A framework for awarding construction projects through term contracts

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ABSTRACT

The term contracts in the construction environment often involve requirements for construction projects that originate from project managers that manage both capital and operational expenditure. The term contracts mainly involve operational services for maintenance of business infrastructure and may not adequately address the risks and specific complexity of work in construction projects, due to the complexity of work in construction projects.

A possibility was identified in term contracts of infrastructure in the civil construction environment of a large international petrochemical business in South Africa, whereby construction projects could be executed through these contracts. This concept would minimise the time required to award construction projects to contractors and the costs involved with this process. The motivation behind this concept was that the maintenance contracts were already established, after a legally governed and compliant tender process was followed and where a sound business relationship exists between the client and contractor. Although there may be many similarities, the merging of the two concepts in the title initiated different arguments, such as the risk that differ in these instances as well as other main aspects of term contracts and construction projects that do not align, in terms of work complexity and supplier capabilities.

Research was conducted to determine whether it would be possible to execute construction projects through existing term contracts and secondly to develop a framework that could guide procurement management personnel to address all the important aspects for the success of this method of execution. The overall description of the research project is described in the first chapter and an overview provided on this study. This was followed by a literature study on the main concepts in the title, including the important similarities and differences found amongst these concepts. A top-down approach was followed with a review of the construction industry, supply chain management, term contracts and thereafter construction projects and project management. The final section of the literature review compares the term contracts to the construction projects and aims to identify similarities and differences in these main concepts in the title of the study.

The research methodology followed was realised through a survey, in the distribution of a questionnaire to respondents from various businesses in the construction, petrochemical and mining industries. The petrochemical company and its contractors (local businesses) formed part of the study. There were 111 completed questionnaires received, from a sample of 300 respondents. The data gathered from the survey indicated that procurement management and relationship management are two key focus areas for successful combination of the construction projects with term contracts.

In the final chapter the framework developed from the findings indicated that collaboration and alignment between contracting or procurement specialists and project teams could ultimately reduce risks, time and cost in the execution of the projects through a hybrid construction maintenance (HCM) contract.

In closing, the recommendations for effective application of the framework are indicated, which could reduce a business's risk. Contract and project managers may realise time and cost saving due to proper planning of procurement activities. Suggestions for future research are listed thereafter, based on the findings regarding the main concepts in the title. The contribution of the business science is the conceptualisation of a framework upon which construction projects and term contracts can be combined and executed in a concise manner, that develops a new efficient manner of streamlining activities in a business through optimisation of the construction supply chain.

Keywords: supply chain management, term contract, construction project, project management, procurement management, construction supply chain.

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KEY TERM DEFINITIONS

Bidder	The business that is bidding and competing against others for work; supplier participant in a tender.
Client	The party that issues the tender and requests or purchases goods or services, also referred to as client or owner of business.
Contractor	The party that delivers the goods or services; often the term 'supplier' is also used in supply chain management.
EPC	Engineering, Procurement and Construction
EPCM	Engineering, Procurement, Construction and Management
Term contract	An agreement between two parties for the delivery of goods or rendering of services for a certain period of time, generally a few years.
Project	A relatively short-term, temporary undertaking to deliver a unique result such as a product or service that has not been delivered in such a way before.
Principal agent	Also referred to as 'consultant', a person or entity acting for and on behalf of the client.
SASOL	South African Synthetic Oils and Lubricants
Tender	A request to a specific supplier market to submit quotations or proposals for rendering services or supplying goods.

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A FRAMEWORK FOR AWARDING CONSTRUCTION PROJECTS THROUGH TERM CONTRACTS

CHAPTER 1: NATURE AND SCOPE OF STUDY

1.1 Introduction

This chapter provides an overview of the need for the study to be conducted as well as the core concepts to be investigated, by listing the importance of the study, main objective and secondary objectives of creating a framework as stated in the title. Thereafter, the methodology of the research design is described, followed by the scope of the study and the known limitations.

1.1.1 Background

Procurement departments in many private and public businesses are often very good at compiling and issuing tenders, as well as negotiating and awarding contracts that add value to their business (Turner, 2010:155). It is further stated that after the contract is signed, it is not effectively managed and optimally utilised throughout its lifecycle, which means the total value-adding benefits are not fully realised.

Competitive tendering is undertaken when a purchasing business advertises its intent to procure services, products or materials by issuing a tender document to different bidders, who then compete to win the business (Stanley, 2011). Engineering and construction projects and term contracts are mainly awarded to contractors by public institutions and private businesses that issue tenders when the need arises. A construction contract or project both involve an agreement negotiated to enable and govern the construction of an asset or a combination of assets, which are interrelated in technology, design or function (Koppeschaar *et al.*, 2014). For purposes of this study, distinction needs to be made between a project and a term contract.

A project is defined as a relatively short-term, temporary undertaking to deliver a unique result such as a product or service that has not been delivered in such a way before, but may have been previously delivered in a similar way (Watt, 2014:10). A term contract (hereinafter referred to as a 'contract') can be defined as an agreement between two parties to maintain one or more assets owned by another party, which can be common across industries (Wilkinson, 2013). The assets to be maintained can be equipment, buildings, facilities, landscape, information technology and systems. Term contracts for the maintenance of assets can be found in the retail, medical, information technology, manufacturing, petrochemical or other industries (Wilkinson, 2013).

The party or business that is purchasing, requesting or ordering goods or services or both, shall be referred to hereinafter as the ‘client’. The party delivering the goods or services or a combination of both, shall be referred to as the ‘contractor’. A term contract for maintenance is usually awarded for a period of two to five years, depending on the business’s procurement policy and procurement laws and regulations of the country in which it conducts business.

1.1.2 Problem statement and core research question

Many businesses in different industries issue tenders to various contractors for once-off large projects, while they already have a term contract in place for related or similar services, with a specific contractor. By linking two or more services or products in a combined agreement with a contractor, which would otherwise have been procured with two separate tenders, a business can realise more value and negotiate better prices; this is called ‘linkage’, a strategic supply chain management concept (Turner, 2010:28). Linkage is a concept that will therefore be examined in this study to determine whether it will be advantageous for a business to ‘link’ or incorporate projects into its term contracts. The concept of incorporating projects into maintenance contracts originated from the capacity constraints experienced in the procurement department of an international petrochemical business, whereby the procurement personnel did not have the time to issue numerous tenders for projects and term contracts, which in essence contained the same materials and services.

There have been various opportunities and problems identified in the supply chain of the project-based construction industry (Segerstedt & Olofsson, 2010:351). According to Claycomb and Frankwick (2010), there is not enough research on the discontinuous nature of exchanges in the construction industry project environment, as the major supply chain relationship management literature contributions only address continuous exchanges in client-contractor relationships of long-term periods. It is also stated by the same authors that there are many challenges due to the discontinuous nature of projects, such as uniqueness of project scope, socio-, technical- and political terms, complexity of works, and the number of parties involved. Current and future development of modular building systems may also pose new opportunities for contracting in the construction project environment. The aim of this study is to resolve the following problems:

There is no known framework or guideline available to procurement and project management personnel to execute construction projects through term contracts. Another problem exists that the issuing of a project to another contractor takes time and increases costs due to numerous negative factors that add on to this problem. According to Angst, Wowak, Handley and Kelley (2017:1132) several suppliers competing against each other for lower prices sounds like good practice, but under longer-term contracts, it destroys the possibility of a good relationship between contractor and client.

Relationship deterioration can develop between contractor and client, as trust is not reinforced by issuing work to other contractors when there is a contract already in place and readily available for use; another factor of this problem is when the contract term is over, bidders would prefer not to bid for a maintenance contract as they may be able to earn higher profits through once-off issued tenders or projects for large volumes of work (Mangano & De Marco, 2014:247). A single sourcing strategy may encourage suppliers to take advantage of economies of scale and cut input costs, invest smarter and thereby reduce production costs or improve service delivery and value (Yim, 2014:350).

Secondly, when a contractor is under pressure to lower rates, they might submit a bid based on lower quality materials and incompetent cheap labour, which will increase the true costs of the contract in the end (Stanley, 2011). In many cases, the bidder often tenders very low to outbid the other contractors, in order to gain the bid, but ends up with less than enough resources to perform the required services, or being unable to adhere to engineering changes when they realise the cost impact (Morledge & Smith, 2013:25).

Single sourcing can enable a client to focus on developing longer-term relationships with suppliers that may result in increased buyer power, total transaction costs being reduced and economies of scale realised through consolidated spending (Angst *et al*., 2017:1132). Tender processes are lengthy and costly to a business: when public or private businesses launch a tender process, it may sometimes take months or even years to appoint a successful contractor; therefore, a client may wait very long for services to be rendered that may be required urgently, thereby creating a great deal of frustration for the purchasing business or client (Stanley, 2011).

A business's operational and financial risk increases as a newly appointed contractor is not necessarily aware of the operational or technical requirements of the client's business and the relevant industry. It is often found that suppliers aim to lower costs by lowering quality and providing poor service delivery, which can be detrimental to the client as the client maintains the risk of running into claims after the work was done or the project completed and overspending their predetermined budget (Morledge & Smith, 2013:25).

1.1.3 Core research question

What advantages and opportunities exist in the execution of a construction project through a term contract and can a framework be utilised for this linkage of concepts?

1.1.4 Research objectives

The research objectives are divided into primary and secondary research objectives. The primary research objective is to:

1.1.4.1 Primary research objectives

To develop a general framework that can be used to award construction projects through existing term contracts that have been put in place through the formal tender process, which may guide contract management specialists and project managers to mitigate business risks, increase performance and add value to the procurement management process within a business.

1.1.4.2 Secondary research objectives

Flowing from the primary research objective, the secondary research objectives are to:

- Do a literature review of the definition, attributes and characteristics of projects, term contracts and related purchasing and supply management concepts;
- Identify key aspects and general structures of projects and term contracts respectively through a literature review;
- Collect data through a survey based on key aspects and general structures of projects and term contracts;
- Compare key aspects and general structures or frameworks and attributes of the two main procurement concepts and forming patterns or alignment from the constructs developed;
- Develop an approach for the linkage of projects to term contracts in a governed and sustainable manner; and
- Make recommendations and conclusions for maintaining separation in execution projects and term contracts.

1.1.4.3 Importance and benefits of proposed study

The research conducted in this study adds value to employees within a business, who are working in the contract management and project management environments, in the following ways:

- Prior to this study, there was little research available on the combined procurement concepts in the title of the study; however, there is research available on both these topics for project management and contract management respectively, and therefore this study may develop some interesting findings in determining how to execute construction projects through term contracts.

- Expenditure increases on contracts versus once-off purchased spending (single orders or projects awarded to contractors), is in many cases a key performance indicator of contracting and procurement personnel. An increase in cost containment and cost saving initiatives could mean higher performance appraisal to these employees.
- Target performance areas such as channelling external spend through term contracts and minimising spend through single once-off purchasing, means the different business risks are comprehensively addressed in a contract with standard agreed terms and conditions, which cover all possible scenarios. Through this, again, the financial risks may be reduced.
- A relationship between contractor and client may be improved in terms of trust and loyalty or other aspects. The client can benefit from maintaining good relations with its contractors in various ways, which will be determined in the study.
- At present, no known framework, guideline or process is available on a structured approach to execute construction projects by utilising existing term contracts. This study may set a guideline, framework or work instruction to project managers, contract and procurement personnel and contract managers on how to be able to do this successfully and mitigating all the possible business risks.

1.2 Field of study

The field of study encompasses construction projects and facilities, and asset maintenance services. Both of these include single-discipline and multi-discipline civil and mechanical engineering and construction services. The businesses participating in the study, either delivered a service in construction projects or term contracts as an agent or contractor or procured services as a client in the petrochemical or mining industries.

1.3 Scope of study

Construction projects and term contracts in the petrochemical and mining industry, specifically focusing on input from engineering and construction businesses that execute projects and term contracts for and on behalf of South African Synthetic Oils and Lubricants (SASOL).

1.4 Geographical scope

The geographical scope of the study in terms of data gathered is limited to the business: SASOL in South Africa, and specifically engineering and construction businesses that execute construction and engineering works for SASOL.

1.5 Research methodology

In the literature study, research was conducted through the use of journal articles found in Google Scholar, published from 2009 onwards to ensure relevancy of the topics covered. E-books that were utilised for research were found on the North-West University (NWU) library site and ProQuest E-books website. A few older sources were used, as these were the original sources of literature information. Empirical research was conducted through a research survey by means of quantitative data gathered through a survey questionnaire, compiled by the researcher.

The research survey questionnaire was compiled based on the main topics that arose from the literature and constructs were created from these topics. There are six constructs from which 55 questions were developed and included in the questionnaire. The questionnaire was sent to the Statistical Consultation Services of the NWU to determine its validity and evaluate the questions, thereby ensuring the questions are not leading respondents in the study to answer in a certain manner. The questionnaires were emailed to different construction and engineering businesses in South Africa, including employees in different business units of SASOL. After an adequate total response of 111 questionnaires were received by the researcher from a sample of 300 questionnaires distributed, it was sent to the Statistical Consultation Services of the NWU to analyse data using statistical methods through a program called the Statistical Package for the Social Sciences (SPSS). The analysis of data was evaluated by the researcher, findings reported and conclusions drawn, which were compiled into a usable contracting framework and recommendations at the end of the study.

1.6 Delimitations and assumptions

The scope of research and assumptions that were made are described hereunder.

1.6.1 Delimitations

The client is a public or private business or any other form of business that procures services or materials or a combination thereof, from another entity, whether an agent, consultant, engineering house or construction business. The client, upon which research was conducted for purposes of this study, is a South African petrochemical business that operates globally. Several other public and private businesses in the construction industry were included, that serve as contractors to the client. The study will conduct research on project management and contract management in the petrochemical and construction industries.

1.6.2 Assumptions

Due to the vast amount of information and research available, as well as the extensive literature that can be researched within project management or contract management, this study will be limited to main factors of the two concepts, as the time and capacity of the researcher to complete the study in the required time frame will be very limited.

1.7 Limitations to the study

The researcher experienced a number of limitations to this study, which, if addressed, could greatly assist with ease of extending future research on the subject and title.

1.7.1 Limited time to complete the study

This study is completed as a partial requirement for a Master's degree in Business Administration (MBA) mini-dissertation, within a period of two calendar years. The construction projects and term contracts referred to in this study are either single-discipline or multi-discipline, though it will mainly focus on civil engineering and construction as the main discipline under review. The field of supply chain management in the construction industry has many other aspects that could not be covered due to the limited time to complete this study. More time is required in order to accurately address the merging of construction projects into term contracts in other industrial and production industries. Even though the principles used in this study could be applied to other industries, the focus of this study was limited to construction projects and term contracts in the petrochemical and mining industries and specifically engineering and construction businesses that execute projects and term contracts for and on behalf of SASOL and other large entities in similar industries.

1.7.2 Limited geographical scope of the study

The geographical scope of the study in terms of data gathered is limited to the client, specifically SASOL in South Africa, and other contracted engineering and construction businesses that execute construction and engineering works for SASOL. The geographical scope can be extended in a supplementary study to include businesses that execute construction services for other large international entities and government institutions, or public entities.

1.8 Layout of the study

The layout of this study is indicated in Table 1.1, listing the chapters with the corresponding headings:

Table 1.1: Study layout

Chapter number	Chapter heading
1	Nature and scope of study
2	Literature review
3	Research methodology
4	Results and findings
5	Conclusions and recommendations

CHAPTER 2: LITERATURE STUDY

2.1 Introduction

This chapter shall provide a review of current literature, firstly on general aspects of the construction industry and complex aspects of the construction supply chain. It aims to evaluate the two main concepts separately, namely construction projects and term contracts. In this review of literature, the main characteristics, advantages and disadvantages of each are evaluated, where after a combination of the two concepts is considered by comparing similarities and identifying differences in the concepts when compared. In conclusion, there will be a deliberation on the combination of the two concepts.

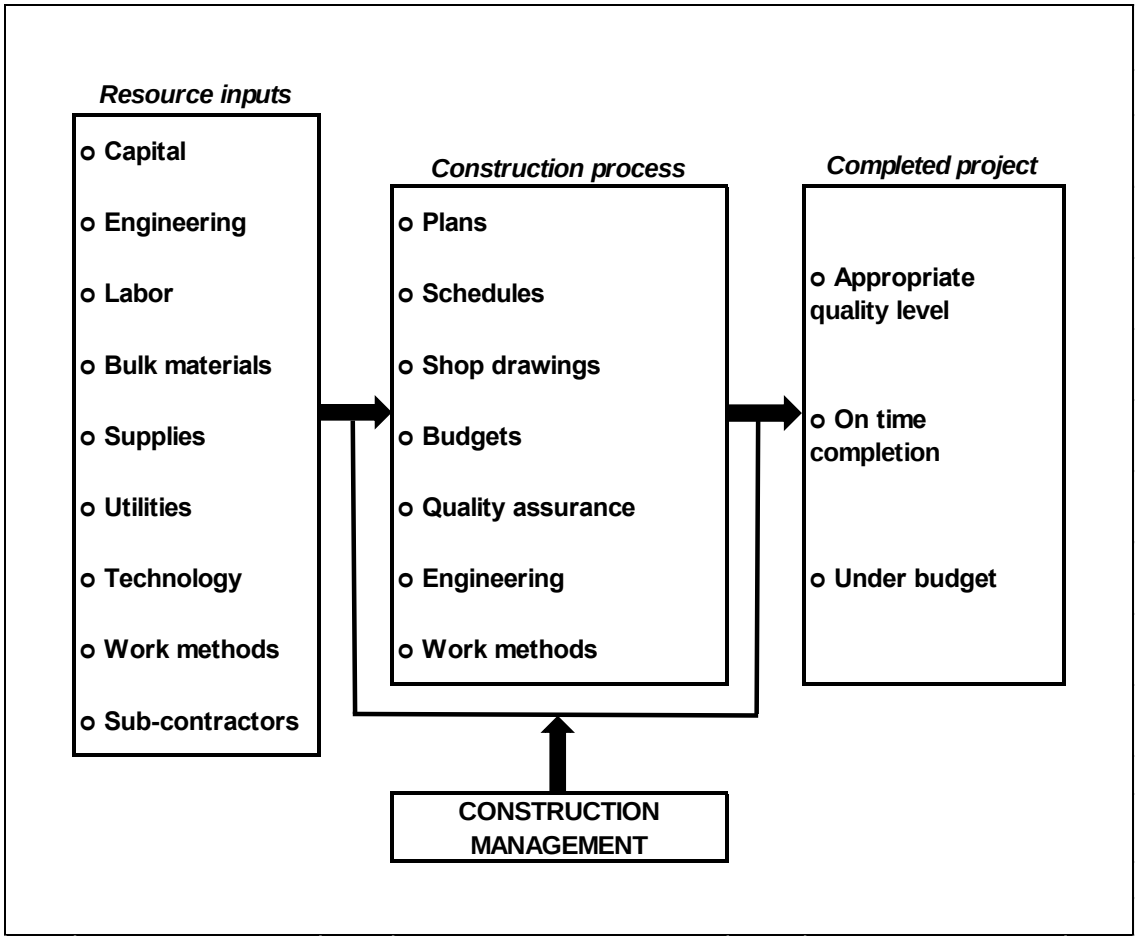
2.2 The construction industry

When aiming to describe the industry in which a production plant exists that manufactures construction materials, it becomes evident that the boundaries between the construction and manufacturing industries are unclear and indeterminate (Segerstedt & Olofsson, 2010:347). It is difficult to characterise the construction industry due to differences in technological advancement and usage, output differences and size of business operations in the commercial, infrastructure, private, public, residential and industrial sectors (Benton & McHenry, 2010:5). The construction industry is notorious for being discontinuous in nature and project-based, yet there is a need for maintaining the equipment, assets or facilities long after these have been constructed (Segerstedt & Olofsson, 2010:351). Figure 2.1 provides a depiction of the complete construction transformation process, which indicates what main activities and general inputs are required to complete a construction project. During the construction tranformation process there are resource inputs that are used in the construction process, these are governed and directed through construction management in order to result in a completed project.

2.3 Construction supply chain management

Meng (2012:189) states that supply chain management is the process whereby relationships are managed between contractors and clients in order to ensure lower costs and higher value in the entire supply chain. Construction supply chain management (CSCM) is the management of a network of multiple businesses that are integrated and coordinated through construction processes and activities, that cross traditional intra-organisational boundaries in order to work towards optimising efficiency and operations in order to establish collaborative long-term stakeholder relationships (Aloini *et al.*, 2012:738). CSCM can be defined as strategically managing the upstream and downstream value chain of several networks of businesses independent from one another, and the integration of processes and activities in order to deliver a finished project and value to the client (Benton & McHenry, 2010:8).

Figure 2.1: Construction transformation process



Source: Benton and McHenry (2010:28).

2.3.1 Sourcing and procurement

Procurement is the process of applying sound business practices to maximise a business's value through the purchasing of goods and services, therefore delivering the right commodity at the right time in the right amount at the right location (Sollish & Semanik, 2012:1). Effective procurement of services or goods requires detailed specifications, an investigation of available suppliers in the market, a clear selection and appointment process and a method to evaluate the supplier and its offering or bid (Wiggins, 2010:171). According to Wiggins (2010:172), typical stages in procurement that are applicable to both term contracts and projects are:

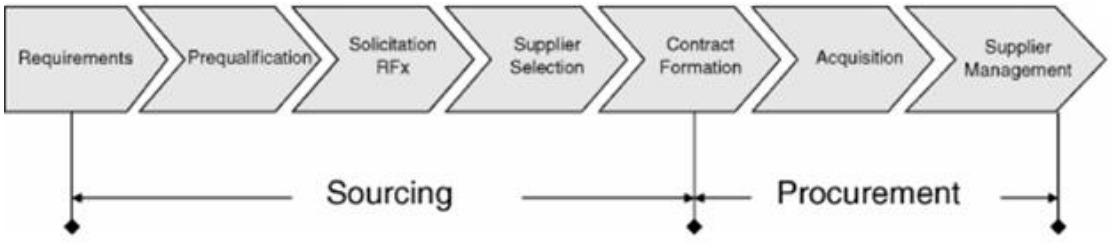
- Determine specification of requirements or scope of work;
- Compile a sourcing strategy;
- Evaluate contract versus in-house options;
- Determine contract type and structure;
- Assessment of risks;
- Initiate tender process;
- Contract award and management (contract lifecycle).

