the companies, whether black- or white-owned.

4.3 Contractor Selection Criteria in Tender Documents for CE and GB Contracts

"By regulation, contractors no longer have to prove that they employ registered professionals in order to qualify for CIDB registration in higher grades. The onus is now on the client to

specify the technical resource requirements in the tender data and to ensure that the contractor that is appointed has access to requisite expertise per project." CIDB (n.d.).

Since it is in the discretion of clients to measure the competency of contractors, this research also evaluated how clients typically select contractors for CE and GB contracts in SA and Internationally. A total of 114 tender documents were collected and analysed in order to determine whether or not clients actually consider contractors' qualifications and experience as part of the criteria for selection during the tendering process.

4.3.1 Data profile

Figure 28 shows the number of tender documents by three groups; grades 1 to 6, grades 7 to 9, and international tenders. The international tenders were randomly selected without comparison of each tender amount to the equivalent CIDB grade. This was done in order to test whether or not technical skills or competence have been evaluated in international tenders regardless of tender amount.

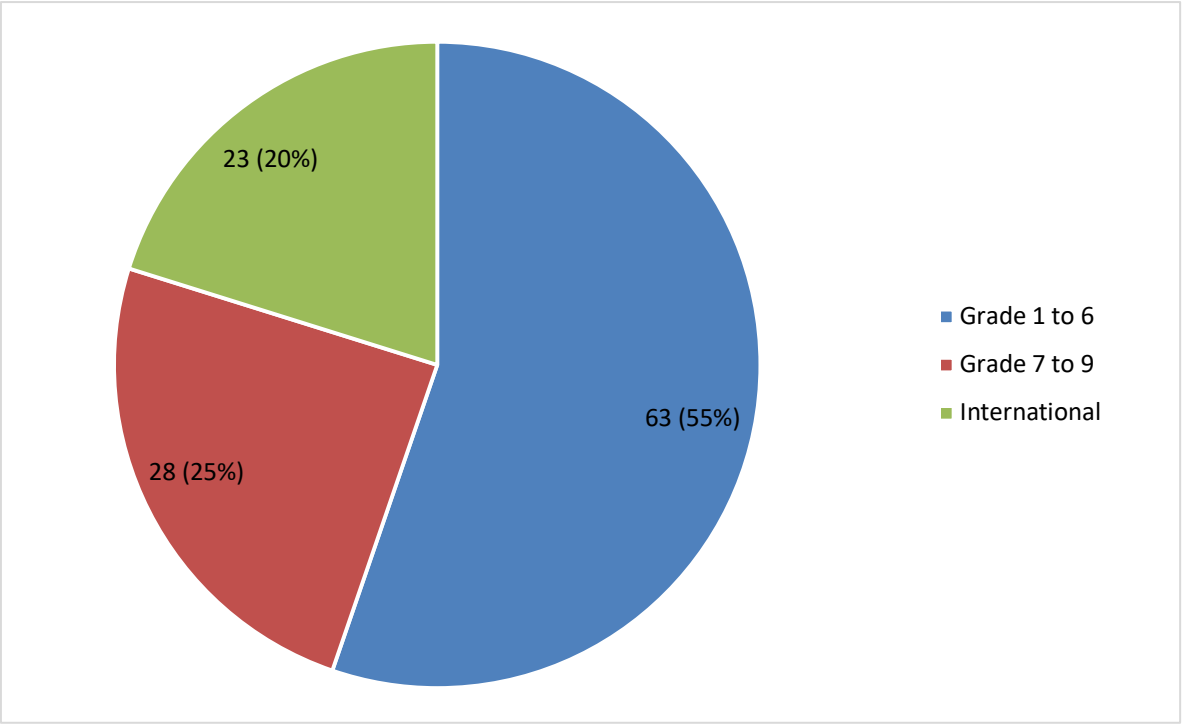


Figure 28: Proportion of tender documents collected by grade

According to the CIDB (2018-a), 72% of the tenders in the CIDB database around South Africa are between grades 1 to 6. This is consistent, in terms of proportions between grades 1

to 6 and grades 7 to 9, with data that was collected for this study in that 69% of the tender documents are for grades 1 to 6 contracts (refer to Table 19).

Table 19: Tender documents collected compared to CIDB open tenders database

Data collected in this research			**CIDB open tenders – May 2018 (CIDB, 2018-b)**	
CIDB grade	**Number of tender documents**	**Percentage**	**Number of open tenders**	**Percentage**
1 to 2	15	17%	35	16%
3 to 4	33	38%	57	27%
5 to 6	12	14%	62	29%
7 to 9	27	31%	61	28%
Total	**87**	**100%**	**215**	**100%**

Figure 29 shows the percentages of the 114 tender documents collected by class of works. The international tender documents that were analysed were found to not have explicitly categorised works classes. It was clear, however, that those contracts involved construction, civil engineering and building works. As such, these documents were classed as being equivalent to both the CIDB GB and CE categories on Figure 29. An additional eight South African documents were categorised as both CE and GB by the clients. These contracts, therefore, allowed for contractors that are registered as either CE, GB or both to bid. It should also be noted that one of the assumptions is that clients have categorised the nature of works of the tender documents correctly. Therefore, no study was conducted to confirm that the classes of works in the tender documents correspond with those of the CIDB.

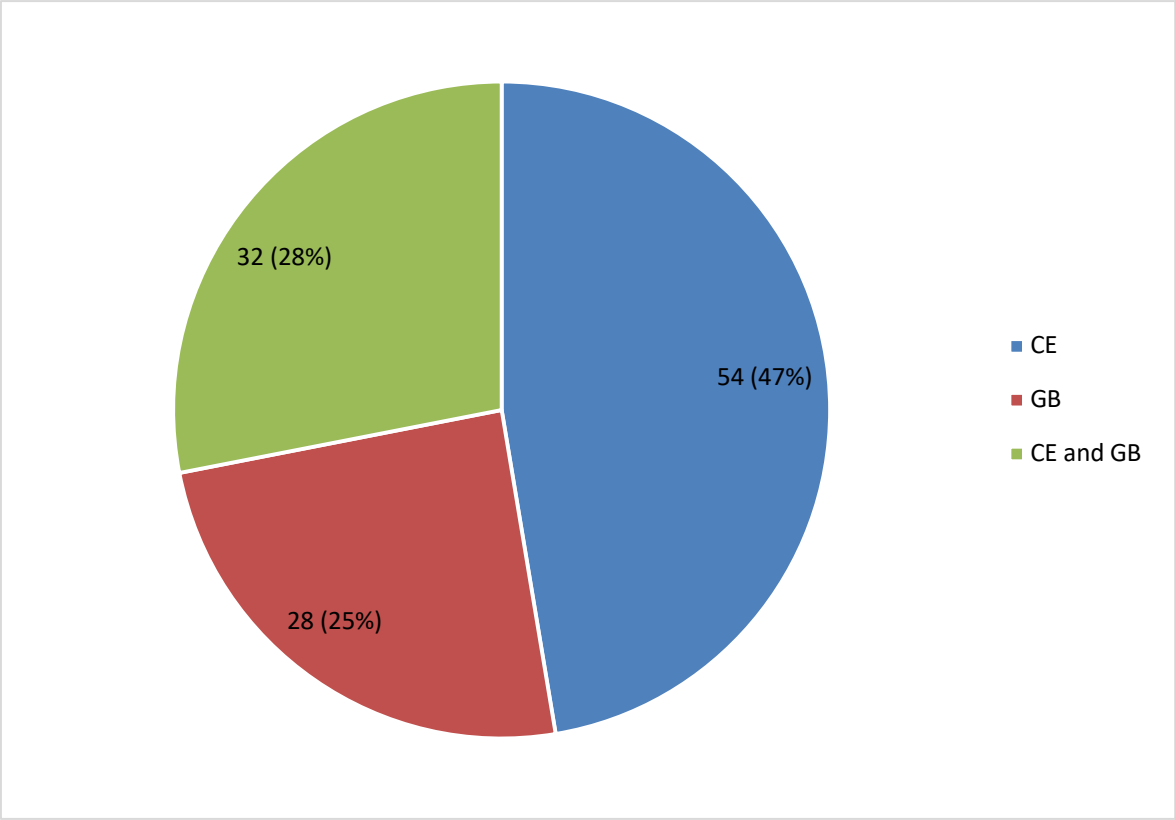


Figure 29: Proportion of tender documents collected by class of works

The nature of work required as specified in the 114 tender documents that were analysed included the following categories:

- Construction, renovation, repair and maintenance on buildings
- Construction and renovations of agricultural infrastructure
- Construction or installation of prefabricated structures
- Construction of dams
- Design and build
- Water and sewer related works
- Roadworks
- Fencing and steelworks

The 20% of the 114 tender documents that were not from South Africa were from Australia, Canada, Ghana, India, Kenya, Sri Lanka and West Indies. The data included a total of 91 South African tender documents, with 28 South African provincial, local and parastatal organisations listed below:

- Airports South Africa

- Cape Town International Airport
- City of Polokwane
- Council of Scientific and Industrial Research (CSIR)
- Department of Agriculture
- Department of Co-operative Governance and Traditional Affairs (COGTA)
- Department of Health
- Department of Home Affairs (DHA)
- Department of Public Works (DPW)
- Department of Roads and Public Works
- Department of Roads and Transport
- Department of Tourism
- Development Corporation
- Ehlanzeni District Municipality
- Eskom
- Joburg Market
- Johannesburg Water
- Knysna Municipality
- Mossel Bay Municipality
- Msunduzi Municipality
- Ndwedwe Local Municipality
- Ngaka Modiri Molema District Municipality
- Prasa
- Sentec
- South African National Road Agency Limited (SANRAL)
- Stellenbosch Municipality
- Taung Local Municipality
- Transnet

A majority of the South African clients – summing up to 62% – were national, provincial and local government institutions while the other 38% were parastatals or private clients as seen of Figure 30. These 91 tender documents covered all nine provinces in South Africa. A total of 61% of the 23 international tender documents were also government contracts.

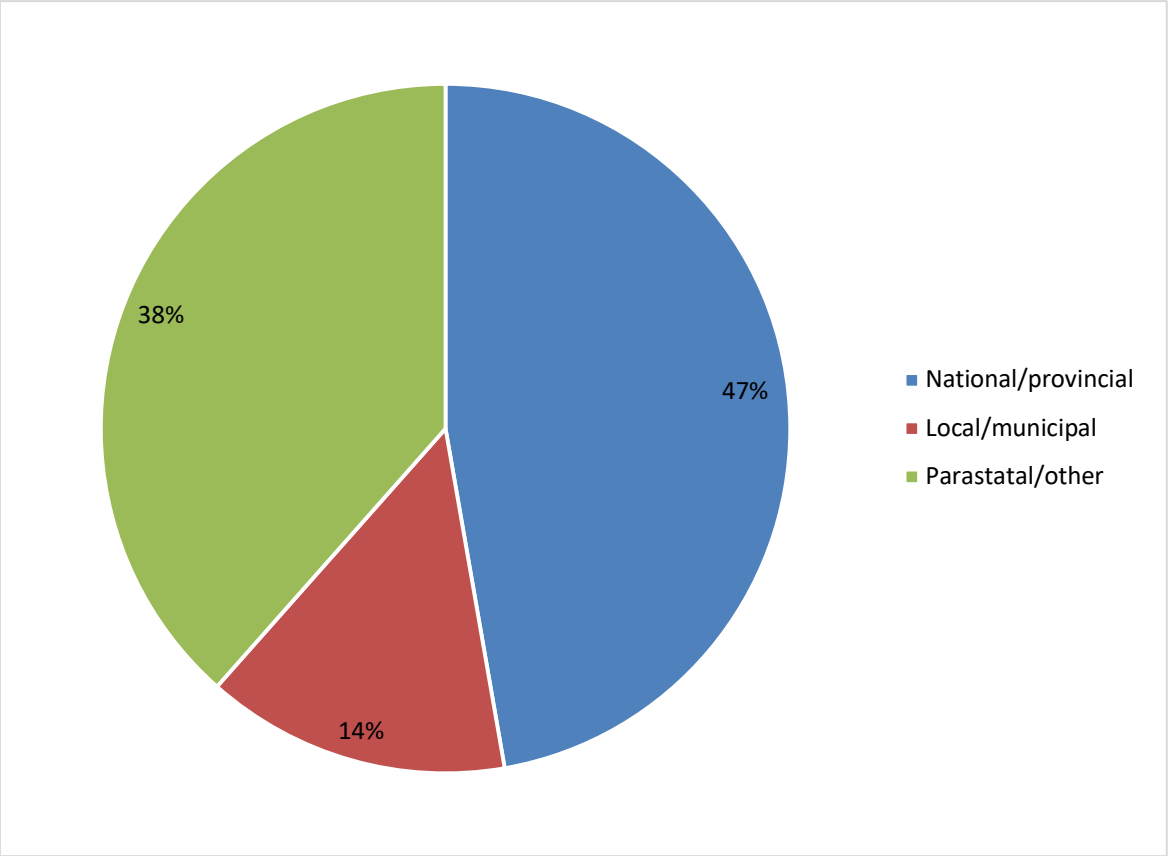


Figure 30: South African clients by sphere of government

The tender closure dates, by year, were between 2005 and 2018 – their proportions by range have been shown on Figure 31. The tender closing dates have been presented in this thesis to show that the data covered a wide range in terms of history and to show the proportion of the data that is current. This is to support the notion that the results represent the current industry practice and that this research is current and relevant; 52% of the tender documents closed in the year this study was concluded, 2018. All but one of the grade 7 to 9 South African tenders closed between January and May of 2018 and were obtained from a database containing active or open tenders.

