FACTORS INFLUENCING SELECTION OF CONSTRUCTION PROCUREMENT STRATEGY FOR WATER INFRASTRUCTURE PROJECTS IN SOUTH AFRICA

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ABSTRACT

Background

Construction procurement strategy concerns the decisions project owners and consultants make to procure the services of contractors and built environment professionals to deliver a new construction project or to carry out refurbishment work. The components of a construction procurement strategy are: packaging strategy; contracting strategy; pricing strategy; targeting strategy; and procurement procedure.

Due to the uniqueness of each construction project and that clients undertake projects for different reasons, construction procurement strategies should be tailored to meet individual project and client requirements. However, research by Watermeyer, CIDB, Murdoch & Hughes, Rwelamila et al. and others have found that this is generally not happening, which, it is believed, contributes to adverse project outcomes.

Leading researchers in the construction industry (Watermeyer; Egan; Murdoch & Hughes, Miller) are of the view that that much of the problems in construction relating to time, quality and budget can be traced back to poor procurement choices. If more attention is placed on getting the construction procurement strategy to match the client and project objectives, the belief is that better and improved project outcomes will follow.

Research objectives

The objectives of the research were to: a) determine the range of construction procurement strategies clients select for water infrastructure projects in South Africa, b) ascertain what factors influence the selection of construction procurement strategies by those clients and c) develop recommendations for aligning construction procurement strategy choices with the intended project objectives and outcomes.

Research methods

The survey research strategy was used whereby respondents provided responses to a schedule of closed and open questions in structured interviews. Ten people were interviewed and selected using the selection criteria listed below:

- People who were involved in water infrastructure projects, comprising clients and those who assist clients in meeting their water infrastructure needs; &
- People who had senior level responsibility within their respective organisations and who directly influenced the construction procurement strategy selection; &
- People from the private and public sectors who are generally referred to as clients or employers, their implementing agents and private consultants; &
- People with a minimum ten years' experience in the construction industry.

Content analysis method was to analyse the data to generate key themes arising from what respondents said in relation to the questions.

Research findings

Respondents did not show a preference for any packaging strategy while all respondents selected the design by employer contracting strategy. Ninety percent of respondents selected bills of quantities for their pricing strategy. Targeting strategy allows clients to meet the secondary procurement objectives on their projects, half of respondents did not have specific targets. Ninety percent of respondents chose to go out to public tender to obtain prices (procurement method). All respondents selected the General Conditions of Contract (GCC) form of contract for their projects.

The factors cited most frequently by respondents were: a) *always done this way,* b) *client policy and rules* and c) *create jobs*. Except to *create jobs*, the other factors of *always done this way* and *client policy and rules* indicate that selections are not based on the requirements of the client and project but rather on what was done previously and/or predetermined and standard practices.

Conclusions and recommendations

A cross-sectional ("snapshot at a point in time") time horizon was used for the research, therefore, an assessment of the appropriateness of the construction procurement strategy for the respective projects was not undertaken nor was it part of the research.

However, based on the factors cited most frequently, respondents' selections of construction procurement strategies were in the main not based on the requirements of projects but rather on what was done previously and/or predetermined and standard practices.

The recommendations are based on the nature of the factors cited most frequently by respondents when selecting their construction procurement strategies and are as follows:

- Separation of the supply chains for general goods and services from those for infrastructure. This recommendation relates to the reliance of respondents on *client polices and rules*;

- Project managers and other built environment professionals must lead the planning and execution of projects and programmes; &

- Development of a skills development specification. This recommendation relates to the apparent lack of knowledge of respondents of the range of options available to select construction procurement strategies from.

DECLARATION

I declare that this research is my own work. It is submitted in partial fulfilment of the requirements for the degree Master of Science in Building in Project Management in the School of Construction Economics and Management in the Faculty of Engineering and the Built Environment, the University of Witwatersrand. It has not been submitted before for any degree or examination in any other University.

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LIST OF ABBREVIATIONS

CIDB:	Construction Industry Development (South Africa)
CIOB:	Chartered Institute of Building (United Kingdom)
ISO:	International Organisation for Standardisation
ICE:	Institution of Consulting Engineers (United Kingdom)
IDMS:	Infrastructure Delivery Management System (National Treasury South Africa)
SIPDM:	Standard for Infrastructure Procurement and Delivery Management

1. CHAPTER 1: INTRODUCTION

This research aimed to identify the construction procurement strategies project owners selected for the construction of water infrastructure projects. The research also aimed to identify factors that informed those selections, i.e. what factors (or project characteristics) project owners considered when developing construction procurement strategies.

Construction projects are typically unique once-off designs and are built on sites which are also unique in nature (Turner, 1990 in CRC, 2008) and every client or project owner is different with their own reasons for undertaking any given project. To satisfy the project needs and client objectives, it is important for clients and those whom they appoint to act on their behalf, to thoroughly understand these and then (through the selection of appropriate strategies) endeavour to achieve both the project needs and client objectives.

Since every construction project is unique and client objectives differ from client to client, it surely would be prudent to tailor construction procurement strategies on a project by project basis. However, research by Watermeyer (2012), CIDB (2010), Murdoch & Hughes (2008), Rwelamila et al. (2007) and others have found that this is generally not happening in the construction industry. Construction procurement strategies are not being developed on a project by project basis, which practice, it is believed, is a major contributor to adverse project outcomes.

In this section, the background to the research is provided, followed by the research problem, the scope of the research, the research question, the research objectives, the rationale for the research and finally the structure of the research.

1.1 Background

Construction procurement strategy relates to the decisions made by people (primarily project owners and consultants who act on the owners' behalf) to procure the services of contractors and consultants (project managers, engineers, architects, quantity surveyors and other built environment professionals) to deliver a new construction project or to carry out refurbishment work.

The components of a construction procurement strategy are:

- Packaging strategy;
- Contracting strategy;
- Pricing strategy;
- Targeting strategy; and
- Procurement procedure (ISO 10845, 2010).

Within each of the components of a construction procurement strategy, there are several options one could select from when developing the strategy. The components and options will be discussed in more detail in the literature review section.

Developing and documenting the construction procurement strategy is intended to take place early in the project (CRC, 2008), before design consultants are appointed and before detailed designs are completed. The aim of the construction procurement strategy is to meet the primary and secondary objectives of the project owner during and after the creation or refurbishment of an asset (CIDB, 2010 & IDMS 2012). Another aim of the construction procurement strategy is to meet the client's business case for the project (CRC, 2008).

Construction procurement strategies may be broadly classified as:

- *Separated & co-operative*; commonly referred to as the conventional method or traditional method. Typically, designs are done by the project owner (or by someone on his/her behalf) with the contractor primary responsible for constructing the works;

- *Integrated;* design & build and variants thereof where the contractor takes responsibility for both design and construction of the works; and

- *Management-oriented*; management contracting, construction management and design & manage (Rwelamila et al. 2007).

Despite the uniqueness of each construction project and the need to develop a construction procurement strategy on a project by project basis, there appears to be a preference in the construction industry to use the traditional procurement method.

According to Watermeyer (2012), most infrastructure projects in Sub-Saharan Africa are procured using the traditional method. Root & Hancock (1996) and CIOB (2010) also found that the traditional procurement method is predominantly used in the United Kingdom construction industry.

The traditional procurement method works best when the designs and specifications are complete at the time of tender (CIDB, 2010). However, this is seldom the case as clients are increasingly required to fast-track projects (Watermeyer, 2012). According to Watermeyer (2012), because clients chose to use the traditional procurement method without designs being completed at the time of tender, the construction costs for the 2010 World Cup Stadia in South Africa, on completion, were 100% higher than pre-tender estimates and 50% higher than contract award values. These findings are similar to the CIOB (2010) findings in the UK construction industry, where cost and time overruns were experienced on more projects implemented using the traditional method than any other procurement method.

Cheung et al. (2003) and Eriksson & Laan (2007), in Eriksson et al. (2010), further argue that the traditional method of procuring construction projects lead to adversarial relationships between the parties and any improvement in the procurement process will contribute to project success.

The preceding paragraphs focused on the traditional procurement method. This is not to suggest that this method is inferior to other procurement methods but rather to note the point that the traditional procurement method appears to be the favoured procurement method by project owners and that it is often used inappropriately.

The point above is supported by Murdoch & Hughes (2008) who argue that "*no one contract type or procurement system is better than the other and that the choice of a procurement system is dependent on the particular nature of any given project".* They further argue that *"consultants who habitually recommend one procurement system over the other without due consideration of the attendant risks, is not acting with that degree of skill and care which the client is entitled to expect".*

Procurement in construction has and continues to receive much attention both locally and internationally, by academics, government departments, industry bodies such as ICE, CIDB, and CIOB and by ISO. All parties acknowledge the importance of procurement in construction and how procurement should be conducted. Detailed processes (& procedures) have been developed and documented, the implementation of which should be straight forward. However, there is overwhelming evidence to suggest that inadequate attention continues to be paid to developing construction procurement strategies.

Leading researchers in the construction industry (Watermeyer; Egan; Murdoch & Hughes, Miller) are also of the view that that much of the problems in construction relating to time, quality and budget can be traced back to poor procurement choices. The belief is that if more attention is placed on getting the construction procurement strategy to match the client and project objectives, then better and improved project outcomes will follow.

The need for considering alternative procurement strategies and a greater understanding of procurement is also supported by CIOB (2010) and CIDB (2010).

1.2 Problem Statement

Despite clear evidence of the positive relationship between developing an appropriate construction procurement strategy and project success, or likelihood of success, those involved in construction projects continue to select inappropriate construction procurement strategies, frequently to the detriment of the project.

There is therefore a need to understand why this is happening.

Previous research in this area include:

- Rwelamila & Edries (2007) found that clients & their consultants do not choose suitable procurement strategies for their projects because they are not aware of the various procurement options available and/or choose procurement strategies based on biased experience. This explanation appears too simplistic as a lack of awareness (when there are currently vast amounts of information freely available) and biased experience only, surely cannot be the dominating reasons why this behaviour prevails; and

- Root & Hancock (1996), found, *inter alia*, that procurement decisions were based on the "*usual practice*", similar to the findings by Rwelamila & Edries (2007). So, if procurement decisions are based on what was done before, and if project failures are common, then why is there no change in behaviour.

1.3 Research Scope

The focus of this research is on construction procurement strategy. When the construction procurement strategy must be developed in the overall process of delivering a typical construction project or portfolio of projects, is shown in **Table 1-1.**

Table 1-1 is adapted from the IDMS (2012) and supports the CRC (2008) argument that procurement planning should be undertaken early in the project. According to the IDMS (2012), procurement planning is part of the *Planning at Portfolio Level* and should be undertaken immediately after the strategic infrastructure plan has been developed and decisions have been taken to proceed with a project or portfolio of projects.

Table 1-1 also illustrates that procurement planning should be done before the appointment of design consultants and before designs are completed. The deliverable of procurement planning is the **construction procurement strategy**.

A further focus of this research is on water infrastructure projects. The decision to focus on water infrastructure projects was based on, a) the researcher having extensive experience with this infrastructure type and b) the researcher has access to respondents working on this type of infrastructure for the collection of research data.

Activities	Stage	
	Gate №	Description
Planning at Portfolio Level	1	Infrastructure planning (strategic infrastructure plan)
	2	Procurement planning (construction procurement strategy)
Planning at Package Level	3	Package preparation (strategic brief)
	4	Package definition (concept report & logistics support plan)
Detailed Design	5	Design development (design development report)
	6a	Design documentation (production information)
	6b	Design documentation (manufacture, fabrication & construction information)
Site	7	Works (completed works)
	8	Handover (taken over by user)
Close Out	9a	Asset data (as built information & asset registers)
	9b	Package completion derations

Table 1-1: Key Deliverables & Activities in Project Delivery (IDMS, 2012)

How projects are procured in the public and private sectors in South Africa differ only to the extent that the public sector is required to comply with certain legislative requirements. The legislation in South Africa governing procurement of goods and services in the public sector

seeks to achieve fairness, equitability, transparency, competitiveness and cost effectiveness (SIPDM, 2015). The principles are the same as those advocated by ISO (2010) for both the public and private sectors. Accordingly, and for this research project, no distinction will be made between procurement in the public and private sectors other than the occasional comparison between the two.

A further point to note is that this research project did not make a distinction between the project owner/employer/client/project custodian and his consultant as the focus was on construction procurement strategy irrespective of who makes the final decision.

A last point to note is that this research project focused primarily on the procurement of the contractor, the entity that undertakes the construction of the works on site.

1.4 Research question

The research question is: *What factors influence the selection of construction procurement strategies for water infrastructure projects in South Africa?*

The aim of the research is therefore to identify the factors that influence the selection of construction procurement strategies for water infrastructure projects in South Africa.

1.5 Research objectives

The objectives of this research were:

- To identify the range of construction procurement strategies clients, select for water infrastructure projects in South Africa;

- To identify what factors, influence the selection of construction procurement strategies by those clients; and

- To develop recommendations for aligning construction procurement strategy choices with the intended project objectives and outcomes.

1.6 Rationale for Research

Researcher capability

Saunders et al. (2012) suggest, *inter alia*, that in addition to possessing the necessary skills to undertake the research, the researcher must have a genuine interest in the topic. In this regard, the researcher has the necessary skill to conduct the research and will supplement any deficiencies (such as analysing the data collected) from readily available resources.

With regards to having an interest in the topic, the researcher has been involved in the construction industry for over twenty-five years, with the past twenty years being primarily on water infrastructure projects. The researcher's roles on projects are as designer, construction manager, project manager and project director and, accordingly, has vast industry-related experience. The researcher is also genuinely interested in procurement, how procurement decisions affect project outcomes and what needs to be done to change/improve decision making in procurement.

Access to the industry for the collection of data did not pose a problem as the researcher has a good network of both clients and professionals and has relatively easy access to them. No significant financial resources were required for this study.

Value of work

The need for improved performances in the construction industry is well documented. For the industry to improve its performance, the industry players must change in some areas. Change in how projects are procured has been suggested by industry experts and other industry bodies as one such improvement area.

A better understanding of how construction procurement strategies are crafted will assist in designing interventions to address this problem. By making some meaningful change, and according to current thinking, improvements in project outcomes could be realised.

The value to society could thus be improved construction project outcomes.

1.7 Research structure

The research is structured as follows:

Chapter 0; Abstract

- This is a short summary or executive summary of the entire research report; and
- The abstract is a very important part of the final report as it is the only section that some may read, and if it is interesting enough, then some may proceed to reading the entire report (Saunders et al. 2012).

Chapter 1; Introduction

- The introduction provides a clear idea of the problem area and why the research is being undertaken; and
- It contains the research question & research objectives and will also provide an overview of the project report and contents of each chapter (Saunders et al. 2012).

Chapter 2; Literature review

- The main purpose of the literature review is to place the research within the wider context. It demonstrates how the research supplements work already done, in this case, in construction procurement strategy (Saunders et al. 2012); and
- The literature review chapter includes the following subsections:
  - ✓ Introduction; how the literature was sourced, selected, etc.;
  - ✓ Procurement in the construction industry (general overview);
  - ✓ Construction procurement strategy;
  - ✓ Construction industry legislative & regulatory framework in South Africa;
  - ✓ Overview of construction industry (size & importance);

- ✓ Current procurement strategies (current industry practices);
- ✓ Studies done by various researchers on construction procurement; and
- ✓ Factors influencing choices in construction procurement strategy;

Chapter 3; Research design and methods

- This chapter provides information that assures readers that the methods used are reliable & valid and the findings can be trusted (Saunders et al. 2012).

Chapter 4; Data presentation and analysis

- This chapter reports the facts as is, without providing opinions and the like (Saunders et al. 2012).

Chapter 5; Discussion of results

- This chapter interprets the findings in Chapter 4 and how they link to the research question and research objectives;

- It includes implications of the findings on current theory identified in the literature review chapter (Chapter 2); and

- The chapter also discusses any limitations in the study (Saunders et al. 2012).

Chapter 6; Conclusions and recommendations

- The conclusion chapter will not introduce new material but rather discuss the findings in relation to the research questions and research objectives. The conclusion chapter also discusses the findings in relation to the literature reviewed in the report (Saunders et al. 2012); and

- One of the objectives of the research is to make recommendations that could bring about change, the report accordingly includes recommendations.

2. CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In this section, the bulk of the literature selected in support of the research project is presented, described and analysed as necessary. Some sources which may not necessarily be mentioned in this chapter, will also be found in other areas of the report to substantiate a specific point.

Secondary literature sources form the bulk of the information, those comprise referred (& peer reviewed) academic journals, books, reports & professional journals. The course lecture notes also provided guidance in this regard. Some articles were also suggested and provided by the research supervisor. Literature that could not be freely obtained through the internet, was obtained through the university library through its subscription to academic journals.

Search terms included *procurement*, *procurement in construction* and *construction procurement strategy*. Procurement in construction is not a new area of study and a wealth of information is available both locally in South Africa and internationally.

The defining parameters used when searching for literature were the search terms as mentioned above. Further, the literature had to be in English and preferably not older than ten years. Also, the literature should appear in referred journals and industry statutory bodies and be related to South Africa and the construction industry in general.

In evaluating the literature for relevance, value and sufficiency, the approach was, and as suggested by Saunders et al. (2012):

- The literature had to be closely related to the research question and objectives;
- Whether the literature has been referenced by previous authors, whether they are current and whether the methodologies in the articles were robust; &
- The literature was deemed sufficient when new searches revealed material similar to what was found before and/or similar articles by the same authors.

Due to the nature of the research area, and that procurement in South Africa (especially procurement in the public sector) is governed by certain legislation and regulations, practice notes and guidelines by the CIDB and National Treasury are referred to extensively.

The following literature review sub-sections presenting themes relevant to the research question and objectives are presented and discussed in this section:

- *Procurement in the construction industry*; this is a general discussion and includes principles from ISO 10845 and the IDMS by National Treasury in South Africa;
- *Construction procurement strategy*; a definition is suggested for construction procurement strategy followed by a discussion on the various components and options one should

typically consider when developing a construction procurement strategy. Framework agreements and risk management through procurement are also discussed;

- *Construction industry legislative & regulatory framework in South Africa*; a snapshot of the legislation and regulatory framework as at 01 March 2013 is provided including a discussion on its impact on construction procurement strategy development;

- *Overview of the construction industry*; an overview in terms of size (in monetary terms) and relative importance to a country's economy are presented. The state of the industry in terms of customer satisfaction is also presented.

- *Current procurement practices;* current procurement strategies by clients (components and options), as understood from the literature, is presented in this subsection;

- *Studies done by various researchers on construction procurement;* the connection between construction procurement strategy and how these influences or has the potential to influence project outcomes is made by presenting and discussing a selection of applicable studies; and

- *Factors influencing the selection of construction procurement strategy*; this will be from a global and local perspective. Typical factors or project characteristics which influence or should influence construction procurement strategy are presented and discussed.

2.2 Procurement in the construction industry

The purpose of this sub-section of the literature review is to establish a baseline understanding of procurement and more especially procurement in construction. It also seeks to contextualise procurement in construction in the bigger project delivery process.

According, this subsection covers two aspects;

- General discussion on procurement; and

- Steps in the procurement process.

2.2.1 Procurement: General

Procurement may be defined as "*a business function charged with and qualifying external sources, forming agreements, and administering them so that material and services that enhance the work of the organisation are reliably delivered*" (Sherman, 1991 in Fourie, 2015).

The above general definition of procurement applies to the procurement of all types of goods, services and works. Numerous definitions have been suggested for procurement in construction. Probable definitions as identified by Hewage & Ruparathna (2013) are considered prudent to include at this stage and are as shown in **Table 2-1**.

Table 2-1: Probable Definitions for Procurement in Construction (adapted from Hewage & Ruparathna, 2013)

Definition	Source *(in Hewage & Ruparathna, 2013)*
Acquisition of new buildings, space in the buildings, either by direct buying, renting, or leasing from the open market or by designing and building the facility to meet a specific need	Mohsini & Davidson (1989)
Strategy to satisfy client development and/or operational needs with respect to the provision of constructed facilities for a discrete life cycle	Lenard & Mohsini (1998)
The process that creates, manages and fulfils contracts	ISO (2008)
Process of obtaining services and supplies for efficient and timely delivery of the end product	Choudhury & Sanampudi (2008)
Framework within which construction is brought about, acquired, or obtained (Construction Industry Board W92 definition)	London (2008)
The purchase of construction-related services with the ultimate aim of creating new building or structure, including all associated site works or alterations, refurbishment, maintenance, extension, or demolition of an existing building or structure	Scottish Government (2011)
Process of identification, selection, and commissioning of the inputs required to construct a project	Department of Business Innovation and Skills (2012)
Acquisition of goods, services, or construction, from a third party, at the best possible price, in appropriate quantity, at the right time and place	Martins (2009); Office of Procurement Ombudsman (2012)
Additional:	
Process which creates, manages and fulfils contracts relating to the provision of goods, services and engineering and construction works or disposals, or any combination thereof	IDMS (2012)

The above definitions suggest, and as highlighted by Hewage & Ruparathna (2013), that procurement is essentially concerned with the realisation of the end facility (a new building or new or refurbished asset). The *process* is also included in several definitions, suggesting that importance should be placed on getting the processes correct.

It would be prudent to obtain a common understanding of what a **process** refers to at this stage. The definition provided by ISO will be used as the definition, as follows:

Process is the "*succession of logically related actions occurring or performed in a definite manner which culminates in the completion of a major deliverable or the attainment of a milestone"* (ISO, 2010).

From the definition of a process above, the implications are that actions are to be performed in a certain sequence or in some order. The actions to be taken must be rational and be based

on some underlying criteria and must be related to the underlying criteria and goal. This discussion is important as this feature of deliberate actions and steps to achieve a goal will be a recurring theme in this research report.

Another point which is important to note at this stage, and as contained in the definition by Lenard & Mohsini in Table 2-1, is the inclusion of the client in the definition of procurement in construction. The ultimate measure of any procurement would be how well, or to what extent, the goals or objectives of the client have been met. This requirement is supported by several researchers (CRC, 2006; Watermeyer, 2012, Murdoch & Hughes, 2008), who argue that the procurement method or system must be aligned to the objectives and priorities of the client. This aspect will also be a recurring theme in this research report.

The National Treasury in South Africa definition of procurement in construction in **Table 2-1** through the IDMS (2012), also places emphasis on the process but is not explicit on the client dimension. Presumably client satisfaction is implied somewhere in the definition.

The definition as suggested by ISO (2010) with some modification to explicitly include the client or customer may be an appropriate definition for procurement in construction, as follows: "*the process that creates, manages and fulfils contracts to meet the client's needs and objectives"*

2.2.2 Steps in the procurement process

Various steps or activities have been suggested for any procurement process, a selection of these is presented and discussed below.

The six principal activities associated with a procurement process, as suggested by ISO 10845 & the IDMS, are:

- "Establish what is to be procured;
- ***Decide on procurement strategies (procedures for packaging, contracting, pricing and targeting strategy & procurement procedure);***
- *Solicit tender offers;*
- *Evaluate tender offers;*
- *Award contracts; and*
- *Administer contracts and confirm compliance with requirements"* (ISO, 2010 & IDMS, 2012).

NEDO (1985) in CRC (2008), suggest seven steps for a successful building procurement, as follows:

- *"Selecting an in-house project executive;*
- *Appointment of a principal advisor;*
- *Care in deciding the client's requirements;*
- *Timing the project realistically;*
- ***Selecting the procurement path;***
- *Choosing the organisations to work for the client; and*
- *Designating a site or building for remodelling".*

New South Wales Government (2005) in CRC (2008) suggests a more comprehensive ten-step procurement strategy (or procurement process), as follows:

- Identify and quantify a service demand for a genuine delivery need in an outcomes strategy;
- Identify service delivery options for meeting the need with stakeholder and preliminary risk analysis;
- Justify proposed option with option evaluation, some financial/economic appraisal and strategy report;
- Define preferred project with brief, risk/benefits analysis, business case and authority to proceed;
- ***Define/select project procurement strategy with brief, risk/benefits analysis and risk management plan, initial methodology report and later strategy report;***
- Define project specification with tender documents, estimate and tender evaluation plan for each contract;
- Call/close evaluate tenders for each contract and recommend/approve/engage best project suppliers;
- Project implementation with supplier(s) carrying out contract work and asset delivery;
- Asset operation/maintenance and then disposal after supplier(s) completes asset delivery; and
- Project evaluation during/after delivery comparing outcomes sought and achieved, and using lessons learnt.

CIDB (2010) & Watermeyer (2012) suggest that a construction procurement strategy is made up of the **delivery management strategy, contracting arrangements** and **procurement arrangements** for a procurement.

The steps in the **delivery management strategy** include:

- Gather and analyse information (spend analysis, organisational analysis & market analysis);
- Formulate project objectives (primary and secondary procurement objectives);
- Make strategic delivery management decisions (PPP, implementing agent, leasing a property, etc.);
- Decide on delivery mode (project or programme); and
- Package works (CIDB, 2010 & Watermeyer, 2012).

The steps in the **contracting arrangements** include:

- Decide on the contracting strategy (design by employer, develop and construct, etc.);
- Decide on the pricing strategy (price based or cost-based contracts); and
- Decide on the form of contract (CIDB, 2010 & Watermeyer, 2012).

The steps in the **procurement arrangements** include:

- Decide on quality strategy (eligibility criteria, evaluation criteria, etc.);
- Decide on procurement procedure (competitive selection procedure, negotiation procedure or competitive negotiations procedure); and

- Decide on targeted procurement strategy (preferencing, mandatory subcontracting, etc.) (CIDB, 2010 and Watermeyer, 2012).

Further, a construction procurement strategy can be developed for a single project, several projects grouped together as a programme of projects or a portfolio of projects (CIDB, 2010 & Watermeyer, 2012). Lastly, the construction procurement strategy must be developed to achieve the desired objectives and value for money with due consideration of the risks and constraints (CIDB, 2010 & Watermeyer, 2012).

It is not the intention in this project to get into much more detail in the steps listed above but rather to place the main area of interest of this research, that of construction procurement strategy, in the bigger process. Construction procurement strategy is the focus of the research and is discussed in more detail in the next subsection. The components of a typical construction procurement strategy are:

- Packaging strategy;
- Contracting strategy;
- Pricing strategy;
- Targeting strategy; and
- Procurement procedures (ISO 10845, 2010; Watermeyer, 2012; IDMS, 2012 & CIDB, 2010).

However, it is worth noting that the steps in the procurement processes suggested above are similar in most respects. All allude to establishing the need for the project, the need to select a procurement strategy for the project, executing the project and closing out the project.

The emphasis by NEDO on exercising care in establishing the client's requirements is also worth noting. As mentioned earlier, the aim is to meet the objectives of the project and client requirements. The NSW Government allude to this aspect by including the stakeholder in the process. The process suggested by ISO 10845 & IDMS is less explicit in this regard.

2.3 Construction procurement strategy

As shown in paragraph 2.2, developing the construction procurement strategy is one activity or step in the procurement process. The context of construction procurement strategy was also highlighted earlier in **Table 1-1**.

The construction procurement strategy must be informed by the reason for undertaking the project (the project objectives) and the broader societal objectives which are to be achieved through the project (Watermeyer, 2012).