Different procurement stages are generally applicable to most term contracts and projects when procuring goods or services; each stage is important in assisting the business to obtain sufficient information regarding the offerings by suppliers or bidders. The time required for each stage can be reallocated to another as with most projects, although the time required for each stage should not be underestimated, e.g. the time required to obtain responses from suppliers can take between three and six months (Wiggins, 2010:176).

This study is specifically concerned with construction services outsourcing in the form of projects and contracts awarded to contractors, as well as a hybrid model whereby services are rendered and materials or equipment are installed. The outsourcing of services can be seen as a way of sustainably managing the total cost of ownership of assets, infrastructure and facilities (Pascual *et al.*, 2012:564). Strategic sourcing is a key component in supply chain management and involves the planned and pre-emptive analysis of supply markets and the careful selection of suppliers to satisfy and meet a business's predetermined and agreed needs, by delivering goods and services or solutions (Wiggins, 2010:172). The main aim of strategic sourcing is to appoint contractors that align with the strategic and operational business objectives of a business, and whereby the word 'strategic' refers to the long-term needs of the business that shall be met through the sourcing plan of action (Sollish & Semanik, 2011:1).

The reason why it is important to know what sourcing entails, is because it is the starting point for the procurement process, which in the end is enabled through the awarding of projects and term contracts. A sourcing strategy should be compiled before a tender process is started, in order to plan the process of procurement. A combined sourcing and procurement process is indicated in Figure 2.2.

Figure 2.2: The sourcing and procurement process



Source: Sollish and Semanik (2011:2).

Strategic sourcing, as indicated in Figure 2.2 does not involve any day-to-day activities such as: routine daily activities, ordering, buying, performance management, analysis or payment; these activities form part of the contract management process (Saxena, 2008:14). A strategic sourcing plan should include and cover the following elements, according to Sollish and Semanik (2012:48):

- A mission and vision statement, which is aligned with the mission and vision of the business's strategic business model;
- An environmental analysis to sketch a background against which the plan is developed, describing the current situation and conditions in sourcing for the specific commodity and identifying stakeholders.
- A SWOT analysis (identify strengths, weaknesses, opportunities and threats) – describing the blockages in mapping the sourcing plan and assisting in setting objectives for the sourcing strategy.
- Assumptions need to be clearly specified in order to enable the business to make adjustments to the plan as and when required, in order to adapt to volatile markets.
- Objectives need to be clear and precise of what the end sourcing goal of the strategy will be.
- Implementation is a high-level description of how the strategy will be implemented through a form of tender and eventually a type of contract or project.

In the review of literature about sourcing and procurement, there are generally no distinctions made between sourcing for projects and sourcing for term contracts. The same principles and steps in sourcing and procurement can be applied in both. In the two sections that follow, the differences between projects and term contracts will be highlighted.

2.4 Supply chain governance and compliance

There are many opportunities for unethical conduct in the construction industry, such as collusive tendering, bid-cutting, conflict of interest, and corruption; due to tough competition and tendencies toward low-cost strategies (Abu-Hassim *et al.*, 2011:2). Although procurement procedures are said to cause long lead times, adversarial relationships and wasted material (Eriksson, 2010:396), these procedures are necessary to safeguard a business from using procurement practices that are anti-competitive or unethical, which could lead to the demise of the business (Bru & Cardonay, 2016:1).

Anti-trust or competition laws are set to protect and support the competition process by increasing or promoting benefits of certain forms of competition and discouraging other negative forms of competition, in order to distribute economic gains and contribute to the efficiency of markets (Gerber, 2010:4). The Competition Act 89 of 1998 of South Africa (the 'Competition Act'), specifically Chapter 2: subsection 5 (1), states that any agreement between parties in a vertical relationship should not deter competition in a market unless it results in a proven technological, efficiency or pro-competitive gain. Businesses establish supply chain policies and procedures in order to obtain transparency, accountability and to operate within the boundaries set by legislation (Abu-Hassim *et al.*, 2011:2). Procurement procedures will affect the selection of contractors to be invited to a tender (Hartmann & Caerteling, 2010:355).

Long-term contracts can encourage sustainable improvement in project activities and facilitate cost reduction by removing the short-term focus of the contract, but this should be executed within a sound governance framework and prescriptions of the Competition Act (Eriksson, 2010:396). Bostrom, Jonsson, Lockie, Mol and Oosterveer (2015:3) indicate that there are direct and indirect instruments of governance that a business can utilise to coordinate and regulate activities, which could comprise a combination of the following: financial and other incentives, procedures of verification and monitoring, rules and laws, norms, standards, as well as rules and guidelines.

2.5 Risk management

Construction contracts for maintenance purposes or projects ensure that all or part of the client's operational risk is transferred to another party (Huber & Spinler, 2012:113). There are numerous risks in CSCM and specifically term contracts, which include inadequate performance management and conflict resolution systems, the absence of change management, a lack of communication between and early inclusion of stakeholders, poor supplier or contractor selection, and underutilisation of systems and collaboration tools (Aloini *et al.*, 2012:747).

The highest factors to be considered in the procurement of term contracts are risk-related, according to Huber and Spinler (2014:793), and include the contract period, cost and maintenance complexity. In order to address the complexity risks, a business can ensure its supplier selection process adequately measures whether the suppliers are able to deliver the required level of services by requesting proof of previous contracts and projects completed, capacity, references form other businesses, as well as compliance and quality procedures (Chartered Institute of Procurement & Supply, 2017:2). Risk management in term contracts should generally address environmental management, resources, cost, time, health and safety (Du Plessis & Oosthuizen, 2018:175). All the factors mentioned need to be captured and adequately covered in a term contract to ensure the risks are accurately assigned to the correct parties.

2.6 Relationship management

In order for a construction project or contract to be successful, there needs to be effective, planned and regular communication between all stakeholders (Yang *et al.*, 2009:340). Suprapto *et al.* (2015b:1074) state that client and contractor collaboration improves relationship attitude and increases teamwork efficiency, which leads to increased project performance. Inter-organisational relationship management or relational contracting is important in construction as it has a major impact on risk allocation and acceptance with regard to detrimental behaviour, avoidance or acceptance, project changes, reciprocity and interdependence, mutual trust, and communication openness between the parties and the teams.

A lean contracting approach is facilitated through cooperative relationships between parties in a project, and this may result in decreases in waste, shorter lead times and the elimination of adversarial attitudes, which reduces work efficiency and information transfer (Erikkson, 2010:395). According to Claase (2010:22), various research studies have led to the development of the conceptual partnering model, which was originally developed by Tang *et al.* (2006:218). This model states that the following is required for optimal partnering and success in collaboration: mutual goals, equity, trust, teambuilding, rapid problem resolution, timeous response and incentives, effective communication, sincere commitment, openness and a positive conducive attitude. Collaborative supply chain relationships are widely recognised by the term 'partnering', which can subsequently be divided into project partnering for single projects, or strategic partnering for multiple projects or term contracts (Meng, 2012:189). Al-Turki (2011:154) indicates that in the absence of long-term relationships, contractors are unwilling to spontaneously invest in employee development, new technology and improved and more efficient equipment.

2.7 Maintenance services outsourcing

The outsourcing of services is the procurement of services from an external business, to contractors with the necessary expertise to deliver the service, which may result in improved quality of services delivered and reduction of costs to the client business due to improved efficiency and effectiveness in service delivery (Pascual *et al.*, 2012:564). Al-Turki (2011:151) states that 'maintenance' is managing an acceptable level of dependability and durability of a facility or asset, including its constituents and ensuring that it will uphold a satisfactory level of quality.

It is stated by Murthy and Jack (2014:1) that systems are prone to degradation and deterioration over time and through utilisation, which may lead to failure in terms of its required level of performance.

It is the managerial function at all levels of the organisational structure that performs continuous assessment and decision-making with regard to assets and its value, dependability and accessibility.

Maintenance includes managing business undertakings such as risk, labour relations, materials and inventory management over a period of time (Al-Turki, 2011:151). It is therefore necessary to maintain a system through certain efforts such as preventative and corrective maintenance, to be able to restore the system to its full performance level or to control the rate at which it deteriorates, in terms of its required level of performance (Murthy & Jack, 2014:1). In a term contract, the work is continuous and the work issued to the contractor differs with each new order. It is common in the mining, petrochemical, oil and gas industries for businesses to award term contracts whereby contractors perform maintenance or installations that are repetitive in nature, and the rates are normally negotiated annually (Van Puil & Van Weele, 2014:141).

2.7.1 Term contract definition

A ‘term contract’ or ‘maintenance term contract’ (hereinafter referred to as a ‘contract’) can be defined as an agreement between two parties to maintain one or more assets owned by another party, which can be common across industries (Wilkinson, 2013). A contract does not necessarily need to be in written form, though it is advised to reduce the contract to writing in case of a dispute arising (Sollish & Semanik, 2012:90). Term contracts need to cover all the costs associated with preventative and corrective maintenance and potential system down-time over a time period that is pre-determined and fixed in the contract documentation, which needs to be managed by knowledgeable professionals employed by the client (Mangano & De Marco, 2014:247).

It is important that a contract should contain four key elements in order for it to be enforceable and legally binding (Sollish & Semanik, 2012:92):

- Mutual agreement between both parties that an offer is made;
- Legality of the offer;
- Consideration: evidence of an exchange of value needs to be present;
- Capacity: the parties need to be legally competent and able to perform its obligations or to even enter into the agreement.

A contract should describe what needs to be done, to what extent common law would apply and what legal accountability each party has, how long it will take to complete, and finally, what are the costs involved (Bowmans, 2016:5). Expensive commercial and industrial assets and equipment need to be maintained and repaired for longevity, which is often not possible for the owner, contractor, or manufacturer of equipment (Wang, 2010:239).

Wang (2010:239) further states that it is not always possible for owners of businesses to carry out maintenance themselves as it is very costly to retain a maintenance team, the scale of maintenance operation in the business is too small to manage maintenance operations and outsourcing services may result in adapting to technological and industry changes more rapidly.

In this study, all 'term contracts' will refer to 'maintenance services term contracts' that are set up for the outsourcing of maintenance and construction services, unless otherwise specified. When some or all of the maintenance activities conducted on a facility or asset are carried out by an external business, it is an outsourced maintenance service contract (Wang, 2010:240). Outsourcing maintenance contract services can result in less risk for the client, higher quality materials and services and the achievement of financial objectives, which means keeping within the maintenance budget (Pascual *et al.*, 2012:564).

2.7.2 Term contract formats

The format of contract selected would determine the nature of the relationship between the client and contract, and should be performance oriented in order to create a partnering relationship rather than adversarial (Al-Turki, 2011:154). A term contract's format varies depending on the context for which it is written, and needs to consider the type of business relationship and scope of services required.

There are numerous contract formats that can be used for term contracts, according to Wiggins (2010:187): Fixed price contract, cost reimbursable contract, schedule of service or product rates, reimbursable and fixed fee combination, partnership or alliance contracts, lump sum contracts, measured time contract, standard contract pro-forma. From the list of contract types mentioned, and according to Sollish and Semanik (2012:93-95), there are five formats of contracts to clearly distinguish from:

- Definite quantity contracts, where a certain guaranteed level or degree of materials delivered or services rendered is required;
- Indefinite quantity contracts, where the volume of work is not guaranteed or known and the contractor could be exposed to risk in terms of sudden fluctuations in volumes;
- Fixed price contracts, which vary between 'fixed firm price-', 'fixed price with incentive-', 'fixed price with economic adjustment-', 'fixed price with price re-determination-', and 'fixed price level of effort' contracts.
- Cost reimbursable contracts, used mainly by government entities and large businesses, and include 'cost plus fixed fee-', 'cost plus incentive fee-', and 'cost plus award fee contracts'.
- Time and materials contracts mean the client remunerates the contractor for time or labour hours worked and materials installed, usually with a base cost plus percentage profit added.

The contract format to be used shall depend on the specific need or service required by the client and the industrial or commercial facility or asset that needs to be constructed. Contract types are normally distinguished based on the combination of allocation of risk, incentives and remuneration (Suprapto *et al.*, 2015:1359). The technical operations specialists, contract management specialist as well as the technology and business enablement specialist need to be involved in the contracting process to ensure all the needs and risks of the business are addressed appropriately in the contract (Mangano & De Marco, 2014:248).

2.7.3 Term contract characteristics

Three main characteristics of term contracts are central to the contract document function to manage and assign responsibilities and risks to both parties (Murthy & Jack, 2014:12):

- Maintenance contracts are continuous in nature and have many different activities performed with separate start and finish dates from the contract start and expiry date, which can be classified as 'jobs' or separate small projects (Deprez *et al.*, 2018:1).
- There is a long-term focus on supplier relationship management and the relationship needs to be carefully managed by both parties to foster a collaborative culture and information sharing environment, in order to be successful in the contract execution of activities (Suprapto *et al.*, 2015b:1082).
- Collaboration and communication are key, as indicated in the previous paragraph; if there is no collaboration between parties, they would find it difficult to execute activities on time and within the projected time frames, and this could lead to asset or plant failure due to non-execution of the critical maintenance activities (Rameezdeen, 2014:32).

2.7.4 Term contract components

There are certain standard components in a construction term contract that are displayed hereafter in Table 2.1.

Table 2.1: Standard components of a construction term contract

1	Standard form of contract: general terms and conditions	11	Limitations of liabilities
2	Engineering designs	12	Warranties
3	Deliverables and scope of work	13	Insurance bonds
4	Work schedule baseline	14	Performance bonds
5	Roles and responsibilities	15	Penalties and incentives
6	Performance period and reporting	16	Fees and retainers
7	Place of delivery	17	Subcontractor approvals
8	contractor's place of performance	18	Amendment or change requests process
9	Pricing and payment terms	19	Product or equipment support
10	Termination procedure		

Source: Murthy and Jack (2014:111-112).

2.7.5 Term contract objectives

Outsourcing of maintenance through contracts is a manner in which a business can improve its performance and competitive advantage by creating value through external resource use and ultimately achieving cost benefits (Godoy *et al.*, 2014:102). An objective of a maintenance services contract is to allocate risk and assign obligations and responsibilities to the parties of a contract. These obligations are organisation, guarantees and insurances, contract period, guarantees, job performance requirements as well as payments and liabilities (Osipova & Eriksson, 2011:1151). Erikkson (2010:395) is of the opinion that contractors and clients develop attitudes towards self-protection instead of collaboration to meet contract objectives when the focus in tenders is solely on lowest prices. Further to this, it is indicated that a limited number of competent contractors should be selected through the supply chain process that are trusted by the client, to ensure contractors that are selected are capable of delivering what is required.

2.7.6 Term contract disadvantages

The main disadvantages of outsourcing maintenance services are the reduction of employees' knowledge of maintenance within the business and being limited to dealing with one contractor, which increases the risk of no service delivery significantly (Wang, 2010:240). Pascual *et al*. (2012:564) support this statement and elaborate further that a scarce maintenance service that is outsourced can result in a dependency on the contractor and could lead to a contractor developing a monopolistic attitude and setting high rates for their services.

Hassanain *et al.* (2015:231) are of the opinion that outsourcing through term contracts cannot only contribute to the loss of expertise internally, it could also lead to a loss of control or pose a risk to data security. Disputes have often been the result of irregularities and contradictions in term contracts, which decreases contractual performance (Manango & De Marco, 2014:347).

It is further stated by Pascual *et al*. (2012:564) that in-house knowledge of the maintenance of key facilities, assets and equipment is lost with outsourcing and a need often arises to manage performance of the contractor and external resources. Therefore, it is suggested that only the maintenance implementation part of maintenance activities should be outsourced, in order to reduce cost and risk of the client business, and that maintenance management and planning should be retained internally (Al-Turki, 2011:153).

2.7.7 Term contract advantages

Al-Turki (2011:153) states that the advantages associated with outsourced maintenance contracts are total system cost reduction, higher quality of work, work being executed faster, focused strategic asset management, faster application of the latest technology, exposure to specialists and freeing up internal capacity. There are numerous advantages to outsourcing maintenance services to construction contractors, namely (Pascual *et al.,* 2012:564):

- Expertise of outsourced contractors may result in maintenance best practices and latest advances in technology applied;
- Capital investment reduction for the client;
- Strategic management is focused on more by the management of a business as capacity and time is not allocated mainly to monitoring and management of maintenance services;
- Financial risk is managed through continual cost increase management as the contract is tailored and established for the specific needs and requirements of the client.

Manango and De Marco (2014:24) state that term contracts involve many contacts and meetings between client and contractor that occur on a frequent basis, which may positively influence trust and collaboration between parties.

2.7.8 Term contract management

Contract management can be defined as the practice that ensures that a client's strategic objectives are reached and that contract obligations are met by both parties to a contract (Van Puil & Van Weele, 2014:55). Mishra *et al*. (2015) are of the opinion that formal contracts are a crucial requirement in order to govern relationships between partners, stipulating the roles and responsibilities of the parties involved and allocating performance expectations.

It is important to understand the lifecycle of a contract in order to fully grasp the importance of effective contract management; the stages are pre-contractual, contractual and post-contractual and are described in more detail hereafter (Van Puil & Van Weele, 2014:65-68):

- Pre-contractual stage: involves the contractor's sales and marketing efforts and the client's invitation to tender.
- Contractual stage: the actual contract award;
- Post-contractual stage: engineering and design if it forms part of the contract's scope of work, subcontracting and procurement of materials, executing the works, testing of the work, maintenance and guarantee period and finally claims.

These stages vary among contracts and some sub-stages only occur once whereby others may occur more often, for example where claims are instituted. Maintenance contracts require the scope of work to be executed more than once and often not the entire scope of work at a time.

According to the Competition Act no. 89 of 1998, a vertical agreement is prohibited when it may prevent or lessen competition in a specific market; unless it can be proven that there is technological, efficiency or their pro-competitive gain from such an agreement. Based on this requirement, certain businesses put measures in place to prevent non-competitive sourcing in its procurement policy. When contracts are awarded, the maximum term allowed at some businesses is five years, unless a longer period can be substantiated with a strong motivation that complies with certain criteria.

As most contracts of this nature are awarded for the full term of five years and may be critical in sustaining operations, e.g. roads to be maintained for transport or refractory maintenance on boilers and burners, it is crucial to maintain a good relationship between contractor and client. The best value can be added to a businesses' supply chain through effective management of its contracts with suppliers; the contract management function is not only the role of procurement. In addition, it is an interaction with legal, tax, audit, accounting and insurance functional groups in a business and an alignment of their objectives (Saxena, 2008:14). There are many stakeholders in contract management, but the main stakeholder is the procurement department that needs to be actively involved in how the contract is executed, as they have the knowledge and expertise, and have negotiated the terms and conditions (Turner, 2010:157).

A comprehensive contract management plan needs to be compiled and implemented, which clearly states responsibilities and duties and which party they are assigned to, in effectively managing a supplier based on the terms in the contract and obtaining optimal quality goods or services through the contract (Sutt, 2011:85).

2.8 Construction projects

The section that follows will review the main concepts regarding construction projects and contractual agreements utilised in construction projects.

2.8.1 Definition

A project is a temporary undertaking to develop and deliver a unique result, service or product that has a fixed start and finish date and reaches its end when the objectives of the project are reached (PMI, 2013:3). There may be elements of a project that seem repetitive in the project's deliverables and activities, but the underlying fundamentals and characteristics of the project will be unique to that specific project (Morledge & Smith, 2013:46).

According to the Project Management Institute (PMI) (PMI, 2013:4), projects can be utilised to bring about a number of solutions, for example: developing a new solution (product or service); construction of infrastructure, a building or plant; implementing a change in structure or processes; effecting a new system; and enhancing or refining business procedures or processes or conducting research. Projects have six main aspects that need to be monitored continuously in order for it to be successful (Watt, 2014:13-14):

- Cost: approved budget for the project, which includes all expenditures associated with the execution of the project;
- Scope: the project outcomes or work that need to be executed, in other words the purpose of the project;
- Quality: the combined criteria and standards required for the project deliverables to perform as planned;
- Risk: the probability and negative impact that might occur through external events;
- Resources: facilities, funds, labour, equipment and all other items required to execute project tasks.
- Time: often the most overlooked and underestimated aspect of a project, which is the time required to complete a project.

These aspects may be regarded as secondary objectives to the main project scope objective, which is to issue the client with a completed project, as optimal management and fulfilment of these six aspects will result in a successful project.

2.8.2 Project management

Project management is an application of tools, skills, techniques and knowledge to meet certain agreed or contracted requirements and these can be accomplished by integration of several (47 in total) management processes that are cogently grouped. These can be summarised into five groups of processes, as follows (PMI, 2013:5):

- Initiating;
- Planning;
- Executing;
- Monitoring and controlling;
- Closing.

A guide for managers to utilise when managing projects, which provides clear and constant project terms and concepts, is the PMI's Project Management Body of Knowledge (PMBOK) (Watt, 2014:24). The PMBOK lists ten knowledge areas that need to be managed, implemented and fulfilled in order to manage a project; these can also be regarded as overall steps that can be further broken up into more sub-sections to assist in achieving a completed project (Watt, 2014:25): task integration, scope, time and schedule, cost, quality, human resources, communication, risk, procurement and stakeholders. These areas can also be seen as areas of risk that need to be mitigated and managed in order for the project to be successful.