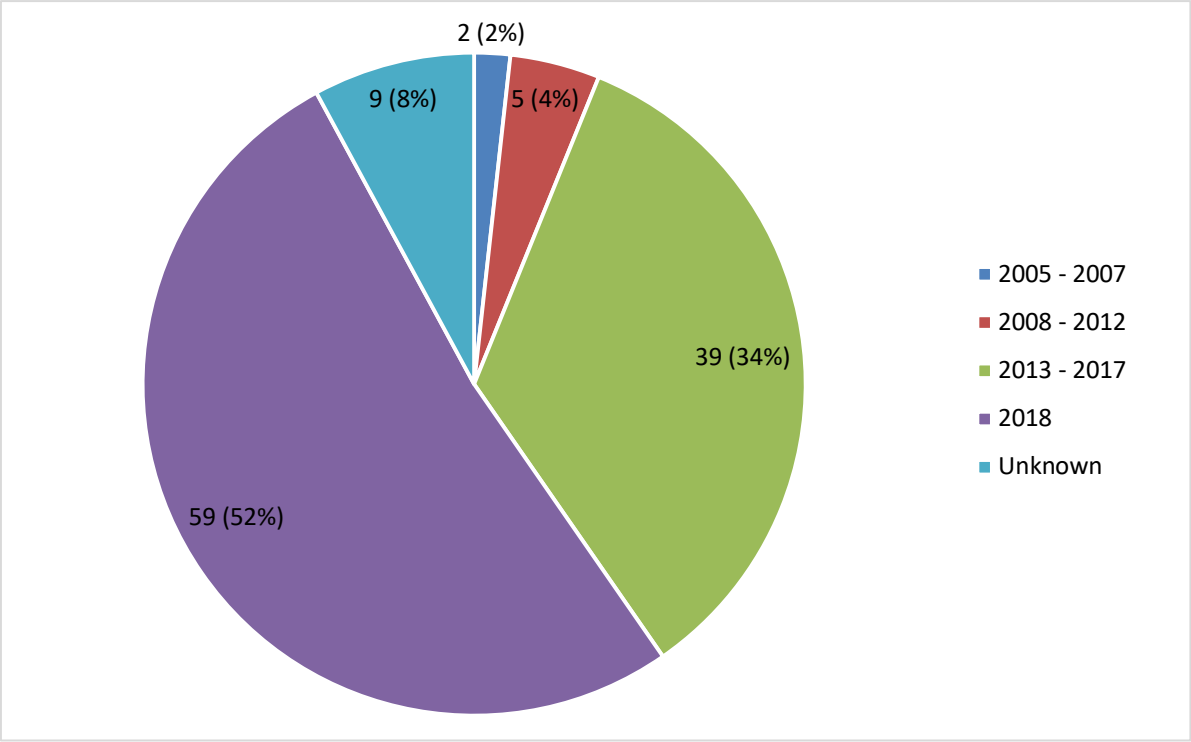


Figure 31: Proportions of tenders by closing date (year)

The closure dates on nine of the tender documents were classified as 'unknown' as the closing dates were not specified on the documents. This is because some of the documents analysed were draft documents that did not have finalised closure dates and the tenders may have not been advertised. This, however, did not affect the data and the results thereof as the parts of the tender documents that are pertinent to the study are the sections that are relevant to the selection and evaluation of contractors. Five of these documents were international tenders from Canada, Kenya and Australia which were classified as 'generic construction tenders' where evaluation criteria for contractor selection seemed to be uniform for those respective clients.

4.3.2 Analysis of tender documents

The first objective of collecting the tender documents was to establish the criteria typically used to evaluate contractors by public sector clients in South Africa and to determine how these criteria have been used to prequalify contractors for CE and GB works. The second objective was to determine the global standard or best practice in this regard. This study found that the most common criteria used for evaluation of contractors has been first functionality and thereafter, financial offer (price) and preference.

In the financial offer criteria, for South African tenders, tenderers or bidders are essentially scored against the lowest tenderer while, for preference, tenderers are scored according to their B-BBEE status. The ratio of the price to the B-BBEE status has been 90:10 or 80:20, meaning that this part of the evaluation has been in favour of the lowest tenderer regardless of how they compare to the other tenderers in the same shortlist in terms of competence.

This study intended to determine whether or not the functionality stage of the procurement process considered the technical qualifications and experience of contractors. The functionality criteria of each tender document were analysed based on the qualifications of key staff, experience of key staff, company experience (number of relevant projects conducted and number of years in the construction industry), and professional body registration. The key staff that were mentioned in the tender documents included site supervisors, foreman, project managers and engineers. The other criteria used for functionality scoring, that have not been evaluated in this study, included plant and equipment, labour, and project execution plans and methodology.

Financial standing, tax clearance, B-BBEE registration and financial offer (price) were all standard criteria in all the South African documents. In addition, the absence of proof of either of these criteria was cause for disqualification. Points were allocated for B-BBEE status and financial offer for all 91 South African tender documents.

Only one of the 23 international tender documents was found to have a scoring system for qualifications and experience of contractors, however, it seemed most specified that all bidders should have these qualifications and experience; making the absence of such evidence cause for disqualification. As such, the international tender documents were only analysed in terms of the number that specified technical competence as part of evaluation and considered the lack thereof as cause for disqualification.

4.3.2.1 Contractor evaluation criteria

This section of the thesis contains the results of the analysis of contractor evaluation criteria used for the selection of contractors. Table 20 contains the number of South African tender documents that included qualifications and experience of key staff, and company experience

as selection criteria and those that did not. Also demonstrated on Table 20 are the proportions of these tender documents where clients had specified that, over and above not obtaining the minimum functionality score, the lack of qualifications and experience was cause for disqualification.

Table 20: Summary of results for technical functionality criteria

Functionality criteria	**Scored (91 documents, SA only)**			**Cause for disqualification (all 114 documents)**		
	Yes	**No**	**Partially**	**Yes**	**No**	**Partially**
Qualifications of key staff	36	52	3	34	79	1
Experience of key staff	45	46	0	23	91	0
Company experience	74	16	1	32	82	0
Professional body registration	19	72	0	14	77	0

The criteria that have been categorised as "partially" for scoring and disqualification are those where clients did not specify explicitly what is required. For example, for technical qualifications, three of the tender documents, all falling under the grades 1 to 6 groups, only requested curriculum vitaes (CVs) of key staff, but did not stipulate what qualifications would be considered and how they would be scored. One of the tender documents, also in the grades 1 to 6 group allocated scores for provision of company profiles, which is assumed to contain previous projects conducted, but did not show how company experience would be scored.

The South African tender documents were categorised into two groups, grades 1 to 6 and grades 7 to 9, to determine which group of contractors are most likely to be expected to have technical expertise as reflected in Figure 32. The four categories of technical competence that were used are qualifications of key staff, experience of key staff and company experience.

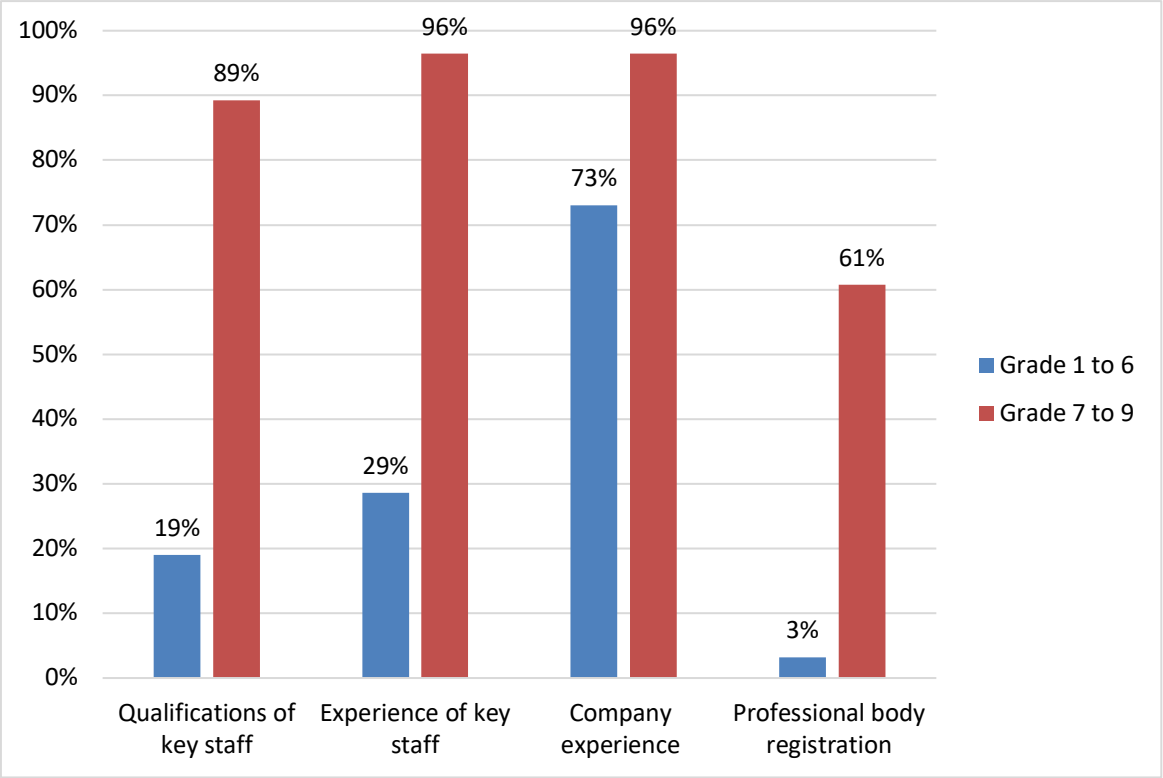


Figure 32: Proportion of tender documents with score allocations for competence by grade

The evidence presented on Figure 32 shows that clients generally hold grades 7 to 9 contractors to a higher competency standard that grades 1 to 6 contractors. The former group of contractors was expected to have staff with technical expertise, whereas for the latter group, most clients did not evaluate qualifications and experience of key staff, and professional body registration as part of the functionality scoring system. Clients procuring grades 1 to 6 contractors did, however, tend to typically evaluate company experience as part of the selection process, and hence, a majority (73%) had assigned scores for this competency criterion.

In order to confirm the conclusion drawn above – that grades 7 to 9 contracts require technical expertise and contractors are typically awarded points for such expertise – this research went further to determine the proportion of tender documents that explicitly stated that lack of technical expertise, or the evidence thereof, would result in contractors being eliminated prior to the functionality stage. The results of this analysis are presented in Figure 33.