Project objectives (reason for undertaking the project and broader societal objectives) must be translated into procurement objectives (Watermeyer, 2012) as a precursor to developing the construction procurement strategy.

Watermeyer (2012) argue that the "*procurement objectives may relate either to the delivery of the actual product (primary objectives) or what can be promoted through the delivery of the product (secondary objectives)".*

Typically, **primary procurement objectives** would include:

- ✓ Adherence to budget;
- ✓ Adherence or importance of schedule;
- ✓ Importance of quality/performance;
- ✓ Rate of delivery;
- ✓ Environmental/health and safety aspects;
- ✓ Buildability;
- ✓ Relationships (long-term relationship, early contractor involvement, integration of design and construction);
- ✓ Client involvement in project;
- ✓ End-user satisfaction; and
- ✓ Maintenance and operational responsibilities (Watermeyer, 2012).

Typically, **secondary procurement objectives** would include:

- ✓ Alleviation & reduction of poverty;
- ✓ Minimisation of the harmful effects of development on the local environment;
- ✓ Establishment and strengthening of indigenous building materials and methods;
- ✓ Promotion of construction technologies that increase employment; and
- ✓ Promotion of the use of environmentally sound goods, building materials and construction technologies (Watermeyer, 2004a in Watermeyer, 2012).

In this subsection, the following are discussed;

- ➢ A definition for construction procurement strategy is suggested;
- ➢ The components of a construction procurement strategy are discussed together with typical construction procurement strategies used in South Africa;
- ➢ Framework agreements are discussed; and
- ➢ The relationship between risk management and procurement is also discussed.

2.3.1 Construction procurement strategy: Definition

ISO 10845 and IDMS by National Treasury in South Africa define construction procurement strategy as:

The "*selected packaging, contracting, pricing and targeting strategy, and procurement procedure for a particular procurement"* (ISO 10 845, 2010 & IDMS, 2012).

The definitions provided by CIDB (2010), ISO 10845 (2010) and IDMS (2012) appear to be different but a closer examination of the CIDB (2010) definition shows that the components are essentially similar to those of ISO (2008) and IDMS (2012). For this study, the typical components of a construction procurement strategy are therefore:

- ➢ Packaging strategy;
- ➢ Contracting strategy;
- ➢ Pricing strategy;
- ➢ Targeting strategy; and
- ➢ Procurement procedure.

Within each of the components of a construction procurement strategy, there are several options that one can select from to develop a procurement strategy for any given project. Construction procurement strategy components and options available in South Africa are discussed in the following paragraphs. The components and options per component are summarised in **Table 2-2**.

Discussions on framework agreements and risk management through procurement are also included to complete the picture on procurement in construction.

The summary in **Table 2-2** is a snapshot and reference guide to the various components and options which one could typically select from when developing a construction procurement strategy.

Table 2-2: Summary Construction Procurement Strategy Components & Options

Component	Options	Discussion & References
Packaging strategy	• Work package (or project); • Package (of work packages or projects); • Programme (of projects); • Portfolio (of programmes)	Refer paragraph 2.3.2
Contracting strategy	• General contracting (design by employer or traditional contracting); • Design & build; • Management contracting; • Construction management; • Other (PPP, DBO, etc) not discussed in this report; not commonly used;	Refer paragraph 2.3.3
	Standard forms of contract to govern contracting relationship: • JBCC PBA; • NEC3 ECC; • FIDIC; • GCC; • CIDB;	Refer paragraph 2.3.3.5
Pricing strategy	Price-based: • Lump sum; • Price lists or price schedules; • Activity schedules; • Bill of quantities; Cost-based: • Cost reimbursable; • Target cost;	Refer paragraph 2.3.4
	Standard forms of contract to support pricing strategy	Refer paragraph 2.3.3.5

Component	Options	Discussion & References
Targeting strategy	Secondary procurement objectives addressed, *inter alia*; • Participation of previously disadvantaged women contractors; • Maximise on the number of jobs created during construction;	Refer paragraph 2.3.5
Procurement procedures	• Negotiated price; • Competitive public bidding; • Competitive bids from pre-selected contractors; • Negotiation with a selected group of contractors;	Refer paragraph 2.3.6
Framework agreements	• Pre-procurement arrangements	Refer paragraph 2.3.7
Risk & procurement	• Relationships between contracting & pricing strategy & risk	Refer paragraph 2.3.8
Conclusion	• Conclusion: Construction procurement strategy	Refer paragraph 2.3.9

2.3.2 Packaging strategy

According to IDMS (2012), packaging strategy refers to the "*organisation of work packages into* contracts".

A *work package* may be regarded as the smallest amount of construction works (maintenance project &/or construction project) that can be let out as a single contract. A *package* may be regarded as several work packages grouped together, to be let out as a single contract, or a package order (CIDB, 2010). Package orders may be let out through framework agreements (CIDB, 2010), framework agreements are discussed later in this report.

Packages may be further grouped together into programmes of projects and programmes can be further grouped together into a portfolio of projects (CIDB, 2010).

The relationships between work packages, packages, programmes and portfolio of projects are shown in **Figure 2-1**.

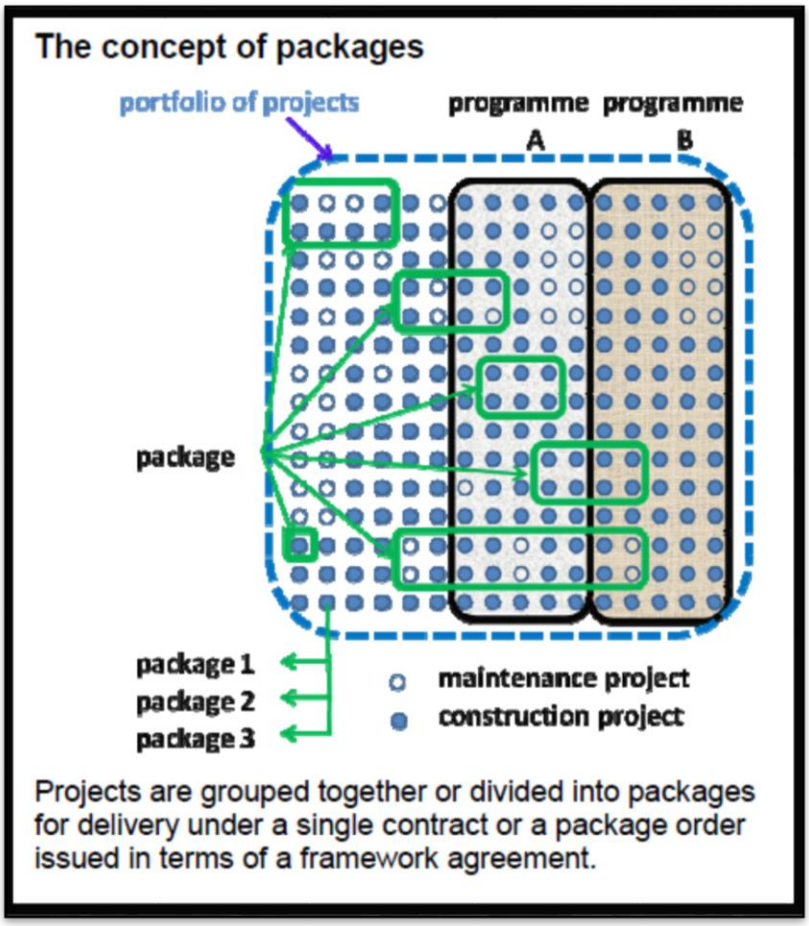

Figure 2-1: Relationship between Work Packages, Packages, Programmes& Portfolio of Projects (CIDB, 2010)

In packaging works, there are several factors that must be considered. Primary factors include:

- *"Interdependencies between projects and programmes; whether there is a need to let projects together;*
- *Whether the employer intends using framework agreements;*
- *The spatial location of projects;*
- *Scale and nature of the works;*
- *Economy of scale;*
- *Project risk and risk allocation;*
- *Scheduling requirements; and*
- *Organisational & managerial complexities"* (Watermeyer, 2012).

Secondary factors relate to those objectives in addition to the primary or immediate objectives of the project (ISO 10845-1 in Watermeyer, 2012). An example of a secondary procurement objective is the unbundling of projects into smaller contracts so that smaller contractors may be eligible to tender, due to for instance CIDB contractor grading in South Africa.

Watermeyer (2012) however cautions against breaking projects into smaller contracts if the employer does not have the necessary administrative capacity to manage the increased number of contracts which will result.

Breaking projects into smaller contracts could also result in uncertainty on contractual responsibilities. An alternative to breaking up projects into smaller contracts is to pass this responsibility onto a main contractor. The main contractor appoints sub-contractors for work packages as part of a targeting strategy (Watermeyer, 2012).

The packaging strategy thus has the potential to manage all sorts of risks and meet client primary & secondary objectives, including, *inter alia*, the following:

- An employer can package projects considering his internal capacity and capability. Clients with few resources should not unnecessarily unbundle projects thereby creating many contracts to manage; and

- Infrastructure that has a high level of interdependencies such a water pipeline connected by two reservoirs with a pump station in between. This project could for instance be let to a single contractor with the option for the employer to select the pumps and electrics contractors as subcontractors to the main contractor. The main contractor will thereafter be responsible for managing the interfaces between the different components of the works.

2.3.3 Contracting strategy

According to IDMS (2012), a contracting strategy refers to the "*strategy that governs the nature of the relationship which the employer wishes to foster with the contractor, which in turn determines the risk and responsibilities between the parties to the contract and the methodology by which the contractor is paid*".

ISO (2010) defines the contracting strategy as the "*strategy which is adopted to procure goods, services, or construction works, to hire or let anything, to undertake disposals or to operate a concession in the most advantageous and cost-effective manner*".

The definition by IDMS (2012) provides a more precise and focused definition for this research project, as contracting strategy in this research project deals with the three main components of:

- Intended nature of the relationship between the employer & contractor;

- How risks & responsibilities are shared between the parties; and

- Method of payment to the contractor (not to be confused with pricing strategy which is dealt with later in this chapter).

The commonly used contracting strategies are discussed below. Discussions on other contracting strategies such as public private partnerships (PPPs), design build & operate (DBO) and the like are not dealt with in this research report as they are not commonly used by most organisations and individuals in South African. Those contracting types are also used in very specific circumstances which are considered beyond the scope of this research.

2.3.3.1 General contracting (design by employer or traditional contracting)

General contractor (or design by employer or traditional contracting) involves the separation of design and construction. A main contractor is employed by the employer (client) to build what the designers (architects, quantity surveyors, engineers) have designed (Murdoch & Hughes, 2008 & Watermeyer, 2012). The contractual relationships between the parties in general contracting are as shown in **Figure 2-2**.

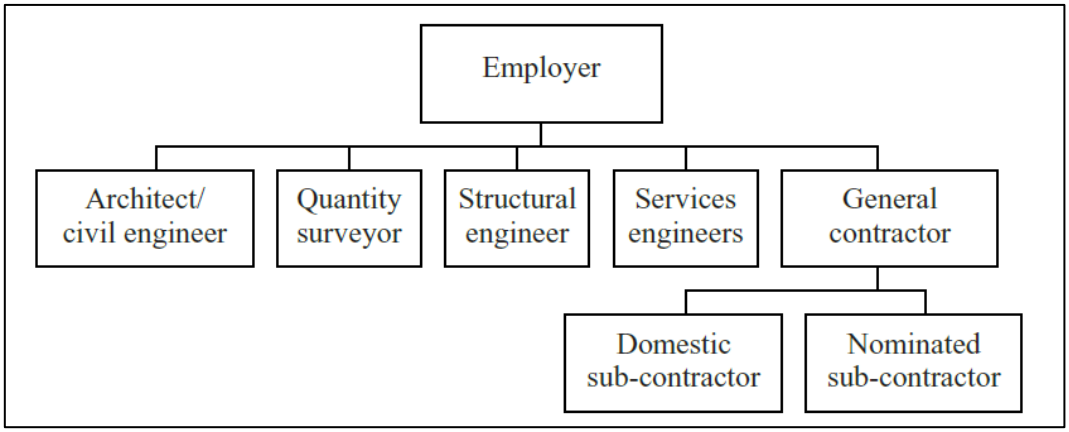

Figure 2-2: Contractual Relationships in General Contracting (Murdoch & Hughes, 2008)

According to Spiers (1983) in Murdoch & Hughes (2008), general contracting has been in use in the United Kingdom since the 19th Century. Prior to general contracting, building works were procured by clients directly with trade contractors (similar to current construction management contracting) or as design & build contracts with a lump-sum price.

In general contracting, the contractor agrees to build what the designers design. The contractor should be invited to price a complete set of documents which describe the works fully. The contractor's price is based on detailed bills of quantities (Murdoch & Hughes, 2008).

Murdoch & Hughes (2008) argue that the bills of quantities are one of the most important documents in general contracting and it cannot be produced if the designs are incomplete. The bill of quantities not only forms part of the pricing document but is also an important mechanism in controlling costs as the project progresses.

Designs are usually not fully complete for various reasons, including: leaving choices to be made as late as possible, the need to fast-tracked projects, missing information on ground conditions and the like. Because of incomplete information, bills of quantities cannot be accurately prepared. When contracts are let with incomplete documentation, there is a high demand for communication and information; "*these demands render the process very difficult"* (Murdoch & Hughes, 2008).

Typical circumstances (which all or most should be present) under which general contracting should be used, include:

- The employer undertakes the designs and takes responsibility for it;
- The employer's designer is sufficiently experienced to lead and co-ordinate the design team and to manage the interface between design and construction;

- The design & documentation is sufficiently complete when the contractor is selected;
- An independent quantity surveyor plans and controls the financial aspects of the project; and
- The contractor is selected based on the contractor's estimate and the employer carries the risk that the estimate may be wrong (Murdoch & Hughes, 2008).

In summary, in the design by employer contracting strategy, the employer assumes risks associated with the design, accuracy of all information and the risk associated with the price of the completed works. The employer must also be a position to manage the contract in an efficient manner and must have all or most of the detail and issues resolved before calling for tenders.

A significant advantage of the design by employer contracting strategy is that the employer remains in control of the project all the time and can make changes to the design if he needs to, with relatively lower financial implications.

2.3.3.2 Design & build contracting

In design & build (or design & construct), the contractor takes responsibility for all or most of the design and builds the works, all in accordance with a brief from the employer (Watermeyer, 2012).

The contractual relationships between the parties in design & build contracting are as shown in **Figure 2-3**.

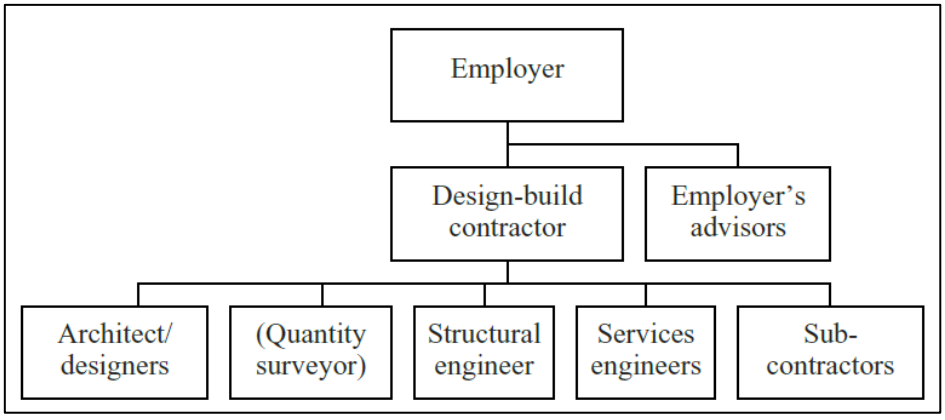

Figure 2-3: Contractual Relationships in Design & Build Contracting (Murdoch & Hughes, 2008)

Murdoch & Hughes (2008) argue that design & build contracting has been around for a long time and that it is common in many industries for somebody to buy something that is designed and produced by a third party (producer). They further argue that before the emergence of architecture as a profession, pre-industrial society used to procure buildings through design & build contracting and that the separation of design from production led to the emergence of general contracting in the 19th Century.

Murdoch & Hughes (2008) note that there are numerous successfully completed design & build projects, over a wide spectrum of projects. They also argue that the design & build contracting has wide applicability.

Design & build may take the form of performance-based contracting where the contractor takes responsibility for all aspects of the design (based on a performance specification from the employer) or takes over designs partially completed by the employer's designers and further develops the designs and builds the works. For continuity, and in the latter case, the employer may require the contractor to take over the contracts he has with the current designers in a process referred to as novation (Murdoch & Hughes, 2008).

Another form of design & build is where the contractor provides a standard pre-designed building or system building in response to the employer's specifications. Usually, a large amount of the product design would have been completed before hand and the contractor would adapt the product to specific site conditions (Murdoch & Hughes, 2008).

Factors to consider when deciding if design & build contracting is suitable for a project include:

- The employer's familiarity with construction. Employers who have limited knowledge of construction would be better served going the design & build route as opposed to say a general contracting route;
- Relative importance of time, cost, function, quality, value for money, etc. If for instance time is most important, then design & build may be appropriate as the contractor can commence building concurrently with designs;
- The technical complexity of the project;
- The need or likelihood of the employer to make changes as work proceeds. In design & build contracting this could prove to be costly to the employer;
- Responsibility and communication, If the employer wishes a single point of responsibility and to deal with one party only, then design & build contracting would be a suitable option; and
- Need for an early start on site (Murdoch & Hughes, 2008).

2.3.3.3 Management contracting

In managing contracting, the employer/client engages the management contractor early in the project to provide construction expertise to design and then manage the construction of the works (CIRIA, 1984 in Murdoch & Hughes, 2008). The management contractor is not employed to construct any part of the works but to manage the process only. All construction activities are undertaken by sub-contractors (Murdoch & Hughes, 2008).

The contractual relationships between the parties in management contracting are shown in **Figure 2-4**.

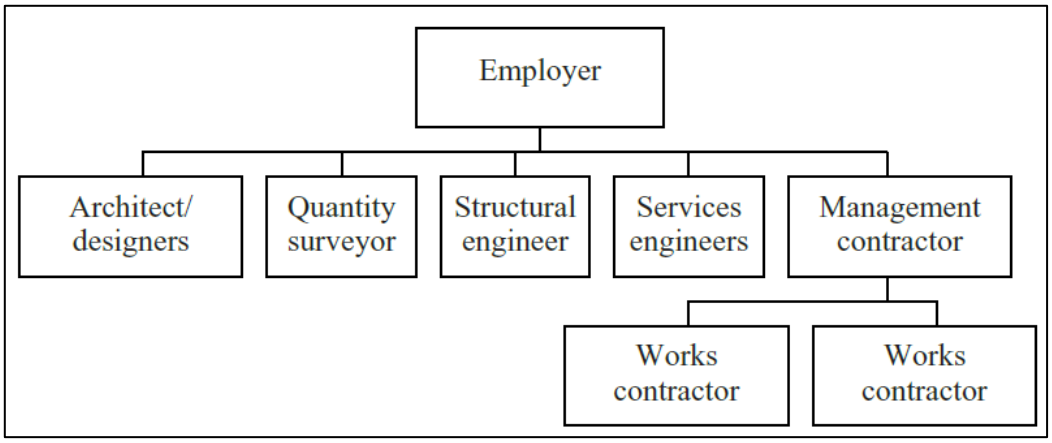

Figure 2-4: Contractual Relationships in Management Contracting (Murdoch & Hughes, 2008)

Due to his early appointment, the management contractor is part of the design team and his status is similar to that of the other professionals. The management contractor's risks are also similar to that of the other professionals (Murdoch & Hughes, 2008).

Although the management contractor appoints the works contractors (or sub-contractors), he is not legally responsible for the defaults of the works contractors. The risks are distributed between the client and the works contractors (Murdoch & Hughes, 2008).

According to Murdoch & Hughes (2008), the most significant risk between management contracting and other traditional forms of contracts is that the employer pays the management contractor whatever he spends on the works contractors, plus his agreed management fee.

Factors to consider when deciding if management contracting is suitable for a project include (most of the factors should be present):

- The employer wants the designs to be done by independent designers;
- The employer wants early completion of the project;
- The project is large;
- Project is complex;
- Ability of the employer to make changes during construction; and
- The employer wants maximum price competition for building the works (Murdoch & Hughes, 2008).

2.3.3.4 Construction management contracting

In construction management, the employer contracts directly with trade or specialist contractors for the construction work. The construction manager has no contractual responsibility for the performance of the trade contractors. The role of the construction manager is that of *construction consultant* in the same way the architect is a *design consultant* (Murdoch & Hughes, 2008). Each of the parties enters into direct contracts with the employer.

The contractual relationships between the parties in construction management are shown in **Figure 2-5**.

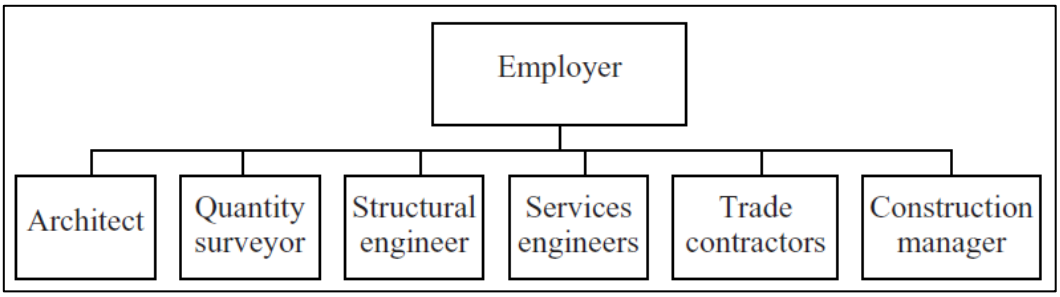

Figure 2-5: Contractual Relationships in Construction Management (Murdoch & Hughes, 2008)

According to Murdoch & Hughes (2008), construction management originated in the USA as the need arose to construct large and increasingly complex projects quickly and reliably. With the increasingly complex projects came a significant increase in the number of technical people typically involved in projects, and, according to Murdoch & Hughes (2008), the *management of the people became more of a management issue than an architectural issue.*

The intention in construction management is to split the design from management, the construction manager should therefore be a specialist in management. The skills required are therefore different from those of a general contractor and likely different from those of a management contractor (Murdoch & Hughes, 2008).

Watermeyer (1995) in Watermeyer (2012) suggest that the construction management method could be used in providing support to fledgling contractors or embryonic enterprises or aspirant entrepreneurs to complete their projects satisfactorily.

According to Murdoch & Hughes (2008), the construction management method is most suitable when some or all the following circumstances are present:

- The employer is familiar with construction and knows some or all the professional team;
- Time and costs are the dominant risk areas;
- The project is technologically complex;
- The employer wants to make minor changes to requirements as the projects proceeds;
- The project lends itself to design being split from management;
- The employer requires an early start on site; and
- While the price needs to be competitive, value for money is more important.

2.3.3.5 Standard forms of contracts

Standard forms of contracts commonly used in South Africa are included at this stage of the discussion as, ideally, the contracting strategy selected should be supported by an available standard form of contract. Otherwise, considerable effort could be expended to adapt a current standard contract or develop a new contract to govern the intended relationship between the parties.

The pros and cons of the various forms of contracts are beyond the scope of this research project. However, the point to note is that various forms of standard contracts (& options within these standard contracts) have been developed over time to suit different contracting and

pricing strategies. Thus, once the contracting and pricing strategies have been decided upon, a suitable form of contract with applicable options should be selected.

The standard forms of contracts that one can choose from in South Africa are shown in **Table 2-3** together with a brief discussion on their usage.

Table 2-3: Standard Forms of Contract in South Africa (Adapted from CIDB, 2010)

Standard Forms of Contract	Discussion
• NEC3 Engineering & Construction Contract • NEC3 Engineering & Construction Short Contract • FIDIC Conditions of Contract for Construction & Building & Engineering Works Designed by the Employer • FIDIC Conditions of Contract for Plant & Design • FIDIC Conditions of contract for EPC Turnkey Projects • FIDIC Short Form of Contract General Conditions (Short Form) • JBCC Principal Building Agreement • JBCC Minor Works Agreement • GCC 2010	These forms of contracts are suitable for construction; As can be seen from the titles of most of the forms of contracts, they are suitable for different contracting strategies; For instance, in the case of a design & build contracting strategy, the FIDIC Conditions of Contract for Plant & Design would be appropriate;
• CIDB General conditions of contract • NEC3 Term Service Contract • NEC3 Short Term Service Contract	Suitable for maintenance only
• NEC3 Engineering & Construction Contract with or without NEC3 Term Service Contracts	Suitable for maintenance & construction
• FIDIC Conditions of Contract for Design, Build & Operate Projects • NEC3 Engineering & Construction Contract plus NEC3 Term Service Contracts	Suitable for construction, maintenance & operation

A further guide for identifying a suitable form of contract is provided by CIDB and is as shown in **Figure 2-6**. In selecting an appropriate form of contract, one must consider project characteristics and the contracting strategy.

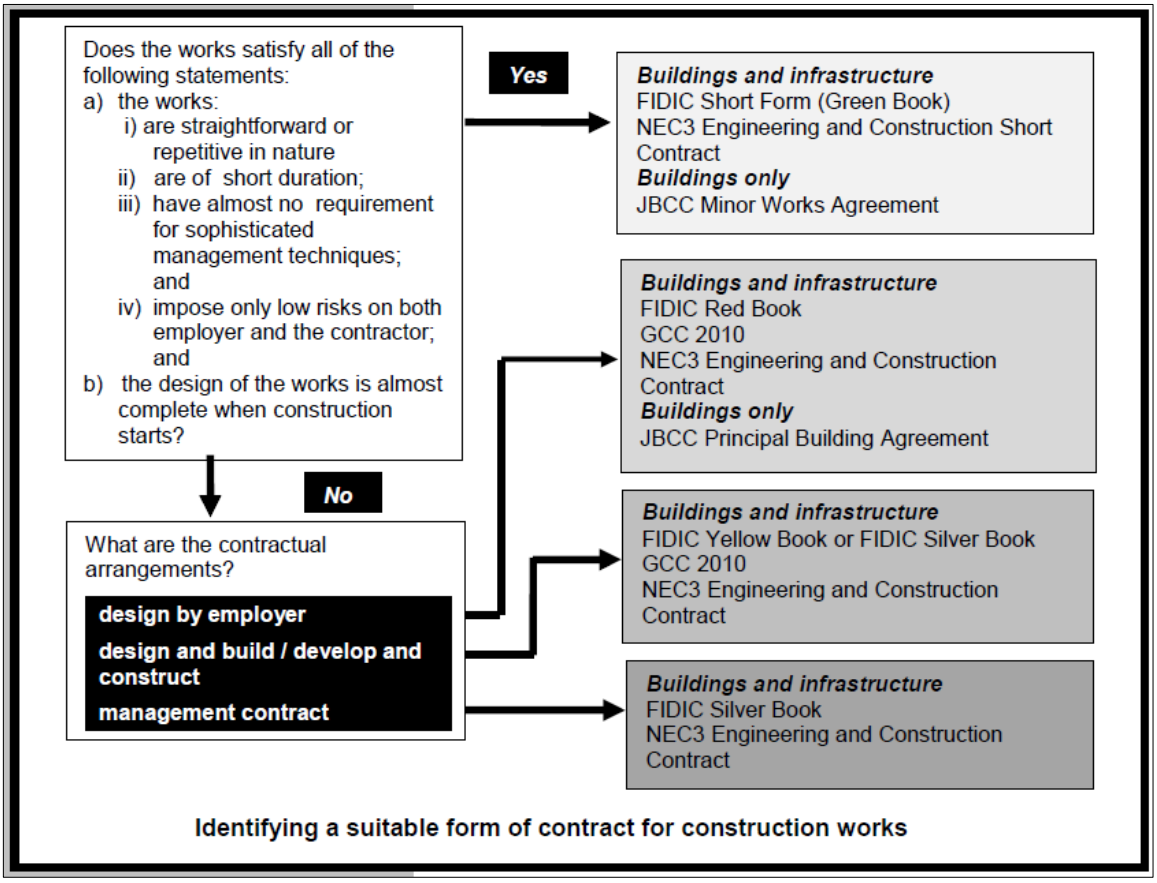

Figure 2-6: Guide in Selecting a Suitable Form of Contract (CIDB, 2010)

2.3.4 Pricing strategy

Pricing strategy refers to the "*strategy which is adopted to secure financial offers and to remunerate contractors in terms of the contract*" (IDMS, 2012 & ISO, 2010). Pricing strategies can be categorised as *price-based* or *cost-based (*Watermeyer, 2012).

