Cape Peninsula University of Technology

CONTRACT PROCUREMENT STRATEGIES FOR PROJECT DELIVERY TOWARDS ENHANCEMENT OF HOUSING SUSTAINABILITY IN SOUTH AFRICA

by

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DECLARATION

I, Iyiola Bolumole, declare that the contents of this thesis represent my own unaided work, and that the content has not been previously submitted for academic examination towards any qualification. Furthermore, this thesis represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

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Signed Date

ABSTRACT

The supply of housing products that is durable, obtained at optimum cost and available within the shortest time possible describes the term *sustainable housing*. Findings derived from the reviewed literature concerning the ever-increasing quest of construction clients for 'best value for money' on construction projects brought about the emergence of alternative contract procurement strategies. Essentially, literature revealed that it is vital to adopt an appropriate contract procurement strategy, one that best addresses particular project needs and objectives, as the adoption of an inappropriate procurement system would result in excessive project cost and time overrun, low project quality standards and the dissatisfaction of involved construction stakeholders.

The quest for the supply of sustainable housing in the Western Cape, South Africa, prompted the need to establish an effective contract procurement strategy for housing project delivery. Noteworthy, this study identified five (5) objectives directed towards establishing an effective contract procurement strategy to enhance sustainable housing delivery: 1) the first objective examined the effectiveness of contract procurement strategies used for housing projects; 2) the second objective identified the factors influencing the selection of a suitable contract procurement strategy for housing projects; 3) the third objective analysed the influence of contract procurement strategies on project cost, time and quality; 4) the fourth objective examined the benefits and shortfalls associated with various contract procurement strategies on housing project resources – construction materials, machinery and manpower; 5) and the last objective was to establish the contract procurement strategy that is most effective for the delivery of sustainable housing.

This research adopted a mixed methodological approach involving the administration of close-ended quantitative questionnaires submitted to construction professionals and stakeholders and semi-structured qualitative interviews conducted with construction site managers and supervisors. SPSS version 24 software was used to analyse the quantitative data elicited, and "content analysis" was used to analyse the information obtained through the qualitative interviews. Cronbach's alpha coefficient reliability test was conducted on scaled research questions to ensure the reliability of the research questionnaire.

The research findings revealed that the traditional and the design and build contract procurement approaches are cost, time and quality effective and therefore satisfactory, while the traditional contract procurement system is also effective regarding construction stakeholder satisfaction. The research identified that the significant factors influencing the selection of a contract procurement strategy include delay and mistakes in producing design

documents; client inability to brief and make timely decisions; project type, nature, scope and complexity; lack of communication and feedback; lack of discipline among construction workers; and finally, lack of availability of construction materials.

The study concluded that thorough consideration of these findings by construction stakeholders within the construction industry will enhance the delivery of affordable, sustainable housing. The research study recommends, among other issues, the comparison of effectiveness of contract procurement strategies on project performance on a site-by-site basis, through work study and other available strategies, to further enhance sustainable housing delivery in the South African construction industry.

Keywords: contract procurement strategy, strategy, project delivery, housing sustainability, construction stakeholders

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DEDICATION

To all members of Olufemi Folahan (Fola-Bolumole) family

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DEFINITION OF TERMS

- **Contract procurement**: organised methods or processes and procedures for clients to obtain or acquire construction products; the organisational structure needed to design and build construction projects for a specific client.
- **Procurement strategy**: the process of taking a building project from its early planning phases to completion and occupation by the building's users.
- **Strategy**: the skilful planning and managing of the delivery process, involving a carefully devised plan of action that needs to be implemented. Strategy, for the purpose of this study, also means system, approach and method.
- **Project:** a temporary endeavour, undertaken to create a unique product, service or result.
- **Project delivery:** a system of handing over a unique product, through the application of knowledge, skills, tools and techniques to project activities, to meet project requirements.
- **Housing:** structures in which people dwell. It is a heterogeneous, long-lasting, immobile and essential consumer good, an indicator of social status and income differentials.
- **Sustainable housing:** the supply of a housing product that is durable, attained at optimum cost and available in the shortest time possible, meeting housing demands of clients, now and thereafter (present and future).

ABBREVIATIONS AND MEANINGS

- **CIDB:** Construction Industry Development Board
- **CIOB:** Chartered Institute of Building
- **CPS:** Contract Procurement Strategies
- **CWMF:** Capital Works Management Framework
- **GDP:** Gross Domestic Product
- **GMP:** Guaranteed Maximum Price
- **MV:** Mean Value
- **PMBOK:** Project Management Body of Knowledge
- **PPP:** Public-Private Partnership
- **RICS:** Royal Institution of Chartered Surveyors
- **SADC:** South African Development Community
- **SASQL:** South African Statistics Quarterly Labour
- **SPSS:** Statistical Package for the Social Sciences
- **STD:** Standard Deviation
- **3Ms:** Material, Manpower and Machinery

ARTICLES FOR PUBLICATION

- **Bolumole, I. and Fapohunda, J.A. 2017.** *Effectiveness of construction contract procurement strategies on project key parameters towards sustainable housing delivery in South Africa.*
- **Bolumole, I. and Fapohunda, J.A. 2017.** *Factors that influence the selection of contract procurement strategies for housing projects in the South African construction industry.*

CHAPTER ONE

1.0 Introduction

Every institution needs a procurement system that is within the legislative framework, fair, equitable, transparent and cost effective (CIBD, 2012a:online). Morledge and Smith (2013:54) opined that the efficient procurement of construction work through the choice of effective procurement strategy is one of the major determinants of success or failure of project delivery. Essentially, there is a definitive need to continually assess and enhance the effectiveness of the adopted procurement method to improve housing delivery, and consequently, the vital sustainability concerns. The procurement systems of concern for this research include the traditional method, design and build method, labour only method, direct labour method, project management method, management contracting method, build-operate-transfer (BOT) method and design-build-operate-transfer (DBOT) method, among others.

Contract procurement strategies have been described as organised methods or processes and procedures for clients to obtain or acquire construction products (Abdul Rashid *et al.,* 2006:67). Apart from the traditional approach, there are now other 'fast-tracking' or innovative procurement systems employed by the construction industry worldwide. The various procurement strategies differ from each other in terms of allocation of responsibilities, activities sequencing, process and procedure and organisational approach towards affordable housing delivery. These differences invariably impact the delivery of a sustainable housing. However, Woodward (2001:232) buttressed that the frequency of uncompleted and abandoned project occurrences requires effective contract procurement strategy to deliver projects.

Sustainability entails meeting the present economic needs of people without destroying the resources that will be needed by persons in the future, based on long range planning and the recognition of the finite nature of natural resources (Sutton, 2000:online). Sustainability is critical because all choices pursued and all actions taken today will significantly affect everything in future. In other words, decisions should be carefully taken at present to avoid limiting the choices of generations to come. The concept of *building sustainability* is a means to avoid conflict between economic development and environmental protection. This entails applying economically-viable and eco-friendly techniques to sustainable housing as a solution to environmental issues, finding ways to save and protect the environment and inflict

minimal harm to natural resources (Sutton, 2000:online). Hughes, Hillebrandt, Greenwood and Kwanu (2006:17) opined that the major aim of the construction industry is to deliver and maintain the built environment, which comprises housing, educational, industrial, and commercial and infrastructure facilities.

The construction industry is a service rendering industry in which design and production are carried out by more than one entity outside the project site. In most other industries, designs, schemes, modelling, production, fabrication, quality assurance and marketing deeds are primarily embarked on within the same organisation and site, albeit by diverse experts or units (Sanvido *et al.,* 1992:98). *Infrastructure* is a generic term covering the provision of electricity, communications, water, sewerage, gas, air, railways, harbours, roads and the likes (Seeley, 1986:118). All these facilities may be either public work procured by a public authority – such as government department – public utilities or private work procured by a private owner or organisation or by a private developer (Miller, 2013:182).

There are other elements that determine project delivery success, but the aim of this research is to ascertain effective contract procurement strategies in relation to other project success factors and resources utilisation (materials, manpower and machinery – the 3Ms) for project delivery towards enhancement of housing sustainability. Strategy in the delivery of sustainable housing could be considered as the skilful planning and managing of the delivery process, involving an implementable carefully devised plan of action (Miller, 2013:44). It is about taking appropriate decisions in relation to available options and prevailing circumstances with the intention of achieving optimal outcomes.

This study focuses on the choice of a contract procurement system to best enhance the successful delivery of sustainable housing. Masterman (2003:256) emphasised that the adoption of effective procurement methods will initiate the achievement of efficient sustainable housing delivery in respect of cost, time and quality – at *all* times. He further explained that an effective procurement strategy adoption will enhance the achievement of client and stakeholder satisfaction throughout the building life cycle in regard to cost, time and quality, both now and thereafter (present and future).

1.1 Background to the study

According to Jeselski and Talukhaba (1998:185), construction contract procurement evolved in South Africa in 1994, when the South African Ministry of Public Works identified a pressing need for public sector procurement reform regarding construction projects. After an initial review of the regulatory environment that influenced procurement systems, it was

decided that the reform could not be embarked upon on a sector by sector basis since an essential review of the entire public-sector procurement system was required (Jeselski & Talukhaba, 1998:186). Consequently, the Ministry of Public Works and the Ministry of Finance undertook a joint inventiveness that culminated in the release of the Green Paper on Public Sector Reform in 1997 (Jeselski & Talukhaba, 1998:186).

It is notable that, at the request of construction industry stakeholders, a Procurement Focus Committee was established by the Inter-Ministerial Task Team for Construction Industry Development in 1999 to evaluate facets of construction contract procurement and delivery management (Jeselski & Talukhaba, 1998:186). In 2000, the committee urged that a consistent and standardized construction contract procurement system be established in the construction industry; hence, CIDB encountered a major challenge in developing a construction contract procurement system that would fit the following:

- be compatible with the supply chain management framework that was being established by the National Treasury in terms of the Public Finance Management Act, 1999, and the Municipal Finance Management Act, 2003;
- meet the needs of a decentralized public construction contract procurement system in the sense that the accounting officers or accounting authorities in arms of state would be responsible for their own procurement processes; and
- be attractive to and serve the needs of the private sector (Jeselski & Talukhaba, 1998:186).

Therefore, in efforts to improve contract procurement performance, many new procurement systems emerged globally during the 1980s and 1990s, providing better selections and flexibility (Seeley, 1986:118). It is crucial that clients make the absolute right choice of a project procurement method in a progressively complex condition with an extensive array of objectives and procurement systems. Amidst the prevailing procurement methods, the traditional method of contract procurement was previously the most common and widespread form of public sector project procurement until the inadequacy of the method surfaced around 1960 (Miller, 2013:182).

Under the traditional delivery method, construction projects follow a traditional approach in which the client engages an architect and other construction professionals to be in charge of the design and specification of his project. Under a dispersed bid contract, the client appoints an independent general contractor to construct the project. The designer is then paid a fee, relative to the services delivered, whereas the contractor’s reimbursement is

characteristically built into the cost of construction (Masterman, 2003:64). Moreover, Ashworth (2006:68) suggested that for organisations with massive, continuing volumes of project, design and build, services may be delivered by public sector design expertise, rather than consulting designers, as the designers frequently serve as project managers and construction managers as the project progresses through its life cycle. It is therefore vital to integrate design and construction, which are treated as separate entities under the traditional procurement method.

It is worth noting that different contract procurement systems contribute to the successful delivery of sustainable housing in terms of allocation of risks (environmental, economic, social – sustainability concerns), activities sequence (management integration), and process, procedure and organisational approach in project delivery; hence, an effective procurement system must be established to satisfy client and stakeholder needs, taking cognisance of price certainty (cost/affordability), time schedule (delivering housing according to scheduled time to meet clients' housing demands), complexity of design, and numerous other factors.

1.2 Statement of the problem

While there is a need to address the various issues influencing sustainable housing delivery, this particular study addresses the selection criteria and suitability of contract procurement systems for sustainable housing projects. Mathonsi and Thwala (2012:3583) highlighted the relevance of the architects, quantity surveyors, engineers and builders in an effort to promote best value-for- money for construction clients through advising the adoption of a procurement strategy that best addresses project objectives. However, the construction industry has yet to reach a consensus on the most effective strategy for contract procurement for housing projects.

As a developing country, South Africa faces quite a number of socio-economic challenges, which influence the South African construction industry (Oshungade, 2015:4); hence, construction project objectives are rarely met, particularly due to these socio-economic challenges, as clients tend to get accustomed to, and stick with, a 'traditional' procurement approach that frequently fails to address the requirements and sensitivities specific to a particular project type (Mbanjwa, 2004:11). In other words, there is a definite need to establish a certain project requirement for an effective procurement method that best addresses the demand of such project (Oyegoke, 2011:573). However, the concern is how the different contract procurement strategies influence housing delivery and how each

method enhances the sustainability of the same, given that the method, process, procedure and organisation vary according to the systems. The procurement systems being employed for construction projects must be analysed critically and intensively, with clear differentiation identified between the traditional and non-traditional approaches and variations as such, for clients to have a more astute understanding for selecting an effective procurement approach that suits each specific project need (Skitmore, 1988:72).

As mentioned, the introduction of different 'fast-tracking' contract procurement strategies is the attempt by the industry to provide more alluring deals to clients seeking, quite understandably, the 'best value for money' out of projects in term of cost, time and quality (Masterman, 2003:230). The different contract procurement strategies present different methods, processes and procedures of project construction for clients. These different strategies also prescribe the variation of the organisational structure of the project teams in terms of role, responsibility and authority. This research assesses contract procurement strategies, the attributes and the impact (both beneficial and detrimental) of each system on the delivery of sustainable housing.

1.3 Aim and objectives

1.3.1 Aim

The aim of this research is to identify the most effective contract procurement strategies for project delivery towards enhancement of housing sustainability in the Western Cape, South Africa.

1.3.2 Objectives

The research objectives are as follows:

1. to examine the effectiveness of contract procurement strategies used for housing projects;
2. to identify factors that influence the selection of a suitable procurement method for housing projects;
3. to analyse the influence of contract procurement methods on the delivery of sustainable housing in terms of cost (affordability), time and quality;
4. to examine the benefits and shortfalls associated with each procurement method used on housing project resources (materials, manpower and machinery); and
5. to identify the procurement strategies that are most effective for the delivery of sustainable housing.

1.4 Research questions

The contract procurement strategies adopted for project execution influence delivery in quite a number of ways. Wrong conceptualization by the project team often leads to untimely and poor quality delivery, increased cost, and worst of all, project abandonment, with its associated environmental, economic and social effects, thereby leaving involved justifiably stakeholders dissatisfied. It is for this reason that this study addresses the following relevant questions:

1. How effective are the contract procurement strategies used for housing projects?
2. What factors influence the selection of a suitable procurement method for housing projects?
3. What are the influences of the contract procurement methods on the delivery of a sustainable housing in terms of cost (affordability), time and quality?
4. What benefits and shortfalls are associated with each procurement method on housing projects' resources (material, manpower and machinery)?
5. Which procurement strategy is most effective for the consistent delivery of sustainable housing in the Western Cape, South Africa?