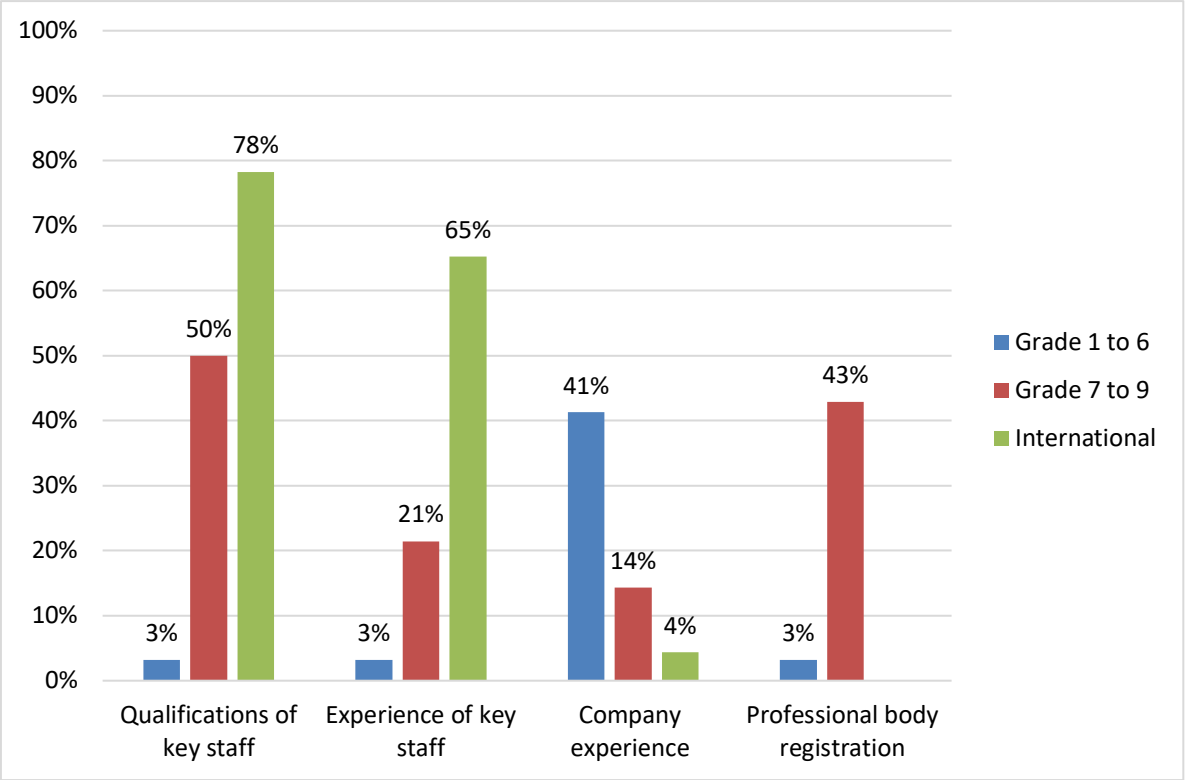


Figure 33: Proportion of tender documents where lack of competency evidence is cause for disqualification

As expected, the study found that more clients procuring grades 7 to 9 contractors generally eliminated contractors who do not have key staff with contract related expertise than the grades 1 to 6 group (50% for grades 7 to 9 compared to 3% for grades 1 to 6). Grades 7 to 9 contractors were expected to demonstrate the qualifications and experience of their key staff, and only after that could they move on to the functionality stage. Once contractors have progressed to the functionality stage, scores would be assigned by the level of expertise rather than merely by demonstrating the presence of such expertise. Similar results were found for the international tender documents, with a majority of them stating that lack of evidence for key staff qualifications (78%) and experience (65%) would lead to the disqualification of contractors from the tendering process.

The disqualification conditions with regard to company experience as a functionality criteria were, however, found to differ from the results presented on Figure 32. It was found that more of the grades 1 to 6 contracts stated that contractors who did not demonstrate previous contract related experience would be disqualified than was the case for grades 7 to 9 and international contracts. It may be that, since contractors of the lower grades may not have enough of a track

record, as alluded to by CIDB (2009), clients put more stringent evaluation measures to ensure that they select the ones that had actually previously completed similar projects and have references. In conjunction with this finding, grades 7 to 9 contractors may be regarded or assumed to have a proven track record simply by virtue of their grade designation. It may also be that clients procuring grades 7 to 9 contractors regard the competence of the key staff (qualifications and experience) of these companies as a more reliable measure of potential performance than previously completed projects (company experience).

A majority of the grades 7 to 9 contractors were also evaluated on their professional body registration statuses. Scores were assigned to contractors with key staff that were registered with professional bodies such as ECSA, SAICE and the South African Council for Project and Construction Management Professionals (SACPCMP). Registration with professional bodies or associations can be regarded as evidence that an individual has reached a particular level of expertise in their career or is committed to professional development, and also adds to one's credibility. Therefore, this step in the procurement process adds more rigor to the pre-selection of contractors as it also provides clients with a measure of staff expertise. This was not the case with the grades 1 to 6 and international contracts.

4.3.2.2 Qualifications of key staff

As initially posited, the trend line on Figure 34 shows a general increase in the percentage of tender documents where scores were assigned to key staff qualifications by grade. This is in support of the premise that clients generally hold the more established contractors to a higher standard with regard to technical expertise than the less established contractors. For example, 6% of the grade 4 tender documents were found to have been evaluating and scoring contractors on the qualifications of their key staff, while the grade 7 tender documents were at 92%. The qualifications that clients typically assigned scores for and assessed for functionality for CE and GB contracts included civil engineering, and construction and project management.

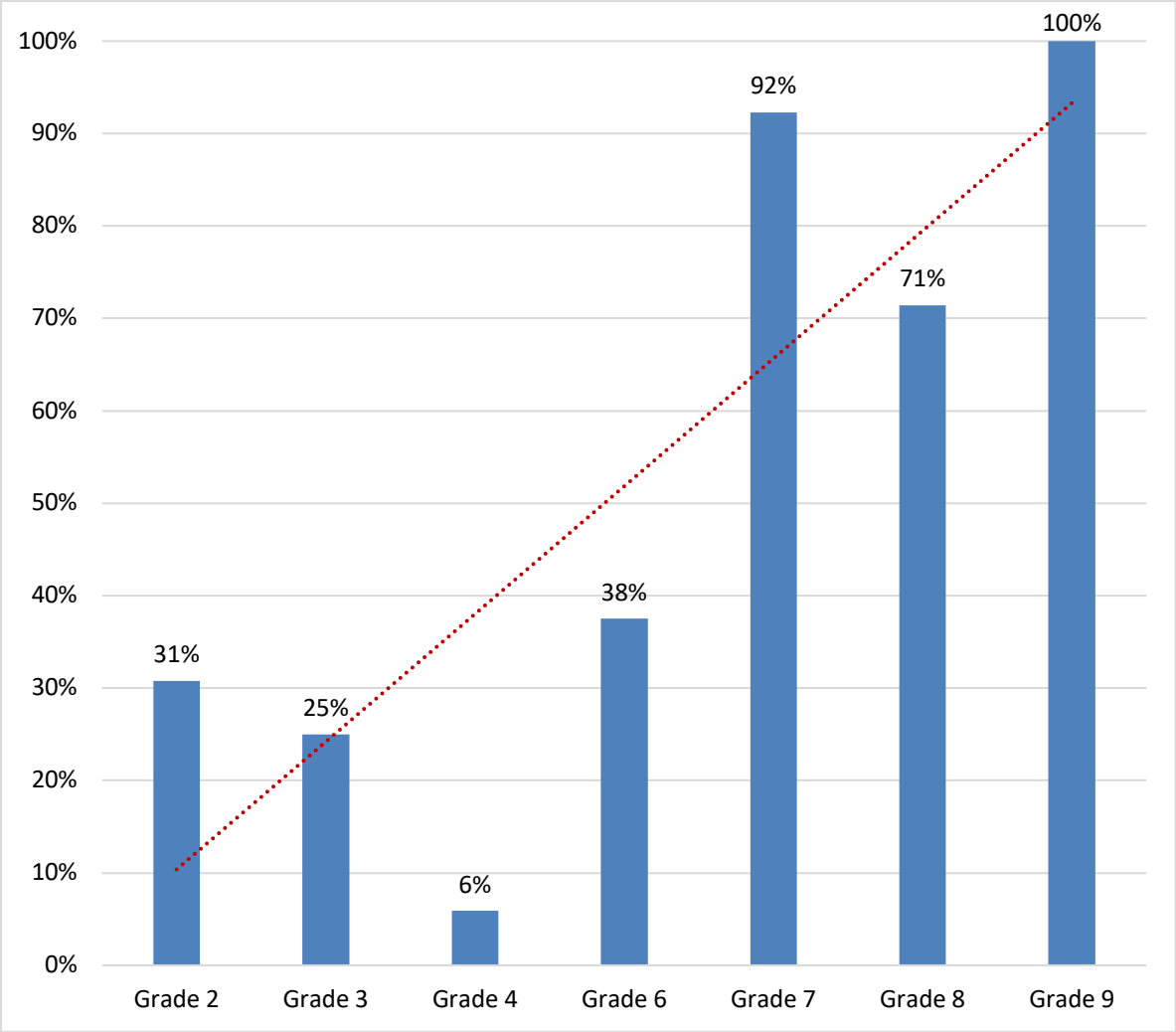


Figure 34: Proportion of tender documents with functionality scores for qualifications of key staff

It should be noted that for the sample of grade 1 and 5 tender documents that were evaluated, none had included qualifications of key staff in their functionality scoring, hence they are not included in Figure 34. The international tender documents did not have a functionality scoring system or an equivalent scoring method for the evaluation contractor competence, and hence, do not reflect on Figure 34 either.

In addition to the results provided above, Figure 35 shows the percentage of tender documents that explicitly stipulated that lack of qualifications, or lack of the evidence thereof, would result in disqualification of contractors. This percentage also showed a general increase from one grade to the next. This is further evidence that the higher the grades, the more clients expected contractors to have technical expertise in relation to their staff complement.

Grades 1 to 5 contracts were not included in Figure 35 as none of the clients involved considered lack of key staff qualifications as cause for disqualification from the tender process. This is also in support of the previous findings that the more established and international contractors are generally expected to have staff with CE and GB related qualifications; which, from Figure 35, starts at grade 6. In addition, these results also provide evidence that it was possible for clients procuring grades 1 to 5 contractors to have appointed one that did not have any CE or GB related qualifications, or any qualifications at all.

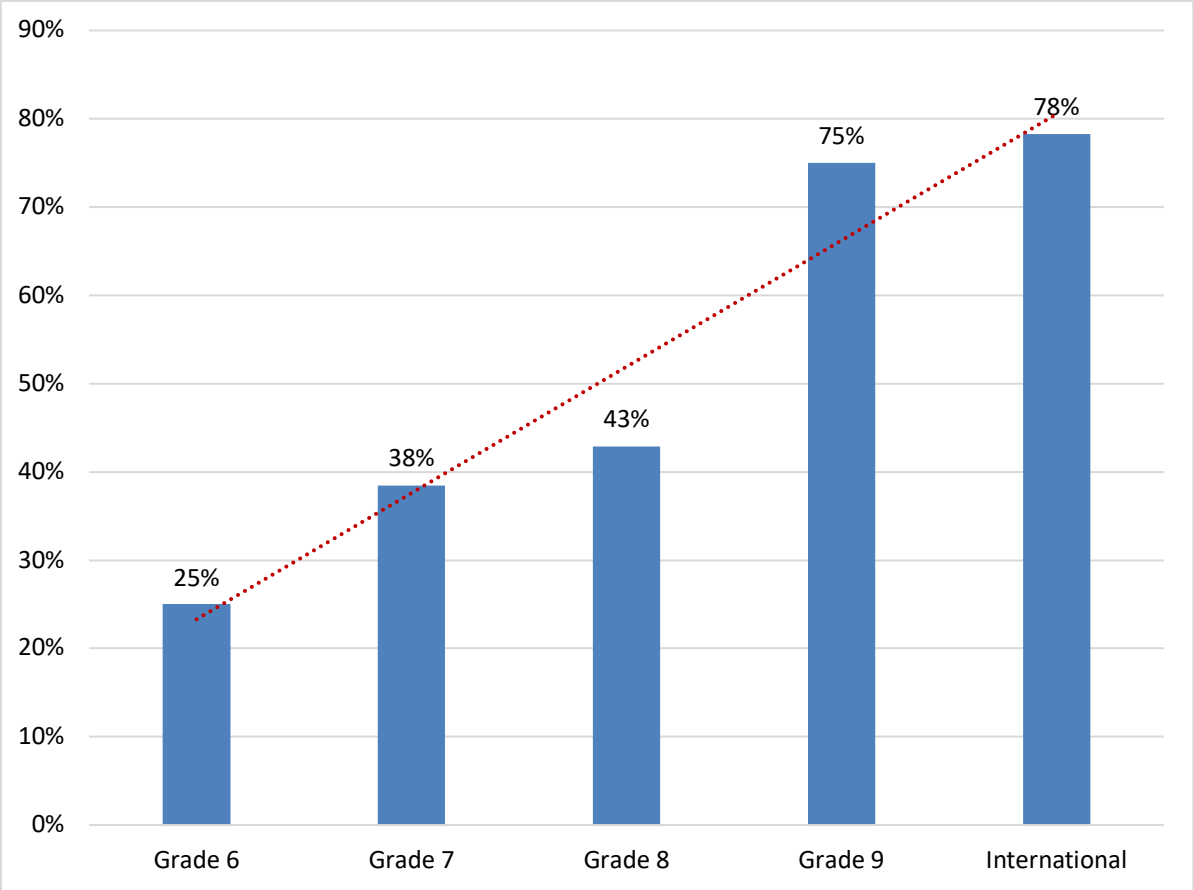


Figure 35: Percentage of tender documents where lack of qualifications is cause for disqualification

These results are also in support of the study premise that technical qualifications of key staff form part of the distinguishing factors between grades 1 to 6, and grades 7 to 9 and international contractors. In addition, it seems that clients may also be aware of this factor and evaluated the different groups of contractors accordingly in their respective procurement processes.