2.3.4.1 Price-based pricing strategies

In priced-based pricing, the contractor submits a total price for the works being let. This usually takes the form of a lump sum price or lump sum prices which the contractor arrives at by himself based on information (drawings, specifications, activity lists, schedules) provided by the employer or by pricing a bill of quantities prepared by the employer Watermeyer, 2012).

The common price-based pricing strategies are discussed below.

Lump sum

The employer obtains prices from contractors without preparing a bill of quantities for the contractor to price. Typically, the employer will make drawings, specifications and a performance specification available to the contractor to assist in his pricing. The information provided by the employer to the contractor could vary in detail depending on the employer's contracting strategy. Lump sum pricing is suitable for design by employer, design & build and develop & build contracting strategies (Watermeyer, 2012).

In lump sum pricing, the contractor assumes the risk for the price he submits. If, for example, he does not provide adequately in his price for the full scope of works or for delays due to no fault of the employer, he cannot contractually claim those costs from the employer.

The employer may make interim payments to the contractor. This would require some sort of interim payment mechanism to be put in place early in the contract with an independent verification process. Interim payments to the contractor could be subjective as there is no clear mechanism in place.

Price lists or Price schedules

This method is similar to the lump sum method except that the list or schedules are prepared by either the employer or the contractor. The contractor works out prices per item in the list or schedules based on the information provided by the employer, with the total of all the prices being the contractor's price for the works, (Watermeyer, 2012).

As in lump sum pricing, the contractor assumes the risk for the price he submits. If, for example, he does not provide adequately in his price for the full scope of works or for delays due to no fault of the employer, he cannot contractually claim those costs from the employer. The contractor would however, be entitled to additional payments if for instance the number of items in the list or schedule increases (Watermeyer, 2012).

The employer can make interim payments once the contractor has completed an item or items as a clear interim payment mechanism is in place.

Activity schedule

This method is similar to the lump sum method except that the contractor prepares the activity schedule based on information provided by the employer. The contractor breaks down the works into activities in response to the planning and scheduling of the employer. The contractor works out prices per activity, with the total of all the prices per activity being the contractor's price for the works, (Watermeyer, 2012).

As in lump sum pricing, the contractor assumes the risk for the price he submits. If, for example, he does not provide adequately in his price for the full scope of works or for delays due to no fault of the employer, he cannot contractually claim those costs from the employer. The contractor would however, be entitled to additional payments if the scope increases (Watermeyer, 2012).

The employer can make interim payments once the contractor has completed an activity as a clear interim payment mechanism is in place.

Bill of quantities

The employer prepares a comprehensive bill of quantities and, together with detailed drawings and specifications, solicits prices from contractors. The contractors arrive at their respective prices by pricing the bills of quantities

Whilst the contractor takes responsibility for individual rates making up his price, the employer takes responsibility for the completeness and accuracy of the bill of quantities (Watermeyer,

2012). The final price is only really known at completion of the project and is based on actual quantities of work performed by the contractor.

For the employer to be able to prepare accurate bills of quantities, the designs and specifications must be fully or substantially complete (Watermeyer, 2012 & Murdoch & Hughes, 2008). It therefore follows that using a bill of quantities pricing strategy is suitable for a design by employer (or general contracting or traditional contracting) contracting strategy.

The employer can make interim payments to the contractor at pre-agreed intervals, usually monthly as a clear interim payment mechanism is in place.

2.3.4.2 Cost-based pricing strategies

In cost-based pricing the employer reimburses the contractor for his actual costs incurred and some upfront agreed fee or mark-up. The mark-up is either a fixed amount per week or month or a percentage of costs. Typical cost-based strategies are cost reimbursable and target cost (Watermeyer, 2012).

The common cost-based pricing strategies are discussed below.

Cost reimbursable

In cost reimbursable pricing, the contractor is reimbursed for wages, salaries, materials, plant and equipment used in the works at market or competitively tendered prices, including relevant mark-ups and a fee for profit, overheads, etc. (Watermeyer, 2012). The various cost reimbursable components are shown in **Figure 2-7**.

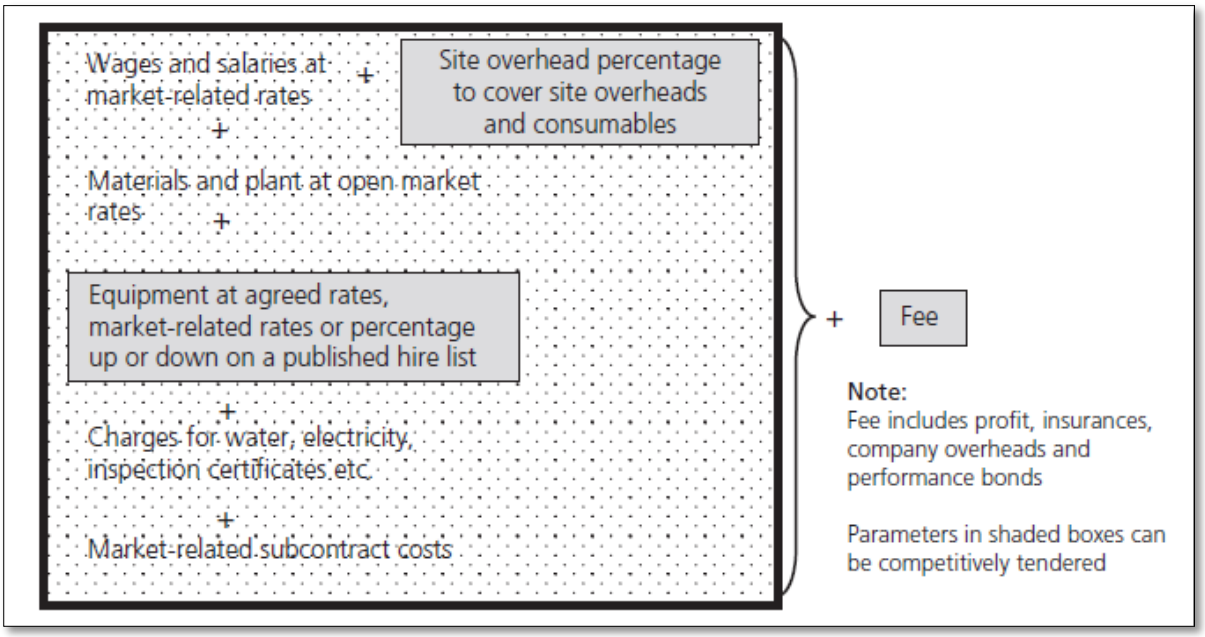

Figure 2-7: Typical Cost Reimbursable Components (Watermeyer, 2010 in Watermeyer, 2012)

A cost-reimbursable pricing strategy is suitable for use in all the contracting strategies discussed in paragraph 2.3.3 and is often used in emergency situations when there is insufficient time to prepare accurate bills of quantities (Watermeyer, 2012).

In cost-reimbursable pricing, the risk for the final price is carried by the employer. The final price can also only really be determined when the works have been completed. Price risk is particularly evident when the contractor is reimbursed at market rates as, in addition to carry the risk related to accuracy of quantities billed, the employer carries all fluctuations in market prices.

The employer can make interim payments based on actual work completed as a clear interim payment mechanism is in place.

Target cost

In target cost, a target price is agreed between the employer and the contractor. The contractor is reimbursed for his costs, profit and overheads monthly or some other agreed interval (Watermeyer, 2012). The difference between the target price at completion (including adjustments) and final cost (the amount paid to the contractor for actual work done) is shared between the employer and contractor according to earlier agreed proportions. The difference could be positive (gain) or negative (pain) (Watermeyer, 2012). The components of a typical target price pricing strategy are shown in **Figure 2-8**.

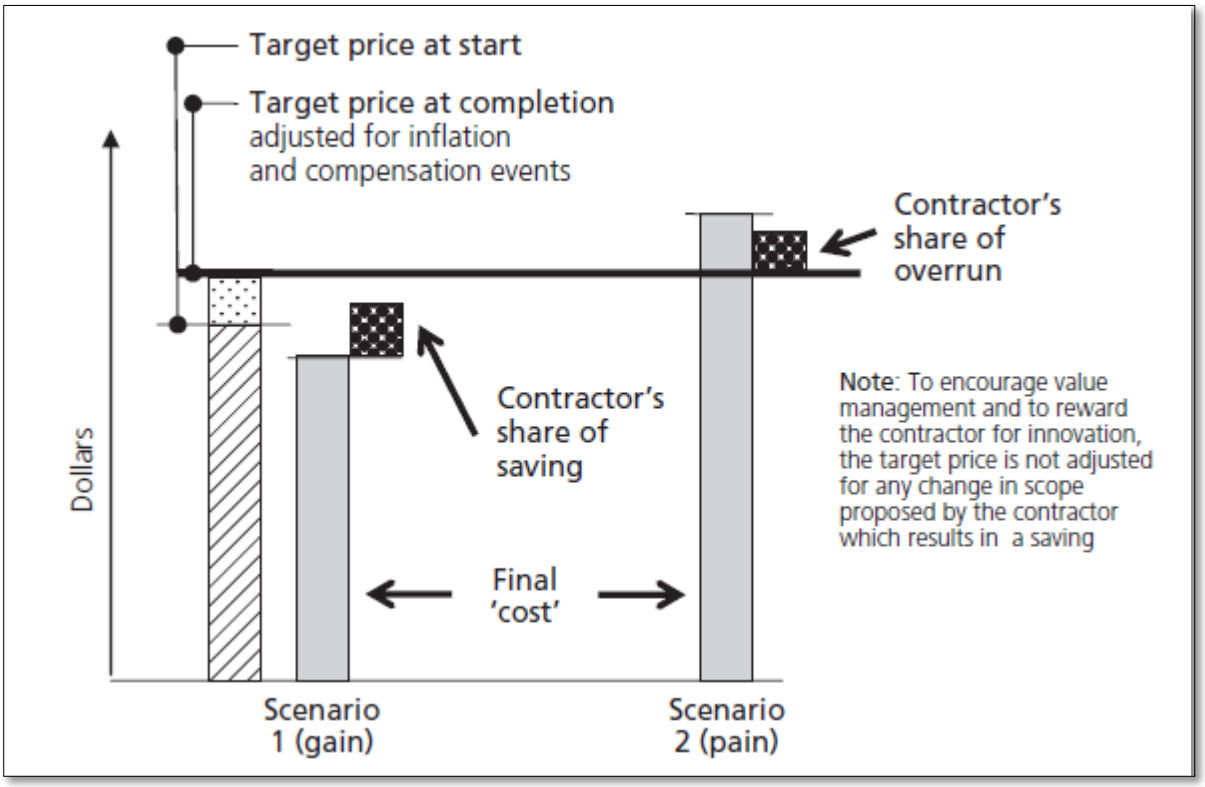

Figure 2-8: Typical Target Price Components (Watermeyer, 2010 in Watermeyer, 2012)

The target price can be obtained by using bills of quantities or an activity schedule. When using bills of quantities, the employer carries the risk for errors and omissions and in setting the target price, while in the case of activity schedules, the contractor carries these risks. Further, any adjustments to the target price due to compensation events (scope increases and/or employer's risks) are carried by the employer (Watermeyer, 2012).

According to Watermeyer (2012), target price pricing requires open book accounting by the contractors as this allows the employer and/or his agents to monitor for what and to whom funds are expended. This implies that the employer must have suitable resources available internally, or is able to engage suitable resources, to manage the contracts.

Target cost pricing allows early contractor involvement in the project and is suitable for design by employer, design & build and develop & construct contracting strategies (Watermeyer, 2012).

The employer can make interim payments based on actual work completed as a clear interim payment mechanism is in place.

2.3.4.3 Standard forms of contracts

Standard forms of contracts commonly used in South Africa were discussed in paragraph 2.3.3.5. Once again, the pricing strategy selected should be supported by an available standard form of contract. Otherwise, considerable effort could be expended to adapt a current standard contract or develop a new contract to govern the intended relationship between the parties.

2.3.5 Targeting strategy

Targeting strategy refers to the "*strategy that enables secondary procurement policy objectives to be promoted"* (IDMS, 2012).

ISO (2010) refer to a *targeted procurement procedure* as "*process used to create a demand for the services or goods (or both) of, or to secure the participation of, targeted enterprises and targeted labour in contracts in response to the objectives of a secondary procurement policy".*

Watermeyer (2004a), Watermeyer et al. (1998) in Watermeyer (2012) suggest that targeting procurement procedures "*can be used to promote secondary procurement objectives such as those relating to redressing racial, gender, ethnic or age imbalances within a society, local economic development and poverty alleviation*".

As can be observed from the above, targeting strategy deals primarily with meeting client secondary procurement objectives. These were noted earlier to include the following:

- Alleviation & reduction of poverty;
- Promotion of construction technologies that increase employment; and
- Promotion of broad-based black economic empowerment principles.

For example, the client may want to promote the participation of previously disadvantaged women contractors in the project and/or the promotion of local materials suppliers in the project. To achieve this, the client may be willing to pay a premium on the contract price.

The client may want to maximise on the number of jobs created during construction. This may require the designs to be developed such that simple construction technologies can be used to increase employment numbers.

In addition to the above secondary procurement objectives, other examples include the reduction of negative impacts on the environment and/or the promotion of health and safety, in addition to the minimum statutory requirements (Watermeyer, 2012).

2.3.6 Procurement procedure

Procurement procedure refers to the "*selected procedure for a specific procurement*" (IDMS, 2012 & ISO, 2010).

Two aspects are covered in this section, that of: a) standard procurement procedures and b) generic tender evaluation methods.

Ultimately, the procurement procedure will depend on the circumstances at the time, decisions made earlier in the procurement strategy development process and the prevailing legislative framework. The discussions on standard procurement procedures and generic tender evaluation methods are therefore brief discussions.

The legislative framework in South Africa is discussed in paragraph 2.4.

2.3.6.1 Standard procurement procedures

The standard procurement procedures as developed by ISO are presented in **Table 2-4** together with a brief description of each procedure.

Table 2-4: Standard procurement procedures (adapted from ISO, 2010)

Procedure		Description
Negotiation	Negotiation	Tender solicited from single tenderer;
Competitive selection procedures *(tender awarded based on lowest price or highest tender evaluation points)*	Nominated	Qualify tenderers entered into database; Tenderers invited to submit tenders based on search criteria;
	Open	Tenderers submit offers in response to advertisements (usually in newspapers)
	Qualified	Tenderers are pre-qualified through an expression of interest process & specified criteria; Qualifying tenderers invited to submit offers;
	Quotation	Tenders solicited from minimum 3 tenderers;
	Proposal 2-envelope	Tenderers submit technical & financial offers in 2 separate envelopes;

Procedure		Description
		Financial offer only opened if tenderer meets minimum technical requirements;
	Proposal 2-stage	Tenderers submit technical proposals only; Offers invited from acceptable tenderers only; Alternatively, contract negotiated with best qualifying tenderer;
	Shopping	Written or verbal offers solicited for off-the-shelf goods; Goods purchased from lowest supplier;
Competitive negotiation procedures *(tenderers shortlisted through series of negotiations & only remaining tenderers invited to submit offers)*	Restricted	Tenderers selected through expression of interest process on objective criteria; Selected tenderers invited to submit offers; Employer evaluates offers & selects tenderers to negotiate with;
	Open	Tenderers submit offers in response to advertisements (usually in newspapers); Employer evaluates all offers & selects tenderers to negotiate with;
Electronic auction	Electronic auction	Tenders evaluated against stated criteria; Eligible tenders invited to submit tenders; these are evaluated & their scores only are published; Tenderers can amend their offers until the auction closes;

2.3.6.2 Generic tender evaluation methods

Tender evaluation methods for the public sector in South Africa are governed by the Preferential Procurement Policy Framework Act, 2000 (Act 5 of 2000). The private sector does not have to comply with this Act and related regulations.

Criteria for evaluating tenders in the public sector in South Africa may be categorised as:

- ***"Financial offer****; the cost of the procurement in monetary terms;*
- ***Quality****; totality of features and characteristics of a product or services that nears on the ability of the product or service to satisfy stated or implied needs; and*
- ***Preference****; a weighting or an adjustment to the price to promote a social or economic objective"* (CIDB, 2008).

Generic tender evaluation methods as published by CIDB are presented in **Table 2-5**.

Table 2-5: Generic tender evaluation methods (CIDB, 2008)

Method	Procedure
Method 1 Financial Offer	1. Rank tender offers from the most favourable to the least favourable comparative offer. 2. Recommend highest ranked tenderer for the award of the contract, unless there are compelling and justifiable reasons not to do so.
Method 2 Financial offer & preferences	1. Score tender evaluation points for financial offer. 2. Confirm that tenderers are eligible for the preferences claimed and if so, score tender evaluation points for preferences. 3. Calculate total tender evaluation points (financial offer + preferences). 4. Rank tender offers from the highest number of tender evaluation points to the lowest. 5. Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
Method 3 Financial offer & quality	1. Score quality; rejecting all tender offers that fail to score the minimum number of points for quality stated in the Tender Data. 2. Score tender evaluation points for financial offer. 3. Calculate total tender evaluation points (quality + financial offer). 4. Rank tender offers from the highest number of tender evaluation points to the lowest. 5. Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.
Method 4 Financial offer, quality & preferences	1. Score quality, rejecting all tender offers that fail to score the minimum number of points for quality stated in the Tender data. 2. Score tender evaluation points for financial offer. 3. Confirm that tenderers are eligible for the preferences claimed, and if so, score tender evaluation points for preferences. 4. Calculate total tender evaluation points (quality + financial offer + preferences). 5. Rank tender offers from the highest number of tender evaluation points to the lowest. 6. Recommend tenderer with the highest number of tender evaluation points for the award of the contract, unless there are compelling and justifiable reasons not to do so.

2.3.7 Framework agreements

Framework agreements refer to an *"agreement between an organisation and one or more contractors, the purpose of which is to establish the terms governing contracts to be awarded during a given period, in particular with regard to price and, where appropriate, the quantity envisaged"* ISO (2010).

IDMS (2012) define a framework agreement as an "*agreement between an institution and one or more contractors, the purpose of which is to establish the terms governing task, batch or package orders to be awarded during a given period, in particular with regard to price and, where appropriate, the quantity*".

A framework agreement sets out the terms and conditions under which a contractor can be engaged by an employer during a given period for a specific procurement as envisaged by the framework agreement (IDMS, 2012). Although a framework agreement may exist between an employer and contractor, the contractor is not guaranteed any quantum of work (Watermeyer, 2012).

The selection of contractors to enter into framework agreements would typically be done through some form of competitive bidding process. The scope of work would be generic but typical of what the employer or client envisages he would have a need for. When a package order has been identified, contractors are invited to submit financial offers in terms of the framework agreement. Contractors may reduce prices in their framework agreements but not increase prices when submitting financial offers (Watermeyer, 2012).

Framework agreements are suitable for design by employer, design & build and develop and construction contracting strategies, with cost-based pricing strategies (Watermeyer, 2012).

2.3.8 Risk management through procurement

Constructions projects contain risks that are unavoidable. The risks should be made explicit and rational commercial decisions taken about which party to should take responsibility for the management thereof (Murdoch & Hughes, 2008).

Murdoch & Hughes (2008) argue that the aim of any contract should always be to deal with risks clearly and unambiguously. However, this is generally not done which leads to excessive claims and disputes which often lead to litigation.

Risk management is therefore concerned with the identification and assessment of risks and deciding who in the team (employer, contractor, designers or other consultants) is bet positioned to deal with the risk (Murdoch & Hughes, 2008).

According to the 2008 CRC (Construction Research Centre Construction Innovation Report: Building Procurement Methods), the decision on what procurement system to use should be made as early as possible and that the decision should consider the associated risks of the project. Murdoch & Hughes (2008) similarly suggest that "*projects involve commercial risks and they involve people and these two aspects are the most significant defining characteristics of projects and project strategies".*

The discussion earlier under construction procurement strategy included project risk management. Under packaging strategy for instance, the point was made that care should be exercised whether a work package or packages or programmes or portfolio of projects should be let as single contracts as those decisions have implications on price and management requirements.

In the discussion under contracting strategy, various options were presented whereby the employer and contractor could take responsibility for design or the design risk. Options on how to manage risks concerning time were also discussed.

Similarly, in the discussion under the pricing strategy, options were discussed on how price risks or price uncertainty could be managed.

Finally, the various standard forms of contracts were also presented, and the point was made that for contracting and pricing strategies, the appropriate standard form of contract should be selected.

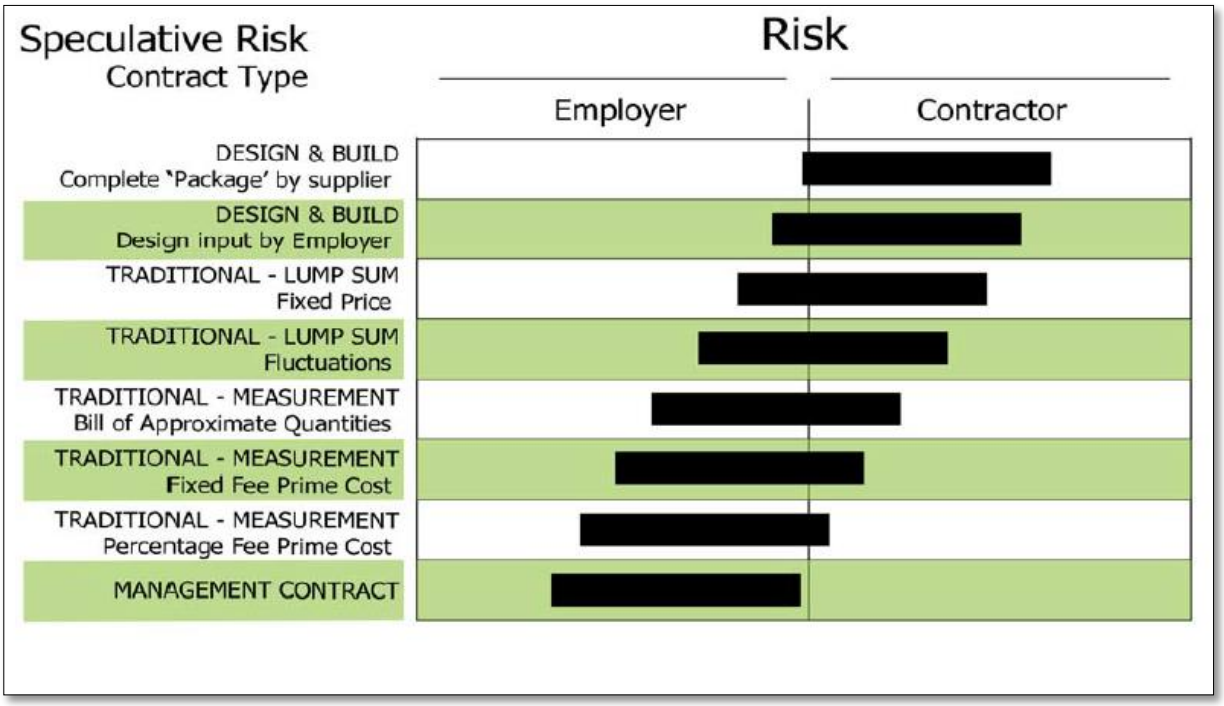

Figure 2-9: Risk Apportionment between Client & Contractor for Different Contracting & Pricing Strategies (CRC, 2008)

Figure 2-9 illustrates the apportionment of risk between the client and contractor for various contracting and pricing strategies. As an example, if the employer does not have the capability and capacity to design the works, then he may well be better off choosing a design & build contracting strategy where the risk for design of the works is passed on to the contractor. The employer would of course assume the risks associated with making changes later in the project and relates to the employer's flexibility as shown in **Figure 2-10**.

A further point to note regarding **Figure 2-9**, is that should the employer want to follow the traditional contracting method, he must understand that, in addition to assuming the risk associated with the design, he assumes price risks which will vary in accordance with the selected pricing strategy.

To conclude on this discussion on risk and construction procurement strategy, **Figure 2-10** is provided to further illustrate the relationship between contracting and pricing strategy and how

these decisions impact on the ability of the employer to influence project outcomes (from a flexibility point).