Table 1.1: Relationship between research questions, research objectives and research method

Research objectives	Research questions	Research methods
To examine the effectiveness of contract procurement strategies for housing projects	How effective are the contract procurement strategies used for housing projects?	Review of relevant literature and administration of structured questionnaire
To identify the factors influencing the selection of a suitable procurement method for housing projects	What factors influence the selection of a suitable procurement method for housing projects?	Review of relevant literature and administration of structured questionnaire
To analyse the influence of contract procurement methods on the delivery of a sustainable housing in terms of cost (affordability), time and quality of products	What are the influences of contract procurement methods on the delivery of a sustainable housing in terms of cost (affordability), time and quality of products?	Review of relevant literature and administration of structured questionnaire

To examine the benefits and shortfalls associated with each procurement method used for housing projects resources (materials, manpower and machinery)	What benefits and shortfalls are associated with each procurement method used on housing project resources (materials, manpower and machinery)?	Review of relevant literature and administration of structured questionnaire
To establish the procurement strategies most effective for the consistent delivery of sustainable housing	Which procurement strategy is effective for the effective delivery of a sustainable housing?	Analysis of retrieved structured questionnaires

1.5 Significance of the study

The South African construction industry has quite a number of completed construction projects with time and cost overruns (Mbanjwa, 2004:14). The consequences of these in terms of the delivery of a sustainable housing are quite enormous. Even with several thousands of projects having been constructed and many more still in the pipeline, the problem still remains far from being eradicated (Kumaraswamy & Dissanayaka, 1998:228). In the midst of this problem, the contract procurement strategies adopted for construction bear a strong relationship with the delivery of a sustainable housing. In recent years, a number of alternative procurement methods have emerged to counter the shortfalls of the traditional system; therefore, the researcher's interest is drawn to non-traditional methods in particular, as these alternative procurement methods are gaining increasing popularity within the construction industry.

The distinctive nature of construction projects is that each project is distinctly unique; hence, integration and coordination of all the activities involved in the construction process, before and during construction, must be a requirement (Kumaraswamy & Dissanayaka, 1998:228). The significance of this study, then, rests with the examination of various contract procurement strategies for adoption within the construction industry for construction projects, and the examination and assessment of the impact of each of these strategies on the delivery of sustainable housing – while taking into consideration, the cost, time and quality – so as to identify the most effective and suitable option for the delivery of each particular project.

On completion of this research, the researcher should be in a position to recommend to prospective clients and other stakeholders, the procurement method to adopt (by tailoring each method to the project needs) and proffer valuable advice on consequent benefits and detriments of the chosen method. With the evaluation of contract procurement strategy, it is expected that this research serves as a reference to consultants, professional bodies and researchers, a guide to policy formulation and the construction industry in general.

1.6 Conceptual framework

The research project's conceptual framework is presented in Figure 1.1 which encapsulates contract procurement strategies in the construction industry and the relationship with construction stakeholders' satisfaction with regard to project delivered in compliance with budgeted cost, scheduled time and specified quality, through effective utilization of the 3Ms (materials, manpower and machinery) as well as the selection criteria for a contract procurement strategy in the delivery of a sustainable housing.

From figure 1.1, the delivery of sustainable housing at budgeted cost, forecasted completion time and specified quality is dependent on the effectiveness of the contract procurement system adopted and the utilisation of the available construction resources towards meeting involved construction stakeholders' satisfaction on the project to be executed. The figure also shows that some factors such as project key objectives, project constraints, risks, *etcetera,* are the criteria that can influence the selection of a contract procurement strategy.

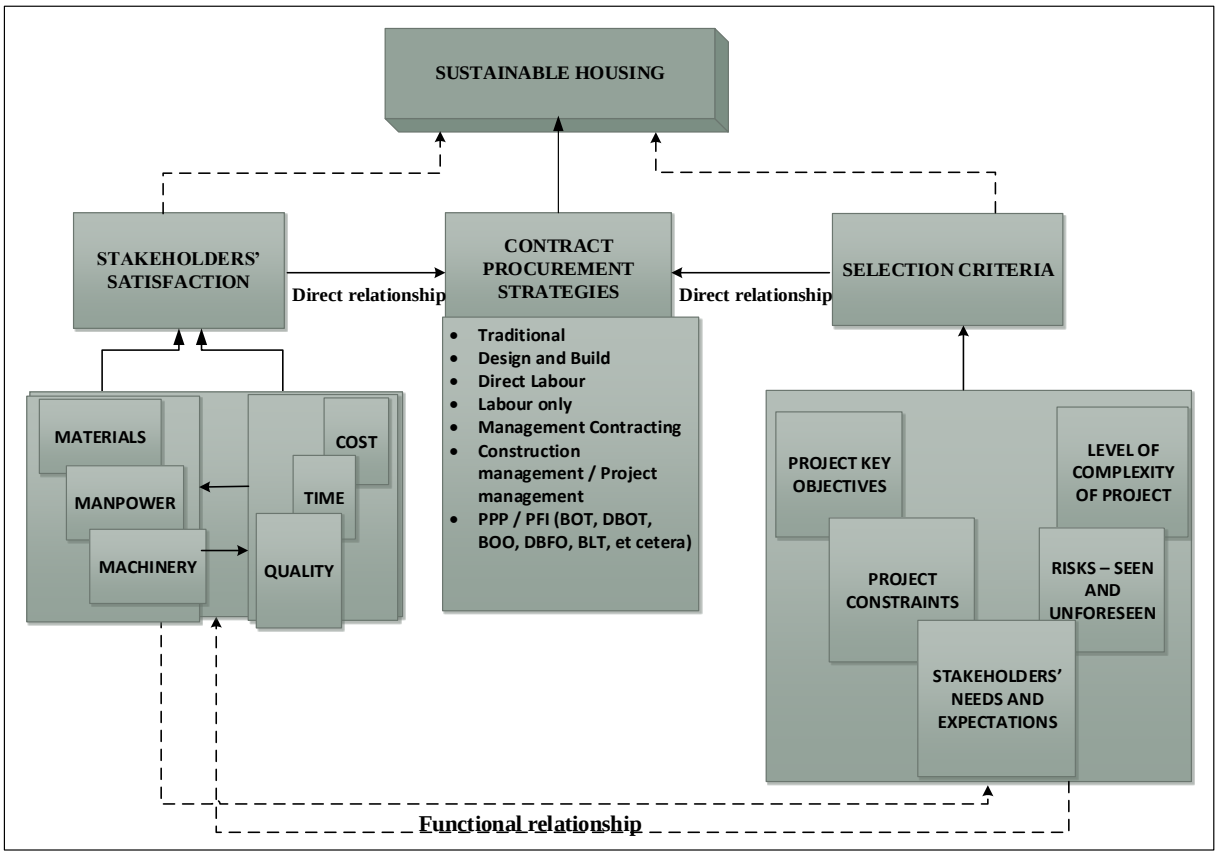

Figure 1.1: Conceptual framework

1.7 Research methodology

The method adopted in data gathering has a significant effect on the reliability of research data and ultimately determines the success of any research effort (Leedy & Ormrod, 2010:55). O'Leary (2013:116) defined *research methodology* as "all-encompassing macro frameworks that offer principles of reasoning associated with paradigmatic assumptions that validate serious schools of research". Mixed method research was adopted for this study; hence, the research adopts both primary and secondary systems of data collection. The collection of primary data comprised the administration of structured questionnaires to study respondents as well as qualitative interviews. The questionnaire for the study is structured in conformity with the research objectives, and semi-structured interviews were conducted with construction site supervisors to validate quantitative findings and also further guarantee result validity.

The secondary data collected for the research is comprised of readily available and accessible information obtained from research conducted by other researchers, involving a review of previous literature relevant to the study that includes reviews of published conference papers, textbooks, published academic journals and articles. Statistical Package for Social Science (SPSS) software version 24 was used in analysing quantitative data. Data elicited from qualitative interviews was analysed using the content analysis method. The responses obtained from qualitative interviews conducted with site supervisors were transcribed verbatim with an electronic device and subsequently summarised and documented.

1.7.1 Population of the study

The population of this study consists of construction professionals which include architects, quantity surveyors, project managers, engineers, contractors and construction site supervisors.

1.7.2 Scope of the study

This study intends to elicit information from construction professionals in the Western Cape of South Africa. This will allow for adequate coverage of the study as Cape Town contains a high concentration of contracting and consulting firms and construction projects in South Africa.

1.8 Key assumptions

The research assumptions were as follows:

i. Selected construction firms encounter challenges regarding contract procurement strategy selection.

ii. The target population will make available pertinent information to justify research objectives and research questions.

iii. Questionnaires and interviews are structured to elicit information in line with the research problem statement, research objectives and research questions.

1.9 Research process

Figure 1.2 illustrates the process of the research from inception to completion.

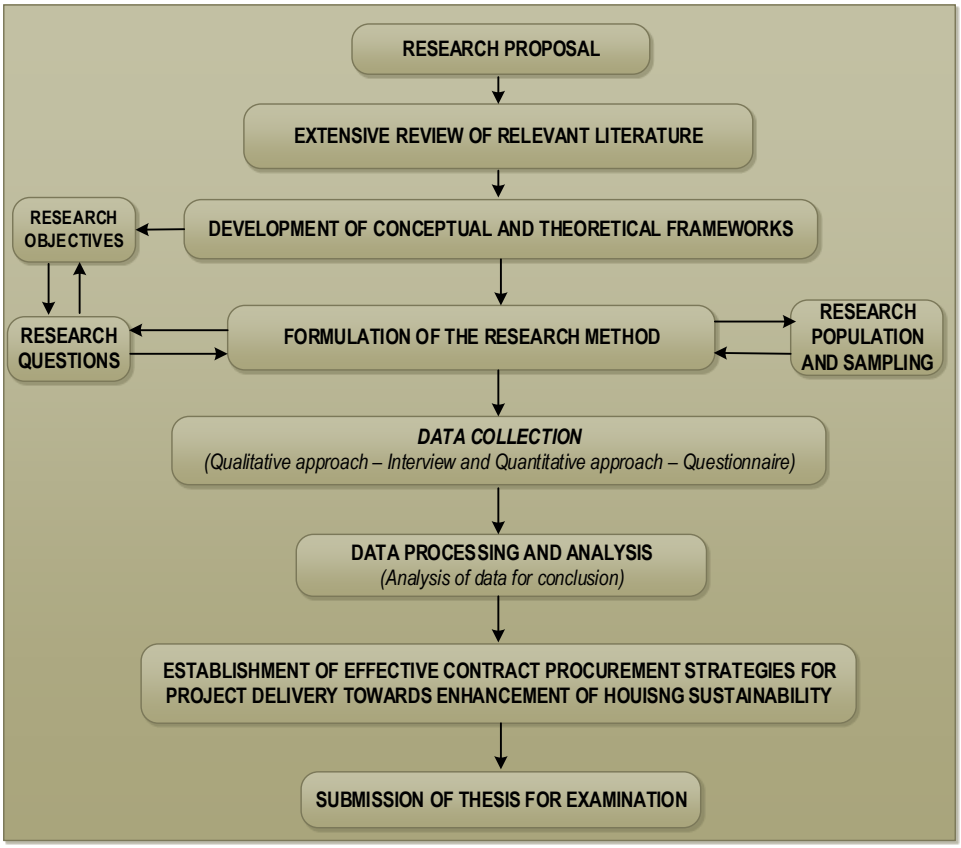

Figure 1.2: Research process

1.10 Ethical considerations

In terms of complying with internationally accepted ethical standards, all names of participants (individuals and organisations) will be stored with utmost confidentiality and will therefore not be recorded on research documents. The study will extinguish all forms of plagiarism by acknowledging the authors of all sources of literature referenced or integrated

into the study. Moreover, no compensation whatsoever will be provided to any participant in the course of the study.

1.11 Thesis structure

Chapters in the study are outlined thus:

Chapter One – Introduction: this is the introductory chapter containing background of the research, statement of the research problem, the problem statement, the significance of the study, the research aim, research objectives, research questions, the scope and limitation of the study, definition of terms and ethical considerations of the study.

Chapter Two – Literature review: this chapter reviews relevant literature of previous research regarding contract procurement strategies for housing delivery. The factors that could enable housing sustainability and the types of contract procurement strategies with their characteristics, advantages, disadvantages, associated risks and projects for which each is best suited is comprehensively reviewed in this chapter.

Chapter Three – Research methodology: this chapter comprises the research method adopted in the study for achieving the intended research aim and objectives. Moreover, this chapter examines the research design, research population, sampling technique, instrument for data collection, administration of instrument, technique for data analysis and model formation.

Chapter Four – Data analysis and discussion of findings: this chapter contains the report on the elicited data, analysing the obtained results. Additionally, it includes a discussion of the research findings, represented in both graphical and tabular formats.

Chapter Five – Conclusion and recommendations: this final chapter, based on the analysis of the findings, draws overall conclusions and offers final recommendations in regard to the aim of the research.

1.12 The chapter summary

The supply of housing products that is durable, attained at optimum cost and available in the shortest time possible, to meet housing demand of clients, now and thereafter (present and future), is considered *housing sustainability*. There are several factors affecting housing sustainability, among which contract procurement strategies is significant. This chapter relates the emergence of various contract procurement strategies as alternatives to the commonly used ‘traditional procurement method’ to more fully achieve project objectives, as

the success of each and every project is rated on the basic standards of project performance – cost, time and quality. The assessed literature reveals just how critical it is that clients make the right choice of contract procurement method, as the adoption of an ineffective method frequently leads to cost and time overrun, and worst of all, project abandonment.

The next chapter elucidates the objectives of the study with reference to relevant literature to address contract procurement strategies and their strong influence on housing sustainability.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Contract procurement strategies towards enhancing housing sustainability will be reviewed in this chapter. The researcher discusses the effectiveness of the various types of contract procurement strategies; the selection criteria; factors influencing the selection of a procurement method; the influence of each identified procurement method on the delivery of sustainable housing in terms of cost, time and quality; as well as the benefits and detriments associated with each procurement method – all aided by previous researchers' findings and observations. This literature review examines contract procurement strategies and their contributions towards enhancing housing sustainability.

2.2 Construction industry

The Construction Industry Development Board Act (2004:online) defines the *construction industry* as "the broad conglomeration of industries and sectors which add value in the creation and maintenance of fixed assets within the built environment". Almost every industry is dynamic in nature and the construction industry is no exception. Its environment has become more dynamic due to the increasing uncertainties in technology, budgets, and development processes.

A building project is completed as a result of a combination of many activities and interactions, planned or unplanned, over the life of a facility, with changing participants and processes in a constantly changing environment (Sanvido *et al.,* 1992:94). Sanvido *et al.* (1992:94) posit that the construction industry differs from most other industries in that it tends to produce a one-off prototype, whereas other industries are mass producers; hence, only when the prototype emerges as a model and is replicated can construction be compared with mass products.