4.3.2.3 Experience of key staff

Figure 36 shows the percentages of tender documents in which clients allocated scores for experience of key staff within the contracting companies. Although the linear trend line shows a general increase, the initial expectation was that these percentages would increase from one grade to the next. This was the case from grade 4 to grade 9, with 97%, on average, of grades 7 to 9 tender documents containing scoring criteria for experience of key staff. A finding that may be regarded as further evidence to support the premise that key staff experience, in addition to qualifications, are part of the distinguishing factors between grades 1 to 6 and grades 7 to 9 contractors.

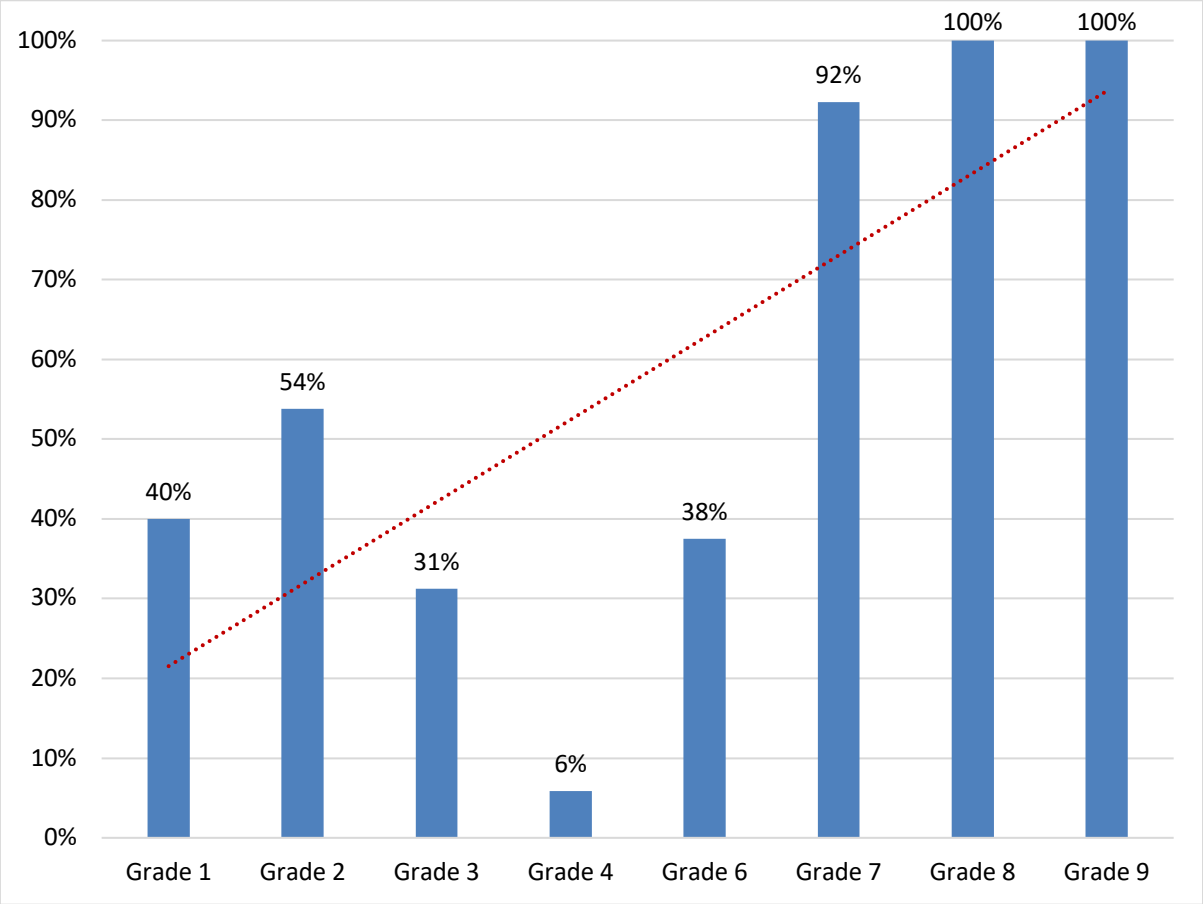


Figure 36: Proportion of tender documents with functionality scores for experience of key staff

Grade 5 tender documents were not included on Figure 36 as none of the tender documents in that grade had included key staff experience in the functionality stage of the evaluation. The author expected the grades 1 to 3 percentages to be lower than that of grade 4 tender documents, however, that was not the case. This may have been because 93% of those grade

4 tender documents were from one client (Mpumalanga Department of Agriculture); providing evidence that clients may standardise their evaluation criteria within their organisations, even though the criteria are not standardise across the industry. This has given rise to differences between public sector clients. In addition, the standardisation of evaluation at the clients discretion may also lead to continual improper selection of service providers if the process within one organisation is flawed. As such, this research advocates for an industry-wide policy lead standard of uniformity. This notion certainly requires further investigation to confirm.

To confirm the conclusion that clients generally regard key staff experience as one of the key measures of competence for grades 7 to 9 contractors , and more so than for grades 1 to 6 contractors, the percentage of tender documents where the lack of evidence of key staff experience would lead to disqualification was analysed (refer to Figure 37).

The linear trend line shows an increase in the percentage of clients who generally disqualify contractors without contract related experience by grade. This increase, however, was expected to progress in a similar fashion to Figure 35. The author notes, however, that there was a low number of grades 1, 6, 8 and 9 tender documents, with these 4 groups accounting for 21% of the 114 tender documents collected. Larger sample sizes for these groups of contractors would need to be collected to draw a definite conclusion on this.

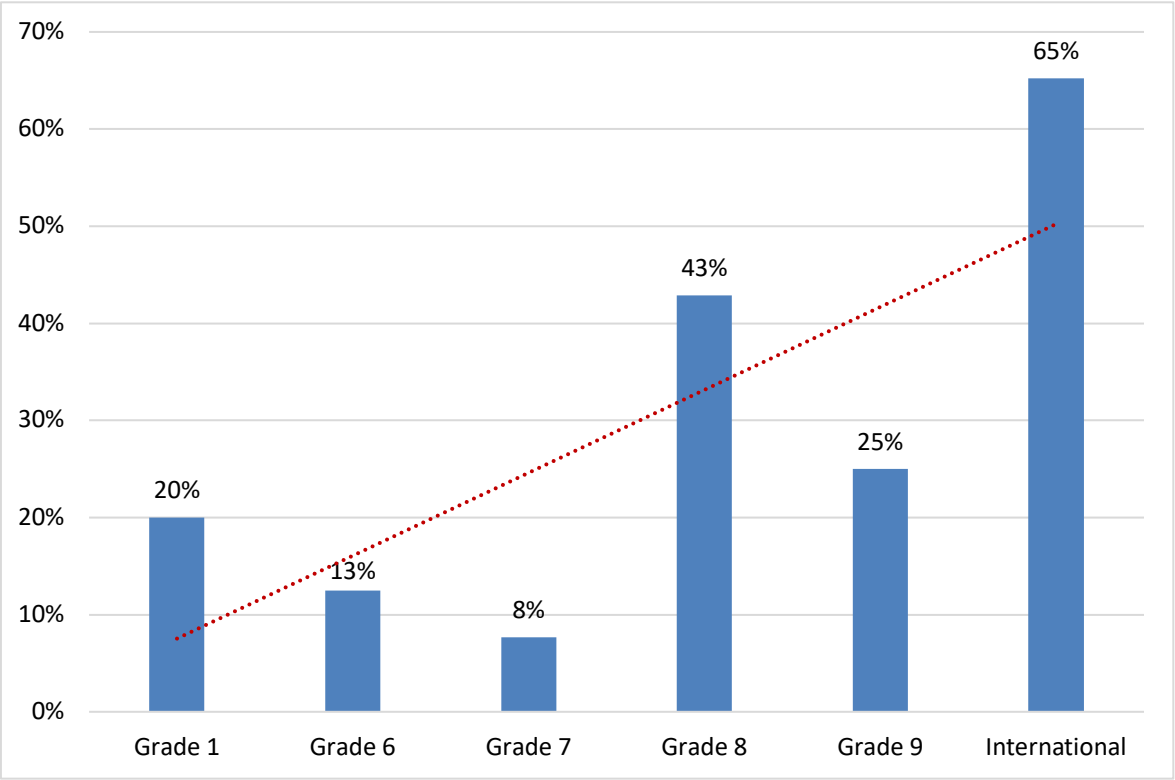


Figure 37: Percentage of tender documents where lack of experience is cause for disqualification

The percentages seem to decrease by grade from grade 1 to grade 7. It may be that CIDB grade 1 is regarded as entry level and, as such, clients require proof of experience for grade 1 contractors. In addition, clients may be of the opinion that the higher the grade, the more experienced the contractor is, and therefore, regard the grade designation as enough evidence. It would seem that the global standard is to disqualify contractors from consideration if they do not demonstrate that their staff have the necessary experience. A majority, 65%, of the international tender documents contained this condition.

Grades 2 to 5 tender documents were not included on Figure 37 as none of them stated that lack of evidence of key staff experience would be cause for disqualification.

4.3.2.4 Company experience

Company experience in the tender documents that were evaluated includes the number of contract related projects undertaken by the contractor, and for some, also includes contactable

references. Figure 38 contains the fractions of tender documents where functionality scores were assigned for company experience.

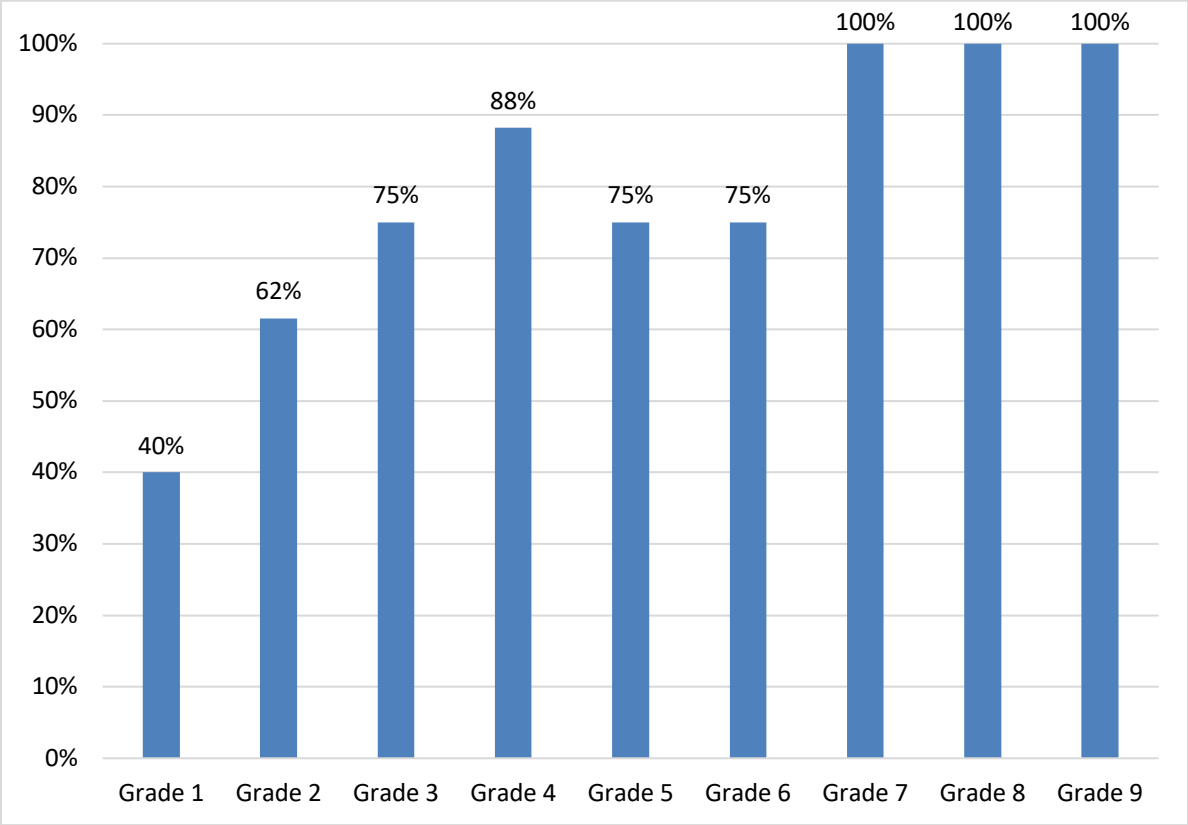


Figure 38: Proportion of tender documents with functionality scores for company experience of key staff

In order to confirm the author's notion that clients regard grade 1 as an entry level grade and, therefore, require proof of experience from these contractors, the proportion of grade 1 tender documents would also be higher than the other groups on Figure 38. On the other hand, it may be that this opinion is valid and clients consider that these contractors have no track record and, as such, it would seem more sensible to assess these contractors based on the competence of their key staff rather than the companies themselves.

Overall, this study found that the importance of company experience does not necessarily increase by grade from grade 4 to 9, in fact, it is generally within the same range. In addition, the majority of all tender documents in all the other grades except for grade 1 assign functionality scores for company experience. This may be evidence that clients generally regard company experience as a competency measure across the board. In order to explore

this further, the fractions of tender documents that eliminated bids for lack of evidence for company experience were also evaluated and presented on Figure 39.