2.8.3 Agency theory

A theory that can be applied to certain forms of contracting in construction projects is the agency theory. The theory relates to a business relationship where one business or party (the 'principal') has delegated certain roles and responsibilities to another business or party (the 'agent'), in order to achieve optimal balance between behaviour and output between the two parties (Murthy & Jack, 2014:16). The agency theory may result in some disadvantages; the agent may not have a similar attitude towards risk as the principal and it may be problematic for the principal to evaluate the agent's activities as their objectives for the project may vary (Dragomir, 2008:1557).

2.8.4 Types of standard project contract forms

Standard contract forms are used in order to obtain uniformity and homogeneity when concluding agreements with large sophisticated or governmental entities (Bowmans, 2016:8). There are numerous standard forms of contracts used in the construction industry in South Africa that are approved by the Construction Industry Development Board (CIDB) for both professional services and for construction services (South Africa, 2015:3), and these include the following:

- The General Conditions of Contract for Construction (GCC) (2010);
- The 1999 Short Contract and Red-, Yellow- and Silver books - developed and amended from time to time by 'FIDIC', acronym for: the International Federation of Consulting Engineers;
- Joint Building Contracts Committee (JBCC) Series 2000: Principal Building Agreement, Minor Works Agreement and other JBCC agreements – developed and amended from time to time by the Joint Building Contracts Committee.
- The New Engineering Contract, Engineering and Construction Contract and Engineering and Construction Short Contract (NEC3) – developed and amended from time to time by the Institute of Civil Engineers;
- The Construction Industry Development Board (CIDB) Standard Professional Services Contract 3rd edition.

The two last mentioned contracts are specifically used for contracting professional services and EPC type contracts. Standard contract forms are often difficult to understand as the terms are sometimes unfamiliar to persons who manage the contract and have little to no known legal background (Rameezdeen & Rodrigo, 2014:31). Complicated and unclear contract terms can lead to difficult comprehension or understanding of the contract (Rameezdeen & Rodrigo, 2014:4). Du Plessis and Oosthuizen (2018:160-161) provide a clear comparison of the four main contracts utilised for construction projects. The general components that are addressed in these contract forms depicted in Table 2.2 are general contract terms, responsibilities and roles of parties, time-related aspects, payment terms, quality, risks, change management, claims, disputes and termination of the contract.

2.8.5 Construction project forms of contract

There are mainly two contract forms that can be used when contracting for a construction project, a bespoke contract that is specifically drafted for the services required and a standard form contract that is a contract that sets out standard terms and conditions to manage common issues and risks that are normally associated with construction activities (Rameezdeen & Rodrigo, 2014:31).

Table 2.2: Content comparison between the four main contracts

FIDIC	***GCC***	***NEC***	***JBCC PBA***
20 Main clauses	***10 Main themes***	***9 Core clauses***	***7 Main themes***
1. General provisions	1. General	1. General	1. Interpretation clauses (clauses 1-7)
2. The employer	2. Basis of contract	2. The contractor's main responsibilities	2. Insurance and security risks (clauses 8-11)
3. The engineer	3. The engineer	3. Time	3. Execution – roles and responsibilities (clauses 12-17)
4. The contractor	4. contractor's general obligations	4. Testing and defects	4. Completion (clauses 18-24)
5. The nominated subcontractors	5. Time related matters	5. Payment	5. Payment (clauses 18-24)
6. Staff and labour	6. Payment and related matters	6. Compensation events	6. Suspension and termination (clauses 28-29)
7. Plant, materials and workmanship	7. Quality and related matters	7. Title – pertaining to material and plant on site (to who does it belong?)	7. Dispute resolution (clause 30)
8. Commencement, delays and suspension	8. Risks and related matters	8. Risks and insurance	
9. Test on completion	9. Termination of contract	9. Termination	
10. Employers taking over	10. Claims and disputes		
11. Defects liability		***Supplementary schedule of options***	
12. Measurement and evaluation		*Main option clauses, with six options*	
13. Variations and adjustments		*Dispute resolution*	
14. Contract price and payment		*Secondary options clauses*	
15. Termination by employer			
16. Suspension and termination by contractor			
17. Risk and responsibilities			
19. Force majeure			
20. Claims, disputes and arbitration			

Source: Du Plessis and Oosthuizen (2018:160-161).

Construction contracts can have different arrangements in terms of the manner in which services are procured; the following are the main arrangements or structures for construction contracts (Bowmans, 2016:12):

- Pure construction contract: in this form of contract, the contractor would only execute the construction part of the work and bears the least risk out of the three contract arrangements.
- Design-build contract: the engineering firm, design consultant form or architect designs the facility, equipment or asset to be constructed and also builds, manufactures or constructs the facility, asset or equipment.

- Engineering, procurement and construction (EPC) or engineering, procurement, construction and management (EPCM) contracts: this contract provides for the appointment of a third party engineering, project management or consultant firm that creates a design, procures and appoints a business to execute the work and manages the entire project.
- A fourth contract structure is a framework contract, whereby the client awards a general contract to more than one contractor.

2.8.6 Construction project contract components

There are certain standard components in a construction project contract document, which may include a variation of the listed components indicated in Table 2.3.

Table 2.3: Components of a construction project contract document

1	Standard form of contract: general terms and conditions	11	Limitations of liabilities
2	Engineering designs	12	Warranties
3	Deliverables and scope of work	13	Insurance bonds
4	Work schedule baseline	14	Performance bonds
5	Roles and responsibilities	15	Penalties and incentives
6	Performance period and reporting	16	Fees and retainers
7	Place of delivery	17	Subcontractor approvals
8	contractor's place of performance	18	Amendment or change requests process
9	Pricing and payment terms		
10	Termination procedure	19	Product or equipment support

Source: PMI (2013:377).

2.8.7 Project procurement management

A construction project's lifecycle starts with the conceptualisation stage, and thereafter the engineering and design phase, supply sourcing and construction, the implementation phase and finally the utilisation phase (Benton & McHenry, 2010:26). Although it is required to evaluate the entire project management process or phases in order to determine whether it can be executed through projects, it is necessary to review and evaluate the procurement management section or phase in more detail.

The procurement management process within project management has four main phases, which are: plan procurement, conduct procurements, control procurements and close procurements (Watt, 2014:21-22). Watt (2014:131-133) describes three main types of contracts used in project procurement management: fixed price contracts, cost-reimbursable contracts, and time and material (T&M) contracts. The fixed-fee contract can be a firm fixed price contract (FFP), fixed price incentive fee contract (FPIF), or fixed price with economic price adjustment contract (FP-EPA).

The cost reimbursable contract types are cost plus fixed fee contracts (CPFF), cost plus incentive fee contracts (CPIF) and cost plus award fee contracts (CPAF). Time and material contracts are a combination of the two previously mentioned project procurement types (PMI, 2013:363-364).

The project procurement process indicated in Figure 2.3 will be compared to the term contract procurement process by indicating what inputs, tools, techniques and outputs need to be included to award a comprehensive contract document, which addresses and assigns all risks. Figure 2.3 provides a detailed view of these processes within project procurement management. Different activities in the project procurement process constitute the lifecycle of a contract. A project team should seek guidance or assistance from the business' specialists in contracting, purchasing, law and technical departments. Involvement by these specialists can be included in the business' policies as a mandate (PMI, 2013:357). The contract lifecycle can be appropriately and effectively managed and the contract defined in such a way that it shares risk between parties or even transfers business risk to the supplier (PMI, 2013:357).

According to PMI (2013:362), a business' processes that influence project procurement are formal procurement guidelines, policies and procedures, and when such resources are not available, the project team can perform the procurement activities or appoint resources to do so, depending on the procurement policy and procurement mandate, and what delegation of authority structure the business prescribes.

Watt (2014:131-133) describes three main types of contracts used in project procurement management: fixed price contracts, cost-reimbursable contracts, and time and material (T&M) contracts. The fixed-fee contract can be a firm fixed price contract (FFP), fixed price incentive fee contract (FPIF), or fixed price with economic price adjustment contract (FP-EPA).

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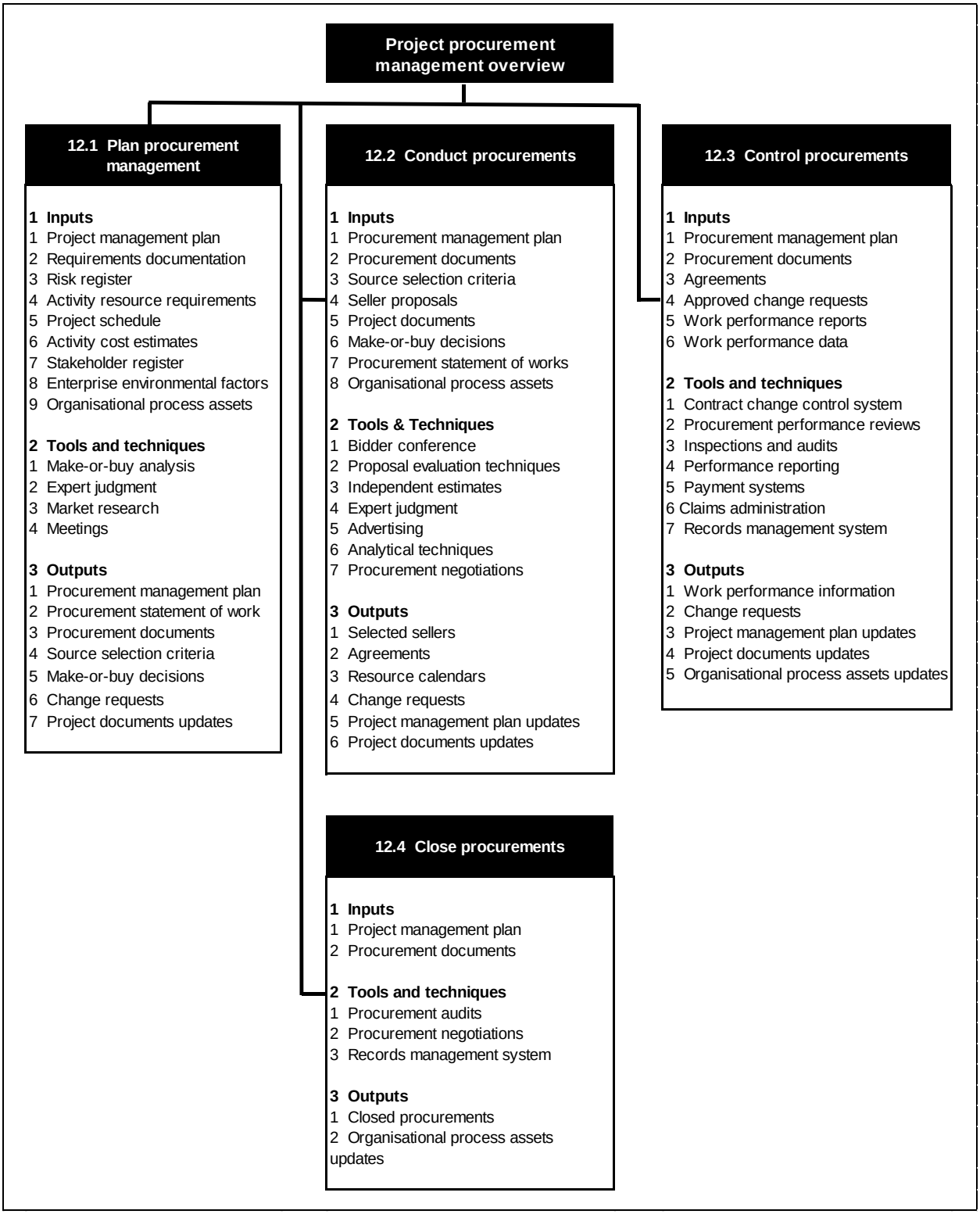
The project procurement process indicated in Figure 2.3 will be compared to the term contract procurement process by indicating what inputs, tools, techniques and outputs need to be included to award a comprehensive contract document, which addresses and assigns all risks.

Figure 2.3: The project procurement management process



Source: PMI (2013:355).

2.8.8 Construction project characteristics

Several risks need to be addressed by the project's contract document; these risks include time management risks, financial risks, performance risks, and quality risks (PMI, 2015:354). The following important factors need to be managed in construction projects (Segerstedt & Olofsson, 2010:351):

- The management of sub-contractors, as delays in material or service delivery from sub-contractors can affect costs by causing time delays.
- Projects are discontinuous in nature, some projects endure for months while others endure for years, depending on the complexity and size of the project. The usually adversarial relationship between contractor and client is established for the duration of the project and ended directly thereafter (Benton & McHenry, 2010:5).

Meng (2012:188) is of the opinion that delays in service delivery and unforeseen costs are the result of material cost increases, lack of contractor management, limited technical ability of contractors and inadequate materials management. Eriksson and Westerberg (2011:199) are of the opinion that knowledge exchange and cooperation between parties in a project are key to the success of a project. A project is considered to be successful when it is completed within the contractually stipulated timeframe, budget and with the required quality in services and materials, as agreed to contractually before the project started (Du Plessis & Oosthuizen, 2018:154).

2.8.9 Collaboration

Due to the uncertainty surrounding projects and the complexity thereof, the construction industry has a poor history of stakeholder engagement and relationship management (Yang *et al.*, 2009:337). Traditionally, contractors and clients have maintained secrecy in terms of information sharing and knowledge transfer to the other parties in a project or contract (Wang, 2010:242). Hartmann and Caerteling (2010:355) indicate empirically that trust could form the foundation for cooperation through joint problem solving and transfer of critical information between client and contractor, which will result in conflict reduction, uncomplicated negotiations and increased project performance. Azambuja *et al.* (2014) state that involvement of all parties including sub-contractors in the engineering and planning phase of a project is critical when aiming to shorten project schedule delivery times, reduce risks and minimise rework.

It is evident that information sharing and open communication channels build mutual trust and contribute to less misinterpretations. It is further stated that partnerships in construction mainly fail due to the absence of open communication channels and the distribution of available information (Wang, 2010:242).

2.8.10 Collaboration tools

It is stated by Kotula *et al.* (2015:244) that stakeholder collaboration and engagement are a critical success factor in construction project sourcing. Successful collaboration requires continuous measurement and improvement, fairness, commitment, common objectives, effective problem resolution, trust, and timeous communication (Meng, 2012:189). Eriksson and Westerberg (2011:202) are of the opinion that an integral part of partnering in supply chain are collaboration tools, which can have a positive impact on service delivery and contractor performance.

Collaboration tools can include team-building activities, partnering facilitation, collaborative IT-tools, mutually set objectives, partnering agreements and joint office building or office sharing initiatives (Eriksson & Westerberg, 2011:202). The most commonly utilised joint IT-tools are electronic data interchange (EDI) technology for sharing information between businesses, although many are opting for web-based integrated organisational systems (IOIS) that enable them to share more cost-effectively and with multiple businesses on a cloud-based web platform (Hadaya & Pellerin, 2010:372).

Collaboration tools can positively influence the performance of contractors. Suprapto *et al.* (2015:1350) confirm that when managerial attention is on collaborative practices, these can positively influence project performance through joint decision-making, mutual objective setting, joint problem-solving practices, continuous improvement by all stakeholders and combined risk management.

2.8.11 Construction project objectives

There are three basic objectives that need to be achieved in a construction projects, according to Benton and McHenry (2010:28), as well as Du Plessis and Oosthuizen (2018:154), which are generally accepted in the construction environment.

The first objective is to complete the project on time as stipulated in the schedule; the second objective is to complete the project within the project budget (Olawale & Sun, 2010:510). The third main objective is to ensure the project is closed out with the acceptable level of quality that was agreed in the project contract document and that value was added. Eriksson and Westerberg (2011:202) state that joint objective setting declares that both parties want to collaborate and that a positive outcome for both is important, and therefore it may improve overall project performance.

2.8.12 Construction project contract limitations

There are some limitations to construction project contracts when compared to term contracts. The start of the supplier relationship is where the project is initiated or contract awarded; the interaction lasts for the duration of the project and thereafter the supplier relationship is ended when the project is completed. Yang *et al.* (2009:337) state that construction projects are known for poor stakeholder engagement and communication between the different parties. The project duration is the full extent to which the client, agent and the contractor engage in communication and whereby the supplier relationship is developed. In some cases, the projects do not endure for a long period of time, which means that there is no real strategic relationship that could be developed between client, agent and contractor (Rameezdeen & Rodrigo, 2014:44).

The sourcing phase of a construction project may often account for a large percentage of the total time allocated to the project planning phase. This sourcing and procurement management stage contains different sub-phases, such as: receiving engineering documentation, supplier solicitation and selection, sourcing strategy and tender compilation, pre-meetings with contractors, tender process, bid receipt and evaluation, contract negotiation and finally contract award (Benton & McHenry, 2010:37). These sub-phases take an enormous amount of time and also have a cost implication on the project as there are procurement personnel who need to administer and complete this process (PMI, 2015:126). An important phase in a capital construction project planning that needs to be addressed before traditional procurement and engineering, is strategic sourcing, which should be properly addressed early in the project and requires closer work process integration and effective supplier selection (Azambuja *et al., 2014*).

Remuneration is significantly high for the entire complement of project admin and management personnel required to execute even a light construction project. These costs can increase precipitously when there are unexpected project delays, which can, in turn, hamper the financial performance of the client. The result of such delays and cost increases is carried over into production and operation delays as the asset or facility cannot be utilised at the specified time as per the project schedule (Benton & McHenry, 2010:56).

2.9 Strategic combination of projects and term contracts

Elsey (2007:3) states that growing contract complexity and volumes, globalisation and stricter legislation have created more awareness of the significance of effective and structured contract management procedures as well as the advantages associated with it. Increasing pressure on public and private businesses to lower costs and improve financial performance has led to the growing recognition of the need to improve their contractual processes and automation thereof (Elsey, 2007:3).

The tenders issued for projects or term contracts are awarded following a very similar procurement process with subsequent steps to reach contract or project award. Put broadly, the typical tender process steps are: compiling a strategy with a scope of work and bill of quantities, determining the contractor selection and bid evaluation criteria, compiling a bidders' list, issuing of a tender, evaluating the submitted tenders and finally awarding the project or term agreement to a contractor (Chartered Institute of Procurement & Supply, 2017:3). A tender process may require a long lead time and occupy labour resources for long periods, depending on the complexity (Eriksson, 2010:396). It also exposes the business to business risks, as the tender process has to be strictly governed in order to adhere to competition and labour regulations.

Audits have to be conducted internally to ensure the contracting or procurement personnel adhere to competitive bidding practices and sound corporate governance principles (Benton & McHenry, 2010:66). When a single project needs to be awarded, the client often seeks to test the market again, which results in the awarding of a large project to another contractor. Disputes between the contracting parties caused by deteriorating relationships within a project or contract are one of the main reasons for construction projects' failure (Doloi, 2013). Cooperation between businesses is a key ingredient in order for a project or contract to be successful (Aanvuur *et al.*, 2012).

This concept of not utilising the existing contract, by awarding a separate agreement to another contractor, is the essence of what this study is aiming to evaluate and improve. Osipova and Eriksson (2011:1152) state that it has been widely recognised that traditional contracting does not support cooperation between clients and contractors and that successful project implementation is dependent on a good relationship between the client and the contractor. As stated by a senior project manager at SASOL: "There have been attempts to execute construction projects through term contracts at SASOL, but the true value that can be added and a proper framework to utilise as the vehicle, has not been explored fully as there is no capacity available at the moment to explore this" (Coetzee, 2018). It is indicated by Ng *et al.* (2010:4) that service value, which is critical for quality and excellence, is derived from interactions and processes that exist between a contractor and client over a certain period.

The client may benefit from maintaining good relations with its contractors in various ways, which will be determined in the study. The research findings that arise out of this study can provide the business with a new framework or guideline on how its procurement personnel and project managers need to execute projects through term contracts, if it is found to be an alternative to issuing a tender for every project. There may be aspects that improve, such as the business relationship, business performance, or risks that are mitigated due to contract terms or conditions that are already established and adhered to by the contractor.

It is possible that there are many advantages for the client in executing projects through its existing term contracts, which will be explored and possibly proven to exist with this study. Multiple collaborations on different projects can improve the process of knowledge transfer and client-contractor collaboration and performance (Eriksson, 2010:396). The contractor that has an existing contract with the client may benefit from such projects as the volume of work is much higher, where the opportunity exists for more profit by making use of economies of scale (Bru & Cardonay, 2016:2). The smaller maintenance jobs are therefore not always as profitable as the costs are high to execute even though volumes are high.

Issuing larger construction projects to a contractor through an existing term contract would improve the business relationship between the parties, provide time and cost benefits to both parties and will assist with managing standard business processes such performance management, which is crucial in construction projects (Mishra & MacCormack, 2015).

2.9.1 Cohesion in projects and term contracts

The main common denominator of a construction project contract and a term contract is the fact that both aim to manage and allocate risk. In both contract methods, there are risks that need to be eliminated or mitigated, such as time delays, poor performance of the contractor, liabilities and insurances, cost increases, amendments to designs and scope of work changes. When comparing the components of construction projects and term contracts from the preceding sections, the common or overlapping contract components were identified and listed in Table 2.4.

Table 2.4: Mutual components in a term contract and a project contract

1	General terms and conditions, standard form of contract	9	Amendment or change request process
2	Deliverables and scope of work	10	Insurance bonds
3	Roles and responsibilities	11	Performance bonds
4	Performance period and reporting	12	Penalties and incentives
5	Place of delivery	13	Subcontractor approvals
6	contractor’s place of performance	14	Warranties
7	Pricing and payment terms	15	Product or equipment support
8	Limitations of liabilities	16	Termination procedure

Source: Author’s own compilation (2018).