Morledge and Smith (2013:280) opined that this all-important industry is sometimes regarded as the ringleader of all other industries because it provides building accommodation and other maintenance works prior to them taking off. The construction industry embraces a wide range of loosely integrated organisations that collectively

construct, alter and repair a wide range of different buildings and civil engineering projects (Andawei, 2014:24). The types of public and private facilities produced range from both residential and non-residential buildings to heavy construction. These physical facilities play a critical and highly visible role in the development process. The characteristics of construction products, including their custom-built nature, immobility, high initial expense, complexity and continuously changing technology, set the construction industry apart from many other industries in both developed and developing countries (De Wilde *et al.*, 1973:12).

According to Myers (2013:222), the construction industry is an economic investment and its relationship with economic development is well-posited: many studies have highlighted the significant contribution of the construction industry to national economic development, although others argue that the extent of its contribution is not always clear. Others have argued that the construction industry can be used to regulate the economy, while others differ with that opinion (Myers, 2013:222). Some also argued that it is economic growth that drives the construction industry rather than the industry advancing the economy (i.e. that the construction industry is not a driver of economic prosperity; rather, it merely follows the 'path' defined by the total economic growth rate) (CIDB, 2012a:online).

Irrespective of the position one takes regarding the relationship of the construction industry to economic growth, this does not in any way invalidate the importance of the construction industry in regard to providing the necessary infrastructures that stimulate economic development, as this industry is central to the process of economic and social development in any country and as such, may be considered as an agent of growth (Gounden, 2000:125, CIDB, 2012a:online). It has been argued that for a country to have meaningful and sustained development, it urgently requires that it indigenizes its construction industry, because if the construction industry is inefficient, it will be difficult for such a country to attain meaningful, sustainable development. It can therefore be construed that the construction industry is required for national development (CIDB, 2012a:online).

Construction projects are primarily building and engineering works. Ofori (1990:123) defined the *construction industry* as that sector of the economy that plans, designs, constructs, alters, maintains, repairs and eventually demolishes buildings of all kinds. Buildings are construction works in which people work, worship, dwell or relax, and as such, can be residential, commercial, industrial, institutional, religion or recreational (Ofori, 1990:125). *Civil engineering* works are more concerned with controlling the natural environment to provide infrastructures such as roads, dams and airports (Seeley, 1986:179). *Heavy*

engineering projects include bridges, tunnels, petrochemical, harbour and mining, for example (Ogunsanmi, 2016:27).

Most construction activity is initiated by sources outside the industry itself, which enters the picture to begin production only after the client has determined the need for a facility and has decided to procure it. In this respect, the construction industry can be considered a service rendering industry (De Wilde *et al.,* 1973:12). In order to obtain the best service and performance from the construction industry, the client must be closely involved in each stage of a contract procurement process (Akram *et al.,* 2012:7).

Construction procurement, according to Akram *et al.* (2012:7), is the process of identifying, selecting and commissioning the contributions required for the delivery of alteration, refurbishment, maintenance, extension or demolition of an existing building or structure, and/or the creation of a new building or facility, to include all associated and related site works. Successful construction procurement is regarded as a project delivered on time, to cost, and to the desired quality, capable of performing the specific function required by the client (Akram *et al.*, 2012:7).

Smith and Love (2001:76) posited that strategies for the procurement of building projects in housing delivery have not changed significantly in the last 25 years, though time and cost overruns are still prevalent in the construction industry. To minimise the incidence of time and costs overruns, the disputes that may often arise, and maximise the reality of project success and thereby enhance housing sustainability, alternative forms of procurement methods such as *partnering* and *alliancing* have been advocated (Davis, Love & Baccarini, 2008:156).

The selection of a contract procurement system for any but the simplest type of project is somewhat difficult, owing to the diverse range of options and professional advice available (Ashworth, 2006:38). Ashworth explained further that expertise that provides only a design service most of the time take the opposite view on individual experiences, prejudice, vested interest, familiarity, and the need and desire for improvement factors that have reshaped contract procurement in the construction industry.

The proliferation of differing procurement approaches have resulted in an increasing demand for a systematic method of selecting an appropriate procurement method for housing projects; this, therefore, becomes a significant but daunting task for clients, as adopting an unsuitable method may lead to project failure (Chua, Kog & Loh, 1999:145). The consequence may be time and cost overrun, which in turn affects the affordability and

sustainability of housing and/or stakeholders' general dissatisfaction (Bennett & Grice, 1990:245). The introduction of many variations of contract procurement strategies came about as a result of the quest for efficient and faster delivery of sustainable and affordable housing. These newly introduced strategies are innovations to the traditional delivery approach aimed at meeting the changing demand of clients (Sharif & Morledge, 1994:295).

The different contract procurement strategies have brought changes not only to the process and procedure of delivering sustainable, affordable housing, but also to aspects of management and organisation (Rashid *et al.,* 2006:88). Today, there are several types of contract procurement systems widely implemented within the construction industry ranging from the traditional method to the many variations of 'fast tracking' systems such as design and construct, management contracting, construction management, project management, direct labour, labour only, Design-Build-Operate-Transfer (DBOT), Build-Operate-and Transfer (BOT).

Clearly, the necessity of selecting and using an effective contract procurement system for a particular construction project, together with the proliferation of differing procurement systems, calls for a more systematic method of selection (Skitmore & Marsden, 1988:76). There are quite a number of contract procurement methods being used in the construction industry nowadays; these will be discussed extensively in this chapter, as the focus of this study is to ascertain and establish effective contract procurement strategies for project delivery towards enhancement of housing sustainability.

2.2.1 South African construction industry in context

South African Statistics Quarterly Labour Force Survey (SASQLS) avowed that the total income of the South African construction industry (building and civil engineering sectors) in 2011 was two hundred and sixty eight thousand, one hundred million rand (R268,100,000,000.00), signifying an upsurge of 12% over the accounted total income of 2007 (Africa, 2010). The report disclosed a huge extension of construction activities in the South African construction industry over a period of four years. It can therefore be argued that the extension in construction activities in the South African construction industry has meaningfully contributed to the South African economic growth (Adebowale, 2014:15).

Unarguably, procurement systems are not uncommon to the South African construction industry as the study conducted within the SADC region, for South Africa and Botswana, revealed that South Africa had adopted a clichéd construction model that included the hybrids of traditional procurement systems throughout the period South Africa was under the

British colony (Mathonsi & Thwala, 2012:3583). So while the South African procurement system is grounded on the British model, the setting as well as the practical application of the models were not properly organised, as at that time South Africa was under apartheid with a dissimilar arrangement and institutional organisation between South Africa and Britain (Mathonsi & Thwala, 2012:3583).

However, Mathonsi and Thwala (2012:3583) posited that in the sphere of procurement systems, South Africa, like many other developing countries, adopts basic and entire processes and the standard usual procedures and strategies for procurement systems that are fair, equitable, transparent, competitive and cost-effective when executing construction projects within the construction industry. This is regulated in all facets of government, including state-owned industrious undertakings through the separate arms of legislation.

Notably, Mathonsi and Thwala (2012:3583) added that not regarding the fact that South Africa is a developing country construction-wise, South Africa has the inherent capacity to undertake both public and private sector construction projects, putting into use the basic cognitive process of universal contract procurement systems, as the ever-increasing requests of clients on project time, cost, quality and risk have given rise to the development and use of alternative construction procurement systems (Cook, 2008:59). However, since each contract procurement system has distinctive characteristics, advantages and constraints, there is hardly any single best system that is suitable for all clients and kinds of projects (Nahapiet & Nahapiet, 1985:219).

2.3 Contract procurement strategies for housing projects

The environmental, social and economic value of housing cannot be underestimated, particularly housing that has been especially designed to improve the liveability of the immediate environment that is essential to building communities, improving social wellbeing and sustaining high standards of living into the future (Sutton, 2000:online). Well-planned and managed investment in housing projects plays a vital role in supporting economic, environmental and social growth and providing capacity to meet the increasing demand for services that accompany strong housing development (Casey & Bamford, 2014:1). Furthermore, an appropriate procurement strategy that establishes careful consideration and analysis of all available options will enable clients to identify the delivery model and procurement method most suitable for the project in question. By adopting an appropriate procurement method, clients can expect to achieve best value-for-money outcomes as risks

will be most effectively managed and the occurrence of contractual disputes, cost and time overruns, as much as possible, will be minimised.

Hughes *et al.* (2006:7) posit that within the construction sector, *contract procurement* has become a complex matter. This is because it refers not only to what is bought, but also to a diverse array of methods for acquiring a vast range of construction products. Before developing a general view of the difference in contract procurement methods, it is advantageous to identify the main features of existing procurement approaches. Contract procurement practices in construction, generally speaking, are quite diverse and complex in the sense that it is quite challenging to outline the various arrangements available (Akram *et al.,* 2012:8).

A *contract* is a key component of a procurement system, a crucial element necessary between two parties teaming up for a project. Davis, Love and Baccarini (2008:158) defined a *contract* as "an agreement between two parties, whereby one party commits itself to deliver goods or services to a second party within a certain delivery time and for an agreed price". They stressed further to define 'The Client' as "The party in need of a service" and 'Contractor' as "The party delivering the service".

Procurement is derived from the word 'procure', which literally means "to obtain by care or effort". *Contract procurement strategies* have been described as organised methods or processes and procedures to obtain or acquire construction products (Abdul Rashid *et al.,* 2006:92). Contract procurement strategies identify the best way of achieving the objectives of a construction project and value-for-money, taking cognisance of the risks and constraints, leading to decisions about the funding mechanism and asset ownership for the project. The aim of a contract procurement strategy is to achieve the optimum balance of risk, control and funding for a particular project (Thomson & Jackson, 2007:429).

Masterman (2003:68) describeD *contract procurement* as the organisational structure needed to design and build construction projects for specific clients. An appropriate contract procurement strategy, typically developed during the 'evaluation' or 'definition' phases of a project, is a key determinant of successful project delivery as it is more than just a high-level plan, it details, practically, the recommended delivery model to be deployed in delivering a project while it also provides clear justification for use on a value-for-money basis (Casey & Bamford, 2014:10).

Project delivery, as described by the Austroads Guide to Project Delivery, is “the process by which the aim or goal of a project is realised or achieved” (Casey & Bamford, 2014:10). Successful project delivery must be supported by an appropriate contract procurement strategy to ensure the essential works and/or services are not delayed or otherwise poorly executed. Programming the development of a contract procurement strategy is thus extremely important from a project management viewpoint. To achieve optimum timing, the procurement strategy development process should commence as early as possible in the project lifecycle, as an element of the project’s ‘evaluation’ and ‘definition’ phases (Casey & Bamford, 2014:10).

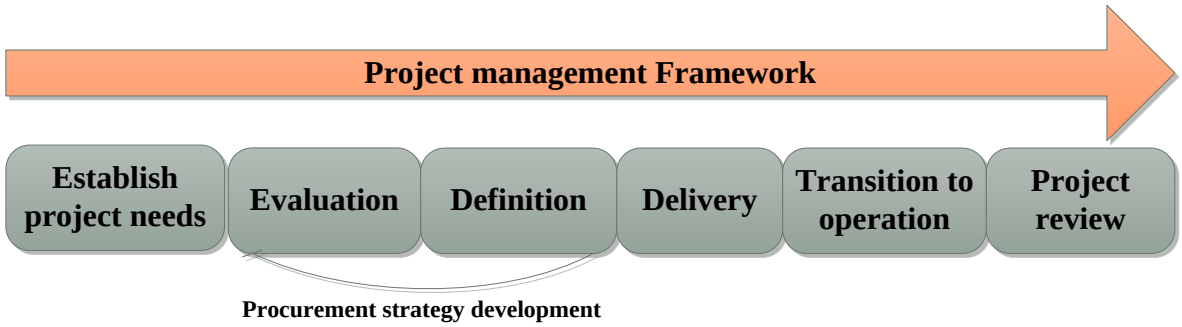

Figure 2.1: Procurement strategy development

(Adapted from Casey & Bamford, 2014:12)

Furthermore, from a project management viewpoint, implementation of the recommended procurement strategy starts from the project ‘definition’ stage, and continues through the ‘delivery’ stage and potentially also the ‘transition to operation’ phase, depending on the chosen delivery model (Casey & Bamford, 2014:12). Implementation of a contract procurement strategy should therefore be programmed to occur during these phases, as shown in Figure 2.2 below:

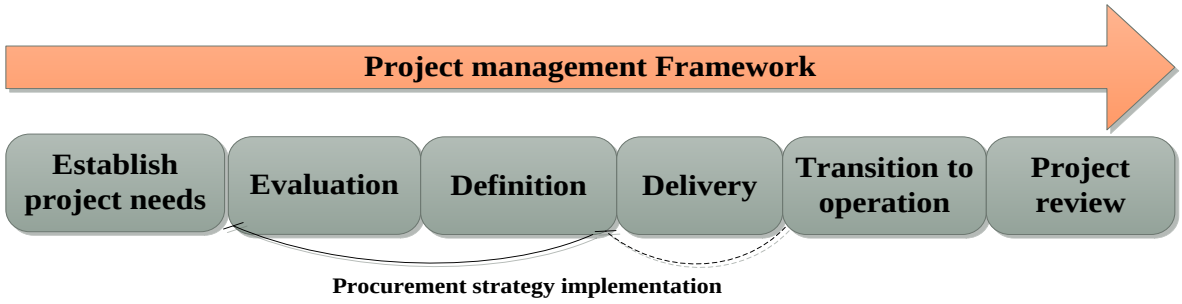

Figure 2.2: Procurement strategy implementation

(Adapted from Casey & Bamford, 2014:12)

2.3.1 Contract procurement strategies effectiveness on housing projects

Before developing a general view of how contract procurement approaches differ, it is vital to articulate the main features, the effectiveness, and the distinguishing characteristics of various contract procurement approaches. According to Ashworth (2006:9) and Hughes *et al.* (2006:18), the following are the contract procurement strategies adopted in delivering housing projects in the construction sector:

- Traditional procurement method;
- Design and Build procurement method;
- Management contracting procurement method;
- Construction management procurement method;
- Project management procurement method;
- Direct labour procurement method;
- Labour only procurement method; and
- Public-Private-Partnership (BOT, DBOT, DBFO, ROT, BOOT, LROT) procurement methods.

2.3.2 Traditional procurement method (separated)

The traditional system of contract procurement has been in existence since the origination of the main contractor, Architectural and Quantity surveying professions, at the end of the 18th century and beginning of the 19th century (Mbanjwa, 2004:82). The traditional method of contract procurement is the most common, well established and recognized model of project delivery (Ashworth, A, 2006:11). According to Mathonsi & Thwala (2012:3583), around 43% of housing projects in South Africa are being executed using the traditional method of contract procurement, as it is the most favoured form of contract procurement.

In this contractual arrangement, a single main contractor is responsible for executing ***all*** construction works in line with an agreed programme, pre-existing design and other project documentation; he subsequently sublets elements of the work to sub-contractors. The client consents that design work is separate from construction work, that is, consultants (an architect and a quantity surveyor) are appointed for design and cost control. (Casey & Bamford, 2014:11). This responsibility extends to all workmanship (manpower) and materials, and includes all work by sub-contractors and suppliers. The contractor is usually

appointed by competitive tendering on complete information, but may, if necessary, be appointed earlier by negotiation on the basis of partial or notional information.