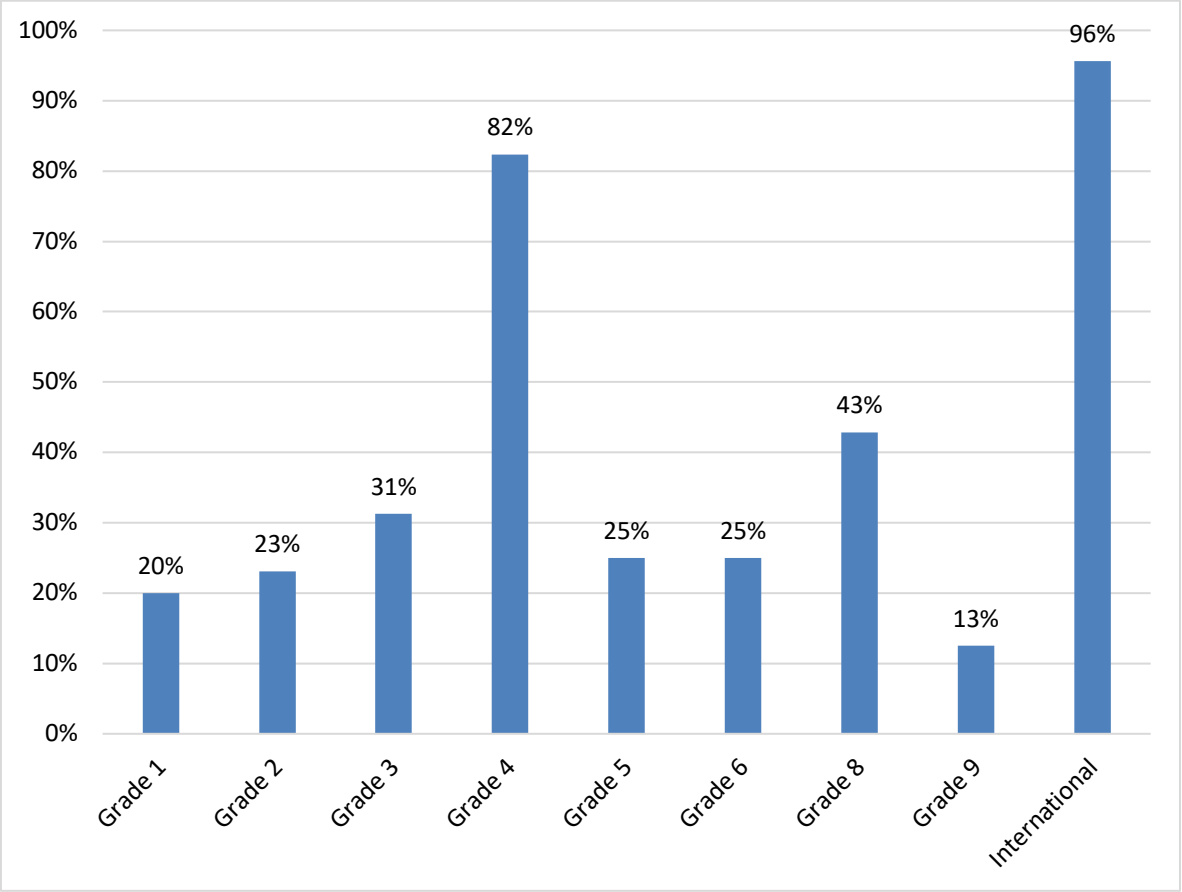


Figure 39: Percentage of tender documents where lack of evidence of company experience is cause for disqualification

It would seem that, generally, the results on Figure 39 are similar to the results on Figure 38 where the percentages are within a small range. This is without considering the international companies and the grade 4 contractors. It is surprising that these narrow range percentages are considerably low; under 45%. It may be that clients ensure that company experience is scored high enough to ensure that the chances of selecting a contractor without relevant experience are low. Making it unnecessary to include lack of company experience as a cause for disqualification. Further research on this would be required, however, in order to confirm this premise.

As mentioned earlier, 93% of the grade 4 tender documents were from one client, and had a standard evaluation criteria, which would explain why the percentage is high. The results may

have been different, and similar to the other eight grades, had the grade 4 data been more general in terms of the clients it covered.

Since the international tender documents did not contain any scoring criteria or systems, the one way to tell whether or not they place any importance on technical competence was through their conditions for elimination. It was found that most of them regarded company experience highly and ensured that contractors who did not demonstrate such experience would not be selected for CE and GB projects.

Overall, company experience seems to be a standard criterion or measure of competence across the industry in terms of how clients pre-select contractors for CE and GB contracts as part of their procurement strategies.

4.3.2.5 Professional body registration

One of the other measures of competence and experience in many industries is an individual's registration with professional bodies as previously mentioned in this chapter. Figure 40 shows the fractions of tender documents that have included proof of professional registration as part of the functionality scoring criteria by grade. Figure 41 shows the proportions of tender documents that stipulated this lack of proof of this criterion would be cause for disqualification.

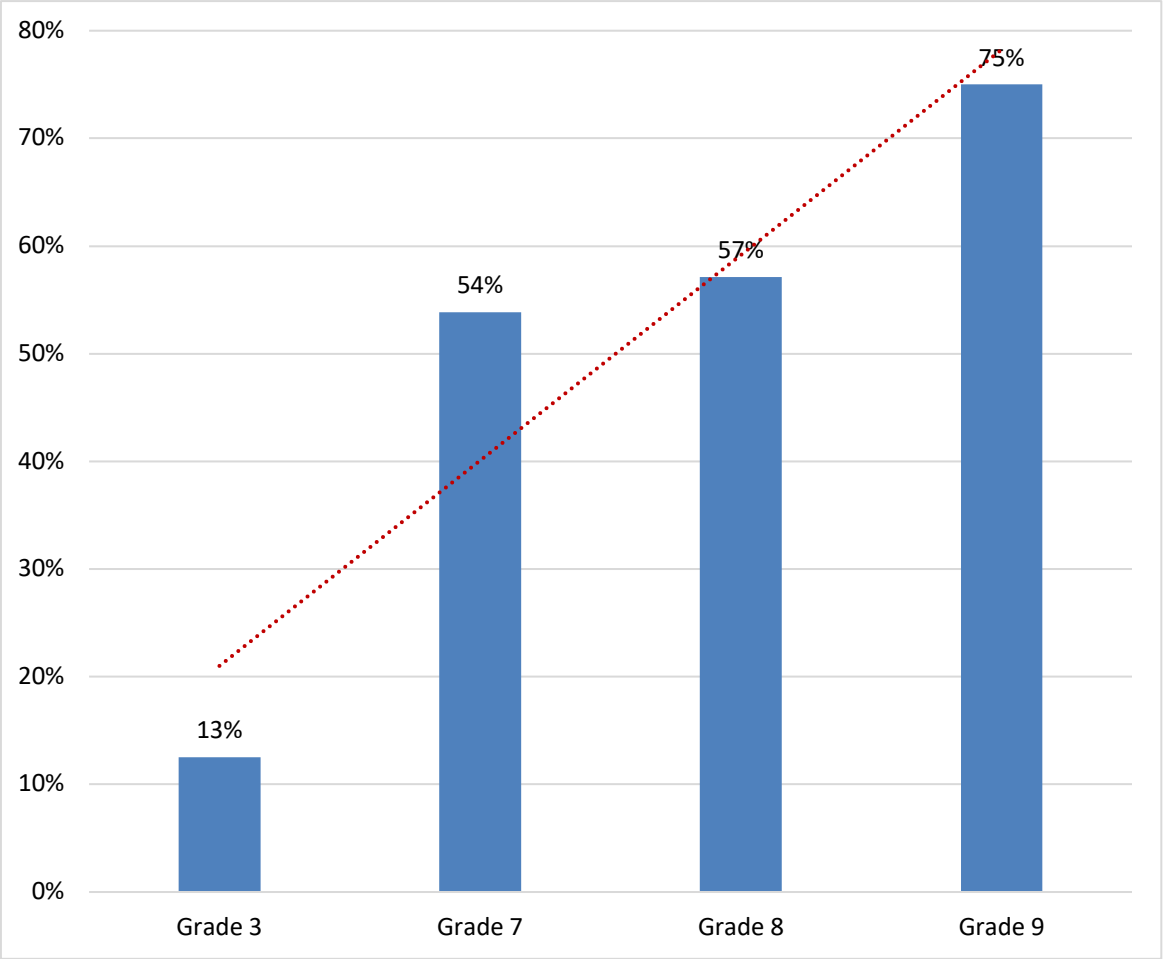


Figure 40: Proportion of tender documents with functionality scores for professional body registration of key staff

The only tender documents that included professional registration of key staff as part of the functionality scoring in the grade 1 to 6 group are 13% of grade 3 contracts. Providing evidence that this measure of competence, although it adds rigor to the evaluation process, is not largely used by clients in the lower grades. In addition, the percentages of tender documents with score allocations for professional body registration increase with the progression in grade.

The above conclusion was tested by evaluating the percentages of tender documents that stated that contractors would be eliminated from the evaluation process for lack of evidence of professional registration. Similar to Figure 40, Figure 41 also shows that the importance of professional registration of contractor staff increases from one grade to the next. This measure of competence also seems to be of more importance to clients procuring grades 7 to 9 contractors.

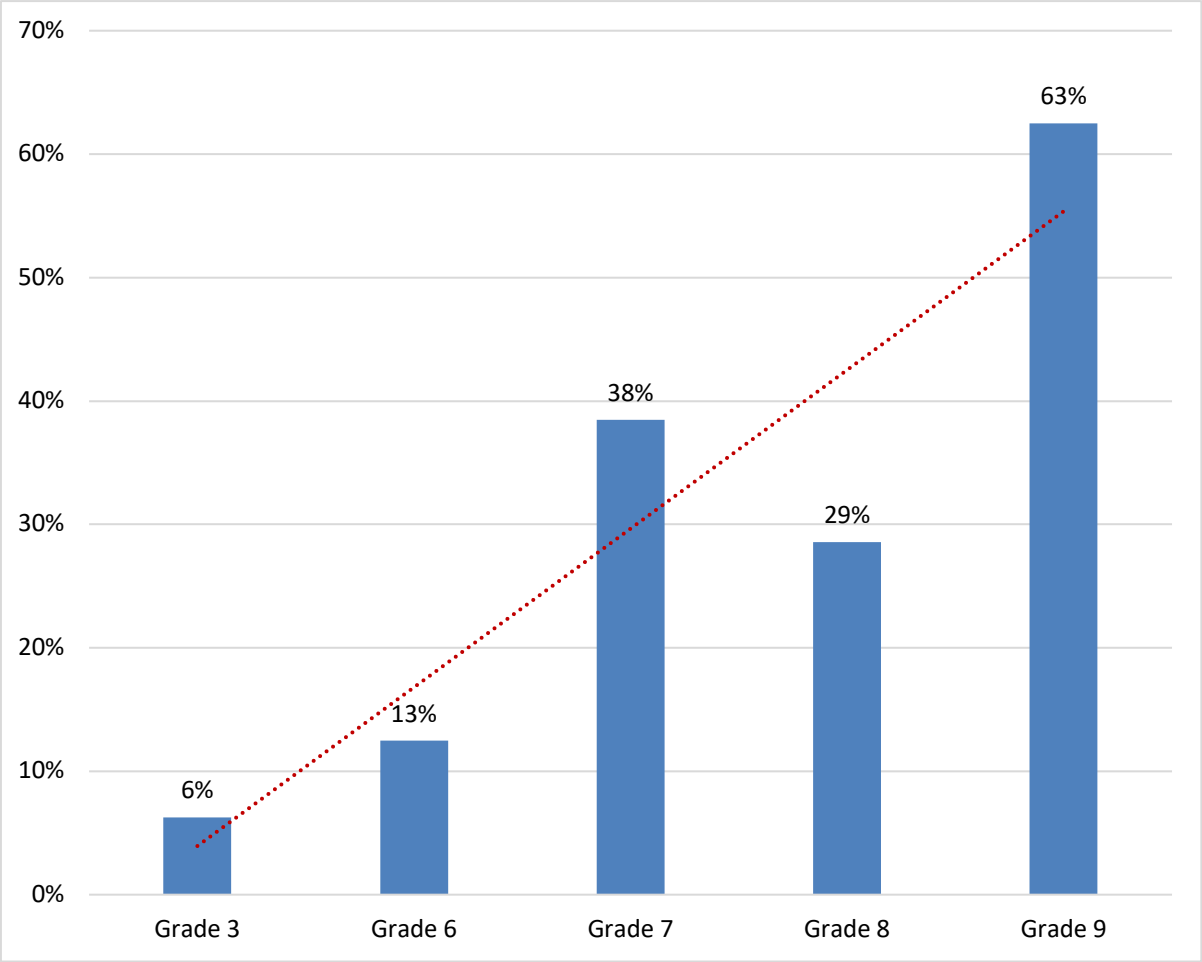


Figure 41: Percentage of tender documents where lack of professional body registration is cause for disqualification

4.4 Summary of results

This section contains the summary of the results presented in Chapter 4. This summary is presented in accordance with the major topics and themes that were addressed in this chapter. It also contains any linkages with the propositions made in this study and the major conclusions that can be drawn from the results presented above.