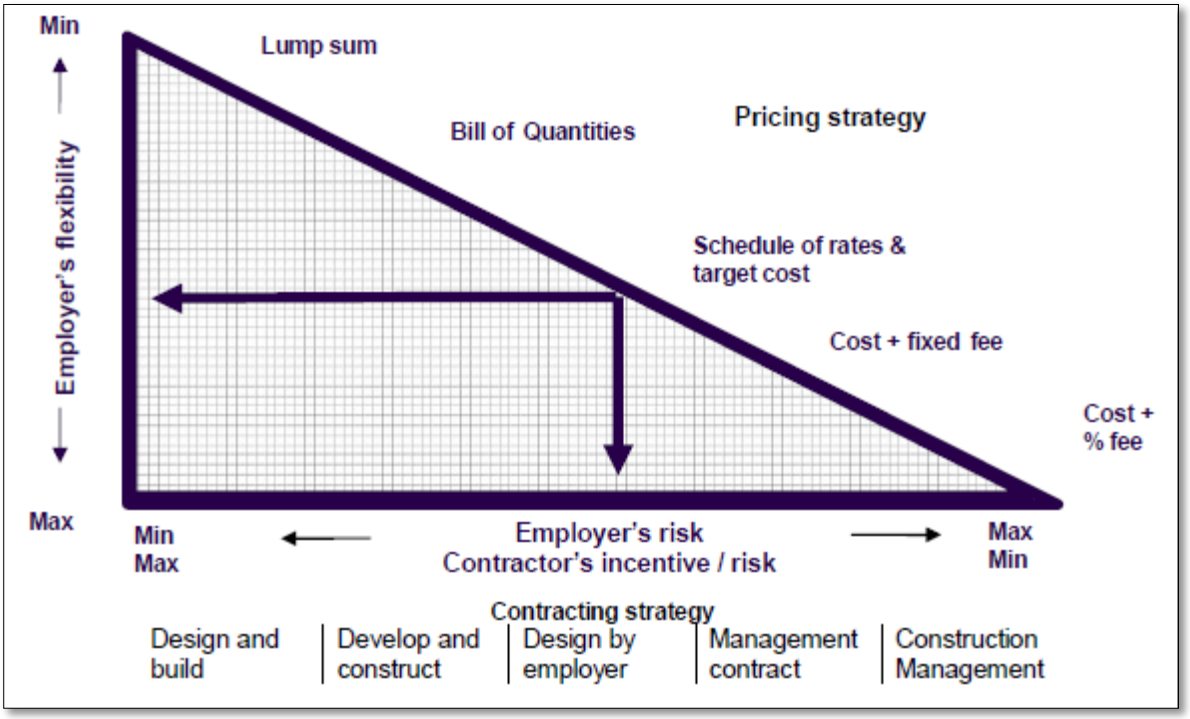

Figure 2-10: Risk, Pricing & Contracting Strategies with Flexibility of Employer (CIDB, 2005)

2.3.9 Conclusion: Construction Procurement Strategy

The discussion commenced with the introduction of project and client objectives and that these should be translated to procurement objectives. Procurement objectives are categorised as primary and secondary procurement objectives. Construction procurement strategies should then be based on the primary and secondary procurement objectives to ensure that the project and client objectives and desired outcomes are achieved.

The components of a construction procurement strategy were presented and discussed, the components are: a) packaging strategy, b) contracting strategy, c) pricing strategy, d) targeting strategy and e) procurement procedures. In addition to the procurement strategy components, various options per component were presented and discussed. The selected option per component together, yields the construction procurement strategy. The construction procurement strategy is governed by a standard form of contract. Various standard forms of contracts were presented which, must be carefully selected to support a construction procurement strategy.

The concept of framework agreements was also presented and discussed. Framework agreements are pre- cursors to the formulation of a construction procurement strategy and can be used to set the background to any procurement for all the components of a construction procurement strategy.

A discussion on the relationship between risk and procurement was also presented. This discussion illustrated the importance of the proper identification of risk and the management thereof, before deciding on a construction procurement strategy.

2.4 Construction industry legislative & regulatory framework in South Africa

The legislative framework governing public sector procurement in South Africa is presented and discussed in this subsection. An understanding of the legislative framework is important as it could have an influence on the construction procurement strategy. It would be pointless debating the various strategies if some of the options are prohibited by the prevailing legislation. As would be seen in the discussion below, the legislation in South Africa does not rule out nor does it prescribe any procurement strategy.

It was mentioned earlier that, whilst the private sector is not required to conform to the legislation governing public sector procurement, firms in the private sector are in effect compliant as the legislative principles are based on general industry good practice (this point is illustrated in the next paragraph).

ISO 10845-1 stipulates that an organisation shall, when establishing a procurement system, ensure that such a system is *fair, equitable, transparent, competitive, cost-effective and promotes other objectives* (relating to secondary procurement objectives) (ISO, 2010). These requirements are similar to the principles of the legislation governing public sector procurement (as discussed below).

The information provided hereunder is an abstracted from a paper entitled: *Public procurement in South Africa: overview;* by Clare Tucker from Bowman Gilfillan and provides a snapshot of the legislation as at 1 March 2013.

"The principal piece of legislation that regulates public procurements is the Constitution of South Africa 1996 (Constitution). Section 217 of the Constitution requires that when an organ of state contracts for goods and services, it must be done in accordance with the principles of fairness, equitability, transparency, competitiveness and cost-effectiveness. This constitutional requirement pulls through in section 51 (1) (a) of the Public Finance Management Act of 1999 (PFMA), which states that an accounting authority must ensure that the particular department or entity has and maintains an appropriate procurement and provisioning system which is:

- *Fair;*
- *Equitable;*
- *Transparent;*
- *Competitive; and*
- *Cost effective" (Tucker, 2013)*

"*The PFMA is implemented through the regulations under National Treasury Regulations (Treasury Regulations)"*

*"*Section *217(3) of the Constitution permits organs of state to implement policies that advance persons who were previously disadvantaged by unfair discrimination. The Preferential Procurement Policy Framework Act 5 of 2000 (PPFA) and the regulations published under it*

in 2011 (PPPFA Regulations), prescribe requirements regarding black economic empowerment (BEE) considerations for state tenders" (Tucker, 2013).

The PPPFA and its regulations in effect allow the client to achieve secondary objectives (if any) for undertaking the project. These would be contained in the targeting component of the procurement strategy. Typically, secondary project objectives would include targeting local suppliers, involvement of youth in the project, pursuing certain environmental imperatives and the like.

At local government, *"The Local Government: Municipal Systems Act 32 of 2000 and the Municipal Finance Management Act 56 of 2003 regulate the manner in which municipal powers and functions are exercised and performed and the management of the financial affairs of municipalities and other institutions in the local sphere of government. The entities to which they apply are required to adhere to the PPPFA"* (Tucker, 2013).

Another piece of legislation, and one which has specific focus on the construction industry in South Africa, is the Construction Industry Development Board Act of 2000 (CIDB Act). The CIDB Act allows the CIDB to, *inter alia,* "*promote and implement policies, programmes and projects aimed at procurement reform, standardisation and uniformity in procurement documentation, practices and procedures within the framework of the procurement policy of government*" (Tucker, 2013).

Further, the Construction Industry Development Regulations require that "*all organs of state only award construction works contracts to contractors who are appropriately registered with the CIDB, advertise tenders and calls for expressions of interest on the CIDB's web based i-tender service and record the award of contracts and any cancellation or termination of a contract in the register of projects on the CIDB website"* (Tucker, 2013).

In examining the various pieces of legislation, the overriding principles deal with constitutional requirements and are the standards against which all procurement by an organ of state is measured.

The principles are:

- ***"Fairness & equitability*** *require that a procurement process must be procedurally fair and focuses on the manner in which the process is conducted. For example, all participants must be given the same information and opportunities.*

- ***Transparency*** *deals with openness & accountability. The process must be conducted publicly, and not behind closed doors. Procurement information must be generally available, procurement rules & procedures should be standardised and made known, and information regarding government contracts and their ward should be accessible; and*

- ***Competitive and cost effectiveness*** *requires an organ of state, while taking into account the other principles, try to procure goods or services at the lowest possible cost and get value for money"* (Tucker, 2013).

A last point to note is that *"the procurement rules do not prescribe the format for procurement; for example, if there are compelling reasons not to conduct the process through open tendering, then the process is not required"* (Tucker, 2013).

The regulations allow for measuring and evaluating technical specifications (referred to as functionality in the PPPFA Regulations) of tenders. Functionality requirements must be objective and must be contained in any tender enquiry document (Tucker, 2013). Once a tenderer passes the minimum requirements for functionality, then the evaluation proceeds on price and preference points achieved (B-BBEE Scorecard). This aspect was discussed in paragraph 2.3.6.2 under generic tender evaluation methods.

In conclusion, the above discussion shows that the legislative framework, as at 1 March 2013, does not place restrictions on procurement choices in the public sector in South Africa long as it is, fair, equitable, transparent, competitive and cost effective.

2.5 Overview of construction industry

The purpose of this subsection is to present an overview of the construction industry in respect of its relative size in monetary terms and relative importance to a country's economy. An indication of the state of the industry in how it serves its customers measured in terms of client satisfaction is also.

This sub-section will cover two aspects;

- Size of the construction industry and relative importance to the economy of a country; and
- Client satisfaction levels.

Size of construction industry & relative importance to the economy of a country

Large sums of funds are invested in construction activities in both the private and public sectors. Expenditure on construction in developed economies in the world, as cited in Hewage & Ruparathna (2013), was: $790 billion in the United States in 2011 (United States Census Bureau, 2012); $74 billion in Canada in 2010 (Statistics Canada, 2011); $ 1 000 billion in China in 2010 (Hammond & Anderlini, 2011); $170 billion in United Kingdom in 2010 (Cabinet Office UK, 2011) and $45 billion in Australia in 2011 (Australian Bureau of Statistics, 2012).

Expenditure on construction in South Africa in 2013 was about $3.9 billion and in 2012 it was about $4.1 billion (SAFEC, 2014).

The size of the construction industry worldwide and in South Africa is massive. In South Africa, the construction industry accounted for 8.7% of GDP in the first quarter of 2014. In the first quarter of 2012, the construction industry employed 986 000 people of which 107 000 were females (Industry Insight, 2012).

Based on the above, the construction industry is undoubtedly an important component in any country's economy and a significant source of employment. In addition to these two aspects, the social benefits associated with the provision of infrastructure is considerable.

Construction industry client satisfaction levels

The construction industry has developed a reputation for delivering projects late, projects coming in over budget and in many instances producing products of poor quality. Overall it has a reputation of poor performance (Egan, 1998; SOU, 2000, Yasamis et al. 2002 & Chan et al. 2003 in Eriksson et al. 2010)).

According to Cheung et al. (2001) in Eriksson et al. (2010), "*construction projects and/or their outcomes heavily affect our modern society; the importance of a well-functioning construction industry is beyond doubt*".

The CIDB (2011) study; *Construction Quality in South Africa: A Client Perspective,* which drew on the CIDB 2009 Construction Industry Indicators and a further study largely amongst public sector clients, found the satisfaction levels of clients measured on projects completed, to be as follows:

- Overall clients were satisfied with the quality of construction in South Africa;
- Clients were neutral or dissatisfied with the quality of construction on around 20% of all projects;
- On 12% of the projects surveyed, the levels of defects were regarded as inappropriate;
- The report also notes that client dissatisfaction is highest in the residential building sector, followed by special works and non-residential building; and
- Low and middle-income residential construction was ranked the lowest in terms of quality achieved (typically ranked poor to average quality), while the quality of upper-income residential was ranked as average to good (CIDB, 2011).

The CIDB (2011) study also found that the private sector was far less satisfied with the quality of work than the public sector and suggested that this could be because the quality of work delivered to private sector clients were indeed lower than that delivered to the public sector or that public sector clients were less discerning than private sector clients.

The first part of the explanation above is somewhat puzzling, intuitively, one would expect private sector clients, especially in South Africa, to command relatively better-quality work than the public sector (due to access to better quality designers & contractors for instance). A more likely explanation could be that public-sector clients are indeed more discerning.

Interestingly, when considering levels of satisfaction for service received by contractors, the following emerges (CIDB, 2014):

- Contractors with CIDB contractor gradings up to and including 7 (works below R40 million), indicted high overall satisfaction levels; between 78% to 87% towards employers and between 77% to 86% towards employers' agents;
- Contractors with CIDB contractor grading of 8 (works up to R130 million), indicted overall satisfaction levels of 70% towards employers and 62% towards agents; and
- Contractors with CIDB contractor grading of 9 (works with no limit in value), indicted relatively low overall satisfactions levels; 51% towards employers and 56% towards agents.

In terms of client satisfaction levels, one could conclude that the construction industry in general, including in South Africa, has opportunity for improvement.

2.6 Current procurement strategies

The information presented in this subsection is derived from the CIDB (2014) report and presents a likely picture of what is happening in the South African construction industry.

This subsection in the literature review will begin to provide insights into one objective of this research project:

To identify the range of strategies used by construction clients in South Africa for dealing with construction procurement.

The CIDB 2014 report is based on projects completed in 2013. Survey forms were sent to *contractors*, employers and agents of 3 475 completed projects on the CIDB database. Completed survey forms were received as follows:

- 1 519 of the 3 475 contractors responded (44% response rate);
- 535 of the 3 432 employers responded (16% response rate); and
- 376 of the 1 586 agents responded (24% response rate), (CIDB, 2014).

Of the 1 519 projects, 569 (about 37%) were for the private sector, the remaining projects were for the public sector. Projects in the public sector were in the large parastatals and all spheres of government.

The types of projects included residential buildings, non-residential buildings, civil works, mechanical works, electrical works, special works and other works.

Whilst the results may not be generalised for the South African construction industry and there are obvious limitations relating to sampling, the findings do however provide useful insights into current procurement practices in South Africa. A further point to note is that the study did not collect information on all the components of a construction procurement strategy. Information was not collected on packaging, targeting and pricing strategies.

The findings for the types of forms of contract used per project type (see **Table 2-6**), the procurement procedures used to solicit tenders per employer category (see **Table 2-7**) and the contracting strategies adopted per employer category (see **Table 2-8**) are provided hereunder.

The JBCC standard form of contract features prominently in **Table 2-6.** While the use of the JBCC form of contract for residential buildings may be understandable (without understanding the specifics of the projects), its use in non-residential buildings, for electrical & special works, is somewhat surprising, especially since the first two project types would typically involve some design by the contractor for which the JBCC form of contract is not suitable.

Similarly, the use of the GCC form of contract (refer **Table 2-6**) for mechanical works, electrical works & special works is also surprising since those project types would typically involve some design by the contractor for which the GCC form of contract is not suitable.

Table 2-6: Form of Contract per Project Type (CIDB, 2014)

Project Type	% Contract Document Type Usage for Each Project Type				
Residential buildings	20	0	68	8	4
Non-residential buildings	13	1	83	0	3
Civil works	76	4	6	10	4
Mechanical works	27	13	10	23	27
Electrical works	27	20	29	18	6
Special works	31	6	44	13	6
Form of contract	**GCC**	**NEC**	**JBCC**	**FIDIC**	**Other**
% Of projects with the form of contract significantly amended	31	36	24	33	18

The proportion of projects on which significant changes were made to the standard forms of contract is also high. This suggests that inappropriate standard forms of contract were selected in the first place which then had to be significantly amended.

On procurement procedures (refer **Table 2-7**), the private sector appears to favour the more focused and direct procedures, negotiated, nominated/selected and quotation, methods than the public sector. The public sector overwhelmingly favours the open procurement method. This could be because of the legislative environment in South Africa. The public sector may be habitually following the open procurement method to stay on the rights side of legislation.

Table 2-7: Procurement Procedures per Employer Category (CIDB, 2014)

Project Type	% Projects Per Employer Category Per Procurement Procedure						
Negotiated	25	6	-	4	2	4	9
Nominated/Selected	24	23	-	13	3	-	9
Open	19	45	82	63	83	77	37
Qualified	6	11	6	8	-	4	27
Quotation	24	13	-	11	3	7	18
Two-envelope system	1	-	12	1	6	-	-
Two-stage system	1	2	-	-	3	8	-
Employer Category	**Private Sector**	**Public Corp (Eskom, ACSA)**	**National Department**	**Provincial Department**	**Metropolitan Council**	**Regional/District Council**	**PPP**

In terms of contracting strategy (refer **Table 2-8**), design by employer is overwhelmingly preferred by both the private and public sectors. The other contracting strategies, while not featuring prominently, appear to be used equally as often by both the private and public sectors.

Table 2-8: Contracting Strategies Adopted Per Employer Category (CIDB, 2014)

Project Type	% Projects per Employer Category Per Contract Type					
Design & build	14	15	-	10	14	11
Develop & construct	4	-	12	1	7	-
Design by employer	68	79	63	66	76	77
Management contract	4	2	12	12	-	4
Construction management	10	4	13	11	3	8
Employer Category	**Private Sector**	**Public Corp (Eskom, ACSA)**	**National Department**	**Provincial Department**	**Metropolitan Council**	**Regional/District Council**

The above discussion has provided some insights into the predominant procurement options selected by clients in terms of contracting strategies and procurement methods. The selection

of the design by employer contracting strategy on most projects is similar to the findings by CIOB (2010) in the United Kingdom and Watermeyer (2012) in Sub-Sahara.

It must however be noted that the reasons for the selections above have were provided in the CIDB (2014) report and it may well be that the selections were indeed based on some rational decision-making process.

2.7 Studies done by other researchers on construction procurement

The purpose of this subsection of the literature review is to make the connection between construction procurement strategy and how it influences or has the potential to influence project outcomes.

In this subsection, the findings of the following three studies will be presented:

- CIOB (Chartered Institute of Building) (2010) into procurement in the construction industry in the United Kingdom;
- Laryea & Watermeyer (2014) at Wits University in South Africa; and
- Rwelamila & Edries (2007) on the knowledge base of civil engineering consultants of construction procurement systems in the Western Cape Province in South Africa.

CIOB (2010) Study

CIOB (Chartered Institute of Building) is an industry body based in the United Kingdom. The organisation was established in 1834. CIOB has a wide range of members which include client bodies, consultants, contractors and specialists in regulation, research and education (CIOB, 2010). The report consulted is entitled; *A Report Exploring Procurement in The Construction Industry.*

The study was conducted amongst CIOB members in the United Kingdom. Emails were sent to 21 890 CIOB members advising them of the online questionnaire survey. The survey was also opened to the public and wider industry.

525 Industry professionals responded to the online survey. The report does not provide information on the sampling method adopted, the findings accordingly cannot be regarded as being representative of the UK construction industry. The findings do however provide useful insights into the research question and research objectives.

Some of the findings of the study, pertinent to this research project, are presented and discussed below.

Respondents overwhelmingly believed that good procurement is synonymous with successful project outcomes as shown in **Table 2-9**.

Table 2-9: Good Procurement Synonymous with a Successful Project (CIOB, 2010)

Question	Responses	
Do you believe that good procurement is synonymous with a successful project?	Yes	86.6%
	No	11.7%
	Don't know	1.7%

On costs and cost overruns, 93% of respondents had been involved in projects that had cost overruns. 59% of respondents indicated that the traditional procurement method was used on projects that had cost overruns (see **Figure 2-11**). 57% of respondents who had been involved in projects that had come in over budget believed that the chosen procurement method directly contributed to costs overrunning.

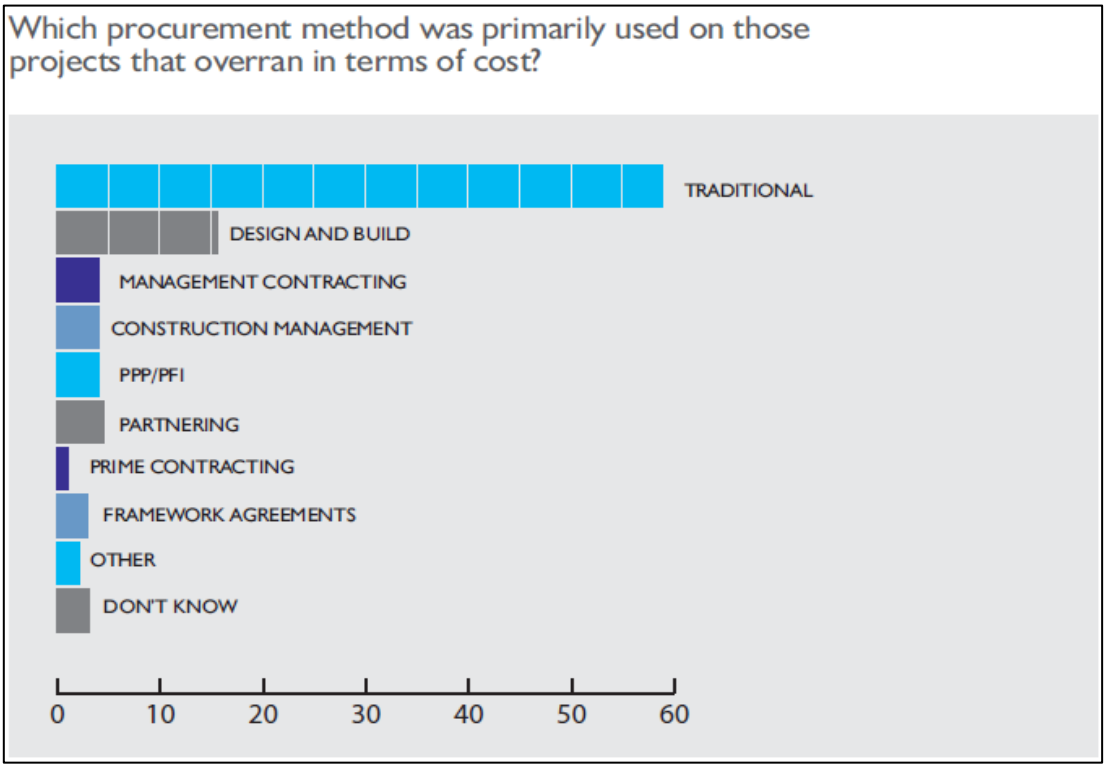

Figure 2-11: Procurement methods & project cost overruns (CIOB, 2010)

On time and time overruns, 93.5% of respondents had been involved in projects that had time overruns. About 60% of respondents indicated that the traditional procurement method was used on projects that had time overruns (see **Figure 2-12**). 49% of respondents who had been involved in projects that had come in late believed that the chosen procurement method directly contributed to the project coming in late.

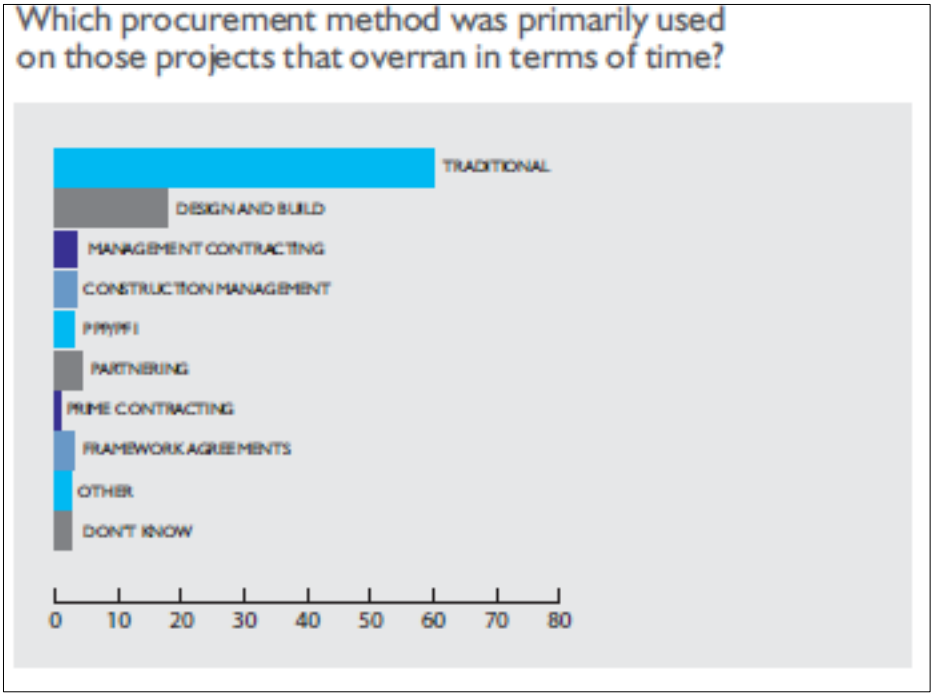

Figure 2-12: Procurement methods & project time overruns (CIOB, 2010)

In summary, the CIOB study reveals, *inter alia*, the following:

- Around 93% (the majority) of respondents have been involved in projects which have come in late and/or which have exceeded the budget.

- Projects let using the traditional procurement method (where designs are done by the employer, open public tenders invited, and contracts awarded on lowest price) appear to be more often associated with both cost and time overruns. This may well be simply because the traditional procurement method is used more frequently than any other method; and

- Around half of the respondents believe that project cost and time overruns are directly because of the procurement method selected.

Laryea & Watermeyer (2014) Wits University Study

Laryea & Watermeyer studied the procurement innovations and project organisation techniques used by Wits University in South Africa to deliver the university's capital works construction projects. The findings in that study were presented in a paper entitled: *Innovative construction procurement at Wits University.*

The university had taken certain strategic (& innovative) decisions on how they will realise their capital projects to be rolled out over a period of six years, from 2008 to 2013. The total value of the projects was about R1.5 billion and comprised of about forty projects which included new buildings and refurbishment of existing buildings.

The initiative by the university over the period of six years was considered successful as the university came in within 6% of the control budget for the portfolio of projects. Most projects

were delivered within the contract award amounts and on time which, and according to Laryea & Watermeyer (2014), is not the norm in South Africa.

The study is specific to Wits University capital projects over the period 2008 to 2013. The study was conducted in 2014 and information for the study was obtained through documentary analysis and interviews with employer and contractor staff members.

The main contributing factors or primary innovations to be able to achieve the noted successes were found to be as follows:

- Establishment of a capital projects office with effective team and reporting system;
- Development of effective polices and systems to deliver value for money;
- Use of project management rather than principal agent to manage the project;
- Educating the project team on supply chains and contracting;
- Building partnerships with contractors through framework agreements;
- Introduction of health and safety management system; and
- Disciplined cost control (Laryea & Watermeyer, 2014).

The enabling factors to be able to achieve the noted successes were found to be as follows:

- Client leadership and expertise supplemented by outsourced project management expertise and capacity;
- Team adoption of a philosophy of collaboration;
- The integration of project teams;
- Early involvement of the contractor in projects; and
- The use of framework agreements NEC contracts (Laryea & Watermeyer 2014).

With regards to the construction procurement strategy components of packaging, contracting, pricing and targeting strategies and procurement procedure, the following are noted:

- ***Packaging strategy***; because Wits wanted to achieve a more collaborative and integrated approach, it chose not to award a single contract to a contractor per project but rather entered into framework agreements with contractors for its different campuses. Integration of the team was achieved through early contractor involvement and/or the allocation of design responsibilities to contractors;

- ***Contracting strategy***; once again to achieve integration of the team, contracting strategies were selected for early contractor involvement and target cost contracts. Contractors were engaged once concept designs were done to further develop designs and the production of construction drawings;

- ***Pricing strategy***; lump sum pricing with activity schedules and target cost pricing with activity schedules were predominantly used;

- ***Targeting strategy***; in evaluating tenders, preferences were given to B-BBEE ratings; and

- ***Procurement procedures***; this included open tender, closed tender, call-offs, negotiated tenders and qualified procedures.

Assuming the criteria adopted in the study to indicate project success is acceptable, attributing the success to all or any one of the interventions cannot accurately be determined. What is clear though is that there are a whole host of interventions which, intuitively would have contributed to the success of the projects, including the procurement methods.

Rwelamila & Edries (2007) Study

Rwelamila & Edries (2007) studied the project procurement competence and knowledge base of civil engineering consultants in the Western Cape Province (South Africa) and found, *inter alia*, the following:

- "*Civil engineering consultants are unaware of or are under-informed about the various construction procurement systems available*"; and

- *"Civil engineering consultants' selection criteria for procurement systems are based on biased experience and conservative choices leading to incorrect decisions with unfortunate consequences".*

2.8 Factors influencing choices in construction procurement strategy

The purpose of this subsection is to present, from current literature, a list (and brief discussion) of the factors that one should consider when developing a construction procurement strategy.

Further, this subsection in the literature review will begin to provide insights into one objective of this research project;

To identify what factors, influence the selection of construction procurement strategies by clients in South Africa.

Various sources were consulted to establish a list of factors that could influence the selection of *construction* procurement strategy options. Those factors are listed in **Table 2-10** and discussed briefly below.