Traditional delivery model is usually used for minor works and straightforward major work projects, (i.e. small and middle-sized construction projects) and whilst it permits an early commencement on site, it also entails less certainty about cost (Cooke & Williams, 2013:47). However, Rowlinson (1999:289) affirms that the traditional method of contract procurement has been criticised for its slowness, as a result of the sequential nature of the work and the attribute of time and cost overruns, including the lack of input from the main contractor during the design phase. Davis (2008:11) identifies three types of contracts under the traditional method of contract procurement:

1. lump sum contracts;
2. measurement contracts; and
3. cost reimbursement contracts.

2.3.2.1 Lump sum contracts

A *lump sum contract* also known as a *stipulated sum contract*, is the traditional means of procuring construction, and still the most common form of construction contract (Designing Buildings, 2017:online). Under this contractual arrangement, the contract sum is determined before the construction work begins, and the construction cost is agreed upon in the contract documents (Davis *et al.,* 2008:11). CIOB (1997) defined a *lump sum contract* in the CIOB Code of Estimating Practice as a "fixed price contract where contractors undertake the responsibility to execute the complete contract work for an agreed amount of money". Ashworth (2006:70) opines that a lump sum contract is only suitable where the project is well- defined, when tenders are sought and substantial changes to project requirements are improbable. In other words, this means that the contractor has the ability to correctly price the works to be executed.

Notably, Hughes *et al.* (2006:79) asserted that lump sum contracts might be less suitable where speed is vital, or where the nature of the works is not well-defined. However, a lump sum contract does not apportion all the project risk to the contractor as it is not a fixed price, nor a guaranteed maximum price; the contract sum on a lump sum contract is subject to change and mechanisms for changing the contract sum include the following, as affirmed by Love (1998:78):

- variations;
- provisional sums;
- fluctuations;
- payment to nominated sub-contractors or nominated suppliers;
- statutory fees; and
- payment relating to the opening-up and testing of works.

2.3.2.2 Measurement contracts

Hughes *et al.* (2006:82) described a *measurement contract* as a 're-measurement' or a 'measured and valued' contract. Measurement contracts are entered into when the design of works can be described in sensible detail but the actual contract sum cannot be determined (Designing Buildings, 2017:online). The contract sum is then calculated on completion of the construction project, based on 're-measurement' of the actual construction work executed and tendered rates (Hughes *et al.,* 2006:82). Measurement contracts permit an early start of construction work on site, before design and working drawings are concluded, and changes to be made to the works are relatively easy (Designing buildings, 2017:online). However, Love (1998:80) maintains that associated risks are inevitable to the client as the cost of construction works is uncertain.

2.3.2.3 Cost reimbursement contracts

A *cost reimbursement contract,* also referred to as a 'cost-plus' contract, is a contractual arrangement where the contractor is reimbursed the total actual costs incurred in executing construction works 'plus' an additional fee (Love *et al.*, 1998:81). A cost reimbursement contract is used where the nature or scope of the work to be executed cannot be adequately defined at the outset, and the risks associated with the works are high (Designing Buildings, 2017:online). As a result, the costs for which the contractor is entitled to be reimbursed must be clearly stated in the contract.

Davis (2008:13) identifies hybrids of cost reimbursement contract:

- cost plus fixed fee;
- cost plus percentage fee; and
- cost plus fluctuating fee.

According to Cooke and Williams (2013:49), the traditional procurement approach is characterised by the following:

- Appointment of contractor is by competitive tendering.
- Designs are completely prepared prior to the commencement of tendering process and actual construction.
- The contractor has no design responsibility whatsoever; hence, the client has total control over the design.
- Due to the separation of the design and construction process, the project duration tends to be lengthy.
- The client appoints professional consultants for contract administration, advice on aspects of design, progress and stage payment that must be made by the client.

Figure 2.3 illustrates the structure of the traditional contract procurement method. As seen, the client has direct contractual links with the design team (Architect, Quantity surveyor, Structural engineers, other designers and the main contractor). Direct information exchange exists between the Client, the architect and the main contractor. The Architect communicates directly with the design team while the main contractor communicates directly with the construction team (sub-contractors, specialists and suppliers).

The structure of the traditional procurement method is shown in Figure 2.3:

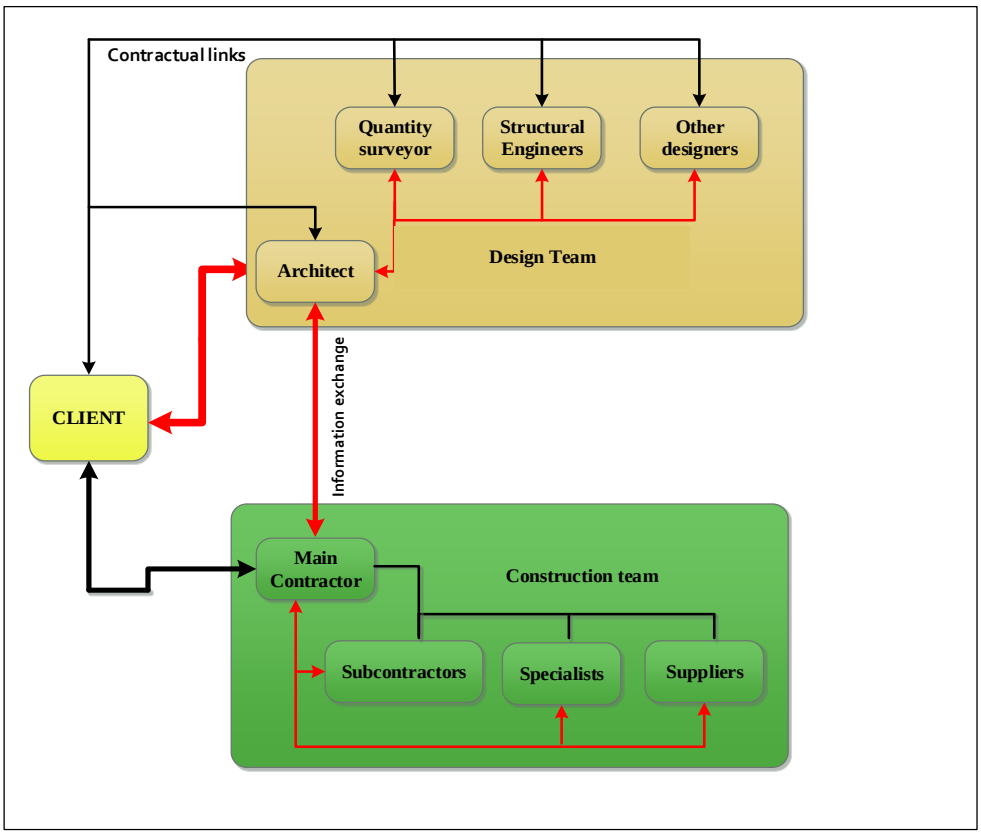

Figure 2.3: Traditional procurement method

(Modified from Cooke & Williams, 2013:47)

2.3.3 Design and build procurement method (integrated)

This method of contract procurement, introduced in the 1980s, is prevalent in midium-sized and larger projects (Gordon, 1994:198). *Design and build* is a generic term describing a procurement route in which the main contractor is appointed to design and construct the work, as opposed to a traditional contract, where the client appoints consultants to design and then a contractor is appointed to construct the work (Clamp, Cox & Lupton, 2007:68). The design and build procurement method appeals to some clients, as it gives a single point of responsibility for delivering the full project.

The contractor can either be appointed to carry out all of the design work, or if the client wishes to have greater influence over the design, a concept design and outline (or performance) specification can be prepared by a consultant employed by the client, and then the contractor is appointed to complete the design and carry out the construction. The contractor may use his own in-house designers to design the project, or appoint consultant

designers, or the client's designers can be employed by the contractor to complete the design (either by innovation or consultant switch) (Clamp *et al.*, 2007:68).

The design and build procurement method ascertains a quicker start of construction works on site, as the close integration of design and construction can result in more effective programming. Time, however, is needed by the client's consultants to prepare an adequate set of requirements, and time is needed to compare and evaluate the schemes from competing tenders. Some clients, however, consider the design and build procurement method appropriate only for simple projects, where design quality is not the main consideration (Kumaraswamy & Dissanayaka, 1998:228). Turner (1997:63) identified variations of contracts under the design and build contractual arrangement, which include the following:

- direct contract;
- competitive contract; and
- package deal contract.

2.3.3.1 Direct contract

Under this contractual arrangement, no tenders for construction work are obtained in competition, although some assessment of the possible competitors may be made before the tendering process. But only one tender is obtained (Davis *et al.*, 2008:14).

2.3.3.2 Competitive contract

Under this arrangement, tenders are obtained from contractual documents that are prepared by the client team to enable several contractors to compete in designs and in prices (Love *et al.*, 1998:82).

2.3.3.3 Package deal contract

This method is frequently used where the competing contractors will take the risk of using a significant part of individual or alternative proprietary building systems or construct variations of an insistent theme (Turner, 1997:68). The adoption of this method provides limited scope for innovation; as such, some contractors may propose to find a site, sell, mortgage or lease a construction product, either at a risk to themselves or at a charge to the client (Watermeyer, 2012:228). According to Turner (1997:156), the following are the key points to consider with design and build procurement method:

- In design and build contracts, there is usually a single point of responsibility. The client, therefore, deals with only one firm.
- The client has no control over the detailed design; however, this might be acceptable where extensive lines of scheme are satisfactory and detail relatively less important.
- Design and construction work can proceed in parallel; hence, the project duration is shortened. However, it is mainly the contractor who benefits from this operational flexibility.
- Responsibility for completing the project within the scheduled time rests wholly with the contractor. The responsibility on the contractor to be answerable for the flow of necessary communication of information is one of the most attractive features of design and construct.
- It is of advantage to the contractor for designers and cost estimators to work closely together, as the contractor is made aware of up-to-date market conditions, to ensure that the contract runs smoothly, economically and expeditiously.

Figure 2.4 presents the contractual structure of the design and build procurement method. It is shown that the client has direct contractual links and direct lines of communication with the Architect, Quantity surveyor and contractor. The Architect communicates directly with the engineering consultants while functional and possible lines of communication exists between the Quantity surveyor and the Architect. The contractor communicates directly with the sub-contractors and in-house work specialists.

The design and build procurement structure is shown in Figure 2.4:

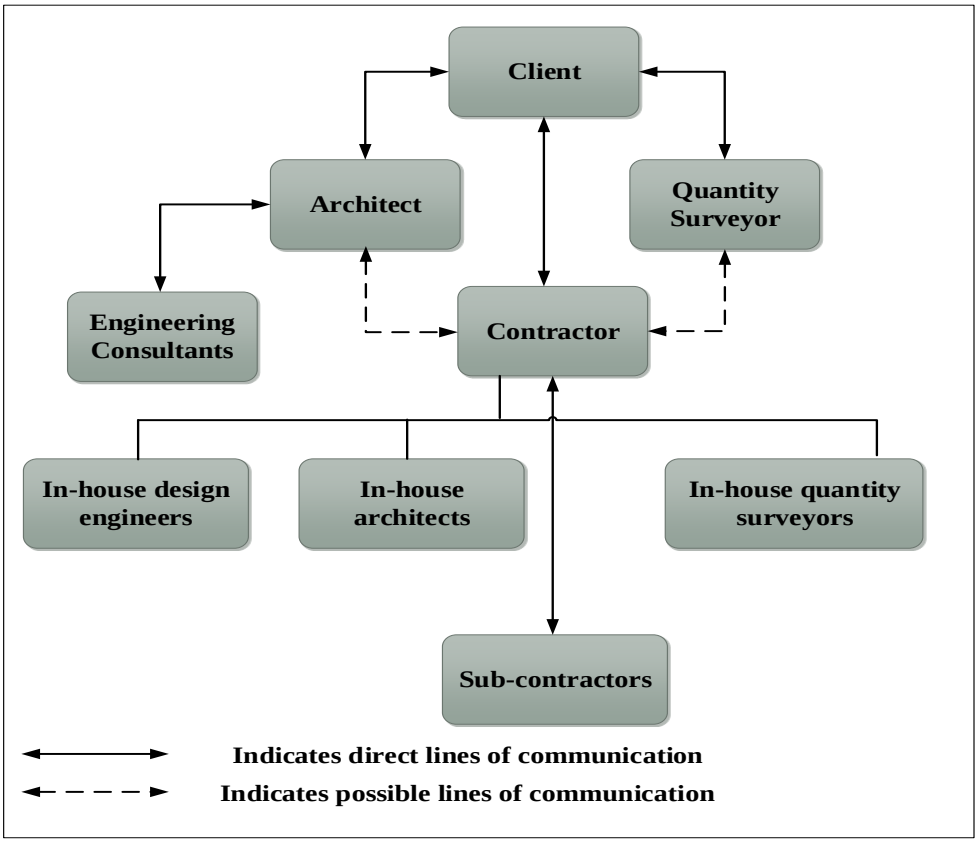

Figure 2.4: Design and build procurement method

(Modified from: Turner, 1997:156)

2.3.4 Management contracting method

According to Ashworth (2006:57), the management contracting procurement method evolved in the 1970s in the United Kingdom, with the aim of building complex construction projects in a shorter period of time and for a low cost. Coupled with the growing trend for building contractors to sub-let all work, the result was a need to procure only a project's management and co-ordination input in conjunction with a close relationship between client and contractor (Hughes *et al.*, 2006:8). Under this delivery model, the client appoints an independent professional design team with responsibilities related to design and management of the project.

So the main contractor is engaged as the 'management contractor', appointed to manage the development of the design, coordinate production of the construction process, enter into

contracts and manage the delivery of the works on behalf of the client (Casey & Bamford, 2014:26). As part of the management contractor's service, the management contractor usually provides and maintains all the necessary site facilities such as offices, storage and mess huts, power supplies and other site services, common construction machinery, welfare, essential attendances on the works sub-contractors, and also deals with labour relation matters, provides advisory and management services, creates work packages, sources and engages work contractors, and coordinates and supervises construction works (Casey & Bamford, 2014:26). Contractual links exist between the client and each member of the design team, including the management contractor and also between the management contractor and each of the works sub-contractors.

Typically, management contracting is a two-stage procurement strategy that necessitates early contractor involvement (Capital Works Management Framework, 2008:10). Prior to stage one, the client appoints professional consultants to prepare a preliminary project brief, which includes a budget estimate and estimated time for completion of the construction project. During the first stage, the management contractor works closely with the design consultants and the client to study the preliminary project brief and polish the design to meet budget and time constraints. Prior to the second stage, the management contractor makes an offer in terms of a guaranteed construction sum to the client based on the studied project brief, and if the offer is accepted, stage two commences and the managing contractor completes the design and manages the construction of the project (CWMF, 2008:10).