4.4.1 Grades 7 to 9 and international contractors' qualifications and experience

Grades 7 to 9 and international contractors' key staff were found to hold qualifications that are relevant to their specific roles within the companies. The technical and the company heads generally had CE and GB qualifications, that is, technical qualifications, while the financial heads generally had business or finance related qualifications. It also seems that it is standard

for technical heads, including COOs, to have technical qualifications. The qualification levels of the grades 7 to 9 and international companies' key staff were generally higher than those of the grades 1 to 6 contractors. These findings further demonstrate the importance of technical qualifications and formal training as alluded to by Wall and Clarke (1996), Prais and Steedman (1986), Thwala and Mvubu (2008) and Ofori (2018).

Researchers have found that lack of experience is one of the major causes of construction business failure (Kangari, 1988; Jannadi, 1997; Arslan and Kivrak, 2008; and Mohamid, 2012). In investigating the impact of this factor on business success, this study found that the company heads and technical heads of the more established companies have construction related experience, while their financial heads have business or finance related experience. The key staff of the grades 7 to 9 and the international companies were found to be on the higher end of the scale with regard to the number of years of experience in the construction industry than the grades 1 to 6 contractors. The international contractors' staff were found to have a higher number of years of experience than the South African companies.

In summation, the international companies and the grades 7 to 9 companies are generally more experienced and more technically qualified than grades 1 to 6 contractors. The key staff of the former group of contractors also generally have qualifications and experience in areas that are related to their specific job functions. Additionally, a number of the company leads, typically within the international companies, also have business or finance related qualifications, over and above their construction and engineering related qualifications. This is in support of the CIDB CMG which attribute contractor success to business acumen. Business related skills such as financial management have been said to be one of the significant factors to business success (Thornihill and Amit, 2003; and Holt, 2013).

4.4.2 Contractor selection in tender documents

In relation to the way clients in South Africa and around the world evaluate tender documents, the study found that:

- the value placed upon qualifications and experience of key contractor staff increases from one grade to the next higher grade,
- it is less likely for clients to appoint grades 7 to 9 contractors who are not technically competent than it is for the grades 1 to 6 group,

- it is possible for contractors to move on to the price and preference stage of the tender evaluation and contractor selection process without having relevant qualifications or experience, however, grades 7 to 9 contractors are generally evaluated on these criteria,
- company experience is generally regarded as a measure of contractor competence across all grades,
- each client tends to use the same evaluation criteria across all their tender documents, therefore, if the criteria is flawed and results in the selection of contractors without the necessarily skills and expertise, then that would apply for most, if not all, of their projects as an organisation,
- clients procuring grades 7 to 9 service providers employ more rigorous measures and strategies to evaluate contractor competence, and as such, attempt to measure potential performance in their evaluation processes, and
- it can also be concluded that grades 1 to 6 CE and GB contractors have no incentive or obligation to ensure that their key staff have the relevant qualifications and experience for projects since it is possible to be appointed for public sector projects without them.

CHAPTER 5: THESIS SUMMARY

This thesis sought to provide a narrative of the construction industry through seven chapters. The first chapter highlighted the research problem and study premise along with the research objectives. The background section presented the rationale for the study and the research questions that the study sought to address. The entire research was based on the premise that technical qualifications and experience of contractors' key staff are part of the distinguishing factors between grades 1 to 6 CE and GB contractors, and more established contractors (CIDB grade 7 to 9 CE and GB contractors and their international counterparts). In addition, these factors should be used as measures of competence, and as part of selection criteria in the procurement process, and that these factors can be attributed to the success of projects and the contracting companies.

The research questions and study premise were addressed predominantly through two chapters; Chapter 2, the literature review, and Chapter 4, the results and analysis chapter. The literature review was divided into four major focus areas which provide literature on the 1) factors that affect contractor success that can be attributed to contractor competence and how this can be evaluated as part of a procurement strategy; 2) construction industry and contractor development; 3) construction industry laws and regulations; and 4) a summary of findings on the competency profiles of CIDB grades 1 to 6 contractors.

The literature review showed that there are a number of factors that contractor failure or success can be attributed to. These include access to resources such as finance, plant and equipment, business skills, and contractor skills (qualifications and experience). Contractor skills at a project level along with continuous development were shown to build competence and directly impact business success. Moreover, this study found that the evaluation of contractor competence should be done as part of the procurement process, that is, prior to appointment, and that qualifications and experience are significant indicators of competence. Also demonstrated in this study was that this is generally not done for South African contractors registered under CIDB grades 1 to 6, which has contributed to their failure and inability to progress through to the higher grades (grades 7 to 9). Chapter 4 added to this evidence by showing that grades 7 to 9 contractors, and their international equivalent, have

the relevant technical qualifications and experience, and clients also evaluate them on these prior to appointment.

The researcher also found that there are noted limitations to the procurement laws and regulations in South Africa, for example the B-BBEE Act, the CIDB Act and the PPPFA. It was found that these policies are predominantly focused on affording previously marginalised groups the opportunity to participate in the economy. However, they do not place enough emphasis on skills development and competency building. In addition, the application of these policies does not allow for clients to evaluate contractor competence during the procurement process for the sake of selecting and appointing appropriately suited service providers for each project. Moreover, the evaluation of tender documents have demonstrated this notion, as the study found that clients generally do not evaluate contractor skills and experience for grades 1 to 6 contractors. Grades 7 to 9 contractors, however, are held to a higher standard with some clients also requiring their key staff to be registered with professional bodies such as ECSA and the SACPCMP. Nonetheless, the difference between the procurement strategies, in relation to contractor evaluation and selections, further evidences the non-uniformity in procurement practices. This study proposed that this is an ongoing policy limitations, which was also highlighted by Dlungwana and Rwelamila (2003), Kganyago (2004) and Gillingham (2009).

One of the solutions presented to alleviate the challenges highlighted in the problem statement and the literature review, in relation to contractor failure and the limitations to procurement policies, was construction industry development (with a focus on contractor development). Ofori (1994, 2012, 2018) highlighted that there is a need to establish a single governing body for the construction industry of any country. This organisation also has the responsibility of formulating strategies for construction industry development. The CIDB in South Africa is one such organisation. Ofori (2018) also states that one of the strategies to developing the construction industry is in developing contractor skills and competencies. Best practice was also shown in the case of Singapore where the government and the Singaporean CIDB also put policies and regulations in place to ensure that clients only appoint professionals and certified skilled workers for state projects. This, among other strategies such as making materials locally available, ensured growth and sustainability in the Singaporean construction industry (Ofori, 1994). These strategies also demonstrate the role that procurement polices

can play in transforming the construction industry and encouraging competency and skills development building on the part of contractors.

In Figure 42, the author revisits the report structure to present a summary of the major findings of this research by chapter.

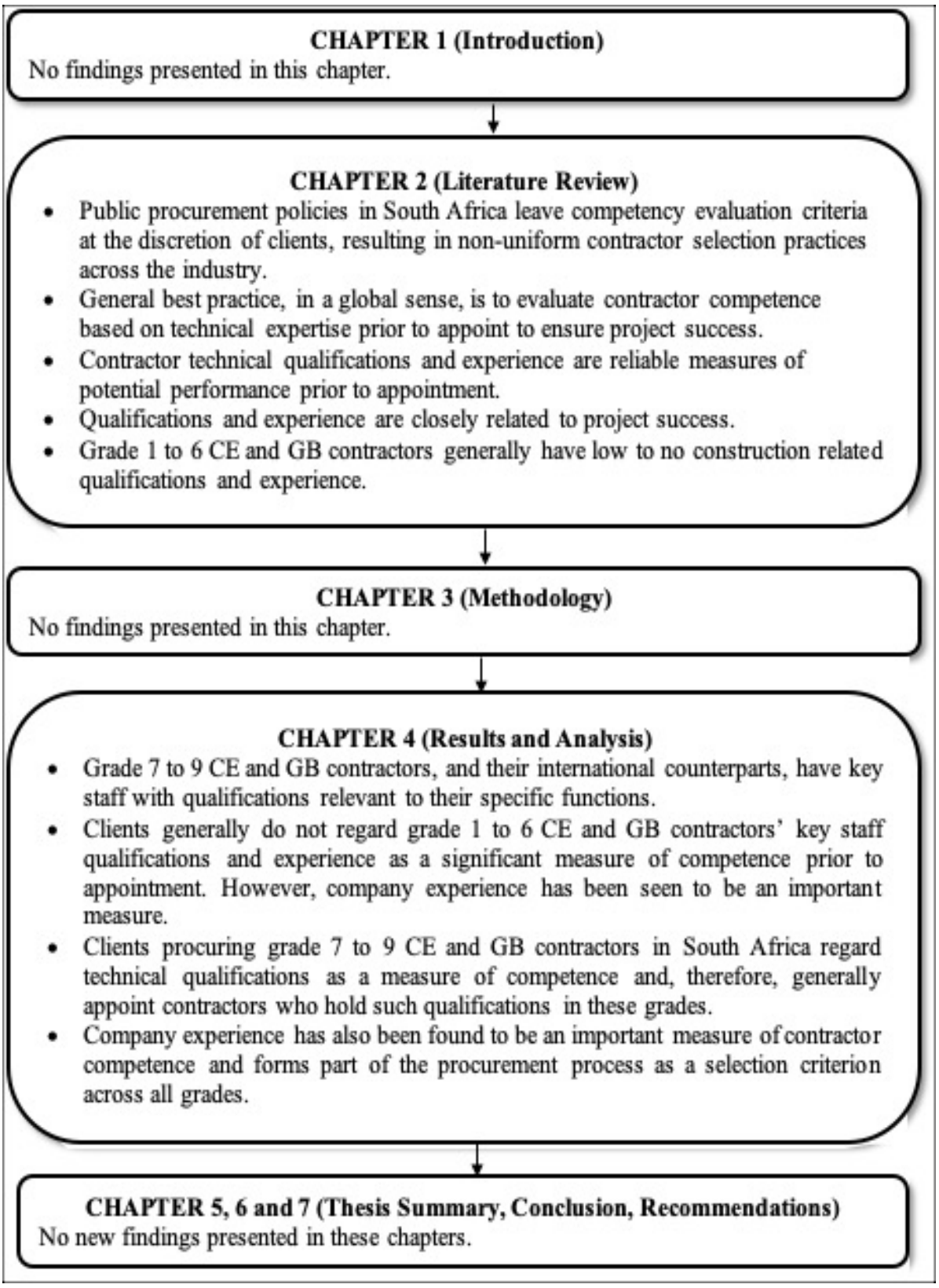


Figure 42: Summary of findings by chapter

CHAPTER 6: CONCLUSION

Research around the development and performance of emerging contractors is largely focused on project failure and mostly attributes that to contractor competence. However, in addition to the contractor competency factor, the procurement strategies in relation to contractor selection also play a great role in the potential failure or success of a particular construction project. Determining the appropriate contractor selection criteria during the procurement stage has the advantage of assessing potential performance of contractors prior to appointment and thus reduces the risk of failure and poor performance. The resultant advantages also include the elimination of cost overruns, low quality outputs, time overruns and scope changes.

In the current contractor selection criteria predominantly used in the South African public sector, price or value of bid essentially carries the most weight in the point system. This means that the deciding factor is ultimately the contractor with the lowest price. The author believes that this mostly results in contractors being appointed with very little consideration of their potential performance or competence. This may be one of the major factors that result in failed public infrastructure construction projects.

6.1 Conclusion on research premise

The research premise as presented in introductory chapter of this thesis states:

> *This study proposed that the main distinguishing factors between Grades 7 to 9 and Grades 1 to 6 contractors that can be attributed to the experience of the companies in the construction industry, and also the technical qualifications and experience of their key staff. In addition, the key or executive staff of these companies hold qualifications and experience that are related to their specific functions within the companies.*

In relation to technical qualifications of key staff of contracting companies, this research found that CIDB grades 7 to 9 contractors generally have staff with construction related qualifications. The majority of key staff in the contracting companies were found to have qualifications that are at least at a four year Bachelor's degree level. In addition, the key staff hold qualifications that are relevant to their function; for example, a construction manager would hold an engineering or construction qualification such as a Bachelor's degree in Civil Engineering, and a Chief Financial Officer would hold a finance qualification such as a

Bachelor of Commerce degree or Chartered Accountant status. Another finding was that most of the CEOs of these companies hold engineering and construction related qualifications. This was found to be one of the differences between grades 7 to 9 and grades 1 to 6 contractors – the lower grade contractors were shown to have lower to no technical qualifications (CIDB, 2011; Martin and Root, 2012; and Muzondo and McCutcheon, 2018).