2.9.2 Term contract limitations

As this study evaluates the manner in which projects can be executed through term contracts, it is necessary to identify and understand the limitations that may exist in term contracts when compared to construction projects. Term contracts do not always necessarily specify how risks will be addressed in the comprehensive manner that it is addressed in construction project contracts.

These business performance enhancing and risk mitigating aspects that are found in most forms of construction project contracts that are not necessarily covered in term contracts are described below:

- Maintenance contracts seldom make use of engineering drawings and designs; this is only requested as an additional requirement, used as and when necessary;
- Clearly defined roles and responsibilities;
- Work schedule baselines are not mandatory and need to be specified for each separate work order as a requirement;
- Limited liability, fees, retainers, incentives and performance bonuses are not included as standard in maintenance contracts, which is a risk to both the client and the contractor;
- Strategic sourcing and contracting are still an emerging function in the construction industry as opposed to the manufacturing industry (Kotula *et al.*, 2015:245).

Term contracts do not necessarily always reflect the size, complexity and nature of the need, or the value that is required from the supplier in a clear comprehendible manner (Elsey, 2007:14). The complexity of supplier selection and the capabilities of the contractor and sub-contractors are also very important aspects that are not necessarily treated as a major sourcing risk in term contracts, as it is dealt with in the construction project procurement phase.

It should, however, be noted that complex, large construction projects in the oil, gas, and power industries require supply chain management processes that are more focused on reliability and asset management, whereas the traditional supply chain management disciplines would rather focus on customisation, flexibility and swiftness of the procurement process (Azambuja *et al.*, 2014). The maintenance contract to be utilised would therefore need to adequately address all technical and commercial requirements of the construction project in order for it to be utilised for this purpose (Elsey, 2007:14).

2.9.3 Contract format selection

The client or principal agent can apply three important factors to consider when it needs to determine what type of contract to use for a construction project or maintenance services term contract. These three factors are rights, responsibilities and risks and have been added to standard form contracts as good practice and to ensure a contract contains beneficial provisions to both or all parties of the contract (CIDB, 2004:1).

Note: An old reference is used here as the documentation from the CIBD has not been amended since 2004 and is still the latest relevant documentation in terms of contracting good practice prescribed by the business.

According to Bowmans (2016:15), the rights of the contractor include being paid on time, possibility of extension of time and access to the site where the works should be executed, the right to terminate the contract and the right to appoint subcontractors. A contractor needs to comply with applicable laws and procedures, respond to communications from the client and substantiate all claims made to the client with proof thereof (Bowmans, 2016:15). The contractor has the responsibilities of completing the work that were contracted, to provide performance guarantees to the client and should be able to provide insurances to the client for when damages occur. The contractor needs to have written agreements in place with its subcontractors and manage these relationships in order to minimise waste and increase value in the supply chain (Benton & McHenry, 2010:59).

There are many risks involved in construction, which would ultimately result in financial loss, and these involve calculation errors, penalties imposed by the client, insolvency of the client, poor management of the project and subcontractor and finally delays such as material delivery delays or licences and permits required to execute certain specialised works (Bowmans, 2016:16). When selecting the contract format, all the specific requirements and risks for that project need to be considered and clauses included in the contract to act as mitigating measures.

2.10 Chapter conclusion

There are numerous similarities in project sourcing and procurement that are in line with the process followed by contract specialist to source and procure for term contracts. The major areas that need to be evaluated have been identified as procurement management, relationship management, risk management, compliance and governance, agreement format and supply chain processes and procedures. These six elements form the constructs for the study upon which a framework was developed after collected data were captured and analysed. The framework may assist procurement professionals to streamline the process of correctly issuing a construction project through a term contract.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides a detailed narrative of the empirical research study conducted within businesses to determine whether construction projects, which are either contracted out or issued on tender, would be better executed if awarded through existing term contracts between two businesses. The study was conducted within South African businesses of different sizes, whereby the largest business operates in the petrochemical industry and the other businesses deliver a service to this business as its contractors.

In order to gather the required data to accurately address the research questions, a quantitative research method was selected and a survey was conducted. The newly compiled survey instrument was derived *a priori* from the constructs that developed from the literature study in Chapter 2. This questionnaire that the author developed was sent to businesses that were located in close proximity to each other in Secunda, Mpumalanga, in South Africa. All these businesses not only have employees with experience in the construction industry, their employees also have construction project experience specifically in the petrochemical environment at large businesses such as SASOL, which was the main business from which the study was conducted and served as the client.

In Bryman *et al.* (2017:5), it is argued that business and management research is concerned with understanding businesses and the nature of conducting business, as well as solving critical problems related to management practices. It is also stated that cross-sectional studies deal with a comparison at a specific point in time (Institute for Work and Health, 2015); therefore, this study will be cross-sectional.

This study will evaluate the current manner in which projects are executed and whether it adds value to a business through reduction of time and procurement cost to award and execute projects through existing term contracts. Bryman *et al*. (2017:108) contend that a cross-sectional research design focuses on quantitative research. In order to understand this study's business research objective thoroughly and assist the management in deciding whether to execute projects through term contracts or to rather award projects as separate agreements, the quantitative research method, known as a survey, was used to gather data. It is argued that cross-sectional researchers can ensure alignment with important quantitative research criteria, as well as internal and external validity, by ensuring that adequate representativeness of the population is captured in the selected sample (Bryman *et al*., 2017:108).

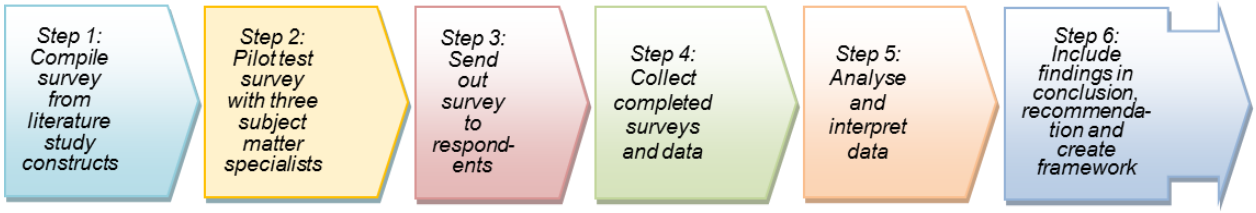
The researcher ensured that all the characteristics of the sample were representative of that of the population based on this information, by sending the questionnaire to all employees within the contract- and project environment in ten purposefully selected businesses within the specific location identified. The population and sample are further described in the section hereafter.

3.2 Quantitative data

According to the Institute for Work and Health (2015), the nature of the research question will greatly determine the research design. A researcher has the option of either using quantitative or qualitative research methods or a combination of the two. Qualitative research looks to develop a socially constructed dynamic reality that provides a descriptive and in-depth explanation of a phenomenon that is holistic in nature, yet context sensitive, from the perspectives of the people involved based on a constructive epistemology (Yilmaz, 2013:312). Quantitative research can generally be divided into two categories: studies that discover causal relationships or inferences, and studies that aim to describe events, called 'descriptive studies'. Descriptive studies often make use of surveys or observational methods and are used to describe a studied phenomenon or population's characteristics and provide an overall picture at a specific point in time (Bryman *et al.*, 2017:31); therefore, descriptive statistics were found to be an appropriate form of research data analysis for this study.

Quantitative studies are defined by O'Gorman and MacIntosh (2015:155) as the quantification of a research question or research problem and determining the ways in which one or more variables influence other variables. Quantitative data tends to place an emphasis on testing theory and it may lead to a deductive approach when evaluating the relationship between research and theory (Bryman *et al*., 2017:31). The quantitative data collected are based on the themes or constructs that were developed from the literature study in Chapter 2. The quantitative survey gathered valuable information from various sources to provide a broader picture of a solution to answer the research questions. The survey process followed, in order to gather the quantitative data through distribution of a questionnaire, is depicted in Figure 3.1: Survey Process.

Figure 3.1: Survey Process



Source: Author's own compilation (2018).

3.2.1 Population

A population is a collection of all the relevant units within a certain problem field that the researcher would like to study and the researcher needs to ensure that the sample selected is a proper representation of that population (O'Gorman & MacIntosh, 2015:160).

The population for this study consisted of all employees working for businesses contributing to construction projects or civil maintenance work in different ways. The businesses were within close proximity to SASOL and the researcher could make contact with the employees with minimal effort. These businesses' employees formed part of the entire population. In many instances, it is often difficult for a researcher to collect and analyse all the available data, due to limited funds, time and other resources, and therefore it was necessary to make certain sampling decisions and utilise sampling techniques to utilise the correct sample available to the researcher (Saunders *et al*., 2009:210).

The unit of analysis was found firstly in the contracting and project departments within the inbound and outbound supply chains of the participating businesses; secondly, in the three main locations of the businesses' offices: Secunda, Sasolburg and Johannesburg. The researcher had an established business relationship with individuals within some of these businesses, which meant convenient access to the employees to distribute the questionnaire. A unit of analysis or study population is not necessarily referring to people; it can be restaurants or businesses in a country, as it is merely the total set of cases being researched (Saunders *et al*., 2009:212). The population identified for the data collection phase included all employees within the contracting-, procurement- and project departments that award, manage or utilise term contracts and once-off projects including higher-level project- and contract managers who manage those employees; who are employed by the ten selected businesses in its South African business divisions and business units.

The population's information was obtained from the HR departments of the businesses identified, where after specific factors were considered that were crucial in the selection of the sample size. These included years of experience with contracts and projects, education and qualification level. This will ensure the appropriate representative sample is chosen from the population; respondents from all levels of education and experience within the contracting and project departments formed part of the selected sample.

The population chosen flows from the title and primary objective of this proposed thesis and the reason why the researcher selected this unit of analysis specifically is indicated below:

- The population includes individuals and specialists who have knowledge of the contract and project processes;
- They are employed by the business and are geographically located in the researchers' business area, and therefore access to the population is convenient;
- The population is heterogeneous as there are many different people with highly varied skills, qualifications and experiences, who are directly involved with the subject matter;
- The researcher could easily access the population in a professional manner, working from inside a client business's contracting department;
- A sound business relationship and mutual understanding of construction were already established with many of the respondents; again a contribution to the ease of executing research;
- The population contained individuals who had many differences as previously mentioned, but there are important similarities, for example: they were all employed by the businesses, which meant that they had experience with the business's policies and procedures and how these aspects have changed over time. This proved to be valuable in terms of having an overview of what has worked in the past and what has added immense value with the amendments to business procurement and contracting policies.
- The population respondents strive towards the same primary goal, which is the success and sustainability of a business.
- The population consisted of 1500 employees in the ten businesses identified, situated in South Africa.

Sampling decisions that need to be made by a researcher should consider the research design and cannot be made in isolation; it should consider factors such as data collection and analysis methods, the researcher's relationship with the respondents and the conceptual framework and goals (Bickman & Rog, 2008:235).

3.2.2 Sampling

The sampling method used is a combination of three sampling methods: convenience, expert and purposive sampling. Expert sampling occurs when experts in the specific field under stud are chosen who have extensive and relevant experience and knowledge; convenience sampling is used when the sample is conveniently located or easily accessed by the researcher; and purposive sampling is used when the researcher decides who or what would be included in the sample (O'Gorman & MacIntosh, 2015:162).

Bryman *et al*. (2017:176) contend that a sample size is determined by considering factors such as time and cost and requires a compromise to be drawn between the aforementioned and precision of findings and generalisation. This sample size is representative of the population, as the individuals selected differ in many aspects such as education level and amount of work experience that ensured most human variables were considered in the sample selection. It is supposed in Bickman and Rog (2008:235) that purposive sampling may capture the heterogeneity of the population more accurately than accidental or random sampling strategies and that this sampling strategy can allow for critical examinations of the theory topic and the developments that could arise from the study.

The researcher identified ten businesses and requested approval from each business's HR department that some of their employees may be requested to participate in the survey. The HR department was requested to assist the researcher in distributing the questionnaires to the respondents. The researcher engaged with certain identified personnel who contribute to the project and contracting environment and who would provide valuable input. A sampling decision was that employees of the businesses would need to have daily engagement with projects and contracts in their current job positions. This is particularly important as the primary research objective is to determine whether projects and term contract integration add value to the business, which, in turn, will assist managers in strategic decisions regarding consolidation of the two opposing contracting or procurement methods. The sample that was selected consisted of 300 respondents in total.

3.3 Goals of the empirical research

The main goal of conducting this study is to develop a general framework that can be used as an overview of how to award construction projects through existing term contracts that were put in place through a formal tender process. The research will result in the creation of a structured standard and framework to be implemented by a business to guide contract management personnel and project managers to award projects.

The goals of the empirical research connected to this goal through its subset of goals are:

- Collect information from different businesses based on the key constructs identified regarding execution of construction projects and term contracts;
- Make a comparison of the key constructs and their respective themes, to review the two main construction concepts and form patterns or alignment from the constructs developed;
- Develop an approach for the linkage of projects to term contracts in a governed and sustainable manner;
- Make recommendations and conclusions based on the research conducted regarding the execution of projects and term contracts.

3.4 Research instrument

The research instrument in the form of a questionnaire was used to gather data; the constructs used in its development and the creation process of the instrument are discussed hereafter.

3.4.1 Main constructs

The main constructs that were identified after review of the literature relevant to the purpose of this study are indicated in

Table 3.1. These constructs are the main concepts that need to be addressed in order to determine an appropriate framework for executing the construction projects through existing term contracts. This will form the basis of the empirical investigation in order to create a framework for this purpose. The constructs in both construction projects and term contracts will be tested in order to determine alignment and similarity.

Table 3.1: Main constructs

1	Procurement management
2	Relationship management
3	Risk management
4	Governance and compliance
5	Agreement format
6	Supply chain processes and procedures

Table 3.2 provides a depiction of the main constructs and their corresponding elements that were developed for testing from the literature study. The elements resulted in questions for the survey. The main constructs identified were procurement management, relationship management, risk management, compliance and governance, agreement format and supply chain processes and procedures. Even though all six constructs are closely related, there are distinctions to be made. There is no particular order for the constructs identified and all five constructs are deemed equally important in the survey.

The procurement management construct needs to be tested in order to determine whether the manner in which construction materials and services are procured in projects can similarly be applied in term contracts in order to manage procurement of the construction project.

Table 3.2: Main constructs and corresponding elements

CONSTRUCT	ELEMENTS OF THE CONSTRUCT
Procurement management	Insurance provisions
	Size or value of project
	Complexity of works
	Tender process/ request-for-quotation (RFQ)
	Sourcing strategy
	Performance management
Relationship management	Collaboration
	Trust
	Mutual objectives
	Information and knowledge sharing
	Contract type/ format
	Collaborative tools and systems
	Information/ knowledge sharing
Risk Management	Progress/ partial payments
	Principal agents
	Collaborative tools and systems
	Bidders list (supplier selection)
	Corporate governance
Compliance and governance	Contract type or contract format
	Governance procedures
	Industry standards
	Trust
	Performance
	Claims
	Competition law
Agreement format	Allocating risk
	Rewards
	Roles and responsibilities
	Penalties
	Limited liability
	Retention funds
	Performance bonds
	Size/ value of project
	Agent involvement
	Complexity of works
Supply chain processes and procedures	Claims
	Penalties
	Rewards
	Governance procedures
	Collaboration
	Collaborative tools and systems
	Information/ knowledge sharing

Source: Author's own compilation (2018).

The relationship between contractor and client was found to be an important aspect of project and term contract success, when a collaborative environment and partnerships among parties are formed, and therefore this construct needs to be present in the testing of both term contracts and projects.

Various ethical considerations and industry standards necessitate governance and compliance monitoring and application, which are required in construction projects as well as term contracts. It is therefore required to test the governance and compliance aspects of a term contract in order to assess whether it accurately addresses governance and compliance for construction projects. The contract type is an element of the governance and compliance construct and was developed into another main construct, the agreement format, as it can further be extended into various elements that need to be present in the construction project contract form and the term contract format. The agreement format of both a project and a term contract needs to contain the required clauses to address all the risks for the specific purpose it is intended. The risk management construct is closely aligned with the agreement format construct, as the agreement format may determine the effectiveness of a contract to mitigate risks.

The reason for its separation from the agreement format construct is found among the elements identified during the study of risk management, which necessitates the separate construct for risk management. Risks are present before, during and after a construction project is awarded and expires; therefore, risk management forms a critical part of the entire process. Similarly, risks are present in term contracts before they are awarded, during the execution thereof and after expiration of the contract.

3.5 Data collection

A primary data collection method was used to gather data by means of a self-administered questionnaire with closed questions. A self-administered questionnaire with closed questions is one that is completed by respondents themselves and can be personally handed to respondents, or sent through post or email that contains a set of questions with a set of pre-selected answers that respondents need to choose from (Bryman *et al*., 2017:191).

3.5.1 Constructing the questionnaire

The questionnaire contains instructions and a letter that serves as an introduction to the questions and describing the reason for conducting the survey and confidentiality of information obtained. In addition, it contained the contact information of the researcher and the study leader.

Bryman *et al*. (2017:192) state that the advantages of utilising a questionnaire for data gathering over a structured interview are that a questionnaire is less expensive and faster to administer, interviewer effects are minimised, there is no variability in the manner or order that questions are posed and it is more convenient for respondents to complete, and therefore respondents are more likely to act in a desirable manner socially.

From the literature study, the fundamental constructs were identified, which formed the main concepts of the survey. The questionnaire developed for this study was hand-delivered and emailed by the researcher to the respondents mentioned in the previous section, depending on the access to the employees by management of the businesses involved, some requested that the respondents were sent the survey through an email only. The respondents were given ten working days to complete the questionnaire and email their completed questionnaire to the researcher. The research instrument in the form of a questionnaire is attached hereto as Annexure A. The questionnaire contains the final refined questions based on the constructs and themes that were developed from the literature study in Chapter 2.

The questionnaire is divided into three sections, A, B and C, with pre-codes added next to each question in each section. Pre-codes are numbers assigned to each question, which are matched to a Likert scale, which respondents then circle to allow for data capturing at the next stage of the process (Bryman *et al.,* 2017:195). Section A contains demographic variables with pre-codes in vertical format, Section B contains questions developed from the constructs and their core elements in horizontal format with pre-coded responses on a Likert scale, and Section C contains the main risks found in construction projects on the left side of the page and term contracts on the right side of the page, where the respondents were requested to select the top five risks in each instance.

Table 3.3 indicates the constructs with their corresponding questions from Section B that were included in the questionnaire.

Table 3.3: Constructs and corresponding questions

Construct	Questions	Question Number
Procurement management	8	Q7, Q14, Q15, Q16, Q20, Q22, Q26, Q27.
Relationship management	9	Q11, Q39, Q40, Q43, Q44, Q45, Q51, Q52, Q54.
Risk management	11	Q2, Q3, Q24, Q25, Q28, Q29, Q30, Q46, Q47, Q48, Q49.
Compliance and governance	7	Q10, Q31, Q32, Q36, Q37, Q42, Q55.
Agreement format	10	Q4, Q5, Q6, Q12, Q13, Q17, Q18, Q19, Q21, Q23.
Supply chain processes and procedures	10	Q1, Q8, Q9, Q33, Q34, Q35, Q38, Q41, Q50, Q53.

Source: Author's own compilation (2018).

Section A contained six demographic questions with a predetermined selection of responses regarding occupation, gender, size of the employing business, level of education, international experience and if a respondent selected 'yes' in terms of international experience, an additional option is required whereby a respondent needs to indicate their years' experience with international contracts or projects. The demographic variables in Section A were included to determine whether differences in demographics resemble variances in responses and whether certain demographic characteristics indicate alignment in responses. The responses for 55 questions in Section B were captured into pre-set values in the form of a Likert scale, with pre-determined extent measures on a five-point ordinal scale, which places a rank in the order of the responses. The range of responses available to respondents is indicated below:

1 = To a very small extent;
2 = To a small extent;
3 = To a moderate extent;
4 = To a large extent;
5 = To a very large extent.

Section C requires respondents to select five top risks for construction projects and five top risks for term contracts, respectively, in no particular order, from a pre-set list of risks identified from the mutual components and risks found in both concepts; see Pilot testing. The questionnaire was completed by three project engineers in the participating businesses respectively as a pilot test, before the questionnaire was issued to the entire sample of respondents. This was done to test clarity of instructions on the questionnaire, comprehension of questions and to identify weaknesses in its construction and validity. The pilot respondents were requested to comment and provide insight into their experience of participation in completion of the questionnaire.

There were no changes recommended to the questionnaire, and it was indicated to be an instrument that is effortlessly understood and convenient to complete. Thereafter, the questionnaire was sent by email to the total sample selected. Once the questionnaires were received by the researcher, all the data was compiled into one database on an Excel spreadsheet, which was then sent to the Statistical Consultation Services of the North-West University to assist with data analysis. The risk selection in both instances will allow the identification of overlapping risks as indicated in Table 3.4, to determine which common risks need to be managed through the practice of risk management. In the case where there are risks selected in the construction project section, which do not overlap with risks selected in the term contract section, this would indicate which risks are not adequately addressed and could indicate a shortcoming in the term contract in general.

Table 3.4: Mutual risks in construction projects and term contracts

1	Weather delays
2	Planning and scheduling risk (incorrect planning)
3	Cost increases
4	Material supplier delivery risk
5	Competitiveness in market
6	client design
7	contractor's design
8	client's design changes
9	contractor's design changes
10	Skilled labour
11	Sub-contractor risk
12	contractor's equipment, plant and tools
13	Access to facilities or construction site
14	Undetected, unidentified underground utilities (cables/ pipes)
15	Political risk
16	Labour risk (e.g. strikes, hired labour availability)
17	SHE risk (safety, health and environment)
18	Construction industry challenges
19	Agent risk (principal agent appointed by client to manage project/ contract)

Source: Author's own compilation (2018).