CIOB (2010)

The CIOB (2010) study: *A Report Exploring Procurement in the Construction Industry*, (discussed in the previous subsection), found that respondents placed relatively equal emphasis on the factors proposed in the study to them. Those factors are shown in **Figure 2-13**. In that study, respondents were asked to select a maximum of three factors from a list of factors which they believed were the primary factors influencing client procurement method selection.

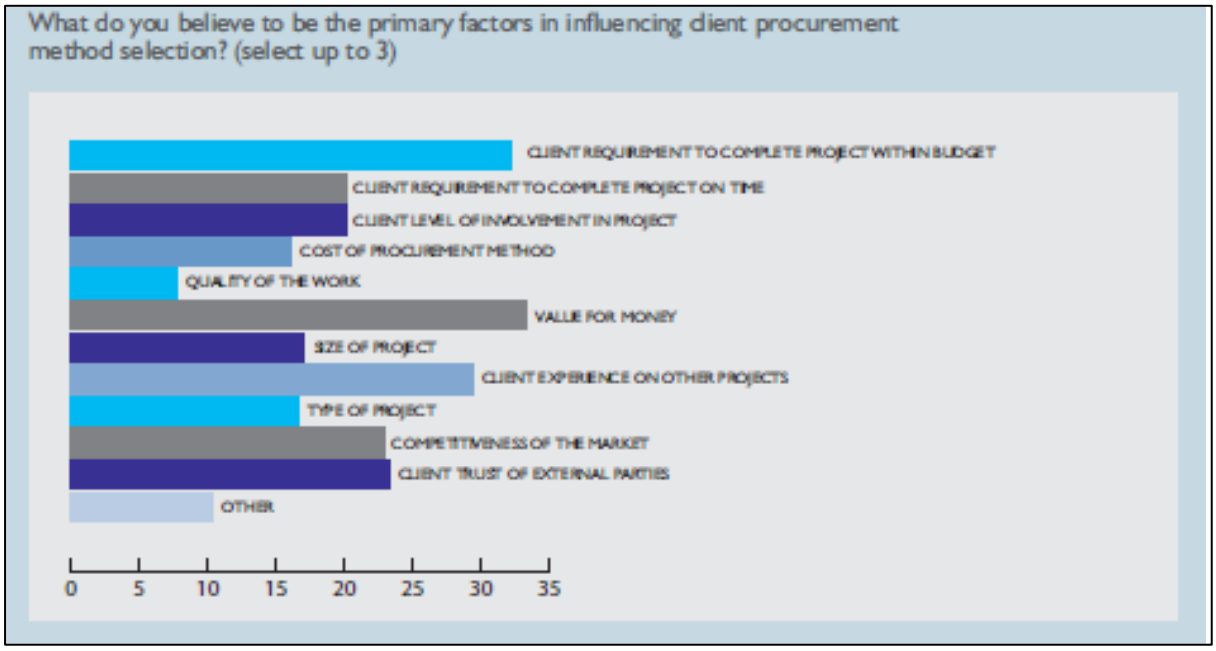

Figure 2-13: Primary factors influencing client procurement selection method (CIOB, 2010)

Further inspection of **Figure 2-13** reveals that the three primary factors influencing clients' procurement method selection to be value for money (33%), client requirement to complete project within budget (32%) and client experience on other projects.

Favie' & Maas (2008)

The Favie' & Maas (2008) study in their paper: *Ranking Construction Project Characteristics*, aimed to rank project characteristics which could be used to choose the procurement method. Forty-three characteristics were identified in the study, the 15 most frequently cited characteristics only are presented in **Table 2-10**.

Eight sources of literature were selected for the research. Using the list of characteristics generated from the literature review, sixteen industry experts working in groups of four people were asked to compile lists (per group) of what they considered the most important project characteristics to be when choosing a procurement method.

The project characteristics were then ranked according to the number of times they appeared in the literature review and the number of times they appeared on the lists compiled by the industry expert groups.

The most important characteristics that emerge from the study are project complexity, followed by size of the project, effects of the environment on the project and importance of the project to be completed on time.

Murdoch & Hughes (2008)

The Murdoch & Hughes (2008) list of most important criteria for choosing procurement methods as contained in their book: *Construction Contracts: Law and Management (Fourth Edition)* is presented in **Table 2-10**.

Murdoch & Hughes (2008) cautions that the criteria they propose is not comprehensive nor will all the criteria apply to all projects as there may well be additional criteria depending on the specific requirements of the project and the client. They further argue the point that the client should be taken through a series of decisions and procurement method options before entering into any contract.

Whilst the criteria are not ranked per say, Murdoch & Hughes (2008) do contend that the first question to be answered is the extent the client wishes to be involved in the project. The other point worth noting is their definition of project complexity: *project complexity does not refer to the technological complexity of the project which can be mitigated by using highly skilled people, but rather the organisational complexity of the project (the number of firms needed for the project).*

CRC (2008)

The CRC (2008) list of factors to be considered when evaluating the most appropriate procurement strategy as proposed by Rowlinson (1999) and Morledge *et. al.* (2006), in the (CRC) report: *Building Procurement Methods* is presented in **Table 2-10**.

The CRC (2008) study does not rank the factors, however it is interesting to note the inclusion of *external factors* in their list of factors to be considered when evaluating the most appropriate procurement strategy.

Summary

The factors or criteria or project characteristics presented in this subsection to be considered when deciding on the most appropriate procurement strategy is not exhaustive and no generic list emerges. Since all projects are unique and clients undertake projects for different reasons, it stands to reason that the factors and indeed their relative importance will vary from project to project and client to client.

However, some common themes do emerge, such as the client's desired level of involvement in the project and that this cannot be arbitrarily decided upon. If the client wants to be involved in all aspects of the project, his capability and capacity must be considered before this is factored into the decision-making process.

Table 2-10: Factors Influencing Construction Procurement Strategy				
CIOB (2010)	***Favie' & Maas (1996)*** *(Highest 15 Stated Only)*	***Murdoch & Hughes (2008)***	***CRC (2008)***	
Client requirement to complete project within budget	Complexity of project	Involvement of client with the construction process	External factors (economic, commercial, technological, political & legal)	
Client requirement to complete project on time	Size of project	Separation of design from management	Client resources (& degree of client involvement)	
Client level of involvement in project	Effects of political, legal & economic systems	Reserving the client's right to alter the specifications	Project characteristics (size, complexity, location & uniqueness)	
Cost of procurement method	Importance for project to be completed on time	Clarity of client's contractual remedies	Client ability to make changes	
Quality of work	Type of project	Complexity of the project	Cost issues (price certainty)	
Value for money	Form of contract	Speed from inception to completion	Timing (importance of time)	
Size of project	Location of project	Certainty of price		
Client experience on other projects	Level of technological advancement			
Type of project	Project life span/life-cycle			
Competitiveness of market	Value of project			
Client trust of external parties	Quality of project			
Other (?)	Type of client			
	Project funding			
	Level of specialisation required of contractors			
	Level of information available at project inception			

3. CHAPTER 3: RESEARCH DESIGN & METHODS

3.1 Introduction

The aim of the research was to answer the research question: *What factors influence the selection of construction procurement strategies for water infrastructure projects in South Africa?*

There are a range of strategies for dealing with the different components and options of construction procurement. However, according to various sources of literature (CIDB, 2014; CIOB, 2010; Watermeyer, 2012), those involved in the development of construction procurement strategies do not always consider the requirements of the client in the procurement strategy selection decision. They habitually select the traditional procurement method to deliver on their infrastructure requirements. This is despite a wealth of evidence (theoretical & empirical) suggesting that this traditional procurement method is not suitable for all types of construction projects and for meeting differing client and project objectives.

In South Africa, organisations such as the CIDB and National Treasury through the IDMS (2012) and SIPDM (2015) strongly advocate for the development of a construction procurement strategy for each construction project or portfolio of projects. Those organisations focus primarily on the public sector. ISO (2010) similarly advocate for a structured procurement process, including the development of a construction procurement strategy per project. ISO's focus is on both the public and private sectors internationally.

The objectives of this research were:

- To identify the range of construction procurement strategies clients, select for water infrastructure projects in South Africa;
- To identify what factors, influence the selection of construction procurement strategies by those clients; and
- To develop recommendations for aligning construction procurement strategy choices with the intended project objectives and outcomes.

According to Saunders et al. (2012), research design provides the plan and direction of how the research question will be answered. Further, for the research to be taken seriously the researcher would need to explain why certain choices were made (Saunders et al. 2012). Accordingly, the research design will be discussed using the research "*onion",* as suggested by Saunders et al. 2012, as a framework (refer **Figure 3-1).**

The following are discussed in this chapter:

- Research philosophy (refer paragraph 3.2);
- Research approach (refer paragraph 3.3);
- Research strategy (refer paragraph 3.4);
- Research choice(s) (refer paragraph 3.5);
- Research time horizon (refer paragraph 3.6);
- Research technique and procedure (refer paragraph 3.7);
- Quality issues; validity and reliability (refer paragraph 3.8); &
- Ethical considerations (refer paragraph 3.9).

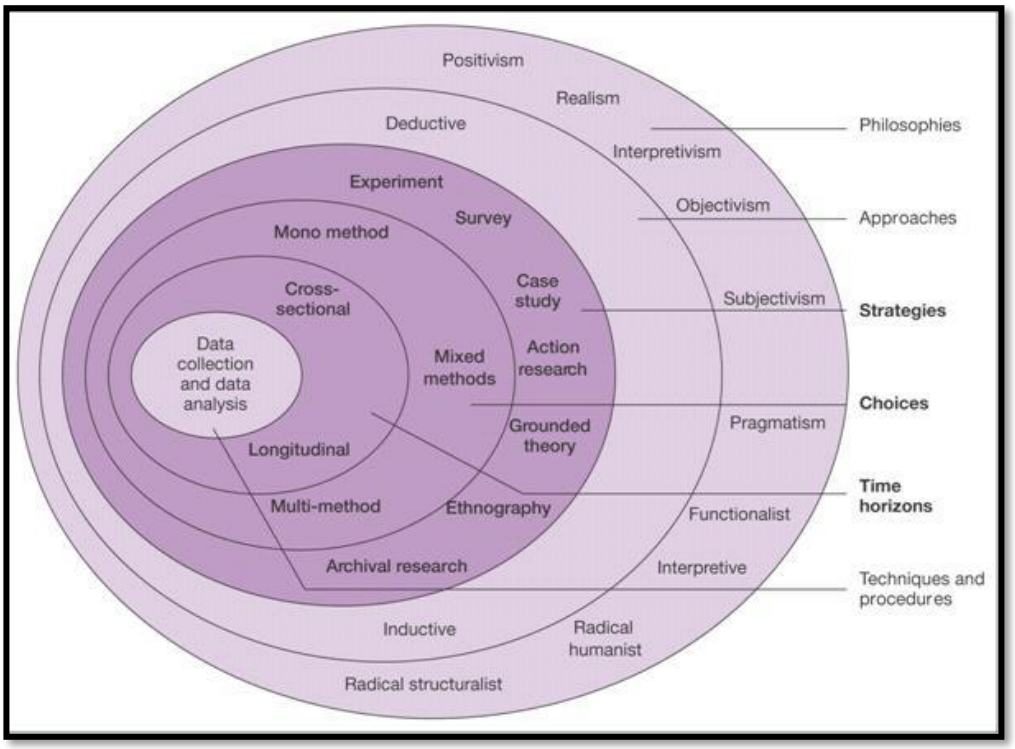

Figure 3-1: Framework for Research Design
(Adapted from Research Onion, Saunders et al. 2012)

3.2 Research philosophy

Research philosophy (the outer most layer of the research onion in **Figure 3-1**) relates to the development of knowledge and the nature of that knowledge (Saunders et al. 2012). According to Saunders et al. (2012), assumptions are made at every stage of the research process. Assumptions of human knowledge and the nature of the realities one encounters shapes the understanding of the research questions, methods used and interpretation of the findings (Crotty, 1998, in Saunders et al. 2012).

The way we "*design and conduct research is shaped by our mental modes or frames of references that we use to organise our reasoning and observations. These mental modes or frames (belief systems) are called paradigms*" (Bhattacherjee, 2012).

Two ways of thinking about research philosophy are ontology (assumptions about how we see the world) and epistemology (assumptions about the best way to study the world), (Saunders et al. 2012 & Bhattacherjee, 2012).

According to Bhattacherjee (2012), ontology asks the question "*does the world consist mostly of social order or constant change*?" and epistemology asks the question "*should we use an objective or subjective approach to study social reality*?"

Based on the two sets of assumptions of ontology & epistemology, social science research can be categorised as belonging to four categories as shown in **Figure 3-2** (Bhattacherjee (2012), and presented below:

- *"If researchers view the world as consisting mostly of social order (ontology) and hence seek to study patterns of ordered events or behaviors, and believe that the best way to study such a world is using an objective approach (epistemology) that is independent of the person*

conducting the observation or interpretation, such as by using standardized data collection tools like surveys, then they are adopting a paradigm of functionalism;

- *However, if (*researchers) *believe that the best way to study social order is through the subjective interpretation of participants involved, such as by interviewing different participants and reconciling differences among their responses using their own subjective perspectives, then they are employing an interpretivism paradigm;*

- *If researchers believe that the world consists of radical change and seek to understand or enact change using an objectivist approach, then they are employing a radical structuralism paradigm: and*

- *If* (*researchers*) *wish to understand radical change using the subjective perspectives of the participants involved, then they are following a radical humanism paradigm"* (Bhattacherjee (2012).

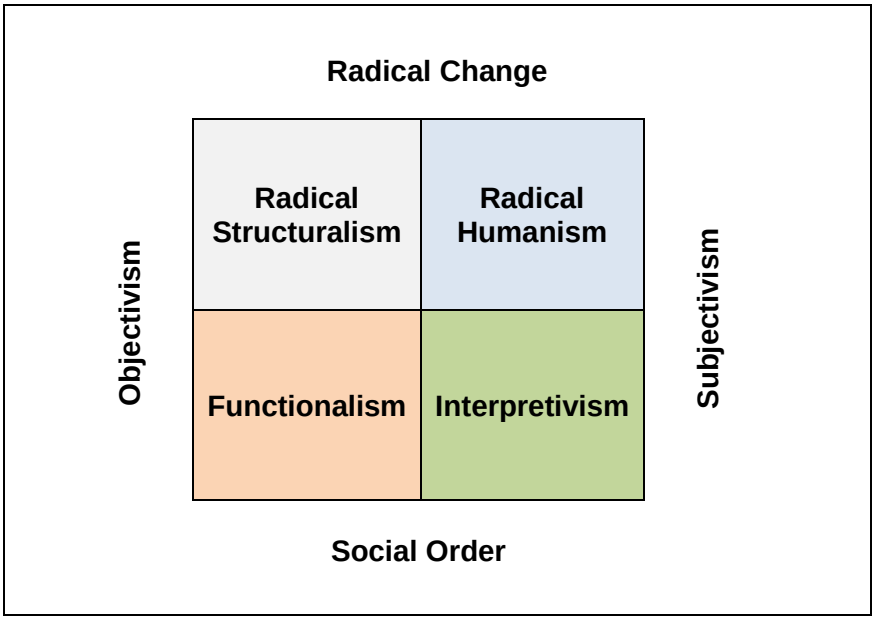

Figure 3-2: Social Science Research Paradigm Categories (Burrell & Morgan, 1979 in Bhattacherjee, 2012)

"Functionalist believe that social order or patterns can be understood in terms of their functional components, and therefore attempt to break down a problem into small components and study one or more components in detail using objectivist techniques such as surveys and experiential research" (Bhattacherjee, 2012).

This research consisted of two parts:

- The first was to identify the range of strategies used by the construction clients and to determine whether there was a preferred strategy (or strategies). This was achieved in an objective manner, a functionalist (or positivist) research philosophy paradigm was thus appropriate.

- The second part of the research sought to identify why the clients made the choices that they did. This required identifying and understanding the factors respondents considered when developing their construction procurement strategy. To achieve this part of the study, and to

objectively collect the data to meet this objective, a functionalist (or positivist) research philosophy paradigm was also considered to be appropriate.

3.3 Research approach

According to Saunders et al. (2012), there are three main research approaches, as follows:

- *Deductive approach*; the development of a theory which is then tested to, for instance, establish if a causal relationship exists between concepts and variables. The progression is from theory to data or theory testing;

- *Inductive approach*; data is collected, analysed and a theory developed. The movement is from data to theory or theory building; and

- *Abductive approach*; begins with the observation of an occurrence and then works out a theory how this could have occurred. This approach moves back and forth, between deduction and induction.

Easterby-Smith et al. (2008), in Saunders et al. (2012), suggest the reasons below why understanding and selecting a research approach is important:

- It informs the research design in terms of the kind of evidence/data that is collected, from where and whom, and the interpretation of the data so that the research question is satisfactorily answered;

- Assist in research strategies and methodological choices; and

- Adapt the research design to cater for constraints such as limited access to data.

Saunders at al. (2012), however argue that the choice of any research approach will depend on the nature of the research topic and amount of information available. For example, a topic with extensive and available literature from which a theoretical framework and hypothesis can be developed, may be more appropriate to a deductive approach.

Two further considerations in choosing a research approach is the amount of time available. A deductive approach is less time consuming than both inductive and abductive approaches. Inductive and abductive approaches may also be riskier in that at the end of the study no useful data and theory patterns may emerge (Saunders at al. 2012).

For this research, a deductive research approach was adopted as this approach was considered the most appropriate to answer the research question and objectives. A significant amount of literature on procurement in construction exists, however, an understanding of what construction procurement strategies and why people choose a strategy (in South Africa) are limited.

3.4 Research strategy

The research strategy may be defined as the plan of how to collect data to answer the research question. Further, the choice of the research strategy is dependent on the research philosophy, the research approach and the methodological choice or choices made. Although, this should not be considered too rigidly due to the open boundaries between the various elements mentioned (Saunders et al. 2012).

The research strategy, according to Denzin & Lincoln (2005) in Saunders et al. (2012) "*is the methodological link between your philosophy and subsequent choice of method to collect and analyse data."*

The research strategy for this study was through surveys whereby respondents were required to provide responses to a schedule of closed questions and open questions in structured interviews. In closed questions, many alternative answers are provided to a question and the respondent is required to choose one. In open questions, the researcher is unsure of the responses and solicits answers from respondents (Saunders et al. 2012). The closed questions provided data to gain insights on current procurement practices from established alternatives in the literature, while the open questions provided (unbiased) data to be able to explain the current procurement practices.

According to Saunders et al. (2012), in structured interviews, the interviewer meets the respondents in person and asks questions from a prepared schedule of questions and does not deviate from the questions. A schedule of questions, or questionnaire, is a data collection method whereby all respondents respond to the same set of questions in a predetermined order (de Vaus, 2002 in Saunders et al. 2012).

Saunders et al. (2012) however caution against using questionnaires for exploratory research and other research in which respondents need to respond to many open-ended questions. For this research, the number of opened-ended questions were kept to a minimum.

Robson (2011) in Saunders et al. (2012) argue that standardised questions work best if the researcher is confident that all respondents will interpret the questions in the same way. This aspect is dealt with later in this chapter under Quality Issues.

The research strategy outlined above was considered appropriate for this research as it linked well with the research philosophy. Further, a survey strategy helped achieve the research objectives. Further considerations in choosing a survey strategy (and not for instance using secondary data) are the limited amount of knowledge currently available to answer the research question and time constraints (in that the survey strategy enables the collection of data from a large sample in a short period of time).

Data was collected as follows (the research instrument is included in Annexure A):

- The first part of the study was *descriptive in nature,* to identify what construction procurement strategies are currently being used and if there was a preferred strategy (or strategies). Structured interviews were undertaken during which respondents were required to provide answers to a schedule of questions.

  According to Saunders et al. (2012), structured interviews (in a descriptive study) can be used to identify general patterns and are helpful when the research design uses a deductive approach.

  The schedule comprised both list and rating questions.

- The second part of the study was *explanatory in nature*, to identify the factors that influence construction procurement strategy selection. In the same interview mentioned above, respondents were required to respond to open questions.

  According to Saunders et al. (2012), and relevant to this research project, open questions encourages the respondents to provide "***extensive and developmental"*** answers. Those

responses were useful to identify the factors that influence the selection of construction procurement strategy.

3.5 Research choices

Research choice(s) refers to whether the research will follow either a quantative or qualitative research design (mono method) or multiple methods research design (Saunders et al. 2012).

Quantative research design is usually associated with a positivist research philosophy and a deductive research approach. A qualitative research design is usually associated with an interpretivist research philosophy and inductive &/or abductive research approach (Saunders et al. 2012).

As stated in the research philosophy section above, the research philosophy adopted for this research was a functionalist (or positivist) paradigm.

Considering the research philosophy, the research objectives and the nature of data collected, the data was analysed quantitatively.

3.6 Research time horizon

There are essentially two options in terms of time horizons for any research: a) cross-sectional ("*snapshot at a point in time"*) studies or b) longitudinal studies and the choice of which will depend on the research question (Saunders et al. 2012).

Another factor to consider when selecting a time horizon for a research project is the amount of time available. Usually in academic studies, and due to time constraints, the cross-sectional time horizon is adopted (Saunders et al. 2012).

According to Saunders et al. (2012), cross-sectional studies usually employ the survey strategy and they also use the qualitative or multiple research strategies such as case studies which are based on short duration interviews.

For this research, and considering the research question and time constraints, a cross-sectional study was conducted.

3.7 Research techniques & procedures

Sampling (population, sampling frame & sample)

Sampling refers to the "*statistical process of selecting a subset of a population of interest for the purpose of making observations and statistical inferences about that population*" (Bhattacherjee, 2012).

The *population* refers to "*all people or items with the characteristics that one wishes to study"* and "*want to generalise about*" (Bhattacherjee, 2012). The population in this study was therefore all people who make decisions on which procurement strategy to select to procure the services of contractors for their construction projects in the water sector in South Africa. The population also included people who assisted project owners or government entities in making the procurement decision or who made the decision on their behalf.

It is prudent to note at this stage that the *population* was not the projects which respondents referenced in their responses but rather the person who spoke about a project of his/her choice.

The unit of analysis was therefore the person. According to Bhattacherjee (2012), the unit of analysis is the person, object, or entity one wishes to draw scientific inferences from.

The *sampling frame* refers to the database of people from which a sample can be selected from (Bhattacherjee, 2012). The sampling frame in this study was all people who make construction procurement strategy decisions. The *sample* refers to the actual or subset of people selected for observation (Bhattacherjee, 2012).

For public sector projects, the responsibility for the development of the construction procurement strategy are officials employed by the client organisation, or professionals in the employ of implementers or professional services providers appointed by the implementers IDMS (2012). An implementer refers to an "*institution or division within an institution responsible for the physical delivery of infrastructure or maintenance projects*" (IDMS, 2012).

In the private sector, the responsibility for the development of the construction procurement strategy would appear to be less prescriptive than for the public sector (private funds being spent). Typically, a member of senior management (such as director of projects), would be responsible for this function.

The *population* in the case of the public sector may be described as officials (professionals and senior administrative staff acting in the capacity of programme or project managers) within client and implementer organisations delegated to develop procurement strategies. The *population* also includes external professional services providers who the clients and implementers appoint to act on their behalf in this regard.

In the private sector, the *population* may be described as the director for projects and delegated staff responsible for developing the construction procurement strategy and external professional services providers appointed to act on their behalf in this regard.

The *population* can be reasonably accurately described. However, establishing the *sample frame* (as none existed) would have been impossible to achieve within the timeframes and resources available for this research project. Whilst the absence of a sample frame did not prevent the researcher from answering the research question and achieving the research objectives, it impacted on the sampling technique adopted.

Sampling technique

According to Bhattacherjee (2012), "*sampling techniques can be grouped into two broad categories; probability (random) sampling and non-probability sampling*". Further, the category of sampling selected will be influenced by how important it is to generalise about the findings in the study (Bhattacherjee, 2012). Not being able to generalise about the population is a limitation of the study, however, this did not prevent the researcher from answering the research question and achieving the research objectives.

When the probability of the sampling unit being selected cannot be accurately determined, *non-probability sampling* can be used (Bhattacherjee, 2012). Accordingly, for this research, and as the sample frame did not exist, *non-probability sampling* was used, more specifically, *homogeneous, purposive sampling* was used.

In *purposive sampling,* the researcher uses judgement in selecting cases that will best answer the research question and meet the research objectives. Purposive sampling is also referred to as *judgemental sampling* (Saunders et al. 2012). Further, if there is clear focus for selecting the sample

and the focus of the research is in-depth, then *homogeneous purposive sampling* should be used (Saunders et al. 2012).

In *homogeneous sampling*, the researcher focuses on a subgroup of the population, where sample members are similar in terms of, for instance, occupation or level of seniority (Saunders et al. 2012). Because the characteristics of participants are similar, they can be studied to greater detail and minor differences will be more noticeable (Saunders et al. 2012).

The sample was selected using the following selection criteria:

- People who were involved in water infrastructure projects, comprising clients and those who assisted clients in meeting their water infrastructure needs, and who were willing to participate in the survey; &
- People who had senior level responsibility within their respective organisations and who directly influenced the construction procurement strategy selection; &
- People from the private and public sectors who are generally referred to as clients or employers, their implementing agents and private consultants; &
- People with a minimum ten years' experience in the construction industry and were involved in procurement in construction.

Saunders (2012) in Saunders et al. (2012) suggest a minimum sample size of between 4 to 12 participants when working with a homogeneous population. Data was collected from ten participants/respondents.

Data collection procedure

Data was collected as described below:

- An initial list of prospective respondents was compiled, using the sample selection criteria;
- Each prospective respondent was contacted by the researcher and, if the person was willing to participate in the research, a date, time and venue was agreed;
- The Participant Information Sheet, Consent Form and Questionnaire (refer to Annexure A) was be sent to respondents by email in advance;
- Structured interviews were conducted in person by the researcher during which the researcher completed the questionnaire based on the responses from participants; and
- Interviews were stopped when the number of completed questionnaires reached ten.

Data analysis

The data collected was analysed both quantitively and qualitatively; "*qualitative analysis is the analysis of qualitative data such as text data from interview transcripts"* (Bhattacherjee (2012). Qualitative analysis is dependent on the researcher's personal knowledge of the context where the

data is collected from and aims to make sense or understand a phenomenon, as opposed to predicting or explaining as in the case of quantative analysis (Bhattacherjee, 2012).

According to Bhattacherjee (2012), content analysis is the systematic analysis in either a quantative or qualitative manner.

Data from the interview transcripts were analysed using the content analysis method to generate key themes arising from what the respondents said in relation to the questions. The process followed in analysing the data, was similar to the process proposed by Bhattacherjee (2012), and was as follows:

- All transcripts were analysed, and relevant content selected;

- A process of *unitising* followed, whereby the relevant words or phrases were grouped into segments;

- A process of *coding* followed, where concepts from the literature were applied to each of the unitised segments to uncover themes. The unitised segments were grouped into two categories or themes, ***project characteristics*** which are related to the primary procurement objectives or ***external factors*** which relate to the secondary procurement objectives clients want to achieve through the project. External factors include providing local job opportunities or promoting the participating of local suppliers and contractors, and other external factors such as client policies and preferences; and

- The coded data was then analysed both quantitively and qualitatively to, for instance, determine which themes occur more frequently, the context thereof and how they are related to each other.