In light of the educational profiles of the two groups of contractors in this study, the evaluation of these contractors in the procurement process was also different. Chapter 4 of this thesis showed that grades 1 to 6 contractors are generally not evaluated against technical qualifications, that is, in general, clients do not expect these contractors to hold the relevant qualifications and, therefore, this factor generally did not hold much weight in the selection of these contractors. Also, most grades 1 to 6 contracts also did not disqualify contractors for not having these qualifications. Equally, the score allocation for technical qualifications, even though rarely applied, were low enough to allow contractors to progress from the functionality stage to the price and preference stage of the selection process without qualifications. This implies that it is highly likely for clients to appoint contractors that are technically unqualified for projects largely based on price and B-BBEE rating. This was not the case with grades 7 to 9 contractors, where clients were found to explicitly specify that construction relevant qualifications were a key requirement in the selection process. In addition to this, clients stipulated that contractors who did not have these qualifications would be disqualified from the process prior to the functionality stage.

Similar differences were found between grades 7 to 9 and grades 1 to 6 contractors in relation to the experience of their key staff – this is also in terms of the way they are evaluated by clients in the tendering process. It was found, however, that even though the lower grade contractors did not have long track records (company experience), clients were found to agree with the study premise that this is one of the factors that can be attributed to contractor success for both grades 1 to 6 and grades 7 to 9 contractors. In this regard, it can be concluded that general industry practice agrees that the number of contract relevant projects conducted by contractors, industry references and the number of years the companies have been active – company experience – can be used as a measure of competence or success prior to appointment.

The CIDB and other authors attribute contractor success to factors such as financial capability and other resources, however, this study has gathered evidence to safely conclude that another factor that is of significance to the successful completion of CE and GB projects is contractor competence. This can be measured by technical qualifications and experience. In addition, this study also found that the qualifications and experience of key staff were the distinguishing factors between grades 1 to 6 and grades 7 to 9 contractors.

6.2 Conclusion on research questions and objectives

This subsection outlines how the research objectives and associated questions were addressed.

Objective: *To highlight the limitations in the procurement strategies used in South Africa for public infrastructure or construction projects and their effects on contractor performance.*

Research Question: *What key policies drive public procurement and contractor selection strategies in South Africa?*

Research Question: *What are some of the key limitations to the policies that drive contractor selection in South Africa?*

This research investigated the historical rationale of the policies and regulations that currently govern public procurement practices in the South African construction industry. The key focus of the study was on the policies that influence contractor selection and appointment for infrastructure projects. The historic study of policy found that the apartheid government disadvantaged non-white South Africans and left without skills and education. Through the Constitution of 1996, and the Bill of Rights, the South African government took regulatory and policy steps to "*heal the divisions of the past*". One of the measures taken by the government was through affirmative action or preferential procurement, which has a direct impact in the procurement of contractors. The findings revealed that these regulatory measures, for example; the CIDB Act 38 of 2000, the PPPFA Act 5 of and the B-BBEE Act 53 of 2003, have achieved transformation within the industry by allowing the participation of previously marginalised enterprises (black-owned and SMME contractors). However, these policies have been found to be largely focused on promoting these SMMEs and achieving equality (Dlungwana and Rwelamila, 2003; Kganyago, 2004 and Gillingham, 2009), but have not achieved transformation in terms of skills and competency development Thwala and Mvubu (2008). Ofori (1994) has shown that that, in order to effectively develop contractor

competency and the construction industry, the government must focus on developing skills and human resources.

In addition, public procurement polices do not explicitly prescribe qualifications and experience as criteria for assessment and leave competency evaluation criteria to the discretion of clients. To further investigate this, the researcher collected and analysed 114 CE and GB works-based tender documents in order to evaluated the evaluation criteria used to pre-qualify, select and appoint contractors. This study found that public sector clients do not uniformly and consistently evaluate contractors for competence. These difference were found to be most prevalent between the groups of contractors (grade 1 to 6 and grade 7 to 9), however, differences were also found to exist even in the same grade of contracts. This research has found that, for grades 1 to 6, clients generally do not place importance on technical qualifications and experience, but do hold grades 7 to 9 contractors to a higher standard. The non-uniform, client discretion based contractor competency evaluation methods and criteria may lead to clients appointing contractors without the appropriate skills and experience, and contribute to poor construction industry performance (Ofori, 2018).

Objective: *To investigate public procurement practices with regard to contractor selection or appointment in a global context.*

Research Question: *What criteria can be used during the contractor selection stage of procurement in order to effectively assess potential performance and competence and, are technical qualifications and experience important indicators of potential project performance?*

A literature review was conducted to determine the global view on some of the most effective contractor evaluation criteria. Chapter 2 of this thesis has shown that there are a number of criteria that are used industry-wide and internationally for the selection of contractors. This includes the evaluation of resources available to the contractor such as access to funds, and plant and equipment. Selection of contractors based on the lowest price has been found to be one of the most common methods of contractor selection. However, this method exposes clients poor performance and low quality outputs (Nieto-Morote and Ruz-Vila, 2012). In order to minimise such risks, clients should evaluate contractors' ability to competently and satisfactorily complete projects (Zavadskas and Vilutienė, 2006). Literature agrees with the study premise that one of the effective ways of to assess contractors' ability to complete a

project is through the evaluation of technical qualifications and experience as part of the procurement process (Nieto-Morote and Ruz-Vila, 2012; Patel, Yadav and Pathak, 2016). However, the application of this was found to vary across contractor grades in the South African construction industry. Additionally, technical qualifications were found to be less important to clients appointing grades 1 to 6 contractors than to clients looking to appoint grades 7 to 9 contractors. This gives evidence of one of the most significant differences between these two groups of contractors which can be attributed to success. Muzondo and McCutcheon (2018) also found that contractors who did not have the relevant technical qualifications and experience performed poorly in projects. Therefore, the author recommended that careful consideration and the evaluation of these competency factors is important in order to properly inform the selection of contractors for the success of any project.

Objective: *To investigate the key elements that are fundamental for the success of a construction company.*

Objective: *To determine the level and type of expertise present in larger contracting companies in South Africa and around the world.*

Research Question: *What are some of the key competency differences between larger companies (grade 7 to 9 and international companies) and smaller companies (grades 1 to 6) that can be attributed to success?*

A literature review was conducted to determine the causes of contractor failure globally and in South Africa. Holt (2013) highlighted that younger and smaller companies are more prone to failure than larger companies. Literature has shown that some of the factors that contribute to contractor failure, both at a local and global perspective, include;

- lack of skills and experience (Thornhill and Amit, 2003; Enshassi, Al-Hallaq, and Mohamed, 2006; and Mahamid, 2012),
- lack of resources such as finance, plant and equipment (Thwala and Mvubu, 2008 and Ofori, 2018), and
- lack of formal qualifications (Debrah and Ofori, 2005 and Bekker and Mashaba (2018).

A summary of four studies conducted in South Africa showing the qualifications profiles of grade 1 to 6 contractors was presented. The CIDB (2011) found 65% of the owners of grades

2 to 4 contracting companies and 45% of grades 5 and 6 had no technical qualifications. Martin and Root (2012) found that 55% of the owners of grades 1 to 4 enterprises had no formal construction industry training. Muzondo and McCutcheon (2018) showed that 44% of grades 2 to 6 contracting company owners had technical qualifications, while 45% had no technical qualifications and the training background of 11% of the of owners were unknown. That is, grade 1 to 6 CE and GB contractors generally lack construction related technical qualifications and experience.

One of the proposed strategies to alleviating contractor failure is construction industry development, particularly contractor development. Ofori (1994) adds that this is the responsibility of the government. Construction industry development should also focus on elements such as human resources development (skills development), contractor development (promoting SMME growth through technical and financial support) and the promotion of locally sourced and produced materials (Ofori, 1994). The South African government has taken positive steps towards this through the establishment of the CIDB and the implementation of contractor development programmes. The CDPs have not been effective in terms of developing the skills and competencies of emerging contractors (Dapaah, Thwala and Musonda, 2017).

On the other hand, the empirical data collected for this research, as presented in Chapter 4, has revealed that the larger contracting companies (grade 7 to 9 and international contractors) generally have staff complement with construction, engineering, project management and business related qualifications and experience. Additionally, the executive staff of these companies also have qualifications and experience that are related to their core functions. For instance, the chief financial officers would generally hold a finance or business related degree, while the technical executives would hold engineering degrees.

Data on the contractor evaluation and selection criteria has shown that grades 1 to 6 contractors are generally not evaluated for qualifications and experience, thus giving no incentive for these contractors to obtain such competencies. Grades 7 to 9 contractors, however, generally hold at least a four year degree, and the qualifications of the key staff are related to their job function within the business. Clients also typically specify that bids submitted for these grades without contract relevant qualifications will not be considered. Company experience was seen to be important for both groups in the perspective of clients.

The lower grade contractors, however, were found to have less experience than the higher grade contractors.

The findings from this research were used to formulate recommendations for contractors, clients, policy maker and for further study. The recommendations are presented in the next section (Chapter 7).

CHAPTER 7: RECOMMENDATIONS

In this final chapter, the author made recommendations that pertain to contractors, the clients that employ them, and construction and engineering industry and procurement policy makers. The recommendations took into consideration the study premise and objective, as well as its findings. Possible areas of future study were also highlighted as this study and its findings are not considered to be exhaustive with regard to the elements and theories that were explored.

7.1 Recommendations for contractors

This study also provided evidence to show that, given the difference in fundamental qualifications at grades 6 and 7, in order for contractors to break through the from grades 6 to grade 7, they would generally require key staff members to have qualifications and experience relevant to CE and GB projects. This study, therefore, recommends that contractors who wish to progress through to the higher grades, 7 to 9, should develop the technical competence of their key staff or hire staff with such skills in addition to addressing the business acumen and resources that the CIDB has highlighted to be the success factors of any construction business.

In all three modules of the CIDB CMG 101, the CIDB agrees that clients generally trust companies with a proven track record. However, the two aspects that the CIDB does not make reference to, that this study has found to have a significant impact on performance, are technical qualifications and experience of key staff. This study, therefore, recommends that contractor development programmes and guidelines be focused on developing technical skills and competence.

7.2 Recommendations for clients

Figure 43 is an illustration of the recommended tender evaluation process. The proposed process incorporates the current standard evaluation system, but also ensures that relevant technical qualifications take precedence by disqualifying tenderers who do not have such qualifications in Part 1 of Stage 3. This ensures that no contractor can move through to the scoring stages (Part 2 of functionality, and Stage 3; price and preference) without the relevant qualifications, and that clients still appoint contractors on fair and competitive financial offers.