3.5.2 Pilot testing

The questionnaire was completed by three project engineers in the participating businesses respectively as a pilot test, before the questionnaire was issued to the entire sample of respondents. This was done to test clarity of instructions on the questionnaire, comprehension of questions and to identify weaknesses in its construction and validity. The pilot respondents were requested to comment and provide insight into their experience of participation in completion of the questionnaire.

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3.6 Data analysis

The data gathered in this study have a number of variables examined through multivariate analysis. Multivariate analysis is used to analyse the data, which means two or more variables were simultaneously analysed using statistical techniques (Wuensch, 2016:1). Both descriptive statistics and frequency analysis were performed by the Statistical Consultation Services of the North-West University, using SPSS (2017) on the response datasets.

Exploratory factor analysis or 'EFA' is a method of multivariate statistical analysis that is frequently used in social sciences to reveal a structure that is not at first easily recognised in a set of multiple variables (Field, 2009:628). EFA should be used when a researcher does not have *a priori* hypotheses about patterns of variables that are being measured. In this instance, the variables are the concepts underlying the questions in the survey. This technique compiles data to reduced sets of summary variables in order to explore the relevant phenomena's core theoretical structure. EFA is a way in which latent variables can be measured, which is often difficult to measure, and it enables a researcher to identify relationships between variables (Field, 2009:628).

Therefore, the correlation between variables is different subset dimensions, which are called factors, grouping these variables together. In using factor analysis, the smallest number of exploratory constructs are used in a correlation matrix to indicate the maximum common variance to be found among the variables. Q-type factor analysis means that factors are calculated from the individual respondents, as opposed to factors that are calculated from the correlation matrix, which is termed an R-type factor analysis. Eigenvalues (Tabachnik & Fidell, 2001:65) measure the variance for a certain factor in all the variables, which is accounted for by that factor. One method of testing dimensionality of Cronbach's alpha (α) described in the section hereafter, can be done through EFA. The appropriateness of the EFA can be tested by Bartlett's test of sphericity and examines whether variables do not have correlations in a population (Fazlagić, 2017:264).

In order to measure how suited the data is in order to use factor analysis, the Kaiser-Meyer-Olkin ('KMO') test is used, which measures the adequacy of sampling for each variable and for all variables combined, or simply stated it is an examination of factor analysis appropriateness for this study. The KMO yields values between 0 and 1, indicating the proportion of variance among variables and possibly a mutual shared variance.

When a KMO value is near to zero, it is possible that when compared to the correlations' sum, there are large fractional correlations that is a significant problem for factor analysis (Friel, 2007:19). Therefore, the KMO needs to be close to 1 and larger than 0.5.

3.6.1 Validity and reliability

Validity can be described as implying utility, and indicates to what level that which is intended to be measured is achieved through the research instrument. It measures whether the scale reflects true differences instead of random error among objects on the studied characteristics; therefore, to be valid, it should not contain any error. Content validity is the manner in which a scale covers the testing of the subject adequately and is also known as face validity (Nestor & Schutt, 2015:100). Criterion validity measures whether an instrument performs as expected or not as a meaningful parameter with respect to other variables when measured against pre-set objective criteria and needs to be consistent, impartial and applicable (Nestor & Schutt, 2015:101). It is further stated by Nestor and Schutt (2015:102) that construct validity tests new ideas and measurements through correlations and inferred relationships among measured variables.

Reliability of an instrument does not necessarily mean that it is a valid instrument, and it indicates the consistency in which the scale yields results. Cronbach's alpha can be used to measure the internal consistency in terms of scale reliability and how narrowly a group of items is related. A value of 0.8 is a generally accepted value for intellectual tests, although for aptitude tests a suitable value can start from 0.7. Values below 0.7 can be expected in psychological testing as there is a variety of constructs being tested (Field, 2009:675). Pallant (2010:100) is of the opinion that, with a scale containing a small number of items, it may prove difficult to obtain a proper Cronbach alpha value; the mean inter-item correlation may be better suited for reporting reliability of the scale, and for this reason both these are reported in the following chapter. A reliability coefficient of .70 or higher is considered acceptable in situations of many social science research, such as this study (Fazlagić, 2017:263).

Another method to analyse internal consistency reliability is the average inter-item correlation, which determines whether the questions on a survey provide consistent and similar scores for items that are supposed to measure the same construct, and it is assists the researcher in stating the validity of a scale (Yilmaz, 2013:318). It is aimed at measuring different aspects and depth of a construct and it would not assist the researcher to have two items on the scale that measure a construct in precisely the same manner, and therefore it is suggested that the inter-item correlations are kept between 0.15 and 0.50. Items that score below 0.15 indicate poor inter-item correlations and may not relate appropriately nor be suitable in the testing of a single construct; conversely, items that score above 0.5 may be detrimental as it no longer improves validity of a measure (Field, 2009:169). The concept of structural validity was advanced by Clark and Watson (1995:311), which indicates the extent to which the inter-item correlations or internal scale structure match the external structure of the target construct.

3.6.2 Statistical significance tests

The ANOVA test assists a researcher in determining whether to reject the null hypothesis or accept the alternate hypothesis, to test groups for differences between them, and to find out whether the survey results are significant (Wuensch, 2016:2). A null hypothesis for the test is that the two means are equal and a significant result would result in the two means being unequal. A one-way ANOVA is applied in this study using the F-distribution to compare two means from two independent groups (Greener, 2008:64). While the ANOVA compares variances between populations, a T-test will indicate whether there is a noteworthy variation between groups by comparing the means. A series of t-tests can be performed on the data, although the result may end in pair comparisons being run as the group number increases. The ANOVA test will assist a researcher to reject or support the null hypothesis by providing one number called the f-statistic and a single p-value (Greener, 2008:64).

In order to establish the importance of a significant relationship and interpret results for practical significance, effect sizes could be calculated from the descriptive analysis and indications provided on whether it is statistically important (Ellis & Steyn, 2003:51). Ellis and Steyn (2003:51) state that t-tests are used to reveal the statistical significance of the difference between two means, where the p-value is a criterion of this, which creates the possibility that the value obtained or a greater value could be achieved under the notion that the null hypothesis is true and that there is no difference between the means. A p-value is considered as sufficient evidence that the result is statistically significant when it is smaller than 0.05, although statistical significance does not necessarily imply that it is noteworthy as tests such as these could yield small p-values with increases in the size of the datasets.

A convenient method of quantifying the size of the difference between two groups is the effect size, which may be applied to any outcome measured in social sciences and is simple to calculate and understand. It indicates how well an idea works within a range of contexts by placing the emphasis on the most important aspect of an intervention and is valuable mostly when quantifying the efficacy of a particular intervention in relation to some comparison.

Other than its statistical significance, which conflates effect size and sample size, the size of the effect promotes a more logical approach to the accumulation of information, and therefore effect size could be an essential tool when effectiveness is interpreted and reported. Ellis (2010:7) states that effect sizes can form part of two relations; the differences between groups also known as the d-family and association measures between groups identified as the r-family. Field (2009:56) describes an effect size as an objective and standardised measure of the magnitude of an observed effect.

An effect size assists in drawing findings concerning a difference in the means, as it is a standardised measure that does not rely on the corresponding sample sizes (Ellis & Steyn, 2003:52). An analysis of variances between two means can be an appropriate method to use in the comparison of two groups (Field, 2009:317). An effect size of differences to be used in this study is Cohen's d, even though many measures of effect sizes have been proposed as effective in literature, this is the most commonly used effect size in social sciences (Field, 2009:57; Ellis, 2010:9). Cohen's d can be used to accompany reporting of ANOVA and t-test results, is extensively used in meta-analysis as an effect size used to indicate the unvarying difference between two means and it is an appropriate effect size for the comparison between two means (Grove & Cipher, 2016:247). Cohen (1992:157) suggests that a small effect size is a value close to 0.2, 0.5 represents a medium effect size and large effect size is close to 0.8. This guideline is used when evaluating the effect sizes in the next chapter.

3.7 Limitations of the study

There were some limitations identified in the study conducted, and these include the geographical scope and time to complete the study.

3.7.1 Limited time to complete the study

This study is completed as a partial requirement for an MBA mini-dissertation, within a period of two calendar years. The construction projects and term contracts referred to in this study is either single-discipline or multi-discipline, though the research focus is mainly on civil engineering and construction as the main discipline. The field of supply chain management in the construction industry has many other aspects that could not be covered due to the limited time to complete this study. More time is required in order to accurately address the merging of construction projects into term contracts in other industrial and production industries. Even though the principles used in this study could be applied to other industries, the focus of this study is limited to construction projects and term contracts in the petrochemical and mining industries and specifically engineering and construction businesses that execute projects and term contracts for and on behalf of SASOL and other large entities in similar industries.

3.7.2 Limited scope of the study

The geographical scope of the study in terms of data gathered is limited to SASOL in South Africa and specifically engineering and construction businesses that execute construction and engineering work for SASOL. The geographical scope can be extended in a supplementary study to include businesses that execute construction services for other large international entities and government institutions, or public entities.

3.8 Ethical considerations

According to O'Gorman & MacIntosh (2015:197), it is important to be clear about your intended study's considerations in terms of ethics and there are three reasons why that are important:

- To improve research results or conclusions;
- To ensure you conduct the research professionally;
- To navigate sensitive topics correctly.

Approval was obtained from the participating businesses' management departments to gain access to respondents. The detail and reasons for the research study was clearly described in the introductory paragraph of the questionnaire. There are no major ethical considerations for this study and no data collected will be sensitive or of a personal nature. The study research application and ethical clearance was obtained before the study commenced. The main client business where the researcher is employed at time of this study, provided approval for the research study to be conducted within the business, as well as inclusion of its contractors. All communication with these contractors indicated that no special privileges will be granted, nor any actions would be taken for taking part in the study, and that it is completely anonymous

3.9 Chapter conclusion

Notwithstanding the limitations identified in this study, there were considerable data collected regarding the status of procurement practices in construction projects and term contracts and a combination of these two concepts. Once the data analysis was complete, the researcher collected the analysed reports and documentation in order to utilise the results and draw significant conclusions from these. The researcher was able to compile a number of findings indicated hereafter in the following chapter; where after the required framework was developed and discussed in the final chapter, which ultimately solves the main research problem of creating a convenient governed vehicle through which to award construction projects.

CHAPTER 4: RESULTS AND FINDINGS

4.1 Introduction

This chapter stipulates the findings derived from statistical analyses of data from all three sections in the questionnaire responses, where after a description is provided on the conclusions that could be drawn from these analyses. Each section is evaluated in terms of the descriptive analysis concluded for every question and thereafter the reliability and validity of the questionnaire are tested and discussed. Although the questions were formulated into statements in the questionnaire, they will still be referred to as questions to maintain consistency throughout the study.

4.2 Descriptive data analysis: results and findings

The descriptive data analysis is segmented hereafter for sections A, B and C of the questionnaire respectively and contains the main constructs, their corresponding questions and a combination of either the mean ($\bar{x}$), standards deviation (σ), frequency (f) and percentage frequency or effect size (d) listed in a table format. The table format includes a graphical depiction of the frequencies by means of gradient filled data bars in blue, to make it easier to identify the highest scoring variables in the set of data. The following section elaborates on the findings in these tables.

4.2.1 Results: Section A

The demographic results in section A of the questionnaire were obtained from questions that determine occupation, gender, size of the business, level of education and international work experience. Each section had its own unique scale with options for pre-set responses based on the question content. The result tables for each question in Section A contains the frequency and frequency percentage for every option of the scale responses. Table 4.1 indicates the results for occupations in the demographic section of the survey.

Table 4.1: Occupation

A1	Occupation	f	f %
1	Contract/ project manager	32	28.83%
2	Contract/ procurement specialist	18	16.22%
3	Engineer/ project engineer	30	27.03%
4	Area/ group leader	8	7.21%
5	Other	23	20.72%
Total		111	100%

The occupation results as depicted in Table 4.1, revealed that the largest group of respondents were contracting and project managers (32 or 28.83%), the second largest group were engineers (30 or 27.03%) and the smallest group consisted of eight area or group leaders (7.21%).

Table 4.2: Other occupation

A1.b	Other occupation	f	f %
Specified occupations (1 - 4)		*88*	*79.28%*
Architect/ principal agent/ quantity surveyor		6	5.41%
Draughtsman/ structural designer		2	1.80%
Project or engineering planner/ project coordinator		3	2.70%
Engineering technician		2	1.80%
Legal advisor		1	0.90%
Managing director/ chief executive officer/ vice president		9	8.11%
Subtotal - other		23	20.72%
Total		111	100%

Table 4.2 portrays the third largest group consisting of 23 respondents (20.72%) classified in terms of occupation under the 'other' occupation group, which had the option of specifying their occupation if it was not listed in the pre-set options. These 23 respondents listed occupations that consisted of architects, principal agents, quantity surveyors, draughtsmen, structural designers, engineering technicians, project planners and coordinators, directors and a legal advisor.

Table 4.3: Gender

A2	Gender	f	f %
1	Male	88	79.28%
2	Female	23	20.72%
Total		111	100%

The gender groups were identified as 79.28% male and 20.72% as female and are shown here in Table 4.3. The respondents indicated in Table 4.4 that 51.35% were employed by large businesses of over 200 employees in total, 27.93% from businesses with between 51 and 200 employees and 18.02% from business with fewer than 50 employees.

Table 4.4: Business size

A3	Business size/ number of employees	f	f %
1	5-50	20	18.02%
2	51-200	31	27.93%
3	200+	57	51.35%
Total		111	100%

Table 4.5: Education level

A4	Education level/ qualification	f	f %
1	Grade 12/ matric	8	7.21%
2	Diploma or B-Tech	25	22.52%
3	University degree	37	33.33%
4	Honours degree	19	17.12%
5	Master's Degree	22	19.82%
Total		111	100%

In Table 4.5, the groups according to education level indicated the largest group of 33.33% or 37 respondents have a university degree; which comprises one third of the total respondents who participated in the survey. The second largest group of 25 (22.52%) indicated a technical qualification or diploma and 22 (19.82%) respondents indicated a master's degree as their highest qualification. The smallest group in terms of education were eight (7.21%) who indicated a matric certificate as their highest level.

Table 4.6: International work experience

A5	International experience	f	f %
1	Yes	49	44.14%
2	No	62	55.86%
Total		111	100%
A6	**Years' international experience**	**f**	**f %**
0	No experience	62	55.86%
1	Less than one year	12	10.81%
2	More than 1 year less than 5	16	14.41%
3	More than 5 years	21	18.92%
Total		111	100%

In Table 4.6 it is revealed that here were 49 out of 111 (44.14%) respondents indicating that they have relevant international work experience, 21 (18.92%) respondents have over five years relevant experience, 16 (14.41%) have between one and five years and 12 (10.81%) has less than one year international work experience.

4.2.2 Findings: Section A

The results in Section A revealed that the majority of respondents are either male, have a university degree, are employed as a manager or engineer and work in a business with over 200 employees. The minority groups were female respondents, respondents with a matric as highest education level and employed by businesses with fewer than 50 employees.

There were number of minority groups in terms of occupation description, such as a legal advisor, technicians and drafting or design employees. Some respondents (21 or 18.92%) have over five years' international work experience, which gives a broad approach to responses from a vast background of knowledge.

4.2.3 Results: Section B

Table 4.7 indicates the mean responses and standard deviation per construct and it is evident that the mean lies above 3.0 in all constructs, except for the supply chain processes and procedures construct which is 2.93. The standard deviation of the constructs are all between 0.44 and 0.47, with the exception of the construct procurement management, which has a standard deviation of 0.518.

Table 4.7: Responses per construct

Construct	Number of items	$\bar{x}$	σ
Procurement management	8	3.49	0.518
Relationship management	9	3.89	0.453
Risk management	11	3.45	0.467
Compliance and governance	7	3.60	0.453
Agreement format	10	3.05	0.446
Supply chain processes and procedures	10	2.93	0.454

In Section B, the comparison was further made between maintenance contracts and construction projects by dividing questions into subsets through allocation according to construction projects (p) or term contracts (m). In this manner, the distinction is shown between the two concepts and areas can be clearly identified where the contract term agreements adequately address critical contractual aspects of construction projects. The sixth construct (supply chain processes and procedures) does not provide a distinction between the two concepts, as these questions were based on general supply chain processes and procedural elements that are present in both construction projects and term contracts.

Figure 4.1: Mean responses per construct: term contracts vs. construction projects

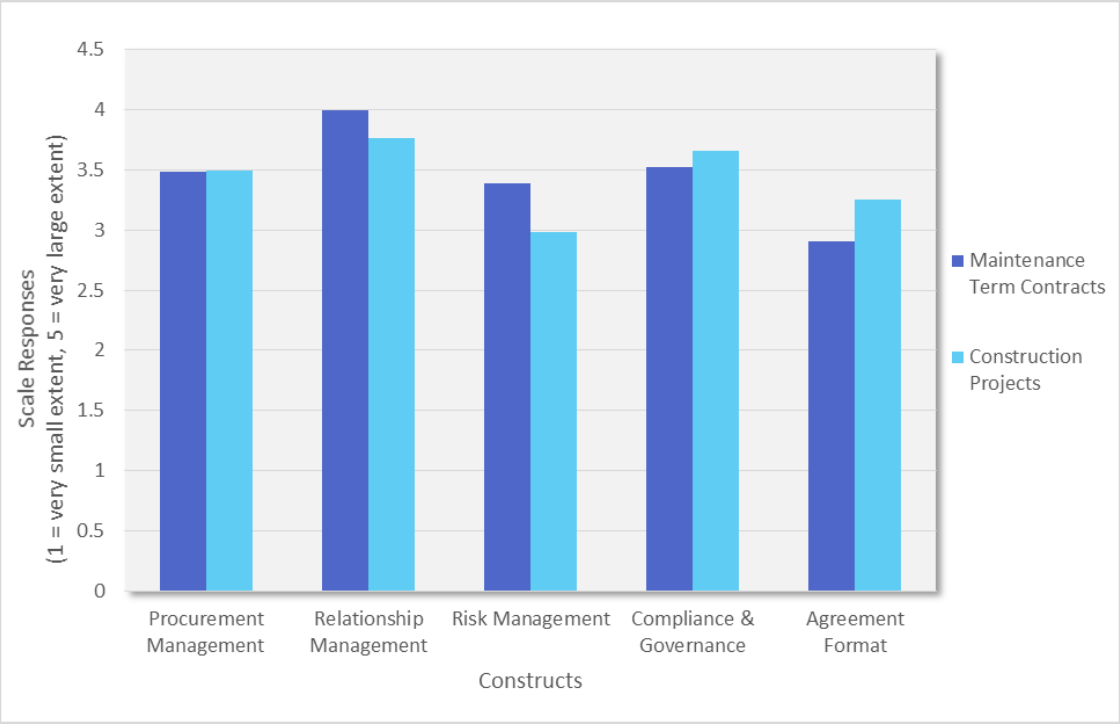


Figure 4.1 depicts a histogram of the mean responses per construct when considering the term contracts in relation to construction projects. There is a similarity in the means between the two concepts and it is very closely related in terms of procurement management, relationship management and compliance and governance. The agreement format and risk management constructs have higher means for construction projects, which could mean that term contracts may need to be improved in terms of the format of agreement and management if contract risks exist.

Table 4.8: Procurement management - standard deviation, mean and frequency

Construct	m / p	Question number	Statement	$\bar{x}$	σ	Response									
						1	f	2	f	3	f	4	f	5	f
Procurement management	m	B7	Past performance is considered when new maintenance term contracts are awarded.	3.67	0.98	2	1.80%	13	11.71%	27	24.32%	47	42.34%	22	19.82%
	m	B15	Maintenance term contract documentation address insurance provisions.	3.42	0.92	1	0.90%	19	17.12%	34	30.63%	46	41.44%	11	9.91%
	m	B27	The time required for a tender process influences the award of a maintenance term contract.	3.35	1.02	2	1.80%	23	20.72%	36	32.43%	34	30.63%	16	14.41%
	p	B14	Contractual documentation of projects address insurance provisions.	3.54	0.94	1	0.90%	17	15.32%	29	26.13%	49	44.14%	15	13.51%
	p	B16	Limited liability clauses are addressed in contractual documentation of projects.	3.50	0.87	1	0.90%	11	9.91%	45	40.54%	40	36.04%	14	12.61%
	p	B20	A Tender Process addresses the value of the project.	3.50	0.93	1	0.90%	15	13.51%	39	35.14%	40	36.04%	16	14.41%
	p	B22	The complexity of work is addressed in the Tender Process for a project.	3.32	0.88	0	0.00%	23	20.72%	38	34.23%	42	37.84%	8	7.21%
	p	B26	The time required for a tender process influences the project schedule.	3.62	0.99	2	1.80%	14	12.61%	29	26.13%	45	40.54%	21	18.92%
Total (n)		8				10		135		277		343		123	

4.2.4 Procurement management

Table 4.8 provides the mean, standard deviation and frequency for the construct procurement management and its corresponding questions, where f indicates the frequency and $\bar{x}$ indicates the mean in the discussion. The most frequent responses selected were 3 (to a moderate extent) and 4 (to a large extent). In term contracts, ***past performance*** is considered to a large extent when contracts are awarded (f = 42.34%; $\bar{x}$ = 3.67), and term contract documentation is considered as addressing ***insurance provisions*** to a large extent (f = 41.44%; $\bar{x}$ = 3.42) with a number of 46 responses. Contractual documentation of projects is indicated as addressing ***insurance provisions*** to a large extent (f = 44.14%; $\bar{x}$ = 3.54) and the time required for a ***tender process*** has a significant influence on the project schedule (f = 40.54%; $\bar{x}$ = 3.62). The highest standard deviation scores, 1.02 and 0.99, were found in the time required for a tender process which influences both a project's schedule and contract award.