Davis, Love and Baccarini (2008:158) posited that management contracting method of contract procurement allows for an early start of construction works on-site, to achieve early completion and afford the client the opportunity to change the design during construction due to its flexibility because drawings and matters of detail can be adjusted and finalised as the work proceeds. The management contractor undertakes the work on the basis of a contract cost plan prepared by a quantity surveyor, project drawings and project specification. Specialist work subcontractors, who are contracted to the management contractor on terms approved by the contract administrator (who may be the architect, the quantity surveyor or the project manager) carry out the construction works (Akram *et al.*, 2012:34).

Management contracting procurement strategy is best suited for major or significant construction projects where there is some uncertainty regarding the specific project

requirements; however, the process of design and construction tends to be shorter than that in either traditional method or the design and build method (CWMF, 2008:10).

Figure 2.5 explains the contractual arrangement of management contracting procurement method. From the figure, direct lines of communication exist between the client, architect, quantity surveyor and management contractor. The management contractor communicates directly with the works contractors and the architect communicates directly with the engineering consultants.

Management contracting procurement structure is shown in Figure 2.5:

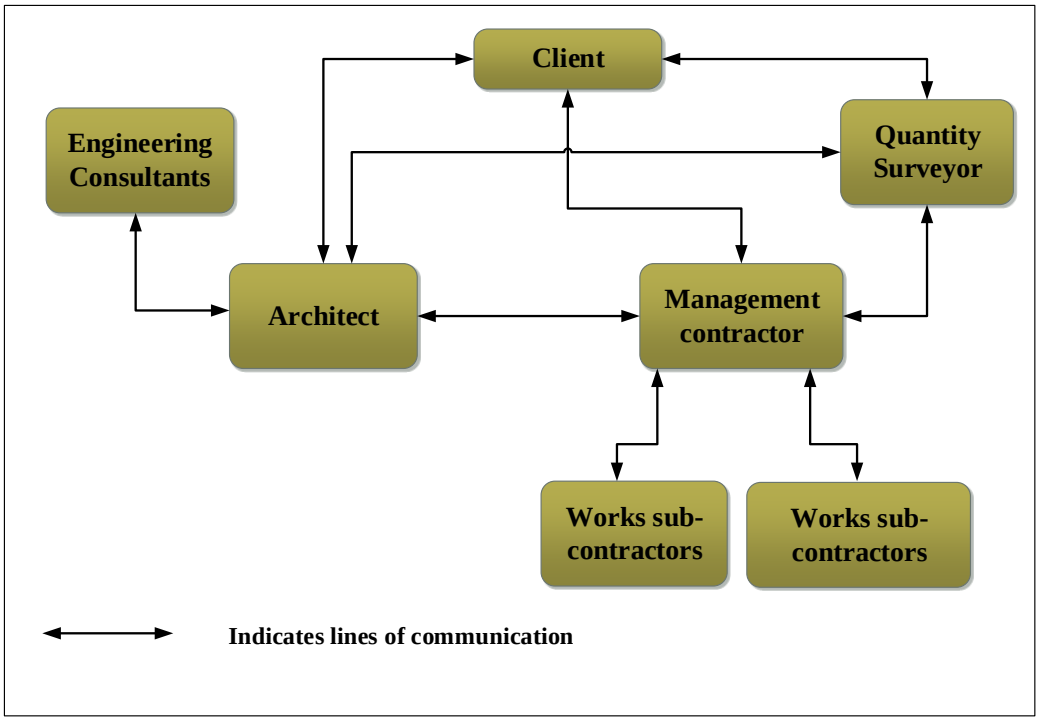

Figure 2.5: Management contracting procurement method

(Modified from: Casey & Bamford, 2014:26)

2.3.5 Construction management procurement method

Construction management procurement method is similar to management contracting in the sense that it is a management consultant service to the client, provided on a fee basis, with the design and construction services being provided by other organisations (Rowlinson *et al.*, 1999:284). Hughes *et al.* (2006:8) posited that the most significant characteristic of construction management method of procurement is that there is no general contractor;

instead, there is a sequence of direct contractual links between the client and the trade contractors, meaning the construction manager is more like a consultant than a contractor.

The construction manager therefore takes the responsibility for the organisation and planning of construction works on site, and also ensures that construction works are executed in the most proficient manner (Akram *et al.*, 2012:34). According to Masterman (2003:65), the following are the responsibilities of the construction manager:

- cooperation and consultation with other members of the client's professional team;
- preparation and updating of a comprehensive construction programme;
- preparation of materials and component flows and arranging for advanced ordering;
- determining required site services and facilities and their location;
- breakdown of project into suitable trade packages in consultation with other members of the client's professional team;
- recommendation of suitable work sub-contractors invited to tender for trade packages;
- obtaining tenders from sub-contractors and suppliers;
- evaluation and recommendation of tenders to client's team;
- coordination of works sub-contracted to trade contractors in ensuring that work is executed in accordance to the master programme;
- establishment of all necessary on-site personnel management with the responsibility of supervising and managing the project;
- deals with all necessary variations that arise during project execution, providing the design team with an estimate of cost likely to be incurred and subsequent issuance of instructions to trade contractors; and
- preparation of all necessary documentations regarding the final account, receiving applications for periodic payments from trade contractors, and submitting these to the quantity surveyor.

Under the construction management procurement method, contractual links exist between the following:

- the client and the construction manager;
- the client and each of the trade contractors; and
- the client and each member of his professional advisers (architect, quantity surveyors and engineering consultants).

The construction manager therefore adopts a consultant role with direct responsibility to the client for complete management of the project, including communicating with design consultants to meet approved objectives (Masterman, 2003:64). The construction manager is paid an approved fee to cover the costs of staff and overheads. In general, this is considered to be the minimum adversarial form of contract and is frequently invoked when design requires running in parallel with construction (Akram *et al.*, 2012:34).

Figure 2.6 explains the contractual arrangement of construction management procurement method. From the figure, direct contractual relationship exists between the client, quantity surveyor, construction manager and design consultants. Functional relationship exists between the construction manager, quantity surveyor and design consultants. Functional relationship also exists between the construction manager and the trade contractors.

The construction management procurement structure is shown in Figure 2.6:

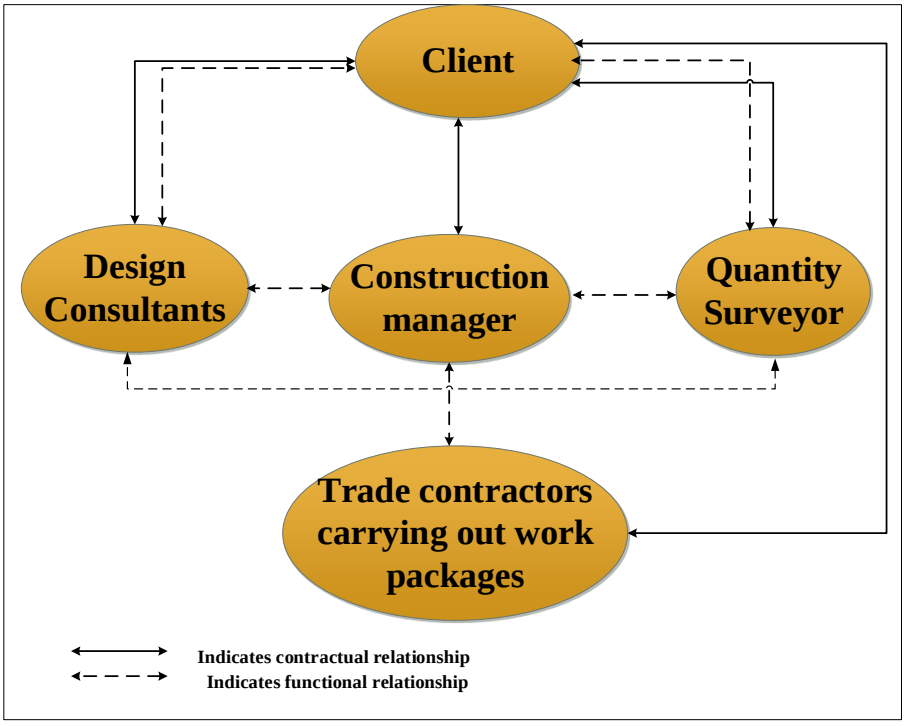

Figure 2.6: Construction management procurement method

(Modified from Masterman, 2003:65)

2.3.6 Project management procurement method.

Project management, according to Guide (2001:49), is defined as the "the application of knowledge, skills, tools, and techniques to project activities to meet the project

requirements". Ramus, Birchall and Griffiths (2006:76) defined *project management* as the overall planning, control and coordination of a project from inception to completion, aimed at meeting a client's requirements and ensuring completion to scheduled time, estimated cost and specified quality standards in order to produce a functionally and financially viable project. Ashworth (2006:66) posited that project management is a function normally undertaken by the client's consultants rather than a contractor. Stressing further, the client appoints the project manager who in turn appoints the design consultants and selects the contractor.

Under this arrangement, the contracts for the sub-contractors are between the client and each sub-contractor. The client is therefore required to be involved in the design development and construction phases of the project. The project manager is responsible for the coordination of design, tender and construction processes. The design, tender and construction functions overlap, with construction work divided into smaller work packages tendered for. Construction work commences as early as the design information is available. Programming of design drawing packages allow for a rolling tender and construction process in accordance with the project programme (Ramus *et al.*, 2006:76). As with management contracting, the final construction costs will only be determined once the final work elements have been awarded.

Figure 2.7 presents the contractual arrangement of project management procurement method. As shown in the figure, direct contractual relationship exists between the client, project manager, architect, quantity surveyor, engineering consultants, contractor and the sub-contractors. Direct contractual relationship also exists between the project manager and the design team.

Project management procurement structure is shown Figure 2.7:

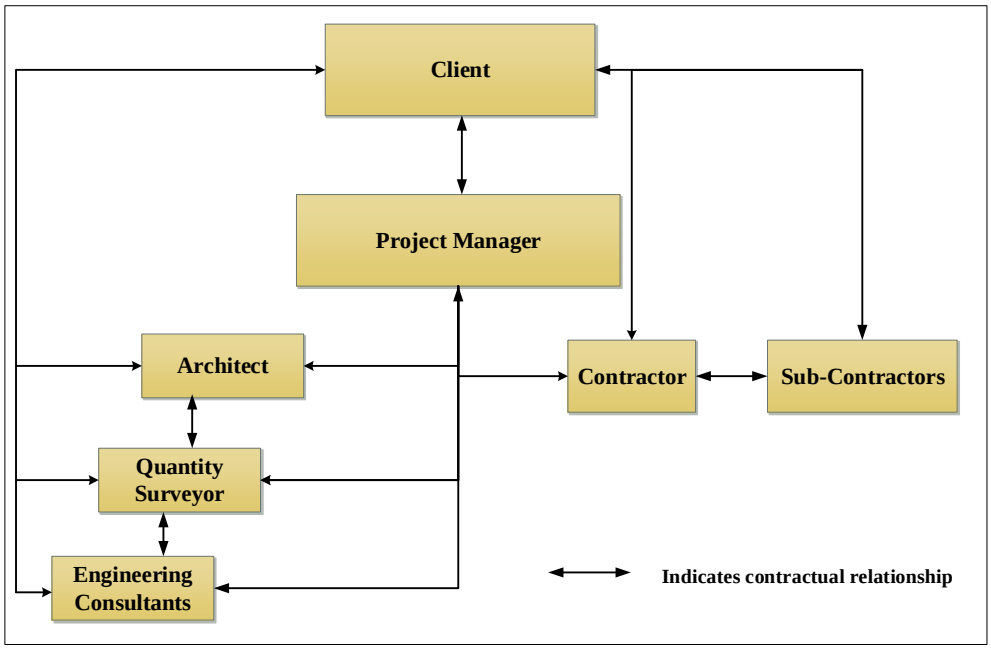

Figure 2.7: Project management procurement method

(Source: Ashworth, 2006:72)

2.3.7 Direct labour procurement method.

Adenuga (2013:23) defined *direct labour procurement method* as a system whereby a construction project is executed by the workers of an organisation rather than the project contracted out. According to Adenuga (2013:22), the direct labour procurement method involves a client employing, organising and mobilizing all necessary resources either in-house or outsourced to execute a construction project, using the required professional whom he pays directly.

The direct labour procurement method is characterised by the client being responsible for the procurement of materials as well as engagement and supervision of labour for project execution. As such, the services of the main contractor are dispensed with. The direct labour procurement method is usually used for small scale projects and maintenance works, especially by government departments (Oladiran, Ogunsanmi & Onukwube, 2007:66).

Figure 2.8 presents the contractual arrangement of direct labour procurement method. From the figure, the client controls the construction process and is in charge of all construction

resources (construction materials, manpower and machinery), in terms of coordination and control.

Direct labour procurement structure is shown in Figure 2.8:

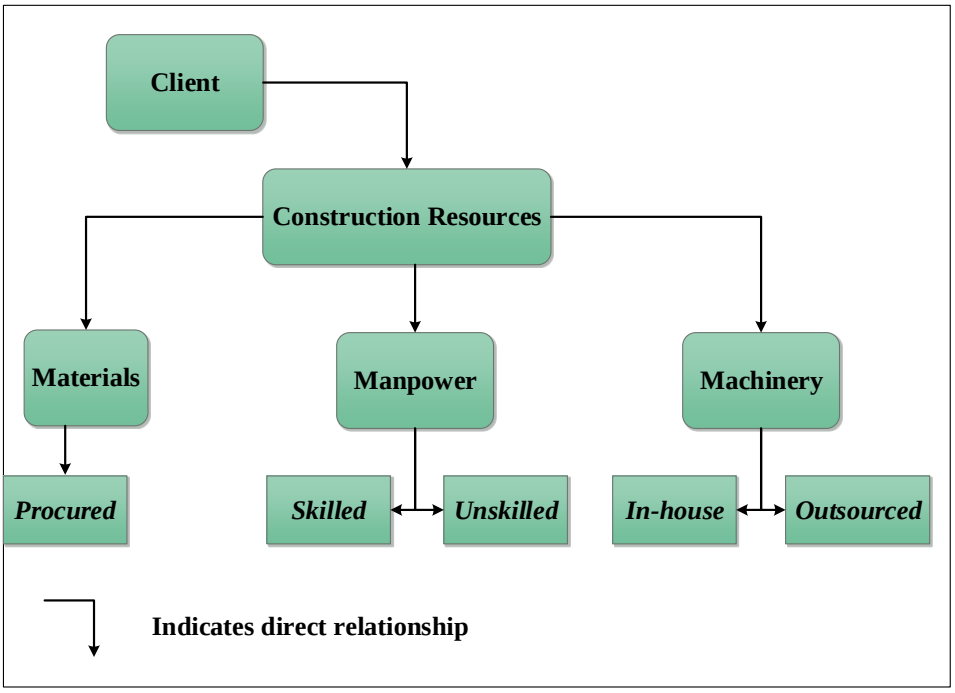

Figure 2.8: Direct labour procurement method

(Source: Adenuga, 2013:23)

2.3.8 Labour only procurement method

Labour only procurement method is the arrangement under which the client contracts out the 'labour only' aspects of construction work (Ogunsanmi, 2016:12). The client is responsible for the provision of all necessary construction materials and resources to be used by the 'labour only' contractor for the execution of the project (Olabode, 2013:3). Olabode (2013:3) posited that the adoption of a labour only procurement method by a client is time and energy consuming for achieving project objectives. Ogunsanmi (2016:17) indicated that one of the major problems in the implementation of the labour only method is that the 'labour only' contractor faces difficulty in harmonizing the construction resources provided by the client for project execution, and as such, the labour only procurement method is used mainly for minor alteration or modification of construction works involving repairs, maintenance and refurbishments.