3.8 Quality issues

According to Saunders et al. (2012), the response rate of completed questionnaires and reliability and validity of data collected are influenced by the design of the questionnaire and that those aspects can be maximised by:

- *"Careful design of individual questions";* emphasis was placed on this. In addition to carefully designing the questions so that relevant data could be collected to answer the research question, the questions in the questionnaire included explanations so that respondents could understand the questions (see pilot testing below);

- *Clear and pleasing layout of the questionnaire;* this was strived for and is as shown in the attached questionnaire in Annexure A;

- *Lucid explanation of the purpose of the questionnaire;* this was achieved and is as shown in Annexure A;

- *Pilot testing;* this was undertaken. Previous studies, for instance by Rwelamila & Edries (2007), found, *inter alia*, that clients were not aware of the various procurement options available to them to choose from.

  After pilot testing, the questionnaire was revised to include explanations for each of the construction procurement strategy components. For example, an explanation was provided for what was meant by the term *contracting strategy*.

Further, diagrams and explanations on generic contracting strategies were included in the final questionnaire as participants in the pilot testing did not appear to know all the options available to them to choose from; and

- *Carefully planned and executed delivery and return of completed questionnaires;* this was strived for and was undertaken as per the Data Collection Procedure presented previously.

Further aspects of validity and reliability are discussed in the following paragraphs.

Internal validity

Validity is concerned with the quality of the research design. *Internal validity* (when using questionnaires) refers to the extent to which the questionnaire measures what is intended to be measured (Saunders et al. 2012).

According to Bloomberg et al. (2008) in Saunders et al. (2012), validity of a questionnaire can also be assessed, *inter alia*, by considering *content validity* and refers to the extent to which the questions in the questionnaire cover the research being undertaken. This can be achieved by carefully reviewing the literature and by discussing and selecting questions with the help of other (knowledgeable) people.

The individual questions were selected to answer the research question and to achieve the research objectives. The questions were based on the literature reviewed. The questionnaire was tested for ambiguity, internal validity, and content validity and was pilot tested before administered.

External validity

External validity relates to whether the findings in the research undertaken can be generalised to other settings or groups (Saunders et al. 2012). In this research, and because a sampling frame did not exist, non-probability, purposive, homogeneous sampling was used. Respondents were selected using criteria developed as presented in paragraph 3.7.

Because of the above, the findings cannot be generalised to the wider population in the water sector in South Africa nor in general in South Africa.

Notwithstanding not being able to generalise the findings to the wider population, the findings did not prevent the answering of the research question and achieving the research objectives.

Reliability

Reliability refers to consistency and whether another researcher (or yourself) would be able to replicate the findings under different times and with different samples. In an interviewer-completed questionnaire, it relates to whether other interviewers would produce similar findings (Saunders et al. 2012).

The questionnaire was designed to avoid ambiguity by ensuring that the questions had sufficient detail. This negated the likelihood of both respondent and interviewer misinterpreting the questions.

For this research, it was important that the right respondent participated in the research. According to Saunders et al. (2012) the confidence level of the right person participating in a structured

interview is high. As this research was conducted by the researcher completing questionnaires through structured interviews, the reliability of the research was enhanced.

Certain questions (or the terminology) in the questionnaire might have been difficult for some respondents to understand. That was a further reason why structured interviews using questionnaires was suitable (Saunders et al. 2012). Consistency within this research was thus enhanced.

Due to the limitations in the sampling method as discussed above, consistency of findings across different samples may not necessarily be achieved.

3.9 Ethical considerations

According to Saunders et al. (2012), "*ethics in research refer to the standards of behaviour that guide your conduct in relation to the rights of those who become the subject of your work or are affected by it".*

Ethical concerns will emerge at all stages of the research, namely:

- when formulating and clarifying the research topic;
- designing the research and gaining access;
- collecting data;
- processing and storing the data;
- analysing the data; and
- reporting the findings (Saunders et al. 2012).

In general, the guidance (and compliance thereof) provided by the *University of the Witwatersrand: Guidelines for Human Research Ethics Clearance Application (Non-Medical)* was strictly adhered. Some aspects of ethical considerations relating to the stages of this research, are discussed below.

- With regards to ethical issues identified at the inception stage of the project and the *research topic,* the topic itself is not new, a wealth of information already exists in the industry and literature and various related studies had been done on the topic. The research was conducted with outmost integrity and objectivity. The possibility of causing embarrassment or some other form of harm or disadvantage, to participants was nil to negligible as participants were not required to provide personal information such as their name, organisation and the like. Data was not collected on the individual or the organisation.

  Another aspect relating to the topic which could possibly be viewed as a conflict of interest is, given that the researcher is active in the construction industry as a consultant, the results could be used unfairly to the researcher's advantage. The researcher could identify (perceived) shortcomings of clients on the subject and take advantage of this. Whilst this is not the intention of the researcher, prospective participants were made aware that the researcher is active in the industry and will not use the information for any other purpose other than for undertaking this research. Their consent, or otherwise, to participate in the research could then be made with this knowledge.

- With regards to ethical issues identified during *designing the research and gaining access,* Saunders at al. (2012) suggest that ethical issues can be identified and dealt with when designing the research. Data was collected by the researcher using questionnaires through structured interviews. Personal information of respondents was not collected. Questionnaires were completed by hand by the researcher based on respondents' responses, the interviews were not recorded in any other manner.

  In gaining access to potential participants, this was done free of any coercion by the researcher. Informed consent was obtained from participants before any data was collected. Informed consent requires that participants must have adequate information on the research (such as in a participant information sheet) and time free of any pressure or coercion to decide whether to participate in the research before being contacted (Saunders et al. 2012). A Participant Information Sheet and Consent Form (refer Annexure A) was sent to participants in advance of them being contacted to enquire about their willingness to participate in this research.

- With regards to potential ethical issues during *collecting data*, it was recognised that despite the respondent having consented to participate in the research, respondents retained their right to withdraw from the research, opt not to provide responses to certain aspects of the research and the like (Saunders et al. 2012). Respondents were treated accordingly.

  Further, the scope of the research should not be expanded from what was agreed. The agreed aims of the research should be adhered to (Zikmund, 2000 in Saunders et al. 2012). The research was conducted in an objective manner. Respondents were not influenced in any way and, once again, were not pressured to provide responses to any questions they were uncomfortable with.

- With regards to potential ethical issues with *processing and storing data*, this was done in an objective manner with strict compliance with the intent of the agreed consent agreement with participants, especially with respect to confidentiality and anonymity.

  Responses from respondents were recorded on hardcopies of the research instrument by the researcher during the interview. The raw data was then scanned to electronic format and will be stored on the researcher's password-protected computer for the prescribed minimum period of (5 years) and then deleted. The hardcopies of the raw data were destroyed by the researcher after scanning.

- With regards to potential ethical issues in *analysing the data and reporting the findings*, it is vital that this is done in an objective manner so that the data collected is not misrepresented (Saunders et al. 2012). Further, the reporting should not be selective in any way (Zikmund, 2000 in Saunders et al. 2012). Accordingly, the data was analysed objectively, and the findings are reported as is without any manipulation of the results to suit any outcome.

The Participant Information Sheet explaining what the research was about, and what was expected of participants, is provided in Annexure A.

For this research, informed consent was obtained as per the Consent Form included in Annexure A. Participants were asked upfront if they consent to participate in the research and were required to record their consent accordingly.

4. CHAPTER 4: DATA PRESENTATION AND ANALYSIS

The survey research strategy was used where respondents were required to provide responses to a schedule of closed and open questions in structured interviews. Each interview lasted between forty-five minutes to one hour. Based on feedback from respondents during the interviews, and for quality reasons mentioned earlier, the researcher completed the questionnaires. Ten people were interviewed.

Data from the interview transcripts were analysed using the content analysis method to generate key themes arising from what respondents said in relation to the questions. Interview transcripts are provided in Annexure B.

The findings of the research are provided in this chapter. Details of the project each respondent referenced in the study are provided in **Table 4-1**, followed by general project information and profile of respondents in paragraph 4.1. The findings are then presented per research objective as follows:

- Range of construction procurement strategies used by clients (refer paragraph 4.2);
- Factors that influenced the construction procurement strategies choices (refer paragraph 4.3); and
- Alignment of construction procurement strategy choices with the intended project objectives and outcomes (refer paragraph 4.4).

Table 4-1: Details of Projects in the Study

Respondent No	Project Description	Nature of Project
R1	Construction of approximately 30 000 Ventilated Improved Pit Latrines (VIPs) over a five-year period; approximate project value R350million	• Large project but technologically simple; • Role players (client, small design team & contractors); • Design straight forward with contractors working from typical standard details; • Components comprise lined or unlined pits & precast concrete top structure toilets;
R2	Construction of 50Ml/day wastewater treatment works; extension to existing treatment works. Approximate project value R500million.	• Large project & technologically complex; • Role players (client, large design team with several specialists & specialist civil, mechanical & electrical contractors); • Design is complex with high level of detail required for construction; • Components comprise major earthworks, reinforced concrete structures, pumps, electrics & control equipment;
R3	Regional bulk water supply scheme; comprising bulk water pipelines, pump stations and reservoirs, including augmentation of the existing water treatment works. Approximate project value R1.3billion	• Large project & technologically complex; • Role players (client, large design team with several specialists & specialist civil, mechanical & electrical contractors); • Design is complex with high level of detail required for construction; • Components comprise major earthworks, reinforced concrete structures, large diameter pipelines with high-pressure

Respondent No	Project Description	Nature of Project
		pipelines, pumps, electrics and control equipment;
R4	Bulk water and sanitation to housing development, comprising rising mains, reticulation and house connections. Approximate project value R35million.	• Small project & technologically simple; • Role players (client, small design team & contractors); • Design is straight forward with moderate level of detail required for construction; • Components comprise minor earthworks, small diameter pipelines & small pump stations;
R5	Service delivery programme for district municipality to implement water and sanitation projects (part of Project Management Unit). Approximate budget R200million.	• Moderate size project & technologically simple; • Role players (client, small design teams & contractors); • Design is straight forward with moderate level of detail required for construction; • Components comprise minor earthworks, small to medium diameter pipelines, small pump stations & reinforced concrete structures;
R6	Urban sanitation refurbishment, comprising mechanical and electrical works and civil works. Approximate project value R50million.	• Small & technologically simple; • Role players (client, small design team & contractors); • Design is straight forward with moderate detail required for construction; • Components comprise minor earthworks, small diameter pipelines & small pump station;
R7	Bulk water supply: Phase 2, comprising abstraction from dam, pump stations, bulk pipelines, reservoirs and upgrade and augmentation of the existing water treatment works. Approximate project value R460million.	• Large project & technologically complex; • Role players (client, large design team with several specialists & specialist civil, mechanical & electrical contractors); • Design is complex with high level of detail required for construction; • Components comprise significant earthworks, reinforced concrete structures, large diameter pipelines with some high-pressure pipelines, pumps, electrics and control equipment;
R8	Industrial development zone: potable water supply, comprising bulk and reticulation pipelines. Approximate project value R320million.	• Large project but technologically simple; • Role players (client, small design team & contractors); • Design is simple with moderate level detail required for construction; • Components comprise minor earthworks, small to medium diameter pipelines;
R9	Potable water scheme, comprising elevated steel reservoir, pump station, rising main and reticulation pipelines. Approximate project value R4million.	• Small project & technologically simple; • Role players (client, small design team & contractors); • Design is simple with moderate level detail required for construction;

Respondent No	Project Description	Nature of Project
		• Components comprise minor earthworks, pre-fabricated steel reservoir, small pump station & small diameter pipelines;
R10	Pipeline replacement programme in urban areas over three financial years. Approximate project value R100million	• Small projects & technologically simple; • Role players (client, small design team & contractors); • Design is straight forward with moderate level details required for construction; • Components comprise minor earthworks & small diameter pipelines;

4.1 Profile of respondents/General information

Information on the experience of respondents, in number of years' experience each person had accumulated, was collected from respondents in pre-determined categories and is presented in **Figure 4-1**. All respondents had more than ten years' experience, with nine (90%) of respondents having more than 20 years' experience.

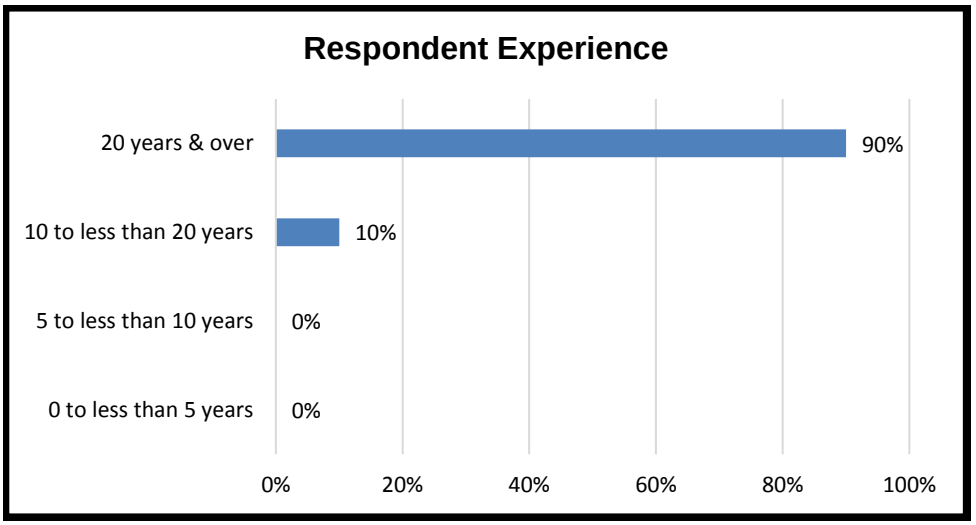

Figure 4-1: Respondent Experience

Information on the location of projects collected during the interviews is presented in **Figure 4-2**. Three (30%) of projects were in rural areas and seven (70%) of projects were in urban areas.

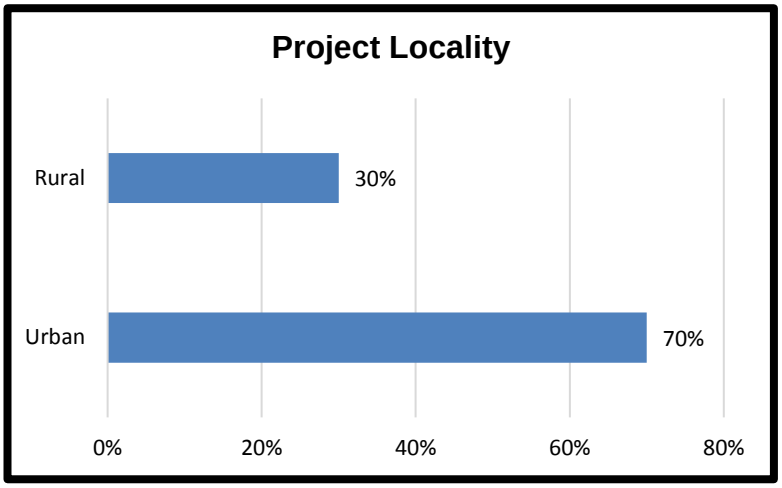

Figure 4-2: Project Locality

All projects respondents spoke on were for public sector clients.

4.2 Range of construction procurement strategies used by clients

4.2.1 Packaging strategy

The packaging strategy respondents chose for their respective projects are shown in **Figure 4-3**. Four (40%) of respondents divided their projects into work packages and let those out as separate contracts. Two (20%) of respondents combined work packages from different projects and let those out as single contracts. No respondents used framework agreements.

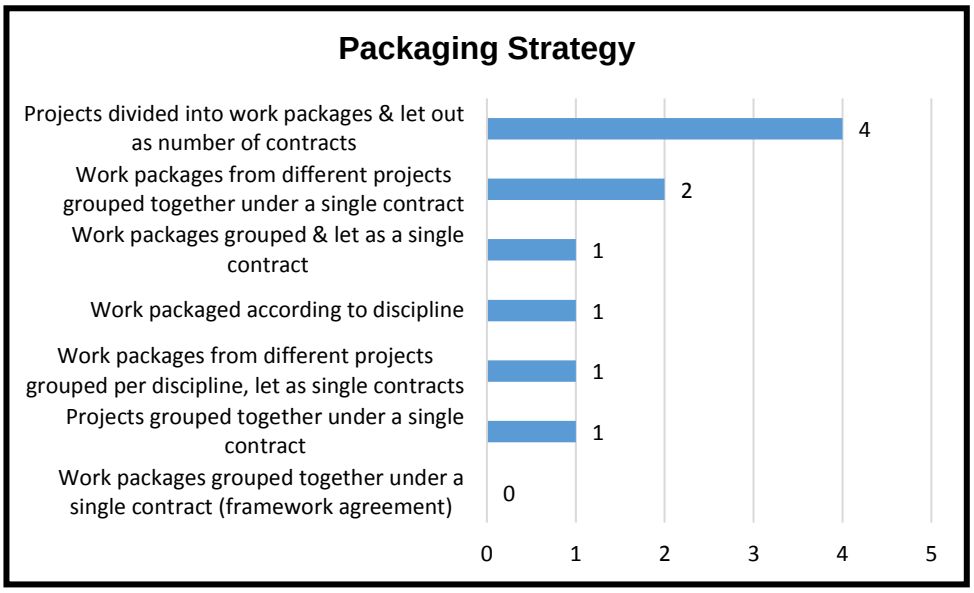

Figure 4-3: Packaging Strategy

4.2.2 Contracting strategy

The contracting strategies respondents chose for their respective projects are shown in **Figure 4-4**. All respondents (100%) chose the design by employer contracting strategy.

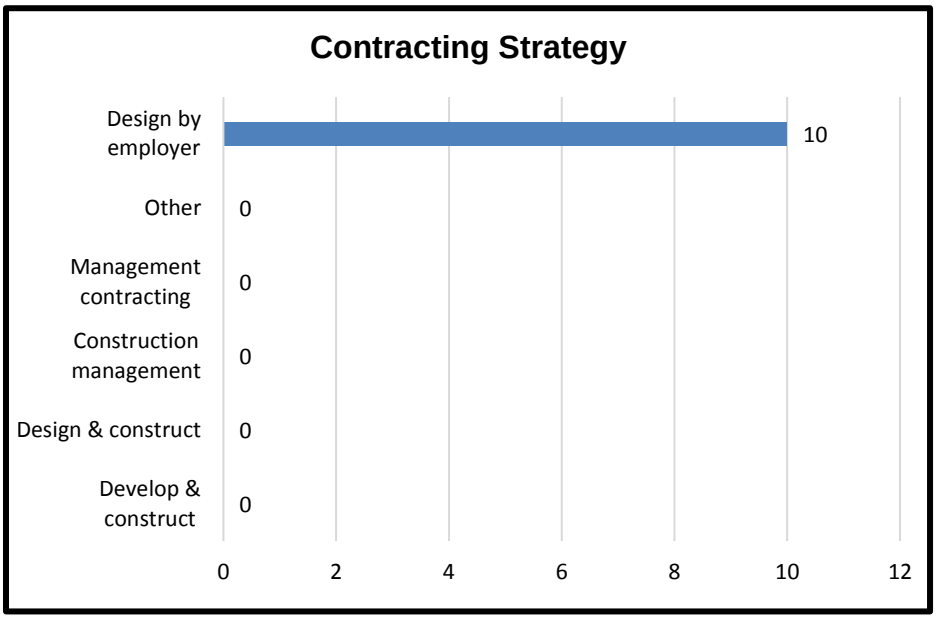

Figure 4-4: Contracting Strategy

4.2.3 Pricing strategy

The pricing strategies respondents chose for their respective projects are shown in **Figure 4-5**. Nine (90%) of respondents chose bills of quantities with one respondent choosing an activity schedule to obtain a lump sum price.

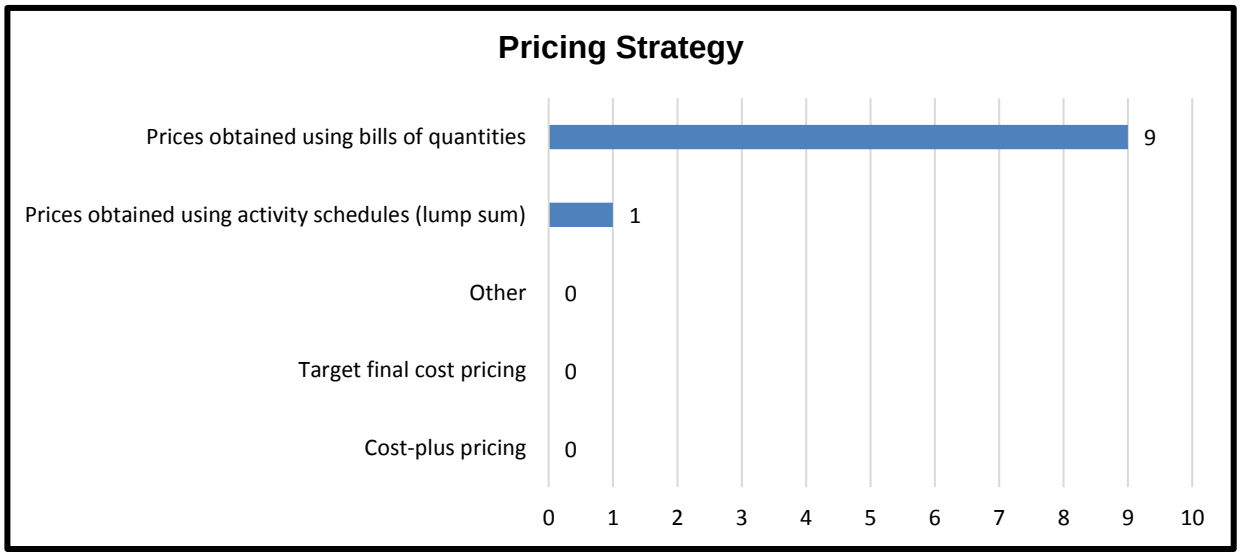

Figure 4-5: Pricing Strategy

4.2.4 Targeting strategy

The targeting strategies respondents chose for their respective projects are shown in **Figure 4-6**. Five (50%) of respondents did not consider any specific targeting, three (30%) of respondents targeted local suppliers and/or local contractors.

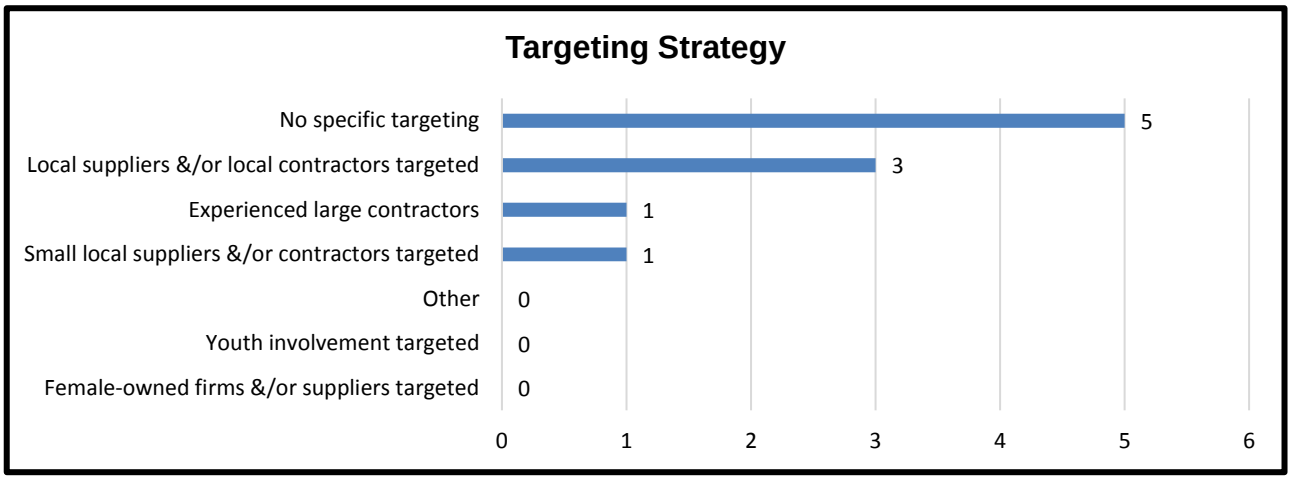

Figure 4-6: Targeting Strategy

4.2.5 Procurement method

The procurement methods respondents chose for their respective projects are shown in **Figure 4-7.** Nine (90%) of respondents chose public tenders and one respondent obtained quotations from a database of client pre-selected contractors.

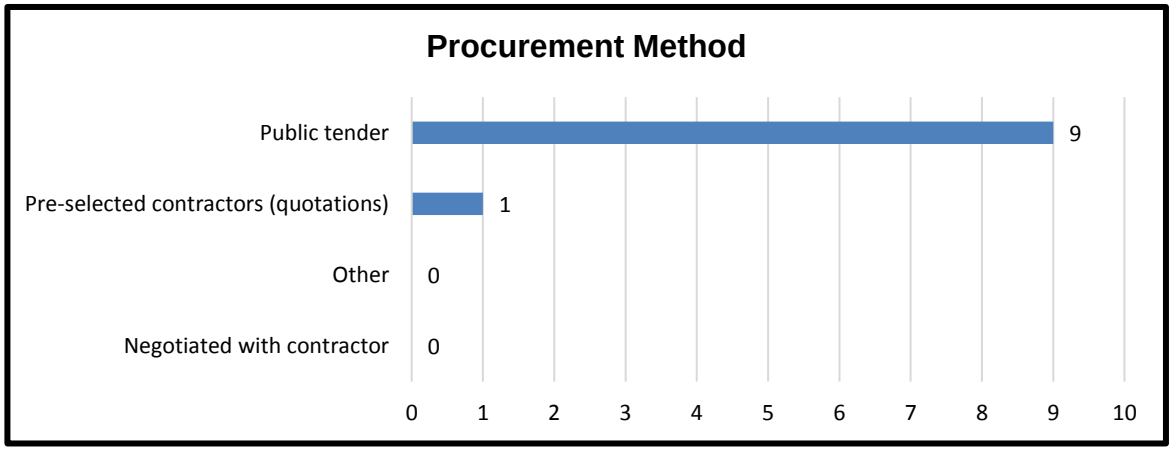

Figure 4-7: Procurement Method

4.2.6 Standard forms of contract

The standard form of contract respondents chose for their respective projects are shown in **Figure 4-8**. All respondents chose the GCC (General Conditions of Contract developed by the South African Institution of Civil Engineering) with one respondent choosing to use a FIDIC form of contract for a portion the works.