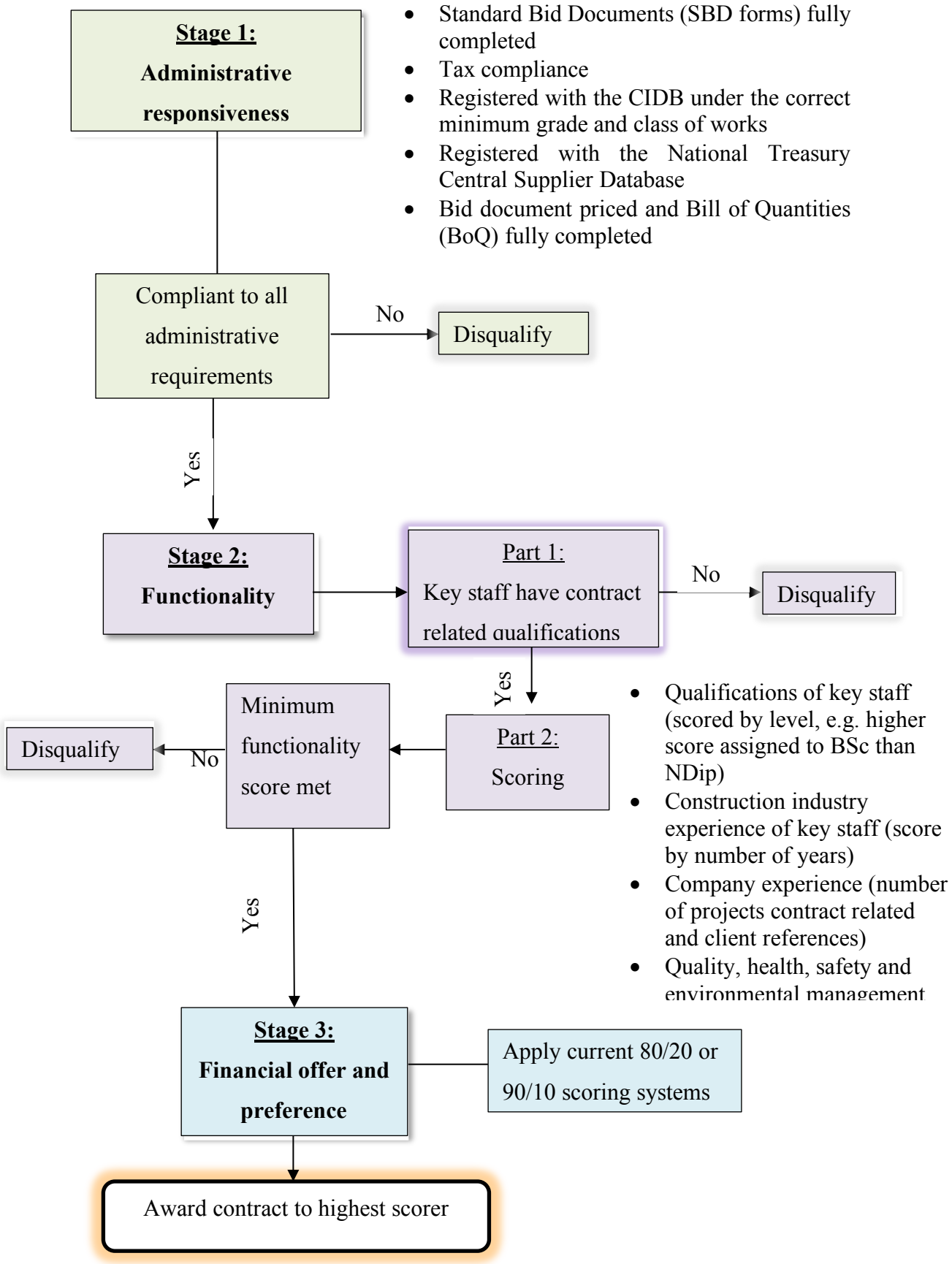


Figure 43: Recommended tender evaluation and contractor selection process

7.3 Recommendations for policy

Procurement policies and regulations in South Africa have made efforts to ensure uniformity in the tendering process and the selection of contractors for public sector contracts and how they are administered. However, this study has found a limitation in that these regulations do not make recommendations on the functionality part of the evaluation and how clients are meant to evaluate contractor competence. This has been found to be non-uniform for clients across the South African construction industry. It is recommended that regulations related to the selection of contractors for public sector projects should include guidelines on competency evaluation prior to appointment (similar to the proposed process on Figure 43). These guidelines should take into consideration the importance of technical qualifications and experience to potential performance and success. In addition to this, efforts by the government should focus on technical skills development of emerging contractors over and above preferential procurement.

7.4 Recommendations for further study

Muzondo and McCutcheon (2018) not only demonstrated that the key staff of grades 2 to 6 CE and GB contractors typically do not have construction related technical skills and experience, but also went on to demonstrate that, due to this limitation, they perform poorly in projects. This study went on to show that the key staff of the more established contractors, grades 7 to 9, generally have CE and GB related technical qualifications. The scope of this study, however, does not demonstrate the relationship between grades 7 to 9 contractors' qualifications and experience with project performance, and instead assumes that their CIDB grade, financial capability and annual turnover are a reflection of success. There is an opportunity for further study into the projects that these established contractors have completed to evaluate their project performance. This can be done in the same manner that Muzondo and McCutcheon (2018) evaluated project performance of grades 2 to 6 contractors by using the DoD indicator, along with the evaluation of quality, cost and client satisfaction factors, for instance. Further research may be required in relation to the phrasing or wording of policy or industry procedures, especially in relation to the CIDB. This is to ensure that policy is structured in such a way as to ensure effective procurement strategies that are uniform across all public sector clients. The procurement strategies that this study proposed are to ensure that contractor competence is evaluated prior to appointment, while still

maintaining the principles of preferential procurement, diversity, and transformation as per the B-BBEE Act.

The evaluation of tender documents for the purpose of evaluating client contractor selection criteria was limited to public sector clients as the predominant funders of infrastructure projects. Further research may be conducted to evaluate the procurement procedures, strategies and best practices used by private sector clients for the selection of contractors, more specifically in relation to pre-qualification prior to appointment. Although literature covered in this thesis demonstrated some best practices, and this study also made some recommendations; the study of private sector procurement and pre-selection practices may add to best practices that may not have been covered by this thesis.

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APPENDIX A: CIDB CONTRACTOR REGISTRATION CATEGORIES

DEFINITION	BASIC WORKS TYPE	EXAMPLES
Civil Engineering (CE)		
Construction Works primarily concerned with materials such as steel, concrete, earth & rock & their application in the development, extension, installation, maintenance, removal, renovation, alteration, or dismantling of building and engineering infrastructure	Water, sewerage, roads, railways, harbours and transport, urban development & municipal services	• Structures such as cooling tower, bridge, culvert, dam, grand stand, road, railway, reservoir, runway, swimming pool, silo or tunnel. • The results of operations such as dredging, earthworks and geotechnical processes. • Township services, water treatment and supply, sewerage works, sanitation, soil conservation works, irrigation works, storm-water and drainage works, coastal works, ports, harbours, airports and pipelines
General Building Works (GB)		
Construction Works that: a) are primarily concerned with the development, extension, installation, renewal, renovation, alteration, or dismantling of a permanent shelter for its occupants or contents; or	Works other than those categorized as: • civil engineering works • electrical engineering works • mechanical engineering works • specialist works	• Buildings for domestic, industrial, institutional or commercial occupancies • Car ports • Stores • Walls

DEFINITION	BASIC WORKS TYPE	EXAMPLES
b) cannot be categorized in terms of the definitions provided for civil engineering works, electrical engineering works, mechanical engineering works, or specialist works		
Electrical Engineering Works – Building (EB) – Electrical certificate required		
Construction Works that are primarily concerned with the installation, extension, modification or repair of electrical installations in or on any premises used for the transmission of electricity from a point of control to a point of consumption, including any article forming part of such an installation	All electrical equipment forming an integral and permanent part of buildings and/or structures, including any wiring, cable jointing and laying and electrical overhead line construction	• Electrical installations in buildings • Electrical reticulations within a plot of land (erf) or building site • Standby plant and uninterrupted power supply • Verification and certification of electrical installations on premises
Electrical Engineering Works – Infrastructure (EP)		
Construction Works that: a) are primarily concerned with the development, extension, installation, renewal, renovation, alteration, or dismantling of a permanent	Building & ancillary works other than those categorised as: • civil engineering works • electrical engineering works	• Buildings for domestic, industrial, institutional or commercial occupancies • Car ports • Masonry (brick, block or stone) and lightly reinforced or

DEFINITION	BASIC WORKS TYPE	EXAMPLES
shelter for its occupants or contents; or b) cannot be categorised in terms of the definitions provided for civil engineering works, electrical engineering works, mechanical engineering works, or specialist works	• mechanical engineering works • specialist works	unreinforced cast in-situ concrete walls and timber fences • Stores • Walls
Mechanical Engineering Works (ME)		
Construction Works that are primarily concerned with the development, extension, installation, removal, alteration, renewal of engineering infrastructure for gas transmission and distribution, solid waste disposal, heating, ventilation and cooling, chemical works, metallurgical works, manufacturing, food processing and materials handling	• Machine systems including those relating to the environment of building interiors • Gas transmission and distribution systems • Pipelines • Materials handling, lifting machinery, heating, ventilation and cooling, pumps • Continuous process systems, chemical works, metallurgical works, manufacturing, food processing such as that in concentrator machinery and apparatus, oil and gas wells, smelters, cyanide plants, acid plants, metallurgical machinery, equipment and	• Air-conditioning and mechanical ventilation • Boiler installations and steam distribution • Central heating • Centralised hot water generation • Compressed air, gas and vacuum installations • Conveyor and materials handling installations • Continuous process systems involving chemical works, metallurgical works, oil and gas wells, acid plants, metallurgical machinery, equipment and apparatus, and works necessary for the beneficiation of metals,

DEFINITION	BASIC WORKS TYPE	EXAMPLES
	apparatus, and works necessary for the beneficiation of metals, minerals, rocks, petroleum and organic substances or other chemical processes	minerals, rocks, petroleum and organic substance and other chemical processes • Dust and sawdust extraction • Kitchen equipment • Laundry equipment • Refrigeration & cold rooms • Waste handling systems (including compactors)
Source: CIDB (2011a)		

APPENDIX B: CIDB CONTRACTOR REGISTRATION FORM EXTRACT

Source: CIDB (2016)

APPENDIX C: TENDER EVALUATION CRITERIA FOR GOVERNMENT TENDERS

F.3.11 Evaluation of BID Offers

The procedure for evaluation of responsive BID Offers will be **Method 4: Financial Offer and Preferences**. BIDs will first be evaluated for Quality. The responsive BIDs for Quality will then be evaluated for Price and Preferences and the BID with the highest combined score for Price and Preferences, is the preferred BID.

The procedure for the evaluation of responsive BIDs is:

a) Quality – **PRE - QUALIFICATION**

Refer to table below titled "Adjudication using a Point System"

b) Financial

Refer to clause F3.11.2 of this BID document and utilising Formula 2. The number of BID evaluation points for financial offer shall be 90.

c) Financial offer and quality combined – **NOT APPLICABLE**

d) Preferences

In order to enforce the Implementation of the CRDP and to ensure local economic development, for procurement above R30 000, Department and Public Entities must allocate preference points as follows: Up to 10 points (for financial values over R1 000 000) will be awarded to service providers who complete the referencing schedule and who are found to be eligible for the preference claimed.

The preference points will be allocated according to the table below:

PREFERENCE (B-BBEE Status Level of Contributor)	
• Level 1	10 points
• Level 2	9 points
• Level 3	8 points
• Level 4	5 points
• Level 5	4 points
• Level 6	3 points
• Level 7	2 points
• Level 8	1 points
• Non-compliant contributor	0 points

The contractor will be expected to remunerate the local workers as per the guidelines stipulated by the EPWP Framework.

Adjudication Using a Point System

Responsive bids will be adjudicated using a point system which awards points on the basis set out in the table here following and described in subsequent sub-paragraphs.

QUALITY & BID EVALUATION CRITERIA FOR PREFERENCE AND PRICE	
CRITERIA	**WEIGHTING**
QUALITY – PRE QUALIFICATION	
Infrastructure and Resources available	**10**
• Plant and Equipment available owned/hired by the Bidder 10 points	
Understanding of the Scope	**25**
• Program of Works and Detailed Method Statement 15 points	
• Bill of Quantities Rates 10 points	
Staffing Profile	**10**
• Details of staff available for this Contract 10 points	
Previous Experience	**30**
• Experience relevant to this technical field 20 points	

• Experience in contracts of similar value 10 points	
Financial Ability to execute the Contract	**15**
• Proposed demand guarantee 5 points	
• Bidder's Bank rating 10 points	
CRDP Proposal	**10**
• An undertaking clearly indicating commitment to partner, guide, empower and work with a benefiting registered local Cooperative 10 points	
TOTAL QUALITY	**100**

NB: The minimum score required for quality, in order to qualify for price evaluation = 50 points out of 100 possible (50%).

Ranking Guidelines:	**% of points scored**
Non-existent or very poor	0%
Some evidence of meeting requirement	20%
Demonstrates capability not strong	40%
Meets requirement well	50%
Very well suited and responsive to requirement	80%
Perfectly suited, meets complete requirement	100%

B-BBEE STATUS LEVEL OF CONTRIBUTOR		
PREFERENCE (B-BBEE Status Level of Contributor)		**10**
• Level 1	10 points	
• Level 2	9 points	
• Level 3	8 points	
• Level 4	5 points	
• Level 5	4 points	
• Level 6	3 points	
• Level 7	2 points	
• Level 8	1 points	
• Non-compliant contributor	0 points	
PREFERENCE (B-BBEE Status Level of Contributor)		**10**

F.4.2 Preferential Procurement Policy

a) General conditions

i) The following preference point systems are applicable to all BIDs:

- the 80/20 system for requirements with a Rand value of up to R1 000 000; and
- the 90/10 system for requirements with a Rand value above R1 000 000.

ii) The value of the works is estimated to exceed R1 000 000 and therefore the 90/10 system shall be applicable.

iii) Preference points for this BID shall be awarded for:

- Price; and
- Specific Goals through Direct preferencing, as specified b) below.

b) The points for this BID are allocated as follows:

POINTS

i) Price

Rand value of above R 1 000 000 90

ii) Direct Preferencing **90/10**

B-BBEE Status Level of Contributor

PREFERENCE (B-BBEE Status Level of Contributor)		**10**
• Level 1	10 points	
• Level 2	9 points	
• Level 3	8 points	

• Level 4	5 points	
• Level 5	4 points	
• Level 6	3 points	
• Level 7	2 points	
• Level 8	1 points	
• Non-compliant contributor	0 points	
PREFERENCE (B-BBEE Status Level of Contributor)		**10**

TOTAL POINTS

100