Labour only procurement structure is shown in Figure 2.9:

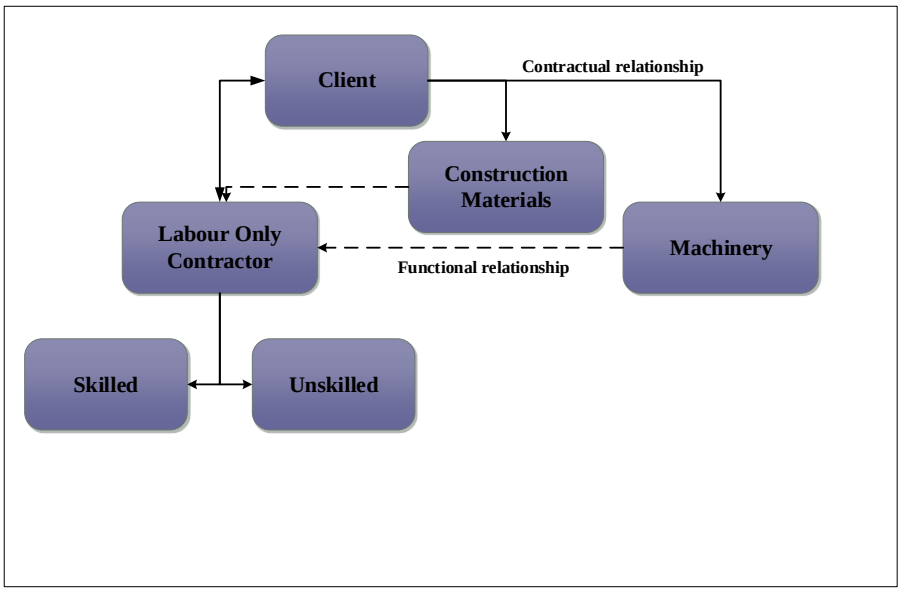

Figure 2.9: Labour only procurement method

(Source: Ogunsanmi, 2003:18)

2.3.9 Public-Private Partnership procurement method (PPP)

Public-Private Partnership (PPP) method of contract procurement is the cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards (Akram *et al.*, 2012:40; Casey & Bamford, 2014:78). However, in recent years, practical changes have been seen in the manner by which construction projects, mostly those in the public sector, are financed (Hughes *et al.*, 2006:10).

In practice, the PPP method of contract procurement is a concession reached by the private sector company to take total responsibility for the full delivery of a service in a stipulated area, including operation, maintenance, collection, management, construction and rehabilitation of the project (Casey & Bamford, 2014:33). Hughes *et al.* (2006:10) posited that PPP is an acceptable procurement practice to achieve best value for the delivery of a public service. Moreover, Casey and Bamford (2014:33) stressed that though the private sector is responsible for the provision of construction properties, such properties are owned publicly even during the concession period, and as such, the public sector is responsible for establishing key performance standards and ensuring that the private sector meets such

standards. Therefore, the public sector is not just the service provider, but the regulator of construction price and service quality.

The PPP is a procurement method that uses a long-term performance based contract and/or concession, whereby the risks associated with a construction project are appropriately transferred to the private sector cost effectively, and to achieve this, there has to be an establishment of a legal company – usually known as 'Special Purpose Company' or 'Special Purpose Vehicle' – as the main contracting firm (Akram *et al.,* 2012:40). Usually the period of concession is valid for 25-30 years; this provides the private sector ample time to recoup the capital incurred and earn an appropriate profit over the period of the concession.

The PPP structure is shown in Figure 2.10:

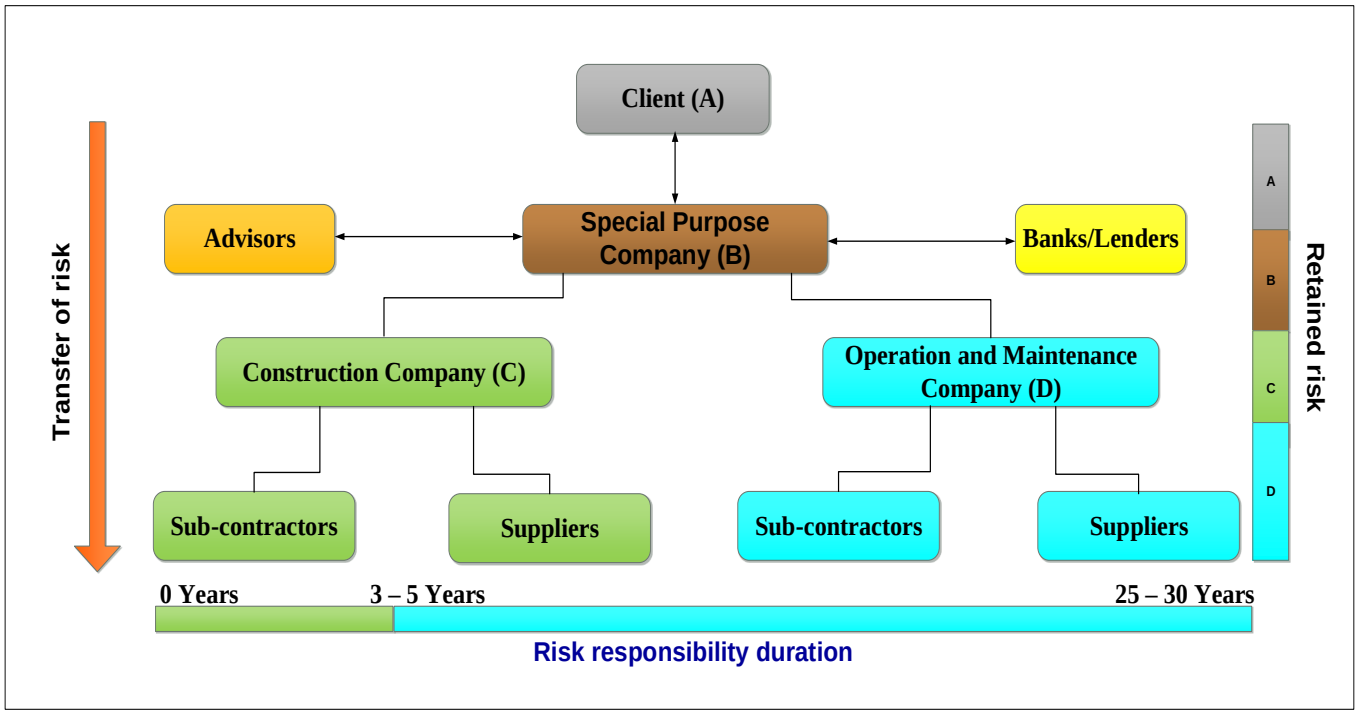

Figure 2.10: Public-Private Partnership structure

(Modified from: Akram *et al.*, 2012:41)

There are varieties of PPP delivery models that allot responsibilities and risks between the public and private partners in diverse ways. According to Akram *et al.* (2012:41), Gounden (2000:98), Miller (2013:189) and Casey and Bamford (2014:40), the following are the variants commonly used to describe a typical public-private partnership arrangement:

1. Build-Develop-Operate (BDO): in this scheme, the private entity buys the facility from the public entity, develops and refurbishes the facility with its own resources and operates the facility through a government agreement stated in the concession contract. Due to the long-term nature of the arrangement, the amount payable is usually increased during the concession period as the rate of increase is often tied to a combination of internal and external variables, allowing the private entity to have a satisfactory internal rate of return on the investment (Miller, 2013:192).

2. Build-Lease-Operate-Transfer (BLOT): under a BLOT arrangement, a private entity accepts to design, finance, build and operate a facility and leases to the government, charging user fees for the lease period, contrary to payment of a rent. At the expiration of the lease period, the ownership and operational responsibility of the facility is transferred to the government at a previously agreed amount. A BLOT scheme provides a good condition for the project company, as the project company maintains the property right while avoiding operational risk (Gounden, 2000:98).

3. Build-Own-Operate (BOO): in a BOO project, the private entity finances, builds, owns and operates a facility or service for an indefinite period. The private entity benefits from any residual value of the facility. This arrangement is used when the physical life of the facility coincides with the concession period. A BOO scheme involves large amount of finance and long payback period (Casey & Bamford, 2014:40).

4. Build-Own-Operate-Transfer (BOOT): a BOOT is a structure whereby a private entity receives an authorisation to finance, design, build and operate a facility (charging of user fees inclusive) for a specified time, after which facility ownership is transferred to the public sector. BOOT differs from a BOT structure in the sense that during the concession period, the private entity owns and operates the facility with the prime goal of recouping the investment capital and maintenance, while aiming at achieving higher margin on the facility (Akram *et al.,* 2012:41).

The specific characteristics of the BOOT structure make it suitable for infrastructure projects like highway construction, roads mass transit, railway construction and power generation, and as such, the infrastructure projects have political importance on the social welfare but are not viable for other types of private investments. BOOT schemes encourage private investment, inject new foreign capital to the country's economy, promote transfer of technical know-how, enhance project completion to time and budget, provide additional financial

service for other priority projects and release the liability on public budget for infrastructure (Miller, 2013:191).

5. Build-Operate-Transfer (BOT): in this structure, the public sector delegates to a private sector to design, finance, build and operate an infrastructure for a long term, under a concession contract; thereafter, ownership of the infrastructure is transferred to the public sector without any remuneration from the private entity (Gounden, 2000:99). During the concession period, the private entity has the responsibility for sourcing finance for the infrastructure project, retains the entitlement of all revenues generated by the project, and can be regarded as the facility owner; however, the viability of the project for the host government depends on the efficiency of the project in comparison with the economics of financing the project with public funds. A BOT project is usually selected in developing a discreet facility, rather than a whole network, although refurbishment services may be involved (Akram *et al.,* 2012:43).

6. Buy-Build-Operate (BBO): this is a delivery model whereby the public sector transfers an asset or facility to the private entity. The transferred assets or facilities are to be upgraded or refurbished and operated by the private entity for a specific period of time, as agreed by both parties (Casey & Bamford, 2014:43).

7. Contract-Add-Operate (CAO): this is a contractual arrangement whereby the private entity adds to an existing infrastructure facility rented from the public entity and operates the expanded project at an agreed sum, over an agreed period of time. There may or not be a transfer agreement on the added facility by private entity (Hughes *et al.,* 2006:83).

8. Design-Build-Maintain (DBM): this model is similar to design and build except that the private entity is responsible for the maintenance of the facility, and payment beyond project completion is based on meeting certain prescribed performance standards relating to physical condition, capacity, congestion and quality; thereafter, the public sector retains responsibility for operation of the facility (Kumaraswamy & Dissanayaka, 1998:227). This model provides an inherent incentive for the design builder to provide a better quality project by creating a life-cycle responsibility for the performance of the facility (Hughes *et al.,* 2006:84).

9. Design-Build-Finance-Operate (DBFO): DBFO is similar to BOOT except that there is no actual transfer of facility ownership. The private entity designs, finances and builds a new facility for the public entity under a long-term lease agreement, and operates the facility for

the period of the lease. In essence, the private entity has the financial obligation throughout the construction period (Li *et al.,* 2005b:132).

10. Design-Build-Operate (DBO): a private entity is authorised to design, build and operate a public facility; however, the public entity retains legal ownership of the facility. A DBO is an integrated partnership that combines the design and construction responsibilities with operations. All project components are procured from the private entity in a single contract, with finance secured by the public entity as the private sector would be bear the 'owner' risks. A DBO is a performance-based procurement method that allows for innovation from the competitive market place, thereby saving rate payers a significant amount, both in capital and life cycle costs (Li *et al.,* 2005a:466).

11. Design-Construct-Finance-Manage (DCMF): a private entity is awarded by a public entity the contract to design, construct, finance and manage a facility, based on the specifications given by the public entity. The project's cash-flows are realised from the rent the government pays on the facility. This delivery model could be construed as a means to avoid new indebtedness of public finance (Gounden, 2000:99).

12. Develop-Operate-Transfer (DOT): this is an arrangement whereby favourable conditions, external to the new infrastructure projects to be built by a private entity, are integrated in the agreement by giving the private entity the right to develop adjourning properties, and as such, enjoy the benefits of rent values therein (Hughes *et al.,* 2006:84).

13. Lease-Renovate-Operate-Transfer (LROT): in this scheme, an existing facility is turned over to a private entity on lease for a particular period of time to renovate the facility and operate it for a given period; thereafter, transfer of the facility to the public entity occurs at an agreed rate of return (Li *et al.,* 2005b:130).

14. Rehabilitate-Operate-Transfer (ROT): in this model, the public entity turns over an existing facility to a private entity to rehabilitate, operate and maintain for a given period as an authority, and at the expiration of the operation period, all legal titles as regards the facility are turned over to the public entity (Li *et al.,* 2005a:465).

2.4 Factors that influence the selection of a contract procurement strategy

The development of a procurement selection process for the execution of a construction project has an essential impact on the achievement of best value-for-money for clients, as there is no particular procurement method appropriate for all project needs (Davis *et al.,* 2008:162). While identifying the factors that influence the selection of a contract procurement strategy, it is vital to comprehensively examine the processes involved in the selection of a contract procurement strategy that meets particular project requirements (Thomson & Jackson, 2007:429). The selection process of a procurement strategy intends to provide clients and all involved stakeholders with a level of transparency and objectivity for the justification of the procurement method to be recommended, as a procurement method gives an outline of the basic means by which project objectives are to be met (Turner, 1997:150).

As a construction project moves through the phases identified by the project management framework (as illustrated in Figure 2.11), there is an increase in cognition of the project. During the project development phase (project appraisal and program formulation) decisions should be taken on the type of building that is needed, the scheduled time frame for the delivery, and the estimated cost available to construct it; hence, it is vital to consider the procurement strategy or strategies that might be best suited to deliver the required project requirements (CWMF, 2008:7). It is of utmost importance to clearly identify project objectives and constraints in the selection process; actions taken should be appropriately considered and comparisons should be made concerning the most suitable procurement method and how it meets project needs. Casey and Bamford (2014:14) identified a four step approach to the selection of a procurement method. Notably, Davis, Love and Baccarini (2008:26) posited that after the completion of each step of selection, crucial decisions must be taken cautiously and documented to justifies the process of transparency. This also serves as a learning tool for upcoming procurement related decisions.