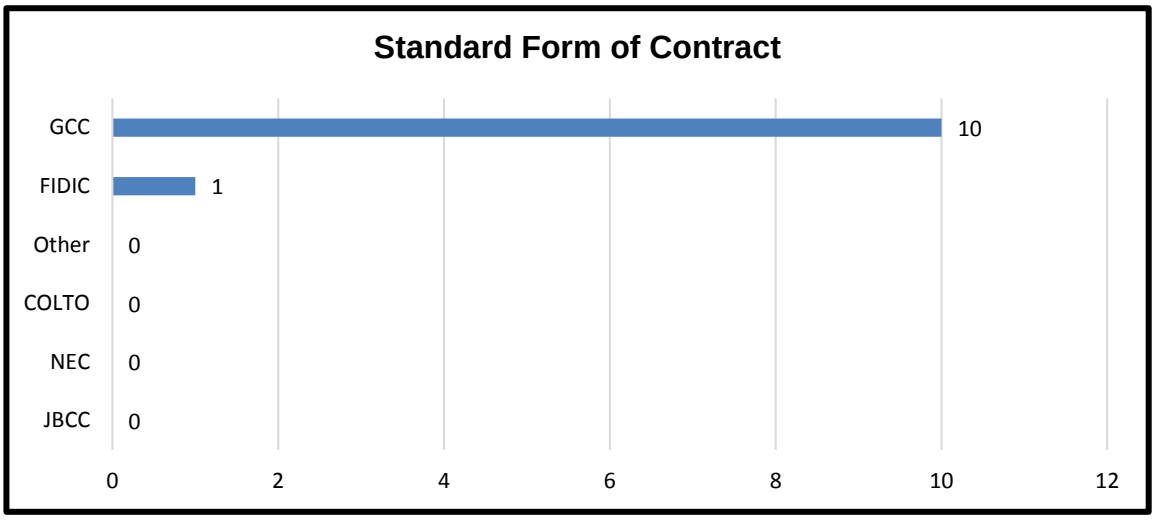

Figure 4-8: Standard Form of Contract

4.2.7 Conclusion

A consolidation of the construction procurement strategies selected by respondents is shown in **Figure 4-9** and summarised below:

- For their packaging strategy, respondents broke up projects into work packages and let those as individual contracts;
- All respondents selected the design by employer contracting strategy;
- Most respondents chose to use bills of quantities to obtain prices;
- Most respondents did not have any specific targeting with some targeting local suppliers and/or local contractors;
- Most respondents chose to go out to public tender as their procurement method; and
- All respondents chose the GCC standard form of contract.

A discussion on the construction procurement strategies selected by respondents is provided in Chapter 5.

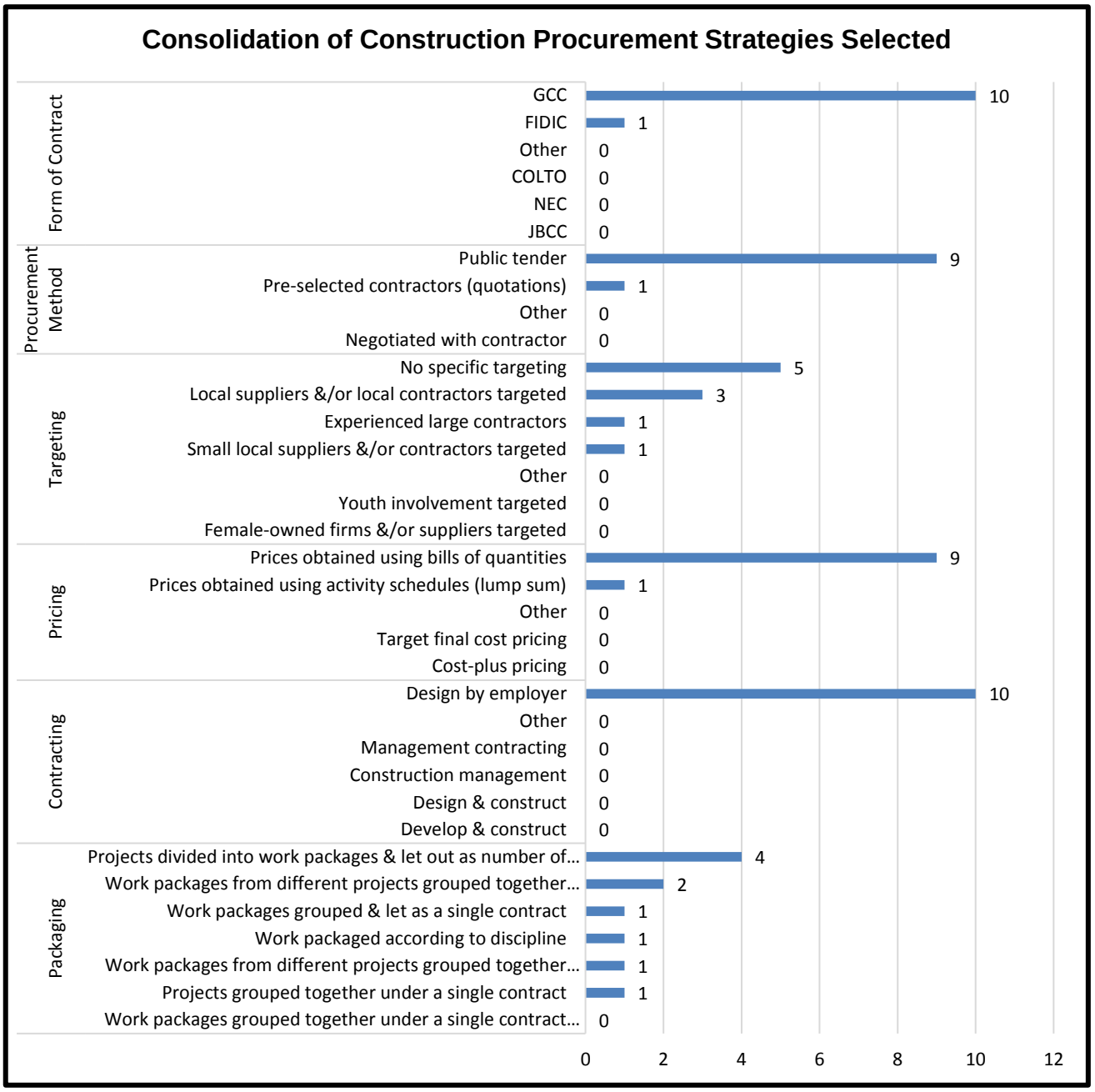

Figure 4-9: Consolidation of Construction Procurement Strategies Selected

4.3 Factors that influenced the construction procurement strategies choices

The factors respondents considered when selecting their construction procurement strategies are presented below. The factors are categorised as either:

- *Project characteristics* (primary procurement objectives); or
- *External factors* (secondary procurement objectives which the client wants to achieve through the construction process & other external factors).

4.3.1 Packaging strategy (factors considered)

The factors respondent considered when deciding which packaging strategy to use are shown in **Figure 4-10**.

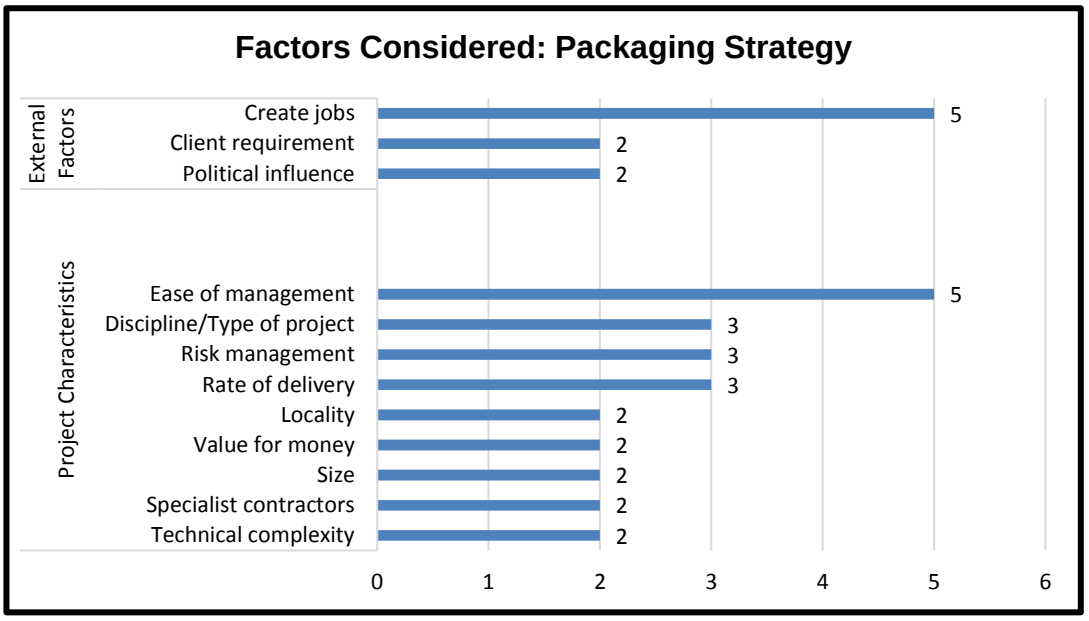

Figure 4-10: Packaging Strategy: Factors Considered

The project characteristic cited most frequently (five times) was *ease of management*, followed by (three times each), *discipline or type of project, risk management* and *rate of delivery.*

The external factor cited most frequently was to *create more jobs* during construction.

Overall, respondents placed more emphasis on project characteristics (primary procurement objectives) than on external factors (secondary procurement objectives and other factors) when making their packaging strategy choices.

4.3.2 Contracting strategy (factors considered)

The factors respondent considered when deciding on which contracting strategy to use are shown in **Figure 4-11**.

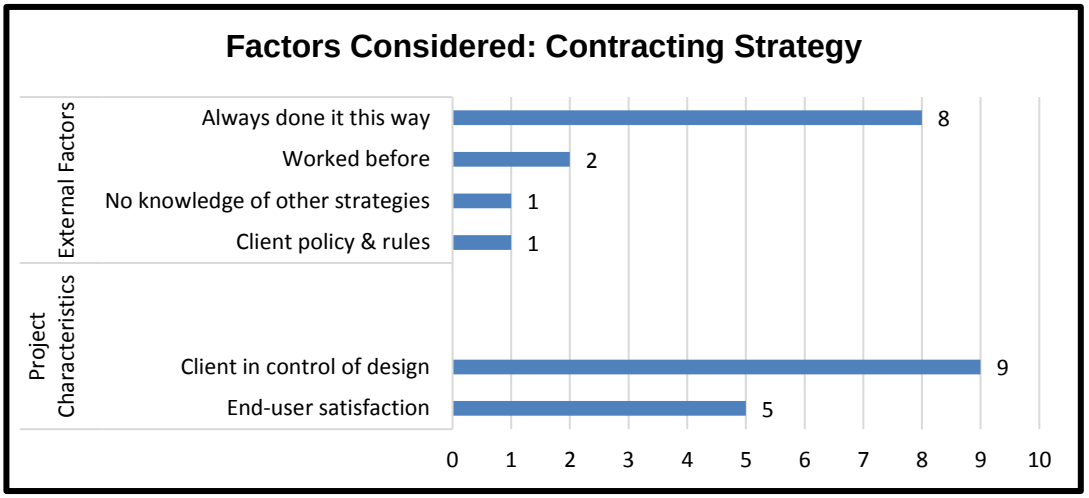

Figure 4-11: Contracting Strategy: Factors Considered

The project characteristic cited most frequently (nine times) was *client in control of design*, followed by (five times), *end-user satisfaction.*

The external factor cited most frequently (eight times) was *always done this way,* followed by (two times) *worked before.*

Whilst respondents marginally placed more emphasis on project characteristics (primary procurement objectives) than on external factors (secondary procurement objectives and other factors), external factors did influence their contracting strategy choices.

4.3.3 Pricing strategy (factors considered)

The factors respondent considered when deciding on which pricing strategy to use are shown in **Figure 4-12**.

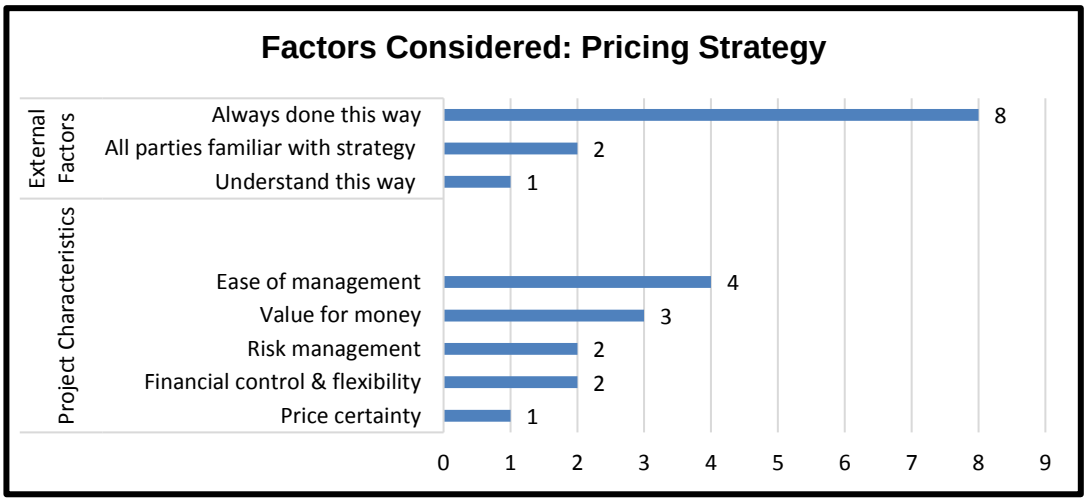

Figure 4-12: Pricing Strategy: Factors Considered

The project characteristic cited most frequently (four times) was *ease of management*, followed by (three times), *value for money*.

The external factor cited most frequently (eight times) was *always done this way,* followed by (two times) *worked before.*

Overall, respondents based their pricing strategy choices on external factors.

4.3.4 Targeting strategy (factors considered)

The factors respondent considered when deciding on which targeting strategy to use are shown in **Figure 4-13**.

Figure 4-13: Targeting Strategy: Factors Considered

The project characteristics cited (one time each) were *technical complexity*, *discipline/type of project* and *eased of management.*

The external factor cited most frequently (nine times) was *create more jobs,* followed by (five times) *client policy & rules.*

Overall, respondents based their targeting strategy choices on external factors.

4.3.5 Procurement method (factors considered)

The factors respondent considered when deciding on which procurement method to use are shown in **Figure 4-14**.

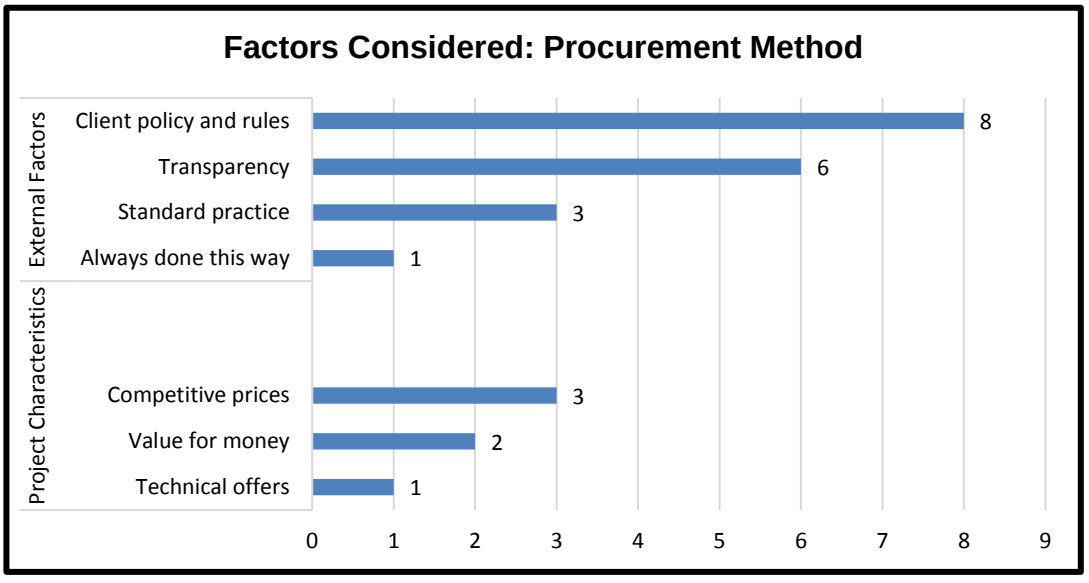

Figure 4-14: Procurement Method: Factors Considered

The project characteristic cited most frequently (three times) was *competitive prices*, followed by (two times), *value for money.*

The external factor cited most frequently (eight times) was *client policy and rules,* followed by (six times) *transparency.*

Overall, respondents based their procurement method choices on external factors.

4.3.6 Standard form of contract (factors considered)

The factors respondent considered when deciding on which form of contract to use are shown in **Figure 4-15**.

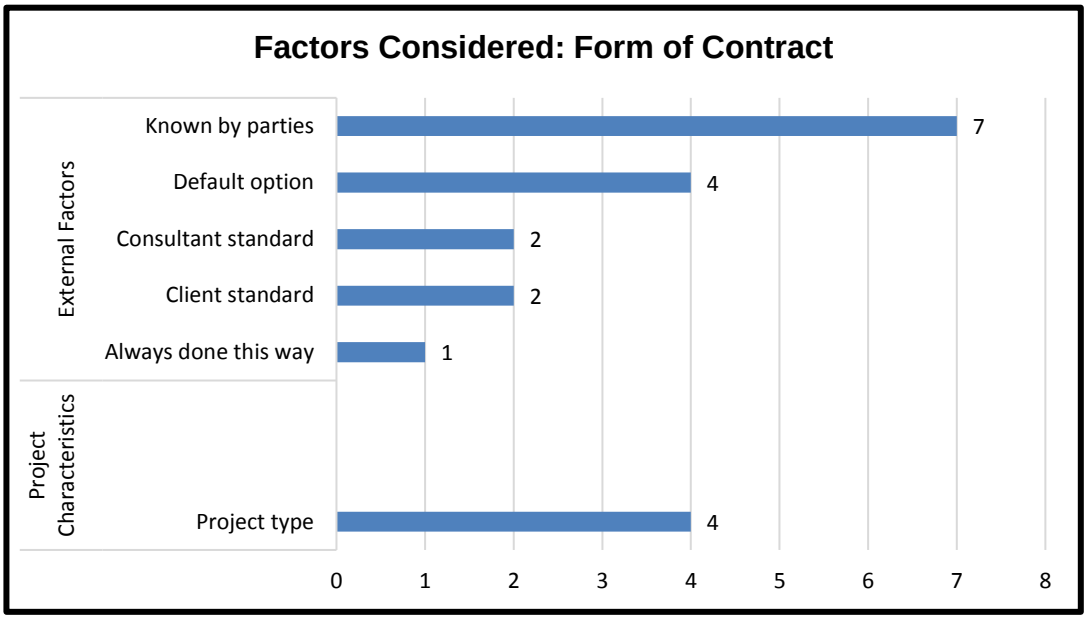

Figure 4-15: Form of Contract: Factors Considered

The project characteristic cited (four times) was *project type*.

The external factors cited most frequently (seven times) were *known by parties,* followed by (four times), *default option.*

Overall, respondents based their choice of the form of contract on external factors.

4.3.7 Conclusion

A consolidation of the factors considered by respondents when selecting their construction procurement strategies is shown in **Figure 4-16**. Overall, respondents placed more emphasis external factors (secondary project objectives and other factors) than on project characteristics (primary project objectives).

A discussion on the factors respondents considered when selecting their construction procurement strategies is presented in Chapter 5.

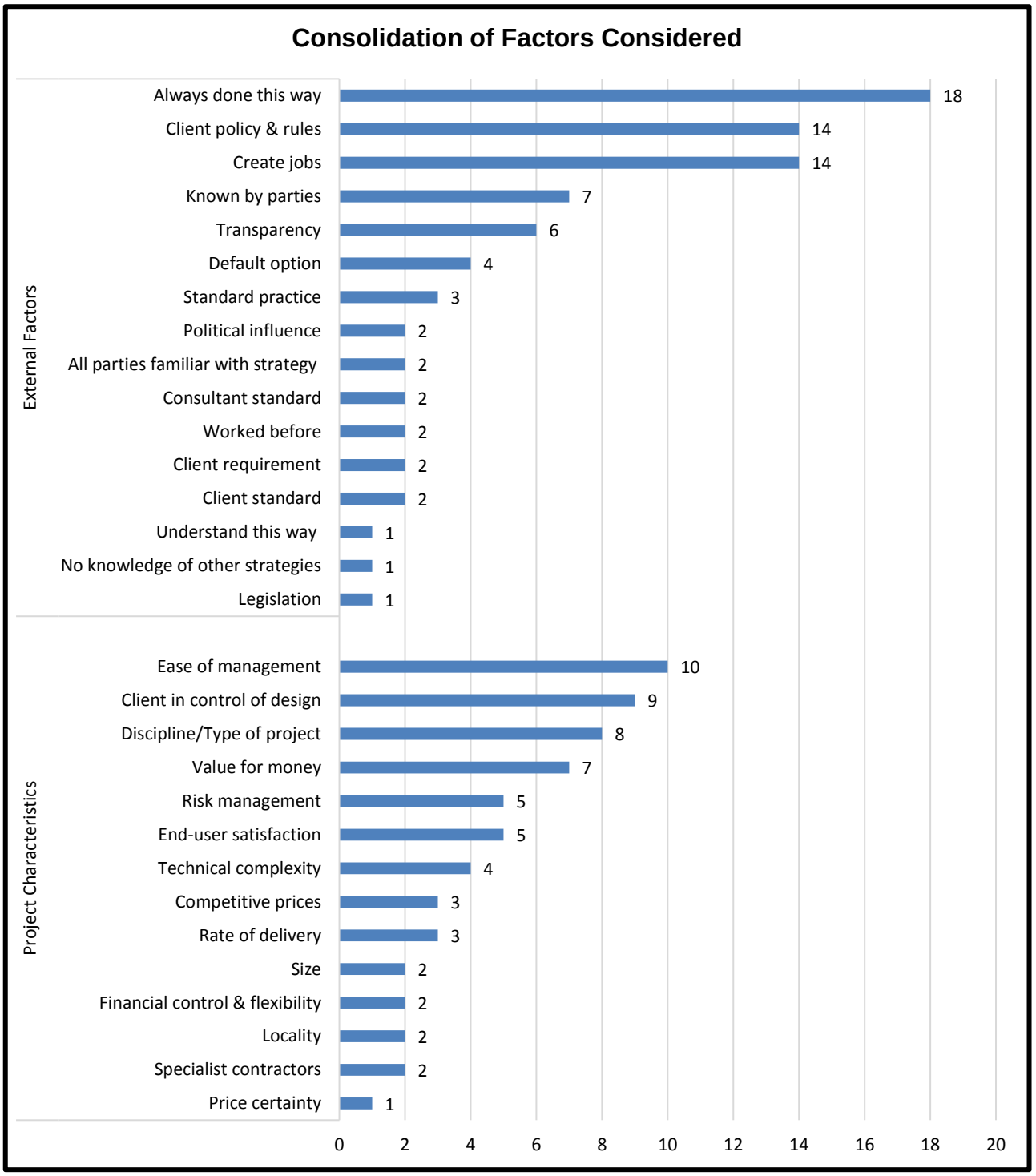

Figure 4-16: Consolidation of Factors Considered

4.4 Alignment of construction procurement strategy choices with the intended project objectives and outcomes

An assessment of the appropriateness of the construction procurement strategies selected by clients was not an objective of this research. Accordingly, interventions to align construction procurement strategy choices with the intended project objectives and outcomes are based on an assessment of the factors considered by respondents rather than the actual construction procurement strategy selected. Interventions are developed further in Chapter 5.

5. CHAPTER 5: DISCUSSION OF RESULTS

This research sought to answer the research question: *What factors influence the selection of construction procurement strategies for water infrastructure projects in South Africa?*

The objectives of this research were:

- To identify the range of construction procurement strategies clients, select for water infrastructure projects in South Africa;
- To identify what factors, influence the selection of construction procurement strategies by those clients; and
- To develop recommendations for aligning construction procurement strategy choices with the intended project objectives and outcomes.

The construction procurement strategies selected by clients and the factors they considered, were presented in Chapter 4, those findings are discussed in this chapter.

This chapter is presented per the research objectives as follows:

- Discussion of results relating to construction procurement strategies used (refer paragraph 5.1);
- Discussion of results relating to factors influencing construction procurement strategy choices (refer paragraph 5.2); and
- Recommendations for aligning construction procurement strategy choices with the intended project objectives and outcomes (refer paragraph 5.3).

5.1 Discussion of results relating to construction procurement strategies used

This research was undertaken using a cross-sectional *("snapshot at a point in time"*) time horizon with one objective being to identify the range of construction procurement strategies used.

An assessment of the appropriateness of the construction procurement strategy for the respective project is beyond the scope of this research. To determine the appropriateness of the construction procurement strategies used, further research would need to be undertaken to assess to what extents the project objectives were achieved and whether the latter can be attributed in part or whole to the former.

The discussion below is therefore in part factual and in part academic.

5.1.1 Packaging strategy

Except for framework agreements, respondents used the full range of packaging strategies available to them.

Respondents did however have a preference to unbundle projects into smaller contracts and let those as separate smaller contracts. This is somewhat surprising considering that by doing this, the client would require additional resources to manage the increased number of contracts, in an industry suffering from skills shortages.

Watermeyer (2012), SIPDM (2015) & IDMS (2012) advise, *inter alia,* that projects should only be unbundled when the client has administrative capacity to manage the resultant increased number of contracts.

5.1.2 Contracting strategy

All respondents chose the design by employer contracting strategy. This finding is similar to the findings by CIDB (2014), in South Africa, Watermeyer (2012) in Sub-Sahara Africa and CIOB (2010) in the United Kingdom.

5.1.3 Pricing strategy

Nine respondents chose the bills of quantities. This is not surprising since all respondents chose the design by employer contracting strategy. Bills of quantities are frequently used in the design by employer (or general contracting) contracting strategy (Murdoch & Hughes, 2008 & Watermeyer, 2012).

5.1.4 Targeting strategy

Five (half) respondents did not have any specific target(s), while three respondents targeted local suppliers &/or local contractors.

Targeting in procurement relates to efforts in contracts to secure the participation of certain enterprises and labour and primarily relates to promotion of secondary procurement objectives, ISO 10845 (2010) & Watermeyer (2012).

Notwithstanding five respondents not having any specific targets, there appears to be a reasonably adequate understanding of targeting through construction contracts.

5.1.5 Procurement method

Nine respondents chose to invite public tenders while one chose to solicit quotations from pre-selected contractors.

The procurement method chosen by respondents in this research is similar to the CIDB (2014) findings where they found that the open and quotation procurement procedures were the dominated methods used.

5.1.6 Form of contract

All respondents selected the General Conditions of Contract (GCC) for their projects, with one respondent also using the FIDIC form of contract for a portion of the works. The findings in this research are similar to the CIDB (2014) findings for the corresponding project type.

5.2 Discussion of results relating to factors influencing construction procurement strategy choices

The objective of this part of the research was to identify what factors respondents considered when selecting construction procurement strategies.

The construction procurement strategies selected by respondents were presented in paragraph 5.1 and the point was made that, an assessment of the appropriateness of the construction procurement strategies for the respective projects is beyond the scope of this research.