Table 4.9: Relationship management - standard deviation, mean and frequency

Construct	m / p	Question number	Statement	$\bar{x}$	σ	Response									
						1	f	2	f	3	f	4	f	5	f
Relationship management	m	B11	The contract type utilised influences the success of a maintenance term contract.	3.71	0.91	0	0.00%	12	10.81%	30	27.03%	47	42.34%	22	19.82%
	m	B40	Collaboration between Client and Contractor contribute to the success of a maintenance term	4.14	0.83	0	0.00%	2	1.80%	25	22.52%	39	35.14%	45	40.54%
	m	B43	Trust between Client and Contractor contribute to the success of a maintenance term contract.	4.01	0.91	0	0.00%	6	5.41%	27	24.32%	38	34.23%	40	36.04%
	m	B45	Mutual objectives between Client and Contractor contribute to the success of a maintenance	4.06	0.92	1	0.90%	2	1.80%	31	27.93%	32	28.83%	45	40.54%
	m	B52	Information sharing between Client and Contractor contribute to the success of a	4.04	0.97	0	0.00%	9	8.11%	23	20.72%	34	30.63%	45	40.54%
	p	B39	Collaboration between Client and Contractor contribute to the success of a project.	3.26	0.85	4	3.60%	16	14.41%	39	35.14%	51	45.95%	1	0.90%
	p	B44	Mutual objectives between Client and Contractor contribute to the success of a project.	4.00	0.99	1	0.90%	6	5.41%	30	27.03%	29	26.13%	45	40.54%
	p	B51	Information sharing between Client and Contractor contribute to the success of a project.	3.83	0.99	0	0.00%	10	9.01%	35	31.53%	30	27.03%	36	32.43%
	p	B54	Mutual performance management between Client and Contractor contribute to the success of	3.95	0.88	0	0.00%	8	7.21%	21	18.92%	50	45.05%	32	28.83%
Total (n)		9				6		71		261		350		311	

4.2.5 Relationship management

Table 4.9 provides the mean, standard deviation and frequency for the construct relationship management and corresponding questions. The most frequent responses selected were 4 (to a large extent) and 5 (to a very large extent). The success of term contracts is largely influenced by the ***contract type*** (f = 42.43%; $\bar{x}$ = 3.71) and ***collaboration*** between client and contractor (f = 40.54%; $\bar{x}$ = 4.14). ***Collaboration*** (f = 45.95%; $\bar{x}$ = 3.26) and ***mutual performance management*** (f = 45.05%; $\bar{x}$ = 3.95) between client and contractor is similarly viewed as contributing largely to the success of a project.

Table 4.10: Risk management - standard deviation, mean and frequency

Construct	m / p	Question number	Statement	$\bar{x}$	σ	Response									
						1	f	2	f	3	f	4	f	5	f
Risk management	m	B3	Partial payments are necessary for work completed on a term contract.	3.30	1.05	4	3.60%	24	21.62%	31	27.93%	39	35.14%	13	11.71%
	m	B25	The bidders list in a term contract tender are comprised of contractors with the required	3.36	0.92	0	0.00%	24	21.62%	33	29.73%	44	39.64%	10	9.01%
	m	B30	Corporate governance practices mitigate legal risk in a maintenance term contracts.	3.46	0.87	1	0.90%	15	13.51%	37	33.33%	48	43.24%	10	9.01%
	m	B49	Collaboration tools (systems) contribute to the success of a maintenance term contract.	3.72	0.81	0	0.00%	9	8.11%	29	26.13%	57	51.35%	16	14.41%
	p	B47	Principal agents positively contribute to the performance management in a project.	3.41	0.87	1	0.90%	18	16.22%	33	29.73%	52	46.85%	7	6.31%
	p	B2	Partial payments are necessary for work completed on a project.	3.83	0.98	1	0.90%	10	9.01%	28	25.23%	40	36.04%	32	28.83%
	p	B24	The bidders list in a project tender are comprised of contractors with the required	3.52	0.89	0	0.00%	16	14.41%	35	31.53%	46	41.44%	14	12.61%
	p	B28	A principal agent acting on behalf of the Client contribute to the success of a project.	3.68	0.97	3	2.70%	10	9.01%	27	24.32%	50	45.05%	21	18.92%
	p	B29	Corporate governance practices mitigate legal risk in a project.	2.64	0.90	12	10.81%	36	32.43%	43	38.74%	20	18.02%	0	0.00%
	p	B46	Principal agents positively contribute to relationship management in a project.	3.45	0.82	1	0.90%	15	13.51%	33	29.73%	57	51.35%	5	4.50%
	p	B48	Collaboration tools (systems) contribute to the success of a project.	3.59	0.80	0	0.00%	12	10.81%	32	28.83%	57	51.35%	10	9.01%
Total (n)		11				23		189		361		510		138	

4.2.6 Risk management

Table 4.10 indicates the mean, standard deviation and frequency for the construct risk management and corresponding questions. The most frequent responses selected were 3 (to a moderate extent) and 4 (to a large extent). In term contracts the ***Corporate governance practices*** mitigate legal risk (f = 43.24%; $\bar{x}$ = 3.46) and ***collaboration tools*** contributes (f = 51.35%; $\bar{x}$ = 3.72) to its success, while the ***bidders list*** in term contract tenders are perceived as containing contractors with the required competencies (f = 39.64%; $\bar{x}$ = 3.36). ***Collaboration tools*** contributes to the success of a project (f = 51.35%; $\bar{x}$ = 3.59). ***Principal agents*** positively contribute to relationship management (f = 51.35%; $\bar{x}$ = 3.45) and the success of a project (f = 45.05%; $\bar{x}$ = 3.68).

Table 4.11: Governance and compliance - standard deviation, mean and frequency

Construct	m / p	Question number	Statement	$\bar{x}$	σ	Response									
						1	f	2	f	3	f	4	f	5	f
Governance and compliance	m	B32	Competition law requirements influence the time to the award a maintenance term contract.	3.01	1.00	6	5.41%	30	27.03%	38	34.23%	31	27.93%	6	5.41%
	m	B37	Industry standards are adhered to in maintenance term contracts.	3.59	0.85	0	0.00%	12	10.81%	36	32.43%	49	44.14%	14	12.61%
	m	B55	Mutual performance management between Client and Contractor contribute to the success of	3.98	0.86	0	0.00%	7	6.31%	21	18.92%	50	45.05%	33	29.73%
	p	B10	The contract type (format) utilised, influences the success of a project.	3.83	0.80	0	0.00%	6	5.41%	28	25.23%	56	50.45%	21	18.92%
	p	B31	Competition law requirements influence the time to the award a project.	2.98	1.00	6	5.41%	32	28.83%	37	33.33%	30	27.03%	6	5.41%
	p	B36	Industry standards are adhered to in projects.	3.67	0.95	1	0.90%	12	10.81%	32	28.83%	44	39.64%	22	19.82%
	p	B42	Trust between Client and Contractor contribute to the success of a project.	4.15	0.84	0	0.00%	1	0.90%	29	26.13%	33	29.73%	48	43.24%
Total (n)		7				13		100		221		293		150	

4.2.7 Governance and compliance

Table 4.11 provides the mean, standard deviation and frequency for the construct governance and compliance and corresponding questions. The most frequent responses selected were 3 (to a moderate extent) and 4 (to a large extent). The success of term contracts can be attributed to ***mutual performance management*** (f = 45.05%; $\bar{x}$ = 3.98) between client and contractor and ***industry standards*** as seen as being largely adhered to in term contracts (f = 44.14%; $\bar{x}$ = 3.59) with 49 responses. ***Trust*** between client and contractor contributes to a very large extent the success of a project (f = 43.25%; $\bar{x}$ = 4.15) and ***contract type (format)*** used can influence its success (f = 50.54%; $\bar{x}$ = 3.83).

Table 4.12: Agreement format - standard deviation, mean and frequency

Construct	m / p	Question number	Statement	$\bar{x}$	σ	Response									
						1	f	2	f	3	f	4	f	5	f
Agreement format	m	B5	Retention funds are required for work completed on maintenance term contracts.	2.43	0.97	17	15.32%	46	41.44%	35	31.53%	9	8.11%	4	3.60%
	m	B13	Risks are allocated effectively between Client and Contractor in maintenance term contract	3.02	0.96	5	4.50%	29	26.13%	42	37.84%	29	26.13%	6	5.41%
	m	B17	Limited liability clauses are addressed in maintenance term contract documentation.	3.21	0.95	1	0.90%	29	26.13%	35	31.53%	38	34.23%	8	7.21%
	m	B19	Maintenance term contract documentation stipulate which party takes accountability in a	3.10	0.96	4	3.60%	29	26.13%	35	31.53%	38	34.23%	5	4.50%
	m	B21	A Tender Process addresses the value of a maintenance term contract.	2.90	1.04	8	7.21%	33	29.73%	41	36.94%	20	18.02%	9	8.11%
	m	B23	The complexity of work is addressed in the Tender Process for a maintenance term contract.	2.79	0.85	2	1.80%	44	39.64%	44	39.64%	17	15.32%	4	3.60%
	p	B4	Retention funds are required for work completed on projects.	3.71	0.94	2	1.80%	8	7.21%	33	29.73%	45	40.54%	23	20.72%
	p	B6	Past performance is considered when new projects are awarded.	2.68	0.97	16	14.41%	27	24.32%	44	39.64%	24	21.62%	0	0.00%
	p	B12	Risks are allocated effectively between Client and Contractor in contractual documentation of	3.03	0.94	4	3.60%	27	24.32%	50	45.05%	22	19.82%	8	7.21%
	p	B18	Contractual documentation of projects stipulate which party takes accountability in a specific	3.59	0.97	2	1.80%	14	12.61%	30	27.03%	47	42.34%	18	16.22%
Total (n)		10				61		286		389		289		85	

4.2.8 Agreement format

Table 4.12 provides the mean, standard deviation and frequency for the construct agreement format and its corresponding questions. The most frequent responses selected were 3 (to a moderate extent), where 2 (to a small extent) and 4 (to a large extent) obtained the same number of responses at a number of 289, respectively. ***Retention funds*** are not required for work completed to a significant extent (f = 41.44%; $\bar{x}$ = 2.43) and the ***complexity of work*** is moderately addressed in the tender process (f = 39.64%; $\bar{x}$ = 2.79) for a term contract.

Risks are moderately allocated between client and contractor in term contracts (f = 37.84%; $\bar{x}$ = 3.02) and construction projects (f = 45.05%; $\bar{x}$ = 3.03). It is indicated that contractual documentation of projects stipulate to a large extent which party takes ***accountability*** in a specific situation (f = 42.34%; $\bar{x}$ = 3.59).

Table 4.13: Supply chain processes and procedures - standard deviation, mean and frequency

Construct	m / p	Question number	Statement	$\bar{x}$	σ	Response									
						1	f	2	f	3	f	4	f	5	f
Supply chain processes and procedures	m,p	B1	Claims are managed efficiently by the Client.	3.65	0.82	1	0.90%	11	9.91%	31	27.93%	51	45.95%	17	15.32%
	m,p	B8	Penalties are actively enforced by the Client for poor performance.	2.66	0.94	11	9.91%	39	35.14%	40	36.04%	19	17.12%	2	1.80%
	m,p	B9	Rewards are awarded by the Client for good performance.	1.83	0.75	38	34.23%	58	52.25%	11	9.91%	4	3.60%	0	0.00%
	m,p	B33	The Client's governance procedures are made available to Contractors.	3.18	0.94	1	0.90%	29	26.13%	38	34.23%	35	31.53%	8	7.21%
	m,p	B34	The Client's governance procedures are understandable.	3.14	0.96	3	2.70%	28	25.23%	37	33.33%	36	32.43%	7	6.31%
	m,p	B35	The Client's employees adhere to their governance procedures.	3.40	0.90	2	1.80%	17	15.32%	35	31.53%	49	44.14%	8	7.21%
	m,p	B38	A tender process minimises legal risk for the Client.	3.65	0.89	1	0.90%	11	9.91%	31	27.93%	51	45.95%	17	15.32%
	m,p	B41	Collaboration between Client and Contractor impair the competitive advantage of a Contractor.	2.55	0.82	7	6.31%	49	44.14%	45	40.54%	7	6.31%	3	2.70%
	m,p	B50	Collaboration tools (systems) between Client and Contractor impair the competitive advantage	2.56	0.86	9	8.11%	47	42.34%	41	36.94%	12	10.81%	2	1.80%
	m,p	B53	Information sharing between Client and Contractor can impair the competitive advantage of a	2.71	0.84	7	6.31%	34	30.63%	58	52.25%	8	7.21%	4	3.60%
Total (n)		10				80		323		367		272		68	

4.2.9 Supply chain processes and procedures

Table 4.13 provides the mean, standard deviation and frequency for the construct supply chain processes and procedures and its corresponding questions. These questions were based on general supply chain aspects that are applicable to both construction projects and term contracts. The most frequent responses selected were 2 (to a small extent) and 3 (to a moderate extent). It was found that ***claims*** are managed efficiently by a client to a significant extent (f = 45.95%; $\bar{x}$ = 3.65) and the ***rewards*** are not awarded by a client for good performance (f = 52.25%; $\bar{x}$ = 1.83). A ***Tender process*** minimises legal risks for a client to a large extent (f = 45.95%; $\bar{x}$ = 3.65), while ***information sharing*** between client and contractor is seen as moderately impairing the competitive advantage of a contractor (f = 52.25%; $\bar{x}$ = 2.71).

4.2.10 Findings: Section B

It is evident from the above findings that contractual documentation of a term contract could adequately address insurance provisions required in construction projects and consider past performance of contractors before a contract is awarded. It is seen that time required for a tender process has an influence on the schedule of projects.

The collaboration between client and contractor plays a major role in the success of construction projects as well as term contracts and the type of contract used in term contracts can consequently influence its success. Term contracts need to include mutual performance management measures when incorporation of construction projects is considered. Collaboration tools contribute to the success of both term contracts and construction projects, which minimises risk of failure, and corporate governance practices in term contracts mitigate legal risk. In construction projects, the principal agents acting on behalf of the client greatly contribute to the relationship management and success of a project.

Governance and compliance have an influence on the success of a project, which is affected by trust between client and contractor and selection of the correct contract type or format. Term contracts contain mutual management of performance between client and contractor, which contributes to its success, while also adhering to industry standards. In terms of the agreement format selected, retention funds and complexity of work are not significantly required and addressed in term contracts. Risks are moderately allocated between client and contractor in term contracts and construction projects and this is adequately addressed. It is indicated that contractual documentation of projects stipulate to a large extent which party takes accountability in a specific situation, which in turn, means that it needs to be addressed in the term contract more specifically with regard to projects.

Through evaluation of supply chain processes and procedures, it was found that generally claims are managed efficiently by a client to a significant extent and that rewards are not awarded by a client for good performance. A tender process indicated minimisation of a client's legal risks to a large extent, while information sharing between client and contractor is seen as moderately impairing the competitive advantage of a contractor. The term contract therefore needs to contain the required clauses to state what the process would be to institute claims and rewards. The tender process is viewed is minimising legal risk, which means that sound governance needs to be followed for term contract tenders when including construction projects as part of the contract scope. Information sharing between contractor and client seems to be negatively related to the competitive advantage of a contractor; this entails that the contractor would be reluctant to share information with the client and the situation could be remedied by improving the business relationship and trust.

4.2.11 Results: Section C

Section C of the questionnaire lists the main risks in construction projects and term contracts and requires a respondent's selection of the top five risks for each. The top risks and frequencies for construction projects in Table 4.14 using gradient filled data bars.

Table 4.14: Construction projects top five risks

CONSTRUCTION PROJECTS			
No.	**f (Total)**	**f (%)**	**Variables**
1	87	15.68%	Planning and scheduling risk (incorrect planning)
2	69	12.43%	Cost increases
3	56	10.09%	Client's design changes
4	52	9.37%	SHE risk (safety health and environment)
5	49	8.83%	Weather delays
	Cumulative percentage	56.40%	

Table 4.15 provides a graphic illustration of the frequencies of the top five risks selected for term contracts in table format using gradient filled data bars.

Table 4.15: Term contracts top five risks

MAINTENANCE TERM CONTRACTS			
No.	**Frequency (Total)**	**Frequency percentage**	**Variables**
1	65	11.71%	SHE risk (safety health and environment)
2	60	10.81%	Planning and scheduling risk (incorrect planning)
3	55	9.91%	Cost increases
4	47	8.47%	Access to facilities or construction site
5	46	8.29%	Skilled labour
	Cumulative percentage	49.19%	

The top five risks in construction projects contribute to a cumulative percentage of 56.40% out of all the risks identified and in term contracts the top five risks contribute to 49.19%. It is evident that the overlapping common risks are ***planning and scheduling***, ***cost increases*** and ***SHE risks*** (safety environmental and health risks). In construction projects these risks are ranked as the 1st, 2nd and 4th most important risks that comprise a total of 37.48% of the total risks. In term contracts, these risks are ranked as the 1st, 2nd and 3rd most important risks that comprise a total of 32.43% of the total risks. The risks that are not highly ranked in term contracts that are ranked as high priority in construction projects are the ***client's design changes*** at 10.09% and ***weather delays*** at 8.83% of total construction project risks. ***Skilled labour*** and ***access to facilities*** were ranked as 8.29% and 8.47%, respectively, out of the total risks identified in term contracts. Access to facilities and skilled labour in term contracts are therefore ranked as high priority in 4th and 5th place, whereas these risks are featured in the 7th and 8th positions for construction projects.

4.2.12 Findings: Section C

The top five risks in construction projects contribute to a cumulative percentage of 56.40% out of all risks identified, and in term contracts, the top five risks contribute to 49.19%. Common risks found among both main concepts are planning and scheduling, cost increases and SHE risks (safety environmental and health risks), and constitutes a large percentage of the risks of both, which may be interpreted as having the same top three risks and concluding that term contracts and construction projects need to mitigate the same top three main risks.

The risks that are ranked as high priority in construction projects are the client's design changes and weather delays, and these are not highly ranked in term contracts. Therefore, the term contract needs to be extended in the inclusion of clauses that adequately cover these risks. Access to facilities and skilled labour in term contracts are ranked as high priority, whereas these risks are featured as moderately high risks in construction projects, and therefore it is adequately mitigated in term contracts.

4.3 Comparison between sections

A comparison was made between the demographics (Section A) compared to the results in Section C and Section B, separately, to determine the effect that demographics could have on a certain construct and the way in which it would influence the result. The comparison was made through the calculation of the mean, percentage, standard deviation and effect size for each variable in each section; the relevant findings are reported hereafter.

4.3.1 Comparison of demographics and Section B

A comparison was made between the demographics in Section A and the results per construct from Section B, all results are attached in Annexure C. The comparison of results contained the number of responses (n) and percentage (%), mean ($\bar{x}$), standard deviation (σ) and effect size (Cohen's d) per demographic variable and construct. A number of results with the highest and lowest effect sizes for each construct per demographic category is discussed in this section.

Table 4.16: Occupation and procurement management

Demographic variable	Description		n	%	Procurement management		
					$\bar{x}$	σ	d
Occupation	A1	Contract/ project manager	28	25%	3.504	0.996	
		Contract/ procurement specialist	18	16%	3.424	1.004	0.081
		Engineer/ project engineer	31	28%	3.419	0.839	0.004
		Area/ group leader	8	7%	3.500	0.884	0.091
		Other	26	23%	3.596	0.986	0.098

In Table 4.16 the results indicate similar means for all occupation group regarding the ***procurement management*** construct with very low standard deviations, and a low effect size of d = 0.004. The responses therefore indicate that the respondents from all occupations indicated have the same perception of procurement management in construction projects and term contracts, selecting a moderate to large extent response.

Table 4.17: Occupation and relationship management

Demographic variable	Description		n	%	Relationship management		
					$\bar{x}$	σ	d
Occupation	A1	Contract/ project manager	28	25%	4.187	0.909	
		Contract/ procurement specialist	18	16%	3.802	0.948	0.405
		Engineer/ project engineer	31	28%	3.867	0.947	0.068
		Area/ group leader	8	7%	3.931	0.903	0.067
		Other	26	23%	4.120	0.854	0.210

There is a large effect size reported in Table 4.17 for ***relationship management*** among contract and procurement specialists (d = 0.405); which indicates that the occupation type has an influence on the perception of relationship management compared to the contract and project manager. This could indicate that relationship management is important to contract and procurement specialists who deal more frequently with the relationship aspect of projects and term contracts than their managers.

Table 4.18: Gender and supply chain processes and procedures

Demographic variable	Description		n	%	Supply chain processes and procedures		
					$\bar{x}$	σ	d
Gender	A2	Male	88	79%	2.905	1.038	
		Female	23	21%	2.909	0.897	0.004

The gender does not have a large effect on the outcome of results for ***supply chain processes and procedures*** (d = 0.004) in Table 4.18; which indicates that both genders view the supply chain processes and procedures in the same manner in that mean responses that are similar.

Table 4.19: Gender and relationship management

Demographic variable	Description		n	%	Relationship management		
					$\bar{x}$	σ	d
Gender	A2	Male	88	79%	4.033	0.927	
		Female	23	21%	3.879	0.911	0.166

In Table 4.19 the effect size d = 0.166 is small, although it is the largest effect found in terms of the comparison for gender and all constructs. The male respondents have indicated in Table 19, that the effect of ***relationship management*** is more significant on construction projects and term contracts, than female respondents.