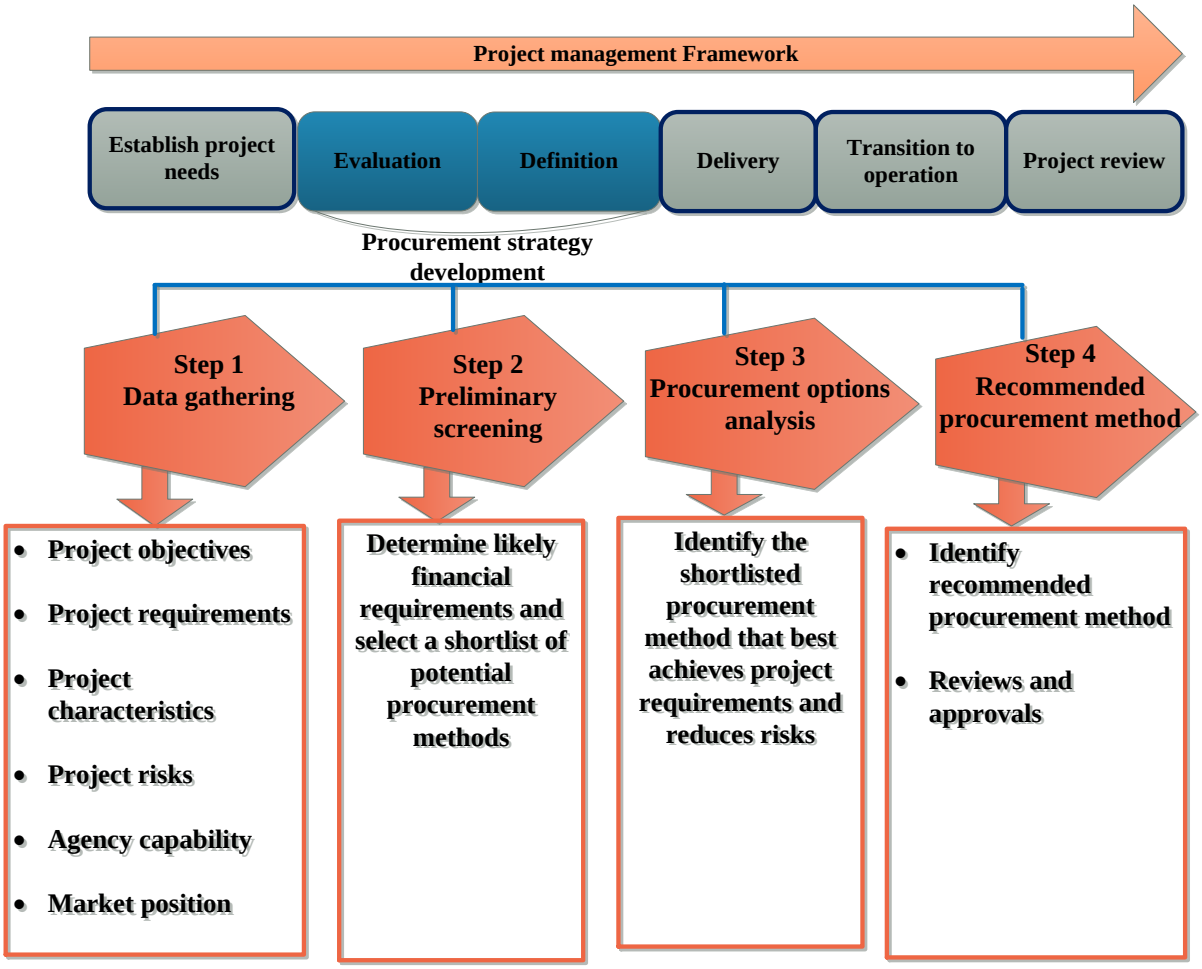

Figure 2.11: Procurement method selection process

(Adapted from Casey & Bamford, 2014:14)

Step 1 - Data gathering: this step involves gathering information and documenting project briefs for the project to be effectively outlined against impending procurement methods. This data gathering process is crucial in the development of project briefs and specifications as these are the key documents that best encompass the project's characteristics and client's specifications (Casey & Bamford, 2014:14).

Step 2 – Preliminary screening: this step addresses the financial aspect of the project in alignment with Step 1 (data gathering) and evaluates possible procurement strategies that provide the best value-for-money (CWMF, 2008:7).

Step 3 – Procurement options analysis: this step evaluates potential procurement options and risk reduction, and identifies shortlisted options that best achieve project requirements (CWMF, 2008:7).

Step 4 – Recommended procurement method: following the first three steps of a procurement strategy selection process, the client is clearly enlightened and identifies a procurement method that best suits project needs and risk profile (Thomson & Jackson, 2007:7).

According to CWMF (2008:8), Thomas and Jackson (2007:8), Skitmore and Marsden (1988:5), Ashworth (2006:62) and Rowlinson *et al.* (1999:289), the following are the factors that influence the selection of a procurement strategy:

- the project key objectives and constraints;
- the risks that could arise during the execution of the project and how best the risks could be managed (seen and unforeseen); and
- the level of complexity of the project.

3.4.1 Project key objectives and constraints

The key objectives of any project are usually identified during the project definition phase (from the project management point of view), as a prerequisite to the procurement strategy selection (CWMF, 2008:8). Davis, Love and Baccarini (2008:29) and CWMF (2008:8) posited that the key objectives of a project generally address the following:

- project scope;
- project cost – to include whole-life-costs and running costs;
- project time – including appropriate allowance for the contract duration (that is, there should be proper project programming and phasing of project milestones and target dates);
- project quality – design criteria to meet specified quality standards;
- project sustainability – considering social, economic and environmental concerns;
- project innovation – this should be encouraged, based on the performance of past similar projects, rather than making prescriptive specifications;
- involved stakeholders' needs and expectations; and
- influence of the improvement of government aims.

Constraints are aspects of a project that influence key project objectives in certain ways (Skitmore & Marsden, 1988:5). All construction projects typically have a unique constraint which may include the following:

- physical constraints – site conditions;
- programme constraints – a master programme should be developed so that the achievability of the key milestones of the project can be reviewed;
- time constraints;
- cost constraints;
- resource constraints – including availability of materials, manpower and machinery;
- skills constraints – including competence and ability of project partakers to deliver the planned project outcomes;
- market condition constraints; and
- government policy constraints.

The key objectives and constraints of a construction project need concurrent considerations as the key objectives and constraints of a project influence the planned outcome of a project and facilitate the careful selection of the most suitable procurement strategy (Davis *et al.*, 2008:30).

3.4.2 Project risks

Risks are events or occurrences, both seen and unforeseen, that could arise during the execution of a construction project and usually influence project delivery outcome (CWMF, 2008:9). Risks that could occur during the execution of a project should be allocated to the best party able to deal with the situations, as inappropriate risk allocation will likely result in project cost overruns, increasing the occurrence of contractual disputes. Therefore, both parties, after thoughtful consideration, must determine the appropriate way to deal with the identified risks before selecting a procurement strategy for the particular project (Thanh Luu, Ng & Eng, 2003:212; Skitmore & Marsden, 1988:76).

3.4.3 Level of complexity of project

According to Davis, Love and Baccarini (2008:1), Thanh Luu *et al.* (2003:215) and CWMF (2008:9), the following are the factors that determine the complexity of a project:

- project size;
- project scope;
- project duration;
- nature of the project;

- involved number of stakeholders;
- extent of technology to be incorporated into the project;
- client knowledge of construction works; and
- market conditions.

Procurement strategies are structured to suit particular project needs; hence, it is vital that a client selects the right procurement system and the right construction professionals, as adopting the inappropriate procurement system will result in detrimental, wasteful and unsatisfactory project outcomes.

2.5 Influence of contract procurement strategies on the delivery of sustainable housing.

The influence of contract procurement strategies on the delivery of a sustainable housing is hereby analysed based on key project parameters – cost (affordability), time and quality.

1) Traditional procurement method

Cost

Abdul Rashid *et al.* (2006:62) posited that traditional method of contract procurement provides cost certainty to clients at the early stage of the project; also, traditional procurement method gives clients stability of price in the sense that the design and complete working drawings of the project have been fully developed and detailed prior to tendering. Abdul Rashid *et al.* (2006:62) stressed further that the traditional procurement method eliminates design and construction vagueness that results in contractors pointlessly inflating construction sums.

Time

Traditional procurement method has the slowest delivery approach due to the linear or sequential process of activities (Olabode, 2013:6). However, Abdul Rashid *et al.* (2006:62) explained that the traditional procurement strategy is preferable to alternative strategies in the sense that it provides accountability and better design and construction control by the client: there is ample time for the client and the project team to examine and evaluate the design before construction.

Quality

Ogunsanmi (2016:12) was of the opinion that the traditional procurement method provides a high standard of quality, as it creates an opportunity for the client to syndicate the best design and management expertise between professional consultants and the contractor.

2) Design and build procurement method

Cost

Masterman (2003:68) noted that although the construction cost is fixed at the tender stage and subject to design changes, the cost incurred in construction while adopting the design and build procurement method is often higher when compared to the cost incurred using the traditional procurement method. Abdul Rashid *et al.* (2006:89) posited that lack of design and specification details during tender has allowed contractors to inflate the construction sum to cover for all uncertainties that could possibly arise during the execution of the project, unless there are variations instructed by the client.

Time

According to Griffith and Watson (2003:89), design and build procurement method is primarily referred to as the 'build-it-fast' project delivery system as the design and construction phases are integrated. Design and build method allows design and construction process to run in parallel, thereby reducing the overall construction period considerably (Abdul Rashid *et al.,* 2006:89).

Quality

The integration of design and construction allows the contractor to utilise his knowledge and experience to develop a more efficient design and construction control programme, which, as a result, allows the contractor to be innovative in improving the construction process and techniques and thereby provide a good quality standard (Turner, 1997:158).

3) Management contracting procurement method

Cost

Ramus, Birchall and Griffiths (2006:114) stressed that the cost incurred in executing construction projects with the adoption of management contracting method tends to be lower

than by using other procurement approaches, due to the fact that the cost of the project is actually the sum of prices quoted by the work contractors.

Time

Management contracting procurement method allows early commencement of construction work while simultaneously improving constructability in the sense that the management contractor has knowledge, experience and competency to effectively manage the design and construction of the project (Masterman, 2003:75). According to Turner (1997:162), management contracting procurement method allows for effective and efficient coordination of construction works and construction resources – materials, manpower and machinery – considerably reducing the construction period as compared to other procurement methods.

Quality

The management contractor is more concerned with the standard and quality of work carried out by various work contractors as the proficiency of the management contractor in selecting durable materials ensures efficient quality for the project, thus securing better project quality (Ramus *et al.,* 2006:122).

4) Construction/Project management procurement method

Cost

Ramus, Birchall and Griffiths (2006:122) opined that there is typically no fixed cost at the commencement of the project except a cost plan prepared by the quantity surveyor. During project execution phase, however, the cost plan could increase or decrease in the anticipated trajectory. Consequently, close cost monitoring must be ensured to prevent cost overrun.

Time

The entire construction work is divided into a number of smaller work packages, tendered for and constructed in accordance with the project programme. Construction work takes off as early as design information is available, taking cognisance of project duration (Masterman, 2003:65).

Quality

Construction/project management procurement method allows design change fairly late into the programme, and because of this, enhances higher work quality, provided the design change does not affect that which had already been built (Ramus *et al.,* 2006:127).

5) Direct labour/labour only procurement method

Cost

Olabode (2013:3) claimed that direct labour and labour only procurement method is a cost saving strategy, as the client purchases all the necessary construction materials from inception to completion and pays all employed labour. This way, there is usually no contractual obligation.

Time

A tendering and negotiation process is not necessary as the procedure for carrying out construction works is significantly simplified, thereby substantially reducing the construction period (Adenuga, 2013:2).

Quality

Iyagba and Idoro (1995:8) and Oladiran *et al.* (2007:16) posited that labour employed directly by clients ease client communication problems, thereby promoting an effective working relationship and environment, controlling quality.

6 Public-Private Partnerships

Cost

The close collaboration of the design and construction team results in more excogitative and less expensive designs; hence, the total cost of services rendered by construction professionals – such as supervision and reviews and contract management activities – can be abridged (Li *et al.,* 2005b:132). Private partners utilise economies of scale, excogitative technologies, procurements and compensation that are more pliant, reducing overhead, facilities maintenance or operating costs (Li *et al.,* 2005a:463)

Time

The PPP model offers both the public client and private contractor freedom to choose excogitative methods in the provision of assets and services, resulting in time saved

because it accelerates project development by avoiding unnecessary delay in project delivery (Hall, 1998:128).

Quality

The PPP model provides better quality standards on projects through improved operational efficiency and excogitation (Li *et al.,* 2005a:463).

2.6 Benefits and shortfalls of contract procurement strategies on housing project resources (materials, manpower and machinery)

1 Traditional procurement strategy

Benefits

The following are the benefits of traditional procurement strategy according to Olabode (2013:3), Woodward (2001:288) and Ramus, Birchall and Griffiths (2006:85):

- The employer controls the design team.
- The contractor is not asked to embark on significant design management risk; he is simply requested to build; hence, there is little or no premium as the price is competitively tried and tested.
- There is a single point of responsibility and the client has a direct relationship with the contractor, facilitating a high level of material, manpower and machinery functionality and improving the quality in the overall design.
- Traditional procurement method is a tried and tested method of procurement with which the construction market is familiar, providing price certainty regarding materials and machinery acquisition.
- Variations (alterations or modifications) to the contract are relatively easy to arrange and have no significant influence on construction materials, manpower and machinery.

Shortfalls

The following are the shortfalls of traditional procurement strategy according to Davis, Love and Baccarini (2008:13), Adenuga (2013:2), Mbanjwa (2004:97) and Akram *et al.* (2012:32).

- Design consultants are often not selected from a competitive tender, resulting in overly conservative design specifications and increased cost of materials and machinery.

- Separation of design and construction oftentimes leads to contractual disputes on defects in design (for which the client is responsible) and/or in materials and manpower (for which the contractor is responsible).
- Design is finalised before construction contract is let; thus, it is difficult and time consuming for the client to implement later design changes on the project.
- Overall project duration is longer than other procurement methods as the strategy is sequential; construction cannot commence prior to the completion of the design.

2 Design and build procurement strategy

Benefits

The following are the benefits of design and build procurement strategy according to Gordon (1994:197); Clamp, Cox and Lupton (2007:67); Kumaraswamy and Dissanayaka (1998:27) and Turner (1997:155):

- Overlap of design and construction activities can cause a reduction in project time and improve constructability due to the contractor's input into the design.
- Use of a guaranteed maximum price (GMP) with a savings option split can stimulate excogitation and reduce project duration and project cost associated with construction materials, manpower and machinery.
- The financial commitment of the client is made from the outset, so price certainty is obtained before construction starts. Client requirements are clearly stated and changes in design are not introduced.
- Single point of responsibility is provided. Client deals with one firm, thereby reducing the project duration by eliminating the commitment of materials, manpower and machinery to contracting designers and contractors separately.
- Close inter-communication between contractor design and construction team promotes cooperation in achieving smooth execution of the contract and prompt resolution of site problems.