The discussion that follows will accordingly assess the factors (or thought process) respondents considered when selecting their construction procurement strategies and relate the factors to the literature reviewed.

5.2.1 Packaging strategy

The top four project characteristics (primary procurement objectives) cited most frequently were: *ease of management; discipline/type of project; risk management* and *rate of delivery.* These project characteristics or factors are included in the factors proposed by Watermeyer (2012).

Respondents also cited the creation of jobs as a further factor considered in developing their packaging strategy. This relates to the promotion of secondary procurement objectives and are included in the factors proposed by Watermeyer (2012).

In general, it appears that respondents went through an objective thought process when selecting their packaging strategies.

5.2.2 Contracting strategy

The two project characteristics (primary procurement objectives) cited by respondents were: *client in control of design* and *end-user satisfaction.* The project characteristics or factors cited, while not comprehensive, are similar to the factors suggested by CRC (2008).

However, the factors appear limited when one considers the nature of the projects as presented in **Table 4-1.** For instance, respondents appear not to have considered the allocation of risk in their decisions (CRC, 2008).

The external factors cited: *always done this way; worked before; no knowledge of other strategies* and *client policy and rules* suggest that respondents are not using objective reasoning when making this decision. The findings are similar to the findings by Rwelamila & Edries (2007) in South Africa and Root & Hancock (1996) in the United Kingdom.

In general, it appears that respondents did not go through an objective thought process when selecting their contracting strategies.

5.2.3 Pricing strategy

Since all respondents chose the design by employer contracting strategy (refer paragraph 5.2.2), it would be expected that bills of quantities would be used. Bills of quantities are frequently used in the design by employer (or general contracting) contracting strategy (Murdoch & Hughes, 2008 & Watermeyer, 2012).

The project characteristics (primary procurement objectives) cited by respondents, except for *financial control and flexibility*, suggest that respondents chose their pricing strategy not necessarily because they chose the design by employer contracting strategy but for other reasons. This observation is supported by the factors cited by respondents of: ease of management; value for money; risk management; and price certainty which are not synonymous with bills of quantities.

The external factor cited by most respondents of *always done this way,* may be the real reason respondents chose the bills of quantities pricing strategy. This finding is similar to findings by Rwelamila & Edries (2007) in South Africa and Root & Hancock (1996) in the United Kingdom.

Generally, it does not appear that respondents went through an objective thought process when selecting their pricing strategy.

5.2.4 Targeting strategy

Targeting in procurement refers to interventions in contracts to secure the participation of certain enterprises and labour and seeks to promote secondary procurement objectives, ISO 10845 (2010) & Watermeyer (2012).

Most respondents cited the *creation of jobs* as the main factor they considered when selecting their targeting strategy, followed by following *client policy and rules.*

Generally, it appears that respondents went through an objective thought process when selecting their targeting strategy.

5.2.5 Procurement method

The project characteristics (primary procurement objectives) cited by a minority of respondents were: *competitive prices; value for money* and *technical offer.* Respondents believed that by going out to open public tender (refer **Figure 4-7**), they would receive competitive bids and therefore value for money.

The external factors cited by most respondents of: *client policy and rules* and *transparency,* appear to be the more likely reasons why respondents selected the procurement method they did.

The dominant procurement method chosen by respondents is similar to the CIDB (2014) findings where they found that the open procurement procedure was the dominated procurement method used.

5.2.6 Form of contract

The only project characteristic (primary procurement objective) cited by some respondents was *project type.* Whilst the form of contract may well be appropriate for the type of infrastructure (largely civil engineering infrastructure), the (only) factor cited suggests a lack of reasoning in the decision-making process. CIDB (2005), SIPDM (2015) & IDMS (2012) advise that the form of contract should be selected on factors such as complexity of the works, management capacity and the contracting and pricing strategy selected.

The external factors cited by respondents of: *known by parties; default option; consultant standard; client standard* and *always done this way*, appear to be the more likely reasons why respondents selected the form of contract they did.

Generally, it does not appear that respondents went through an objective thought process when selecting the form of contract for their projects.

5.3 Recommendations for aligning construction procurement strategy choices with intended project objectives and outcomes

The construction procurement strategies selected by respondents were discussed in paragraph 5.1 and the point was made that, because the research was undertaken using a cross-sectional ("*snapshot at a point in time*") time horizon, the appropriateness of the selected strategies was not assessed.

The factors respondents considered when selecting their construction procurement strategies, were discussed in paragraph 5.2. Except for the factors considered when selecting packaging strategies and targeting strategies, respondents appear not to have based their selections of the other strategy components on objective criteria or factors.

The recommendations are therefore based on an assessment of the factors considered by respondents rather than the actual construction procurement strategy selected by them. A consolidation of factors considered by respondents is presented in **Figure 4-16**. The factors cited most frequently by respondents were: *always done this way*; *client policy and rules* and *create jobs*.

Except for *create jobs*, the other factors of *always done this way* and *client policy and rules* indicate that selections are not based on the requirements of clients or projects, but rather on what was done previously and/or predetermined and standard practices.

Accordingly, the recommendations are focused on creating awareness of and building capability in crafting construction procurement strategies.

6. SECTION 6: CONCLUSIONS & RECOMMENDATIONS

The objectives of this research were:

- To identify the range of construction procurement strategies clients, select for water infrastructure projects in South Africa;

- To identify what factors, influence the selection of construction procurement strategies by those clients; and

- To develop recommendations for aligning construction procurement strategy choices with the intended project objectives and outcomes.

Structured interviews were conducted with ten built environment professionals from the water sector in Gauteng and KwaZulu-Natal Provinces in South Africa.

6.1 Construction procurement strategies used

Respondents did not show a preference for any packaging strategy, all respondents selected the design by employer contracting strategy, ninety percent of respondents selected bills of quantities for their *pricing strategy. Targeting strategy* allows clients to meet the secondary procurement objectives on their projects, half of respondents did not have specific targets. Ninety percent of respondents chose to go out to *public tender* to obtain prices (procurement method) and all respondents selected the General Conditions of Contract (GCC) form of contract for their projects.

The research did not assess whether construction procurement strategies selected by respondents for their respective projects were indeed suitable for the project. However, when considered against the aggregated factors cited by respondents, the following are a selection of general observations with regards to construction procurement strategies selected:

- Respondents did not fully understand, and in some cases, were unaware of, the range of construction procurement strategies available to them;

- Respondents did not understand the potential inherent in the various construction procurement strategies for managing risk on projects. For instance, respondents believed that by using bills of quantities, they were protecting themselves and their clients against price risk, which is obviously not correct; &

- Respondents went out to open public tender for offers because they wanted to avoid conflict and disputes and believed that, open public tender was a transparent process. In some instances, respondents believed that open public tender was mandatory for the public sector; which is not correct.

6.2 Factors that influence construction procurement strategy choices

A consolidation of factors considered by respondents is presented in **Figure 4-16**. The factors cited most frequently by respondents were: *always done this way*; *client policy and rules* and *create jobs*.

Except for *create jobs*, the other factors of *always done this way* and *client policy and rules* indicate that selections are not based on the requirements of projects but rather on what was done previously and/or predetermined and standard practices.

6.3 Recommendations

This research did not investigate whether the procurement strategies selected by respondents were the correct or appropriate strategy for the project they referenced when completing the survey. The research did however seek to identify the thought process or factors respondents considered when selecting their construction procurement strategies.

The recommendations that follow are accordingly informed by the nature of the factors respondents considered when selecting their construction procurement strategies. The recommendations are listed below and discussed thereafter:

- Separation of the supply chains for general goods and services from those for infrastructure. This recommendation relates to the reliance of respondents on *client polices and rules*;

- The planning and execution of projects and programmes must be led by project managers and other built environment professionals; &

- Develop a skills development specification. This recommendation relates to the apparent lack of knowledge of the range of options available to select construction procurement strategies from.

6.3.1 The separation of the supply chains for general goods and services from those for infrastructure

For public infrastructure, clients or project owners or government entities could be the catalyst for change, this recommendation is in accordance with that thinking.

The Public Finance Management Act (PFMA) of 1999 requires the establishment and maintenance of a procurement and provisioning system which is fair, equitable, transparent, competitive and cost-effective (SIPDM, 2015).

The Local Government: Municipal Finance Management Act (MFMA) of 2003 requires the creation and implementation of a SCM policy and development of a framework in accordance with the Act. The focus of the framework is on competitive bidding processes (SIPDM, 2015).

Over time, the regulations developed in accordance with the PFMA and MFMA evolved into supply chains mostly applicable to procuring general goods and services. The current regulations do not address the specific requirements of infrastructure and delivery management (SIPDM, 2015).

To separate the supply chain for infrastructure procurement and delivery management from that for general goods and services, National Treasury in South Africa developed the Standard for Infrastructure Procurement and Delivery Management (SIPDM) for all organs of state to implement from 01 July 2016 (SIPDM, 2015).

The SIPDM provides, *inter alia*, a control framework for the planning, design and execution of infrastructure projects, with review gates. The purpose of a review gate is that a project cannot or should not proceed to the next stage unless all stage requirements are met, including the stage deliverables. The control framework for infrastructure delivery management is shown in **Figure 6-1**. As an example, the deliverable on completion of Stage 2, is *A Delivery and/or Procurement Strategy.*

The SIPDM also provides guidance for clients and delivery teams on the range and options available in South Africa for selecting project-specific construction procurement strategies.

Accordingly, it is recommended that project owners or clients implement the SIPDM within their organisations, if not already done, and instruct their consultants to comply with the requirements of the document.

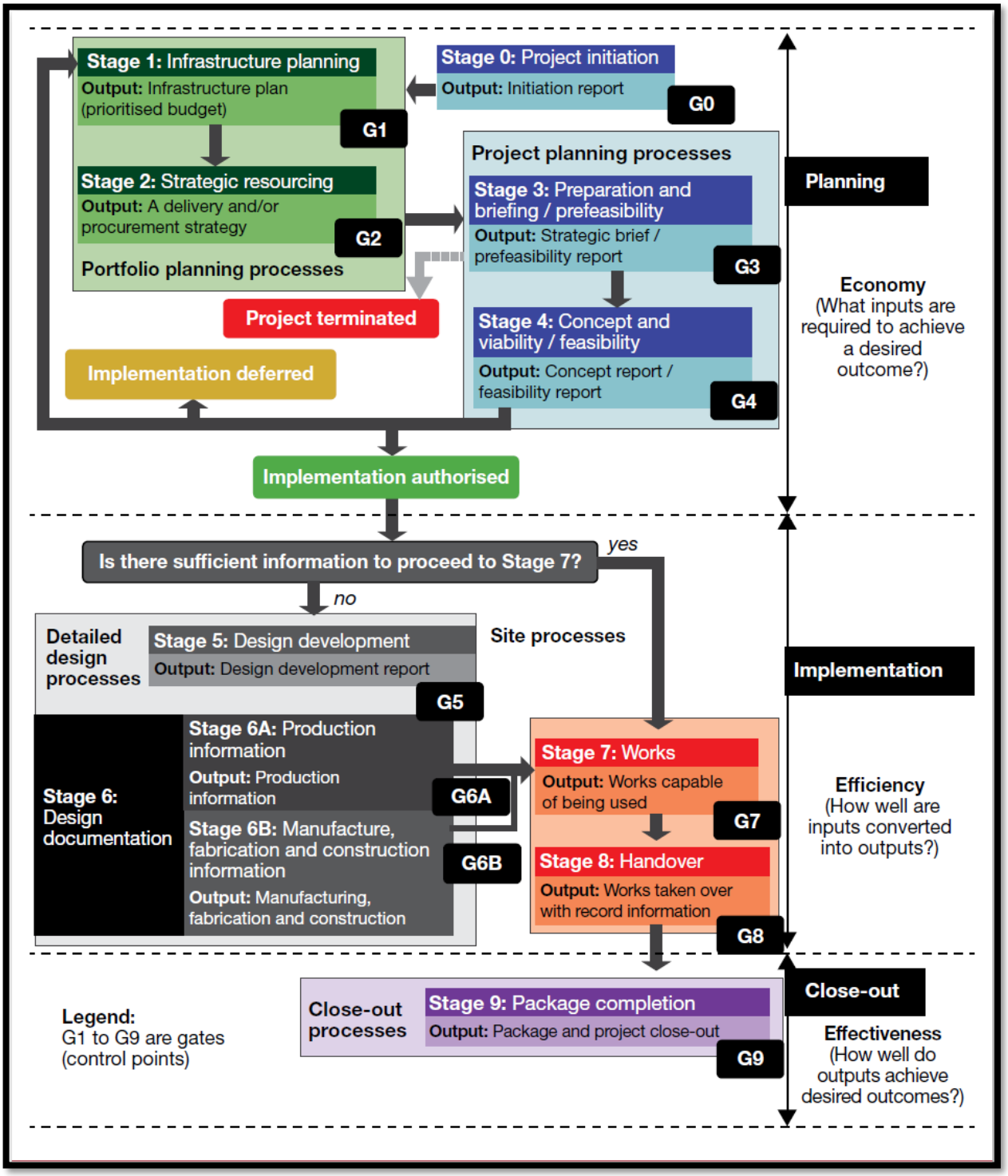

Figure 6-1: Control Framework for Infrastructure Delivery Management (SIPDM, 2015)

6.3.2 The planning and execution of infrastructure projects must be led by project managers and/or other independent built environment professionals

In directing spheres of government to implement the SIPDM, National Treasury in South Africa recognises the current shortcomings in the delivery of infrastructure projects to include, *inter alia:*

- Construction projects are procured in the similar manner as goods and services; and

- The process is often led by non-engineering professionals, usually financial professionals (SIPDM, 2015).

The SIPDM (2015) accordingly requires that, for infrastructure procurement and to achieve *value for money*, persons who are professionally registered in certain categories with built environment councils, prepare procurement documentation, review and evaluate reports and evaluate tenders using quality as objective selection criteria.

As noted earlier that developing and documenting the construction procurement strategy is intended to take place early in the project (CRC, 2008); before design consultants are appointed and before detailed designs have taken place.

Love & Mohamed, 1996 in CRC, 2008, argue that, from the outset, clients should obtain *independent advice* from experienced construction professionals, such as consultant project managers, to solve their infrastructural needs (find appropriate solutions, consider available budget and determine acceptable delivery timeframes).

Love & Mohamed, 1996 in CRC, 2008, further argue that an experienced independent project manager is better placed to meet the needs of the business case for the project (building functionality, or running costs, or speed to completion or capital cost), and "*can align these needs to an appropriate procurement strategy"*.

Laryea and Watermeyer, 2014, attribute the success achieved in the Wits University portfolio of capital projects, in part, to the employment of project managers as opposed to principal agents. Their argument is for people who can manage projects, provide support on programme management, cost control and management of health and safety and that these requirements are best met by project managers.

Accordingly, it is recommended that project owners or clients appoint independent project managers or other appropriate built environment professionals (engineers, architects), whether from their internal resources or externally, to deliver their infrastructural needs. The project manager or other professional must be appointed early in the project, at Infrastructure Planning Stage (refer **Figure 6-1**).

6.3.3 Develop a skills development specification (to include construction procurement strategy)

The factor cited most frequently by respondent (*always done this way)*, is similar to the findings by Rwelamila & Edries (2007) & Root & Hancock (1996) in studies they undertook. The point was made earlier that a wealth of information and practice notes are freely available in the industry, such as those published by the CIDB, ISO and leading authors in the field such as Murdoch & Hughes and Watermeyer. But it appears that decision makers are either not aware of the information or are set in doing things in a certain way. Root & Hancock (1996) suggest an explanation for the latter as *programmed decisions. Programmed decisions* are decisions that are repetitive and routine and are not treated as new (March & Simon, 1958 in Root & Hancock, 1996), problems will occur often and will be dealt with in terms of a procedure or policy.

The recommendations in paragraphs 6.3.1 and 6.3.2 would require people with new skills to implement, replacing the current people with built environment professionals alone will not be good enough.

Accordingly, it is recommended that a skills development specification be developed, if none exists. If one exists, and if required, it should be amended to include components of a delivery management strategy, including the development of construction procurement strategies.

All respondents interviewed in this research are engineers or technologists with engineering qualifications and most of them are professionally registered with the Engineering Council of South Africa (ECSA). Their primary academic qualifications relate to performing engineering tasks and they, typically, move on to perform project and construction management related tasks on projects.

Engineering professionals registered with ECSA perform their services and are remunerated according to ECSA: Guideline for Services and Processes for Estimating Fees for Persons Registered in terms of the Engineering Profession Act, 2000, (Act No 46 of 2000), (Government Gazette Republic of South Africa No 39480).

An inspection of the December 2015 version of the above ECSA Guideline reveals the following under the *Guideline Scope of Services:*

- Under services related to planning, studies, investigations and assessment, no mention is made about developing a construction procurement strategy;

- Under normal services, the assumption is that the nature, form and function of the project has already been defined through previous studies and that engineering services are required to realise the project;

- Under Stage 1 of normal services, mention is made to: advise on procurement policy for the project;

- Under additional services, no mention is made of developing a construction procurement strategy.

Considering the ECSA guidelines focus as noted above, and unless organisations and individuals venture outside those guidelines and academic qualifications and engineering experience, the factors listed earlier by respondents should not be surprising.

According to Matsumoto et al. (2005), "*initially, individuals acquire skills through training and award of qualifications. For both the individuals and the organisation, these supply the core theoretical fundamentals for the work they undertake* and that *these skills are then reinforced by practical experience".* So, it stands to reason that, if individuals do not get training on for instance how to develop a construction procurement strategy, they will not be competent in this area or will have no to little knowledge of this subject matter.

"*It is therefore important to acknowledge, when developing a training strategy, that skill proficiency is achieved from a combination of academic and professional training/qualification and practical experience"* (Edum-Fotwe and McCaffer, 2000; Raelin, 1997, in Matsumoto et al. (2005).

According to Armstrong (1991) in Matsumoto et al. (2005), job analysis and job description techniques assist organisations to compile a map of the skills their organisations need for their business and then these can be matched to individual employees. This would suggest that, firstly, organisations must acknowledge that, in addition to be competent in providing its core engineering or project management services, it must also be competent in providing services related to construction delivery management strategies.

As an example, a map showing the core skills required by an organisation for a level of project manager, matched against an employee skill is shown in **Figure 6-2(a)**. Further, a more focused map drilling down to the skills required by the organisation for a skill (construction procurement strategy), matched against an employee skill in that area is shown in **Figure 6-2(b)**.

The above discussion and **Figure 6-2(a) and 6-2(b)** are provided to illustrate a likely process that can be followed for an organisation to address this apparent weakness in the suite of services it provides to its clients. This weakness, it may be argued, is providing a dis-service to its clients (Murdoch & Hughes, 2008).

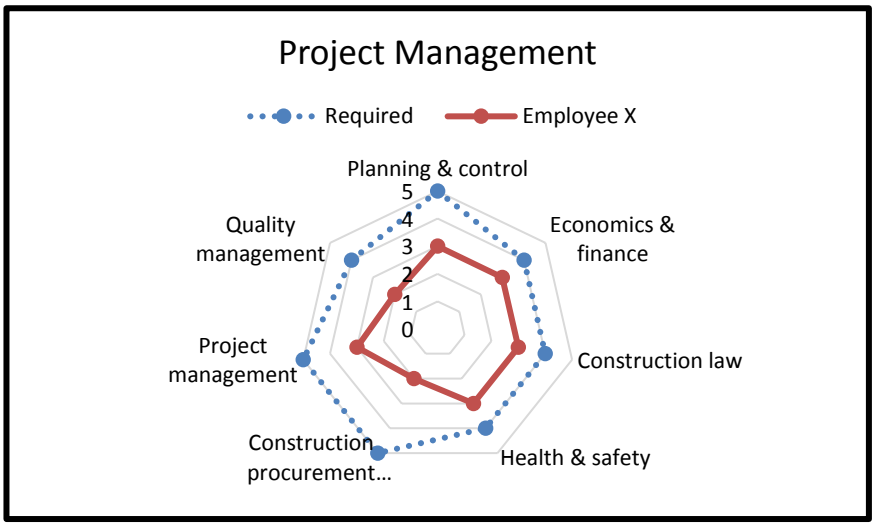

Figure 6-2(a): Skills Map Project Management
(Adapted from Matsumoto et al. (2005))

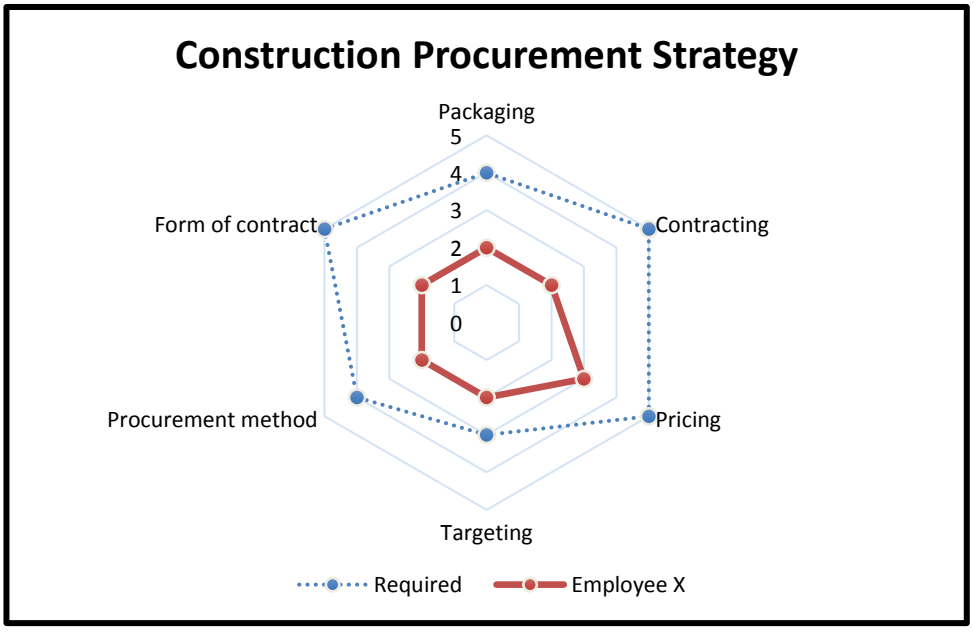

Figure 6-2(b): Skills Map Construction Procurement Strategy Components Management (Adapted from Matsumoto et al. (2005))

6.4 Limitations of research

One obvious limitation of the research is the sampling technique adopted as since no sampling frame existed, non-probability sampling was used. Accordingly, the findings cannot be generalised to the wider water sector in South Africa.

Whilst not being able to generalise about the population would be a limitation of the study, this did not prevent the researcher from answering the research question and achieving the research objectives.

Further, and although not a specific objective of this research project, the project outcomes which respondents based their responses on were not evaluated to assess whether choices they made were appropriate for their respective projects.

REFERENCES

BHATTACHERJEE, A. (2012). Social Science Research: Principles, Methods and Practices. Florida: Creative Commons Attribution.

CRC (Cooperative Research Centre). (2008). Building Procurement Methods. Cooperative Research Centre for Construction Innovation, Brisbane, Australia: Icon.Net Pty Ltd.

CIDB (Construction Industry Development Board) (2005). Choosing an appropriate form of contract for engineering and construction works. Best practice guideline #C2, September 2005. CIDB, Pretoria, South Africa.

CIDB (2008). Evaluation of quality in tender submissions. Inform practice Note #9, August 2008. CIDB, Pretoria, South Africa.

CIDB (2010). Construction procurement strategy, Practice Note #23, September 2010. CIDB, Pretoria, South Africa.

CIDB (2011). Construction quality in South Africa: A client perspective, CIDB, Pretoria, South Africa.

CIDB (2014). Results of the 2014 survey of the cidb: Construction industry indicators. December 2014. CIDB, Pretoria, South Africa.

CIOB (Chartered Institute of Building) (2010). A report exploring procurement in the construction industry. CIOB, Berkshire, United Kingdom.

ECSA (2015). Guideline for Services and Processes for Estimating Fees for Persons Registered in terms of the Engineering Profession Act, 2000, (Act No 46 of 2000). Government Gazette Republic of South Africa, Vol. 606, no. 39480 (04 December 2015): 1-17.

ERIKSSON, P.E. and WESTERBERG, M. (2010). Effects of cooperative procedures on construction project performance: A conceptual framework. International Journal of Project Management, vol. 29: 197-208.

FOURIE, D. (2015). Procurement in the South African public Service: a reflection of the ethical and legislative framework. Public and Municipal Finance, vol. 4, no 2 2015: 38-45.

FAVIÉ, R. and MAAS, G. J. (2008). Ranking Construction Project Characteristics, in CIB Transformation through Construction, K. Carter, S. Ogunlana, & A. Kaka, eds., pp. 1-8.

IDMS (Infrastructure Delivery Management System) (2012). Standard for an infrastructure delivery management system. National Treasury, Republic of South Africa, South Africa.

Industry Insight. (2012). The state of the South African Construction Industry. INTERNET. http://industryinsight.co.za/reports/industry_insight_2nd_quarter_2012.pdf/ Cited 02 August 2015.

ISO (International Organisation for Standardisation) (2010) ISO10845-1: 2010: Construction Procurement-Part 1: Processes, methods and procedures. ISO, Geneva, Switzerland.

LARYEA, S. and WATERMEYER, R. (2014). Innovative construction procurement at Wits University. Management, Procurement and Law, vol.167, Iss MP5 (October): 220-231.

MATHONSI, M.D and THWALA, W.D (2012). Factors influencing the selection of procurement systems in the South African construction industry. African Journal of Business Management, 6(10) (March): 3583-3594.

MATSUMOTO, I.T; STAPLETON, J; GLASS, J and THORPE, T. (2005). Developing a framework to measure organisational and employee skills development in a professional design consultancy. Construction Innovation, vol. 5: 53-66.

MURDOCH, J and HUGHES, W. (2008). Construction contracts: Law and management. New York: Taylor & Francis.

ROOT, D and HANCOCK, M. (1996). Familiarity and procurement preference: Putting the brake on the adoption of new procurement methods. Economic Management of Innovation: Productivity and Quality in Construction, Proc., of CIB W55, Civil Engineering Institute of Croatia, Zagreb, Croatia, 523-534.

RWELAMILA, P.D. and EDRIES, E. (2007). Project procurement competence and knowledge base of civil engineering consultants: An empirical study. Journal of Management in Engineering, vol. 23: 182-192.

RUPARATHNA, R and HEWAGE, K. (2013). Review of contemporary construction procurement practices. Journal of Management in Engineering, vol. 04014038: 04014038-1 – 04014038-11.

SAUNDERS, M; LEWIS, P and THORNHILL, A. (2012). Research methods for business students. England: Pearson Education Limited.

SIPDM (Standard for Infrastructure Procurement and Delivery Management) (2015). National Treasury Standard for Infrastructure Procurement and Delivery Management. National Treasury, Republic of South Africa, South Africa.

TUCKER, Claire. (2013). Public procurement in South Africa: overview. INTERNET. http://uk.practicallaw.com/2-520-8348/ Cited 13 March 2015.

WATERMEYER, R. (2012). A framework for developing construction procurement strategy. Management, Procurement and Law, vol. 165, Iss MP4 (November): 223-237.

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