Table 4.20: Business size and risk management

Demographic variable	Description		n	%	Risk management		
					$\bar{x}$	σ	d
Business size/ number of employees	A3	5 - 50	23	21%	3.450	0.874	
		51 - 200	31	28%	3.542	0.895	0.103
		More than 200	57	51%	3.554	0.934	0.012

Table 4.20 reveals an effect size d = 0.012, that is relatively small for large businesses (more than 200 employees) compared to responses from smaller businesses (less than 50 employees) in terms of ***risk management***. The indication is that respondents from larger businesses may perceive that risk management is slight more adequately addressed that what respondents from smaller businesses perceive.

Table 4.21: Business size and procurement management

Demographic variable	Description		n	%	Procurement management		
					$\bar{x}$	σ	d
Business size/ number of employees	A3	5 - 50	23	21%	3.644	0.967	
		51 - 200	31	28%	3.442	0.867	0.209
		More than 200	57	51%	3.464	0.980	0.022

In Table 4.21 there is a larger effect perception of businesses with between 51 to 200 employees on ***procurement management*** (d = 0.209) than on risk management, even though the effect is still small. The respondents from these businesses indicated a lower mean response ($\bar{x}$ = 3.442) compared to employees from smaller businesses ($\bar{x}$ = 3.644), which could imply that they perceive procurement management to be sufficiently addressed in the concepts.

Table 4.22: Education level and supply chain processes and procedures

Demographic variable	Description		n	%	Supply chain processes and procedures		
					$\bar{x}$	σ	d
Education level/ qualification	A4	Matric / Grade 12	8	7%	2.850	1.183	
		Diploma or B-Tech	25	23%	2.842	0.949	0.007
		University degree	37	33%	2.917	1.005	0.075
		Honours degree	19	17%	2.911	0.950	0.007
		Master's degree	22	20%	2.968	1.047	0.055

Table 4.22 revealed that the level of education did not yield a large effect size overall, with most of the effect sizes lower than d = 0.2. The mean of all respondents were below $\bar{x}$ = 2.0 which indicates that the respondents consider ***supply chain processes and procedures*** as being less suitable in construction in general compared to the other constructs.

Table 4.23: Education level and relationship management

Demographic variable	Description		n	%	Relationship management		
					$\bar{x}$	σ	d
Education level/ qualification	A4	Matric / Grade 12	8	7%	4.181	0.763	
		Diploma or B-Tech	25	23%	3.778	0.907	0.444
		University degree	37	33%	4.060	0.955	0.296
		Honours degree	19	17%	3.912	0.927	0.155
		Master's degree	22	20%	4.126	0.881	0.231

The respondents with a diploma or B Tech degree indicated a small to medium effect size of d = 0.444 in Table 4.23, when the standard deviation of ***relationship management*** is compared to the matric or grade 12 respondents. This group indicated the lowest mean score of $\bar{x}$ = 3.778 when responding to relationship management questions and indicates that they may perceive the relationship management construct as being less effective in construction compared to other education level groups.

Table 4.24: Years international experience and agreement format

Demographic variable	Description		n	%	Agreement format		
					$\bar{x}$	σ	d
Years' international experience	A6	Less than 1 year	12	24%	3.058	0.796	
		Between 1 and 5 years	16	33%	3.260	1.153	0.175
		More than 5 years	21	43%	3.262	1.066	0.002

The international work experience among respondents in Table 4.24 indicated the lowest effect size d = 0.002 for the construct ***agreement format.*** This could suggest that respondents with international experience of different years perceive agreement formats to be only moderately adequate in addressing requirements for construction projects and term contracts, as all groups in this section indicated a mean close to $\bar{x}$ = 3.0.

Table 4.25: Years international experience and procurement management

Demographic variable	Description		n	%	Procurement management		
					$\bar{x}$	σ	d
Years' international experience	A6	Less than 1 year	12	24%	3.260	0.885	
		Between 1 and 5 years	16	33%	3.733	0.957	0.494
		More than 5 years	21	43%	3.601	0.994	0.133

The largest effect size of d = 0.494 for respondents in the group with years international experience (Table 4.25), was indicated by those who have between one and five years' experience for the construct ***procurement management***. These respondents indicated that procurement management is largely adequate, than respondents with less than one year experience, and slightly less than those with more than five years.

Although not one of the effect sizes are over d = 0.5, these effect sizes are below a medium effect and range between a small and medium effect size (Cohen's d). In summary, the occupation groups indicated a low effect size for procurement management and higher for relationship management, the gender groups indicated a low effect size between male and females for supply chain processes and procedures and higher effect size for relationship management. The size of the business revealed an influence on lower effect size in some groups for risk management and higher effect size for procurement management, the education level indicated some lower effect sizes for supply chain processes and procedures, whereas relationship management had a higher effect size when considering the business size in terms of its number of employees. The amount of years in international experience revealed a lower effect size amongst groups for agreement format, and a higher effect size for one group in procurement management compared to others with different amounts of international experience.

4.3.2 Comparison of demographics and Section C

The top five risks identified in construction projects are indicated per occupation in Table 4.26. From Table 26, it is evident that all occupation groups selected planning and scheduling risk as most important except for the procurement and contract specialists who ranked it as second most important with 14% group frequency percentage; this group selected weather delays as the top risk in construction projects with an 18% group frequency percentage. This means that there is misalignment between project and operational personnel and procurement or contracting specialists in terms of risk analysis for construction projects. Further to this, the table indicates that the second most important risk associated with projects are cost increases for project and contract managers and project engineers, whereas area and group managers in the operational function deem the design changes and SHE (safety, health and environment) risks as equally important as the second most important risk.

Table 4.26: Occupation and risk selection in construction projects

CONSTRUCTION PROJECTS				OCCUPATION													
No.	f (Total)	f (%)	Variables	Contract/ project manager			Contract/ procurement specialist			Engineer/ project engineer			Area/ group leader			Other		
				f	Overall %	Group %	f	Overall %	Group %	f	Overall %	Group %	f	Overall %	Group %	f	Overall %	Group %
1	87	15.7%	Planning and scheduling risk (incorrect planning)	21	4%	15%	13	2%	14%	22	4%	14%	7	1%	18%	24	4%	18%
2	69	12.4%	Cost increases	16	3%	11%	15	3%	17%	19	3%	12%	3	1%	8%	16	3%	12%
3	56	10.1%	Client's design changes	17	3%	12%	8	1%	9%	16	3%	10%	4	1%	10%	11	2%	8%
4	52	9.4%	SHE risk (safety health and environment)	18	3%	13%	6	1%	7%	15	3%	10%	4	1%	10%	9	2%	7%
5	49	8.8%	Weather delays	9	2%	6%	16	3%	18%	11	2%	7%	3	1%	8%	10	2%	8%

Table 4.27 indicates the top five risks in term contracts and corresponding occupations of respondents.

Table 4.27: Occupation and risk selection in term contracts

MAINTENANCE TERM CONTRACTS				OCCUPATION													
No.	f (Total)	f (%)	Variables	Contract/ project manager			Contract/ procurement specialist			Engineer/ project engineer			Area/ group leader			Other		
				f	Overall %	Group %	f	Overall %	Group %	f	Overall %	Group %	f	Overall %	Group %	f	Overall %	Group %
1	65	11.7%	SHE risk (safety health and environment)	17	3%	12%	9	2%	10%	20	4%	13%	5	1%	13%	14	3%	11%
2	60	10.8%	Planning and scheduling risk (incorrect planning)	18	3%	13%	7	1%	8%	19	3%	12%	4	1%	10%	12	2%	9%
3	55	9.9%	Cost increases	12	2%	9%	11	2%	12%	12	2%	8%	3	1%	8%	17	3%	13%
4	47	8.5%	Access to facilities or construction site	11	2%	8%	7	1%	8%	14	3%	9%	3	1%	8%	12	2%	9%
5	46	8.3%	Skilled labour	12	2%	9%	7	1%	8%	15	3%	10%	2	0%	5%	10	2%	8%

In Table 4.27 project managers selected planning and scheduling as the top risk, followed by SHE risks and thirdly the cost increases and skilled labour as a tie as third-ranked risk. Procurement specialists ranked cost increases as the top risk, followed by SHE risks as second and in third rank, the planning and scheduling risks, access to facilities and skilled labour were ranked as equally important risks.

Table 4.28: International work experience and risk selection in construction projects

CONSTRUCTION PROJECTS				INTERNATIONAL WORK EXPERIENCE					
No.	f (Total)	f (%)	Variables	Yes			No		
				f	Overall %	Group %	f	Overall %	Group %
1	87	15.7%	Planning and scheduling risk (incorrect planning)	37	7%	15%	49	9%	16%
2	69	12.4%	Cost increases	27	5%	11%	41	7%	13%
3	56	10.1%	Client's design changes	25	5%	10%	30	5%	10%
4	52	9.4%	SHE risk (safety health and environment)	19	3%	8%	33	6%	11%
5	49	8.8%	Weather delays	22	4%	9%	26	5%	8%

There were similarities found in the manner in which respondents with international experience viewed top risks compared to respondents with only local experience. The top risk identified by both groups is the planning and scheduling risk in construction projects (Table 4.28), whereas the top risk in term contracts by respondents with international experience (Table 4.29) is indicated as skilled labour, and cost increases are ranked second most important.

Respondents without international experience indicated that SHE risk is most important in term contracts, whereas cost increases and access to facilities are ranked as second most important in a tied ranking. An important difference to note is that respondents with international experience indicated that a client's design changes are the third most important risk in construction projects, and respondents without international experience indicated that SHE risk is the third most important risk in construction projects. This may be due to a number of reasons and further investigation and research may be required to determine reasons for this.

Table 4.29: International work experience and risk selection in term contracts

MAINTENANCE TERM CONTRACTS				INTERNATIONAL EXPERIENCE					
No.	f (Total)	f (%)	Variables	Yes			No		
				f	Overall %	Group %	f	Overall %	Group %
1	65	11.7%	SHE risk (safety health and environment)	25	5%	10%	39	7%	13%
2	60	10.8%	Planning and scheduling risk (incorrect planning)	22	4%	9%	37	7%	12%
3	55	9.9%	Cost increases	26	5%	11%	28	5%	9%
4	47	8.5%	Access to facilities or construction site	18	3%	8%	28	5%	9%
5	46	8.3%	Skilled labour	27	5%	11%	19	3%	6%

4.4 Assessment of questionnaire

Due to the magnitude of data analysis that can be derived from using SPSS, only a number of measures and results can be reported, therefore, the following sections will highlight the main tests and subsequent results of the assessment of the questionnaire's relationship between variables (actors or groups), reliability, validity and significance.

4.4.1 Reliability and validity

The reliability of the scale is measured by using the Cronbach's alpha coefficient (α) for each construct, which measures the degree of internal consistency (Nestor & Schutt, 2015:101). The Cronbach's alpha coefficients for procurement management, relationship management, risk management, compliance and governance, as well as supply chain processes and procedures are between 0.7 and 0.8. These values are displayed in Table 4.30Table, which is indicative of an acceptable coefficient and maintains that the scale is reliable (Field, 2009:675). It is further stated in Field (2009:675) that a Cronbach's alpha reliability coefficient that is below 0.7 is acceptable is social science studies such as this due to diversity of constructs.

Table 4.30: Construct reliability test

Construct	Number of items	α	Mean inter-item correlation
Procurement management	8	0.714	0.220
Relationship management	9	0.733	0.183
Risk management	11	0.727	0.195
Governance and compliance	7	0.701	0.175
Agreement format	10	0.687	0.155
Supply chain processes and procedures	10	0.737	0.182

The mean inter-item correlation in of all six constructs is revealed in Table 4.30. The values are between 0.15 and 0.5, with the highest result of 0.220 for procurement management and the lowest result of 0.155 for agreement format, which means that there is internal consistency reliability and that the scale is valid.

4.4.2 Factor analysis

Factor analysis is an inductive process that evaluates patterns and correlations in responses to a large set of measurable variables and can be used when a researcher wants to identify a construct's dimensions or factors (Nestor & Schutt, 2015:103). The Bartlett's test of sphericity indicates a value of 0.000 which means that the correlation matrix is not an identity matrix and is highly significant and suitable for factor analysis; there are some relationships between the variables as the p-value is less than 0.001. Taking this into consideration, the test provides the minimum standard to proceed with factor analysis. The principal component analysis was used as a method of extraction with the rotation method Oblimin with Kaiser normalisation in SPSS, to determine the measure of sampling adequacy through the KMO measure.

The KMO using 11 components, were 0.595, and using a 10-component and 9-component factor analysis, the KMO resulted in a measure of 0.595, which means that the sample is adequate for factor analysis as it is above 0.5. The factor analysis utilised not only *explored* the dimensions or groups for variables to be categorised, but also *confirmed* the initial main constructs or groups that were utilised in the questionnaire. The eigenvalues indicated in Table 4.31 shows that component 1 results in 14.530%, variance and component 10 indicates a cumulative percentage of 49.956% of variance.

Table 4.31: Eigenvalues and variance using 10-component factor analysis

Comp-onent	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings
	Total	% Variance	Cumulative %	Total	% Variance	Cumulative %	Total
1	7.991	14.530	14.530	7.991	14.530	14.530	3.893
2	3.285	5.973	20.503	3.285	5.973	20.503	3.879
3	2.885	5.246	25.749	2.885	5.246	25.749	3.053
4	2.487	4.521	30.270	2.487	4.521	30.270	3.658
5	2.088	3.796	34.066	2.088	3.796	34.066	3.786
6	1.954	3.553	37.619	1.954	3.553	37.619	2.274
7	1.821	3.311	40.930	1.821	3.311	40.930	2.037
8	1.772	3.221	44.151	1.772	3.221	44.151	4.099
9	1.621	2.948	47.100	1.621	2.948	47.100	3.433
10	1.571	2.857	49.956	1.571	2.857	49.956	2.514

The communalities among variables have shown a maximum of 0.789 in question B50 of Section B and a minimum of 0.294 in question B55 of Section B, as indicated in Annexure B. All communalities for questions in Section B of the survey are listed in Annexure B. The Levene's test administered on Section B's main constructs and the demographic questions in Section A indicated that most values were higher than p = 0.05 (Sig. > 0.05) which means that the research has met the assumption of homogeneity of variance and can conduct a one-way ANOVA. The Levene's statistic for A1 (occupation) was p = 0.031 for procurement management and displayed a value of p = 0.025 for relationship management.

The ANOVA results indicated a value of 0.0268 for relationship management in testing for A3 (business size) and 0.035 in A1 (occupation). In A1 (occupation), the result was p = 0.017 for risk management and 0.037 for governance and compliance, respectively. By calculating the one-way ANOVA, the researcher identified variability that arose due to the differences between groups and the differences within groups.

The effect sizes were determined by executing a one-way ANOVA test and indicated results based on Cohen's d (see 3.6.2) in terms of demographic questions in Section A compared to the main constructs in Section B of the questionnaire. Only a number of these will be reported, such as A3 (business size), where medium effect sizes were reported as d = 0.43 for construct relationship management and d = 0.61 for agreement format.

Cohen's d for A2 (gender) and agreement format was found to be a medium effect size of d = 0.43 and for relationship management the effect size was small at d = 0.28. In the test for A5 (international work experience), the effect size was d = 0.30 for the constructs agreement format as well as procurement management. A1 (occupation) indicated medium to large effect sizes concerning the construct relationship management (d = 0.71) with responses from contract or procurement specialists (code 2 in A1), risk management (d = 0.60) with responses from engineers (code 3 in A1), and d = 0.73 from other occupations (code 5 in A1) for risk management as well.

The construct compliance and governance with A1 (occupation) indicated a medium effect size of d = 0.52 in responses from engineers (code 3 in A1). Area leaders or group leaders (code 4 in A1) and engineers (code 3 in A1) revealed a medium effect size for agreement format resulting in d-values of 0.54 and 0.49, respectively. From the above indications, it can be inferred that the null hypothesis can be rejected and that there is statistical significance in the results obtained from the survey.

4.5 Chapter conclusion

This chapter revealed the main results and findings obtained from the data that was gathered through the administration of a questionnaire designed by the researcher, based on constructs developed from the literature study that were confirmed using factor analysis. The instrument used proved to be reliable, valid and statistically significant. The findings developed from the survey enabled the development of a framework for the achievement of the research objectives, as indicated in the following chapter.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter of the study indicates what conclusions could be derived from the findings in the previous chapter in order to achieve the research objectives and stipulate the necessary recommendations made by the researcher for application thereof. A framework is proposed for the execution of construction projects through term contracts to be implemented by businesses that require a combination of these concepts through this value proposition, which will add value to its supply chain. The limitations found after data analysis will also be listed as well as future recommendations that are suggested for further research.

5.2 Evaluation of the study

The study is evaluated by determining whether the primary and secondary objectives were achieved.

5.2.1 Primary objective

The primary objective of this study is achieved through the development of a general framework that can be used to award construction projects through existing term contracts that were awarded by following a formal tender process in line with a business's supply chain processes and procedures. This framework could guide contract management specialists and project managers to mitigate business risks that were identified, increase performance and add value to the procurement management process within a business.

5.2.2 Framework

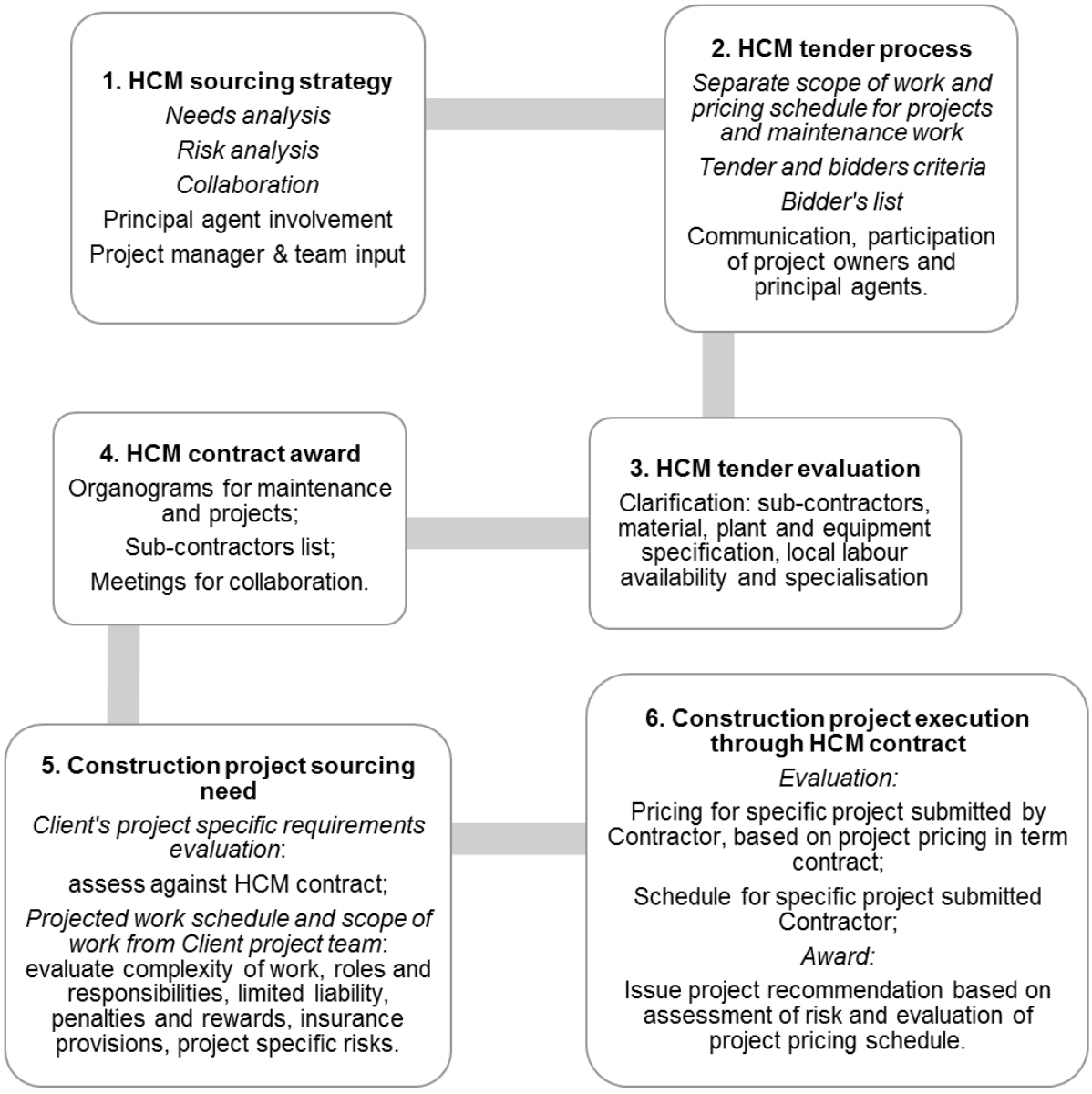
The framework that would enable a standard method of execution for construction projects through term contracts is depicted in Figure 3.2. The framework lists critical focus areas in the linkage of two concepts such as construction projects and term contracts, which need to be incorporated and managed in order for the combination of concepts to be successful. This framework was compiled as a guideline from the findings in the survey as well as the main aspects for success highlighted in the literature study, which are discussed in detail hereafter:

5.2.3 Hybrid construction and maintenance sourcing strategy

A term contract requires a sourcing strategy to be compiled before a tender is launched into the market; the requirement from the findings in Chapter 4 indicated limitations of term contracts to address specific technical and risk related requirements, in relation to the contract documentation of construction projects.

In order to address the requirement for decreased time and cost in construction project procurement management, this process could be improved by amending the sourcing strategy of the term contract to transform into the new contracting concept developed with the framework, which is the hybrid construction and maintenance (HCM) sourcing strategy.

Figure 3.2: Framework for executing construction projects through term contracts



The HCM sourcing strategy needs to incorporate both construction concepts as well as general rules of compliance and governance. Therefore, the HCM sourcing strategy shall address the general contract terms and conditions of the business and include specific requirements such as the scope of work for the maintenance portion of the contract.

The sourcing strategy shall additionally aim to address the construction project work comprehensively, which covers the type of construction projects that could be included in the contract. The contract that would result from this strategy is a new form of contract called a hybrid construction and maintenance (HCM) contract.

A proper needs analysis and risk analysis need to be conducted to determine what requirements may arise for the maintenance scope as well as the construction projects that could form part of the contract. Although construction projects' scope of work is developed as the needs arise (dynamic nature), the general project requirements need to be addressed in the strategy and case studies of past contracts should be evaluated to determine whether all risks are addressed properly. It is further suggested that a separate scope of work document and pricing schedule are included for general items that may be required in construction projects, as the nature of the work will differ from term contract work.

Collaboration was found to be a key factor for success in relationship and risk management of term contracts and construction projects in the previous chapters, and therefore the principal agent, project manager and project team's input is required for the success of the HCM sourcing strategy and contract. It is the responsibility of the contract and procurement specialist to enable collaboration with these key persons and to maintain open communication channels for collaboration.

5.2.4 HCM tender process

The HCM sourcing strategy and tender process shall include a separate general scope of work and pricing schedule for construction projects and maintenance work respectively which shall serve as technical criteria. The supplier selection criteria and bidders list need shall be compiled with consideration of the complexity of work, as well as technical capability of the contractors to perform the work in the general construction project scope of work. Communication and collaboration between the project management team and the procurement specialist shall be central to the sourcing and tender process; the participation between project owners and principal agents is important in this process for the successful integration of the construction concepts in the framework.

5.2.5 HCM tender evaluation

During the tender evaluation, clarification shall be required in bid clarification meetings regarding sub-contractors, material specifications, plant and equipment specifications, local labour availability and specialisation required, complexity of construction project and maintenance work.

5.2.6 HCM contract award

The HCM contract shall include clauses that incorporate limited liability requirements, clear roles and responsibilities, accountability for risk, two separate organograms of the contractor's personnel for maintenance and projects, a sub-contractors list and specific information regarding regular contract meetings for collaboration between all involved parties.

5.2.7 Construction project sourcing need

The construction project sourcing need arises as the project team indicates this need by sending a preliminary project work schedule, budget and scope of work documents to the procurement specialist. The specialist shall then, in turn, assess the project team's specific construction project documents against the HCM contract document to determine whether it addresses the following areas of focus, i.e. the complexity of work, limited liability, roles and responsibilities, and project specific risks.

5.2.8 Construction project execution through HCM contract

The evaluation of the pricing for the specific project submitted by the contractor shall be based on project pricing in the term contract in the same manner that normal maintenance work is priced in a term contract. If there should be a service or material item not specified, the contractor shall indicate this on its proposed cost estimate to the procurement specialist for evaluation and approval. The work schedule for the specific project needs to be submitted with the cost estimate by the contractor. The construction project shall be awarded through an order taken from the term contract after proper assessment of risk and evaluation of pricing by the procurement specialist and project team.

5.3 Secondary objectives

The primary research objective's aim was to establish a framework and this was discussed in the previous section, furthermore, the secondary research objectives were achieved through the following:

- A Literature review completed regarding the definition, attributes and characteristics of projects, term contracts and related purchasing and supply management concepts;
- Key aspects and general structures of projects and term contracts were identified through the literature review;
- Data was collected through a survey based on the key constructs from general structures of projects and term contracts: procurement management, relationship management, risk management, compliance and governance, agreement format, and a sixth general construct, i.e. supply chain processes and procedures;

- Key aspects and general frameworks and attributes of the construction projects and term contracts were identified and patterns formed for alignment of the constructs between the two concepts.
- An approach was developed through the framework regarding the linkage of projects to term contracts in a governed and sustainable manner;
- Conclusions and recommendations are listed based on the research for execution of construction projects through term contracts.

5.4 Recommendation

In comparison of demographics with the other sections of the survey regarding the main constructs and risks, some key aspects were highlighted that indicate different results for constructs amongst demographic groups which require a focused approach with extensive analysis, these constructs were identified as relationship management and procurement management. Through inclusion and implementation of this framework into supply chain processes and procedures, it is recommended that a business places increased focus on the following key factors that could contribute to the success of the HCM framework if these are effectively incorporated and managed:

- Collaboration tools and systems between client and contractor;
- Inclusion of a mutual performance management in the contract;
- Governance and compliance procedures that align with national and international law and industry standards;
- Technical complexity of work addressed in the agreement format selected;
- Accountability assigned to the correct parties to mitigate risks, through the addition of specific clauses for penalties, limited liability, rewards and insurance provisions.

5.5 Managerial implications of research

It was determined that there are two modes of knowledge in business research: mode 1 knowledge, which is created for an academic purpose by academics, and mode 2 knowledge, which is practically applied knowledge that comes from collaboration and interaction with management in businesses (Greener, 2008:10).

The title for this study developed from an actual problem that exists within a large petrochemical business where the researcher was employed for many years. The solution to this problem through the HCM framework will contribute to the management of the researcher's employing business as a client as well as other businesses that act as clients or contractors. The framework develops a way to reduce turnaround time of construction projects and risks associated with projects, and tender processes launched to award construction projects.

By utilising the HCM framework as a guideline for procurement in construction projects, adequate time will be allocated to the sourcing strategy which is the planning phase for the contracting process, therefore allowing for proper procurement planning and alignment of project team members involved in the project. Through this planning process, many risks are identified and addressed before the procurement process commences, which could result in time saved during the actual tender process. The allocation of roles and responsibilities of the entire project team in the HCM sourcing strategy connects the manager of the term contract with the project team that establishes the open communication platform for the cooperative setting required in construction projects and contracts.

The HCM framework ensures that criteria for supplier selection and bid evaluation are clearly identified in the HCM sourcing strategy by the contract manager and project team. This leads to capable suppliers being invited to tenders and awarding of comprehensive contracts that cover all services required for the construction project. The unique value proposition of this study and its framework is aimed at contract and project managers. Through implementation of this framework, it may assist contracting and procurement specialists in decision-making when they need to issue tenders, award term contracts and construction projects, and streamline the process of incorporating projects into term contracts. The study provides a basis and guideline for the combination of term contracts and construction projects that has not previously been conceptualised and illustrated, this is the theoretical contribution of the study to business management sciences.

The manner in which projects are currently executed in the client businesses, suggests that there is no general method or framework to guide this phenomenon and concept of issuing projects through term contracts. Therefore, the framework could create uniformity and reduce time needed to normally execute the projects through traditional procurement procedures.

5.6 Overall limitations of the study

There are limitations in the analysis regarding the large amount of data collected, with the implication that all results could not be reported in this study due to time and capacity constraints of the researcher. The time constraint additionally implied that the researcher was not able to conduct interviews, which could add value to the framework development and future iterations thereof. The businesses that employ respondents that participated in the study, are also limited to ten selected businesses in South Africa that operate mainly in the construction, petrochemical and mining industries.

5.7 Suggestions for future research

It is suggested that this study is extended into another supplementary study whereby interviews are conducted to find suggestions on further development of the framework based on the practical experiences of knowledgeable participants who would be selected based on a combination of their relevant experience, occupation and level of education.

The survey could additionally be distributed to other businesses in other countries to determine the differences and similarities between construction projects and term contracts and how these correlate with this study, in order to provide improvements to the established framework. It would be beneficial for analysis of the HCM contracts as case studies through experimental research, in order to determine the success thereof and the iterations that could develop from the research to amend and improve the mixed construction contract concept.

Although international articles and books were reviewed in the literature study, an in-depth review of international trends is required that could reveal new insights into construction projects and contracts. This suggestion is derived from the findings of respondents with international experience who indicated different risks from the respondents who only indicated local relevant work experience.

5.8 Conclusion

There are many similarities found between construction projects and term contracts, as was evident in the identification of the highest risks between the two concepts, whereby SHE risks, cost increases, and planning and scheduling were identified as the most important risks to mitigate when managing construction projects and term contracts. The differences identified through the survey findings and the literature study imply that the risks differ in these concepts and these need to be managed accordingly in order to implement the suggested framework of executing construction projects through term contracts.

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ANNEXURE A

QUESTIONNAIRE: AWARDING CONSTRUCTION PROJECTS THROUGH TERM CONTRACTS

Ethics number: NWU-00394-18-S4

This questionnaire forms part of a research project by Eugenie Birch (email: eugeniebirch1@gmail.com, mobile no. 083 281 2200), an MBA student at the **Potchefstroom Business School** (North-West University, Potchefstroom Campus), under supervision on Prof. Japie Kroon (email: Japie.Kroon@nwu.ac.za).

Many challenges and risks arise before, during and after the award of construction projects and term contracts. The objective of this study is to develop a general framework or guideline that can be utilised to award construction projects through existing term contracts that have been awarded through a formal tender process.

All information is anonymous and confidential. Only aggregate data will be used and reported.

I would like to thank you in advance for making time to share this information.

Mark only one appropriate option with an 'X'.

It is important to complete <u>ALL</u> the questions.

SECTION A: DEMOGRAPHIC VARIABLES

1. Occupation		Contract / Project Manager		1	
		Contract / Procurement Specialist		2	
		Engineer / Project Engineer		3	
		Area Leader / Group Leader		4	
		Other, mark with 'x' and specify:		5	
				6	
2	Your gender	Male		1	
		Female		2	
3	Number of permanent employees	5 - 50		1	
		51 - 200		2	
		More than 200		3	
4	Your highest Qualification	Grade 12		1	
		Diploma or B-Tech		2	
		University degree		3	
		Honours degree		4	
		Master's degree		5	
5	Do you have international project or contract experience?		Yes	1	
			No	2	
6	If Yes, how many years?		Less than one year	1	
			Between 1 and 5 years	2	
			More than 5 years	3	

SECTION B: AWARDING CONSTRUCTION PROJECTS THROUGH TERM CONTRACTS

Select the most suitable option next to the statement with an "X":

SCALE: 1 = To a Very Small extent, 2 = To a Small extent, 3 = To a Moderate extent, 4 = To a Large extent, 5 = To a Very Large extent

No.	STATEMENT	SCALE				
1	Claims are managed efficiently by the Client.	1	2	3	4	5
2	Partial payments are necessary for work completed on a project.	1	2	3	4	5
3	Partial payments are necessary for work completed on a term contract.	1	2	3	4	5
4	Retention funds are required for work completed on projects.	1	2	3	4	5
5	Retention funds are required for work completed on term contracts.	1	2	3	4	5
6	Past performance of Contractors are considered when new projects are awarded.	1	2	3	4	5
7	Past performance of Contractors are considered when new term contracts are awarded.	1	2	3	4	5
8	Penalties are actively enforced by the Client for poor performance.	1	2	3	4	5
9	Rewards are awarded by the Client for good performance.	1	2	3	4	5
10	The contract type (format) utilised, influences the success of a project.	1	2	3	4	5
11	The contract type (format) utilised influences the success of a term contract.	1	2	3	4	5
12	Risks are allocated effectively between Client and Contractor in contractual documentation of projects.	1	2	3	4	5
13	Risks are allocated effectively between Client and Contractor in term contract documentation.	1	2	3	4	5
14	Contractual documentation of projects address insurance provisions.	1	2	3	4	5
15	Term contract documentation address insurance provisions.	1	2	3	4	5
16	Limited liability clauses are addressed in contractual documentation of projects.	1	2	3	4	5
17	Limited liability clauses are addressed in term contract documentation.	1	2	3	4	5
18	Contractual documentation of projects stipulate which party takes accountability in a specific situation.	1	2	3	4	5
19	Term contract documentation stipulate which party takes accountability in a specific situation.	1	2	3	4	5
20	A Tender Process addresses the value of the project.	1	2	3	4	5
21	A Tender Process addresses the value of a term contract.	1	2	3	4	5
22	The complexity of work is addressed in the tender process for a project.	1	2	3	4	5
23	The complexity of work is addressed in the tender process for a term contract.	1	2	3	4	5
24	The bidders list in a project tender are comprised of contractors with the required competencies.	1	2	3	4	5
25	The bidders list in a term contract tender are comprised of contractors with the required competencies.	1	2	3	4	5
26	The time required for a tender process influences the project schedule.	1	2	3	4	5
27	The time required for a tender process influences the award of a term contract.	1	2	3	4	5
28	A principal agent acting on behalf of the Client contributes to the success of a project.	1	2	3	4	5
29	Corporate governance practices mitigate legal risk in a project.	1	2	3	4	5
30	Corporate governance practices mitigate legal risk in a term contract.	1	2	3	4	5
31	Competition law requirements influence the time to award a project.	1	2	3	4	5

32	Competition law requirements influence the time to award a term contract.	1	2	3	4	5
33	The Client's governance procedures are made available to Contractors.	1	2	3	4	5
34	The Client's governance procedures are understandable.	1	2	3	4	5
35	The Client's employees adhere to their governance procedures.	1	2	3	4	5
36	Industry standards are adhered to in projects.	1	2	3	4	5
37	Industry standards are adhered to in term contracts.	1	2	3	4	5
38	A tender process minimises legal risk for the Client.	1	2	3	4	5
39	Collaboration between Client and Contractor contribute to the success of a project.	1	2	3	4	5
40	Collaboration between Client and Contractor contribute to the success of a term contract.	1	2	3	4	5
41	Collaboration between Client and Contractor impair the competitive advantage of a Contractor.	1	2	3	4	5
42	Trust between Client and Contractor contribute to the success of a project.	1	2	3	4	5
43	Trust between Client and Contractor contribute to the success of a term contract.	1	2	3	4	5
44	Mutual objectives between Client and Contractor contribute to the success of a project.	1	2	3	4	5
45	Mutual objectives between Client and Contractor contribute to the success of a term contract.	1	2	3	4	5
46	Principal agents positively contribute to relationship management in a project.	1	2	3	4	5
47	Principal agents positively contribute to performance management in a project.	1	2	3	4	5
48	Collaboration tools (systems) contribute to the success of a project.	1	2	3	4	5
49	Collaboration tools (systems) contribute to the success of a term contract.	1	2	3	4	5
50	Collaboration tools (systems) between Client and Contractor impair the competitive advantage of a Contractor.	1	2	3	4	5
51	Information sharing between Client and Contractor contribute to the success of a project.	1	2	3	4	5
52	Information sharing between Client and Contractor contribute to the success of a term contract.	1	2	3	4	5
53	Information sharing between Client and Contractor can impair the competitive advantage of a Contractor.	1	2	3	4	5
54	Mutual performance management between Client and Contractor contribute to the success of a project.	1	2	3	4	5
55	Mutual performance management between Client and Contractor contribute to the success of a term contract.	1	2	3	4	5

SECTION C: RISKS Mark the top 5 risk factors with an "X" for BOTH of the following:				
CONSTRUCTION PROJECTS <u>LEFT</u> and MAINTENANCE TERM CONTRACTS <u>RIGHT</u>				
	1	Weather delays	1	
	2	Planning and scheduling risk (incorrect planning)	2	
	3	Cost increases	3	
	4	Material supplier delivery risk	4	
	5	Competitiveness in market	5	
	6	Client design	6	
	7	Contractor's design	7	
	8	Client's design changes	8	
	9	Contractor's design changes	9	
	10	Skilled labour	10	
	11	Sub-contractor risk	11	
	12	Contractor's equipment, plant and tools	12	
	13	Access to facilities or construction site	13	
	14	Undetected, unidentified underground utilities (cables/ pipes)	14	
	15	Political risk	15	
	16	Labour risk (e.g. strikes, hired labour availability)	16	
	17	SHE risk (safety, health and environment)	17	
	18	Construction industry challenges	18	
	19	Principal agent risk (agent appointed by Client to manage project/ contract)	19	

I truly appreciate your time and participation, thank you.

ANNEXURE B

Communalities		
	Initial	Extraction
B1	1.000	0.498
B2	1.000	0.580
B3	1.000	0.397
B4	1.000	0.553
B5	1.000	0.549
B6	1.000	0.480
B7	1.000	0.603
B8	1.000	0.521
B9	1.000	0.625
B10	1.000	0.399
B11	1.000	0.362
B12	1.000	0.526
B13	1.000	0.587
B14	1.000	0.471
B15	1.000	0.392
B16	1.000	0.455
B17	1.000	0.499
B18	1.000	0.491
B19	1.000	0.595
B20	1.000	0.491
B21	1.000	0.655
B22	1.000	0.478
B23	1.000	0.595
B24	1.000	0.489
B25	1.000	0.512
B26	1.000	0.563
B27	1.000	0.403
B28	1.000	0.566
B29	1.000	0.535
B30	1.000	0.651
B31	1.000	0.605
B32	1.000	0.734
B33	1.000	0.594
B34	1.000	0.544
B35	1.000	0.553
B36	1.000	0.454
B37	1.000	0.421

B38	1.000	0.550
B39	1.000	0.462
B40	1.000	0.378
B41	1.000	0.705
B42	1.000	0.490
B43	1.000	0.488
B44	1.000	0.566
B45	1.000	0.560
B46	1.000	0.659
B47	1.000	0.641
B48	1.000	0.347
B49	1.000	0.527
B50	1.000	0.789
B51	1.000	0.563
B52	1.000	0.523
B53	1.000	0.590
B54	1.000	0.373
B55	1.000	0.294

ANNEXURE C

	Description	n	%	Procurement management			Relationship management			Risk management			Governance and compliance			Agreement format			Supply chain processes and procedures		
				$\bar{x}$	σ	d	$\bar{x}$	σ	d	$\bar{x}$	σ	d	$\bar{x}$	σ	d	$\bar{x}$	σ	d	$\bar{x}$	σ	d
A1	Contract/ project manager	28	25%	3.504	0.996		4.187	0.909		3.510	0.920		3.704	1.042		3.129	1.104		2.954	1.046	
	Contract/ procurement specialist	18	16%	3.424	1.004	0.081	3.802	0.948	0.405	3.621	0.923	0.121	3.540	0.948	0.158	3.272	0.977	0.130	2.756	0.873	0.189
	Engineer/ project engineer	31	28%	3.419	0.839	0.004	3.867	0.947	0.068	3.364	0.933	0.276	3.401	0.965	0.144	2.952	0.930	0.328	2.832	0.918	0.084
	Area/ group leader	8	7%	3.500	0.884	0.091	3.931	0.903	0.067	3.432	0.780	0.073	3.661	0.912	0.269	3.175	0.891	0.240	2.938	0.842	0.115
	Other	26	23%	3.596	0.986	0.098	4.120	0.854	0.210	3.769	0.850	0.397	3.753	0.977	0.094	3.300	1.093	0.114	3.035	1.178	0.082
A2	Male	88	79%	3.479	0.959		4.033	0.927		3.548	0.923		3.576	1.007		3.111	1.052		2.905	1.038	
	Female	23	21%	3.527	0.902	0.051	3.879	0.911	0.166	3.522	0.869	0.028	3.696	0.926	0.119	3.278	0.928	0.159	2.909	0.897	0.004
A3	5 - 50	23	21%	3.644	0.967		4.006	0.901		3.450	0.874		3.636	1.067		3.115	1.010		2.880	0.939	
	51 - 200	31	28%	3.442	0.867	0.209	3.956	0.881	0.055	3.542	0.895	0.103	3.633	0.973	0.002	3.273	0.997	0.157	2.963	1.022	0.082
	More than 200	57	51%	3.464	0.980	0.022	4.006	0.954	0.053	3.554	0.934	0.012	3.545	0.970	0.090	3.089	1.039	0.177	2.884	1.021	0.078
A4	Matric / Grade 12	8	7%	3.656	0.976		4.181	0.763		3.648	0.946		3.661	1.135		3.400	1.310		2.850	1.183	
	Diploma or BTech	25	23%	3.365	0.871	0.299	3.778	0.907	0.444	3.568	0.900	0.084	3.625	0.959	0.031	3.142	0.928	0.197	2.842	0.949	0.007
	University degree	37	33%	3.486	0.938	0.129	4.060	0.955	0.296	3.504	0.884	0.071	3.596	0.967	0.030	3.163	1.031	0.021	2.917	1.005	0.075
	Honours degree	19	17%	3.513	0.827	0.029	3.912	0.927	0.155	3.531	0.949	0.029	3.406	0.870	0.196	3.100	0.973	0.061	2.911	0.950	0.007
	Master's degree	22	20%	3.494	1.047	0.018	4.126	0.881	0.231	3.483	0.916	0.050	3.688	1.073	0.263	3.050	1.043	0.048	2.968	1.047	0.055
A5	Yes	49	44%	3.574	0.573		4.017	0.491		3.611	0.491		3.635	0.486		3.217	0.477		2.977	0.528	
	No	62	56%	3.415	0.467	0.279	3.963	0.421	0.109	3.464	0.452	0.300	3.562	0.424	0.151	3.087	0.416	0.273	2.847	0.471	0.246
A6	Less than 1 year	12	24%	3.260	0.885		3.870	0.970		3.561	0.894		3.369	0.937		3.058	0.796		2.808	0.822	
	Between 1 and 5 years	16	33%	3.733	0.957	0.494	3.963	0.886	0.096	3.642	0.946	0.086	3.676	0.961	0.320	3.260	1.153	0.175	3.167	1.075	0.333
	More than 5 years	21	43%	3.601	0.994	0.133	4.175	0.890	0.238	3.619	0.971	0.024	3.748	1.041	0.069	3.262	1.066	0.002	2.938	1.136	0.201

ANNEXURE D

To whom it may concern

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Language editing and translation
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20 November 2018

Dear Mr / Ms

Re: Language editing of dissertation (A framework for awarding construction projects through term contracts)

I hereby declare that I language edited the above-mentioned dissertation by Ms Eugenie Birch (student number: 20771983).

Please feel free to contact me should you have any enquiries.

Kind regards