Shortfalls

The following are the shortfalls of the design and build procurement strategy according to Hughes *et al.* (2006:7); Ramus, Birchall and Griffiths (2006:72); Songer, Molenaar and Robinson (1996:73); Turner (1997:156) and Akram *et al.* (2012:34):

- Difficulties can be experienced by the client in preparing an adequate and appropriately comprehensive brief as a client's changes to project scope and construction resources can be expensive.

- If the contractor's organisation is relatively small, it is unlikely he has as much expertise on design as he has on construction, and as such, the resulting building could be aesthetically less acceptable.
- The client has no assurance of value-for-money on the either project or associated construction resources unless he employs independent advisers, thereby increasing project costs.

3 Management contracting procurement strategy

Benefits

The following are the benefits of management contracting procurement strategy identified by Ashworth (2006:57), CWMF (2008:10), Hughes *et al.* (2006:8) and Davis, Love and Baccarini (2008:17):

- The client deals with a single entity, enhancing improved coordination and collaboration between designers and constructors and effective utilisation of construction materials and machinery.
- There is high time-saving potential on the overall project duration, as design and construction activities overlap.
- Work packages can be let competitively at current market prices.
- Roles, risks and responsibilities of all parties are clear and quality can only be controlled by the design team.
- Design changes are flexible as the management contracting strategy allows great scope for client changes.
- The preliminaries (machinery) and management fee can be fixed, affording a degree of price certainty.

Shortfalls

The following are the shortfalls of management contracting procurement strategy identified by Ashworth (2006:57), CWMF (2008:10), Hughes *et al.* (2006:8) and Davis, Love and Baccarini (2008:17):

- Management contracting procurement strategy is a low risk strategy for the management contractor as there is little responsibility for package contractor default or bankruptcy.

- Although guaranteed maximum price (GMP) can be achieved on construction resources, management contracting procurement is still prime cost in nature as it is an approach that most contractors prefer.
- There can be substantial cost increase as there is oftentimes a tendency for the initial cost plan to be adjusted upwards.
- Close collaboration and information control is required as a client must provide a good quality brief to the design team as the design will not be complete until total construction resources (materials, manpower and machinery) have been committed to the project.

4 Construction/Project management procurement strategy

Benefits

The following are the benefits of construction/project management procurement strategy as stated by Ashworth (2006:66), Rowlinson (1999:284), Walker (2015:284) and Masterman (2003:66):

- There is reduced confrontation between the design team and the construction team.
- Detailed design runs parallel with construction, shortening project duration.
- Privacy of contract between the client and each of the trade contractors provide the client with a readier means of redress in the event of delays arising.
- Client has ownership of tendering and contractual arrangement.
- There is full opportunity to package the work to suit the capability of the trade contractors and to manage on-site interfaces, including construction materials, manpower and machinery.
- Client has the authority to identify and act upon poor trade contractor performance.
- Construction/project manager focuses more on construction programme, sequencing and ‘buildability’.

Shortfalls

The following are the shortfalls of construction/project management procurement strategy as stated by Ashworth (2006:66), Rowlinson (1999:284), Walker (2015:72) and Masterman (2003:66):

- Close cost monitoring and management are critical as there is typically no fixed cost at the start of the project except a cost plan prepared by the quantity surveyor, so as

the tenders come in during construction, the project cost may move above or below an anticipated trajectory.

- The client bears the highest risk associated with design, including the impact of late or incomplete and uncoordinated design.
- The client's financial commitment is uncertain until the last of the work contract is signed.
- The client has a larger number of contractors to deal with instead of only one main contractor.

5 Direct labour/Labour only procurement strategy

Benefits

The following are the benefits of direct labour/labour only procurement strategy highlighted by Oladiran *et al.* (2007:17), Adenuga (2013:22), Saha and Hardie (2010:38) and Ogunsanmi (2016:27):

- There is enormous financial saving on construction materials and manpower and on the project as a whole.
- Project rules, conditions and effective utilisation of construction resources are set by the client.
- Work hours are clearly defined.
- Quality control is closely tracked.
- The labour employed provides positive input, knowing the client's specific needs.

Shortfalls

The following are the shortfalls of direct labour/labour only procurement strategy highlighted by Oladiran *et al.* (2007:17), Adenuga (2013:22), Saha and Hardie (2010:38) and Ogunsanmi (2016:27):

- It is time consuming and extremely stressful.
- It serves as a minefield for the inexperienced.
- Materials, manpower and machinery must be provided by the client.
- Control of productivity by the client is difficult.

6 Public-Private Partnership procurement strategy

Benefits

The following are the benefits of public-private procurement strategy highlighted by Hall (1998:128), Watermeyer (2012:228) and Li *et al.* (2005b:139):

- PPP procurement strategy improves 'buildability' and maintainability.
- It accelerates project development, saving time in delivering the project.
- PPP benefits local economic development through the transfer of technology to local enterprises.
- PPP facilitates creative and innovative approaches, thereby enhancing government integrated solution capacity.
- PPP reduces public money tied up in capital investment by solving the problem of public sector budget restraint.

Shortfalls

The following are the shortfalls of public-private procurement strategy highlighted by Hall, (1998:128), Watermeyer (2012:228) and Li *et al.* (2005b:139):

- Much management time is consumed in contract transaction, reducing project accountability.
- It imposes an excessive restriction on participation as high participation costs are incurred.
- There could be confusion on government objectives and evaluation criteria leading to high project costs.
- The private sector bears the highest risk.

Previous studies and practical stance established that project performance is based on the key project parameters – cost, time and quality; therefore, in practice, a project is considered successful if the involved construction stakeholders are satisfied with the project when delivered on time, within budget and to specified quality. The literature identifies a performance relationship between contract procurement strategies, stakeholder satisfaction, selection criteria, factors influencing the selection of a procurement strategy, and the benefits and shortfalls of the procurement strategies with regard to construction projects. Advice from independent construction professionals on the adoption of an appropriate contract procurement strategy that best suits project needs should be sought, to enhance successful delivery of construction projects.

Figure 2.12 presents the theoretical background of this research. The figure presents the contract procurement strategies/methods used for housing projects delivery in the construction industry. The theoretical framework elaborates the conceptual framework of the study (figure 1.1) and explains the objectives of the research to achieve the aim of the study. The effectiveness of contract procurement methods used for housing projects delivery, the processes of selection of a contract procurement strategy, the factors that influence the selection of a contract procurement method and the benefits and shortfalls of the methods were identified, examined and analysed through review of relevant literature. The influence of the contract procurement methods on project cost, time, quality and stakeholders' satisfaction was also examined.

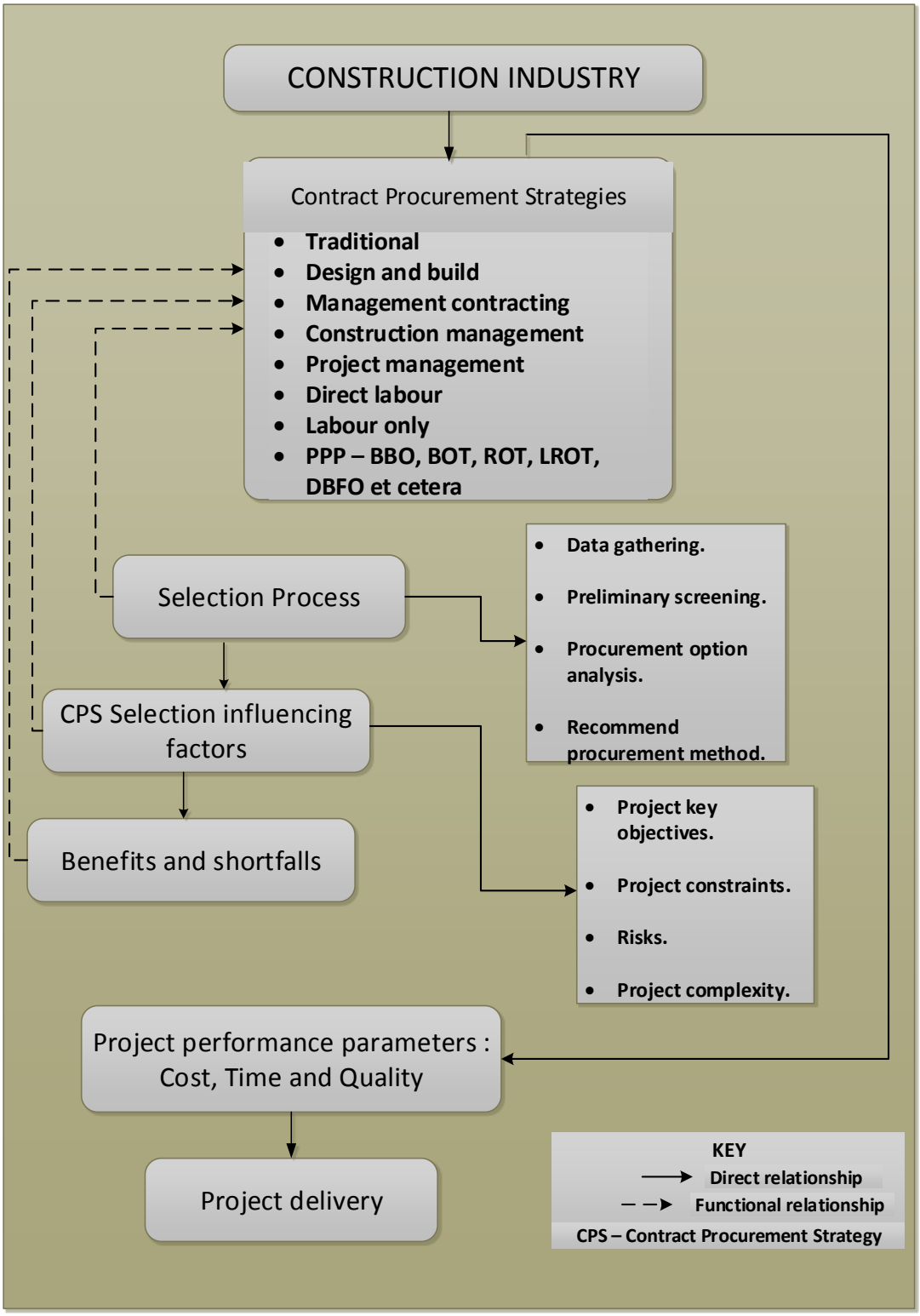

Figure 2.12: Theoretical framework

2.7 Chapter summary

This chapter presents the review of literature on subjects associated with contract procurement strategies. The literature review revealed prevalent contract procurement strategies selected for housing projects. This chapter encapsulates the effectiveness of each of these contract procurement strategies used for housing projects, the process of selection of a procurement strategy, the factors influencing the selection of a procurement strategy, the influence of contract procurement strategies on the delivery of a sustainable housing in terms of cost, time and quality, and the benefits and shortfalls associated with each procurement strategy on housing project resources. Taking cognisance of the tremendous contribution of the construction industry to economic, environmental and social development in South Africa and other parts of the world, it is advised that clients adopt an appropriate procurement strategy that best meets project objectives to achieve best value-for-money on construction products.

CHAPTER THREE

RESEARCH METHODOLOGY AND DESIGN

3.1 Introduction

Based on research objectives, the previous chapter included a review of literature to provide theoretical underpinning towards achieving the aim of the study; now, this chapter presents the research methodology and methods adopted for data collection and analysis. Additionally, this chapter addresses the types of research methods and the specific research design adopted for this study.

3.2 Research philosophies

A significant research philosophy in social science involves generation and testing of hypotheses by proving and disproving data (Neuman, 2002:78). Greene (2006:93) described *research philosophy* as the development and nature of a particular knowledge, as the philosophical position of research guides and justifies the researcher's belief and theoretical decisions. Biggam (2015:136) identified the pillars of the philosophical position of research as follows:

- positivism (realist); and
- interpretivism

3.2.1 Positivism

Positivism, according to Biggam (2015:136), is the terminology used to describe the quantitative characteristics of research as the positivist research is qualified by the ability of the researcher to test hypothesis derived from existing theories, through observations and measurements of social realities. Neuman (2002:82) defines *positivism* as a research paradigm that is based on scientific knowledge or experimental test without influencing human participation. Neuman further describes *positivism* as a research paradigm or framework that involves a deductive approach with an accurate measurement of qualitative data that allows for discovery and confirmation of casual laws to permit the prediction of human behaviour. However, Struwig and Stead (2001:158) assert that not every feature of

quantitative research should be attributed to positivism. Henn *et al.* (2009:27) identified the following as the logic of the positivist research philosophy:

- seeking to recognize processes of causes and effect of phenomena, and to test theories;
- knowledge based on what can be tested by observation of tangible evidence; and
- researchers using scientific method, emphasising control, objectivity and standardisation.

Biggam (2015:98) argued that positivist research is influenced by human participation and observation based on the idea of acquiring quantifiable research data; therefore, the idea involves the adoption of quantitative methods such as questionnaires, experiments, interviews and statistical analysis that is dependent on participants' responses as human participation is inevitable. Kumar (2005:47), Eriksson and Kovalainen (2015:24), and Saunders, Lewis and Thornhill (2011:106) asserted that the simple and significant philosophical positions of positivist research is the knowledge derived, based on results obtained from the application of scientific methods to test observations and hypothesis, as the research aims at examining causes and effects of a particular phenomenon and proffering solutions.

3.2.2 Interpretivism and constructionism

Eriksson and Kovalainen (2015:28) stated that the *interpretivism* of research is described as a philosophical stance aimed at interpreting and understanding the theoretical content of data by adopting social sciences principles. Furthermore, the authors posited that the philosophical background of interpretivism research is based on interpretive or explanatory phenomenology to give subjective meanings to an objective phenomenon; hence, the interpretivist concern is the adoption of unstructured qualitative approach in data collection that includes detailed interviews with the participants. Henn, Weinstein and Foard (2009:28) added that the main focus of a researcher is to understand, interpret and provide meanings to social realities.

Kumar (2005:153) provided four assumptions of the interpretivism philosophy of research:

1. interpretivism philosophy exhibits a critical position and examination on forgotten, hidden or undiscovered knowledge (objective information);
2. the knowledge acquired is sustained by qualitative methods and social relationship with participants;
3. subjective knowledge and social processes and actions are relative; and

4. languages used for interpreting data are derived from social interaction with the participants at a particular location and period.

The fundamental idea of the interpretivist research paradigm is to work with subjective meaning already in the social world by acknowledging its existence, reconstructing the meaning, avoiding distortion, understanding the meaning incorporated as building stones for theorising (Goldkuhl, 2012:135). This research combines the positivist and interpretivist approaches as reflected in the research method of the study.

3.3 Research methodology

Research methodology is defined as all-encompassing macro frameworks that offer principles of reasoning associated with paradigmatic assumptions that validate various schools of research (O'Leary, 2013:110). Hall (1996:29) asserted that the philosophy and the general principles for conducting a research are termed 'Research Methodology'. Leedy and Ormrod (2010:6) described *research methodology* as a holistic process of acquiring, analysing and interpreting data with the aim of reaching a conclusion that widens the knowledge of a study. They further delineated the primary functions of research methodology as follow:

- to set a standard for data collection; and
- to gather the data collected in proper sequence and interpret them.

Research is cyclical in nature, entailing a couple of conditional and coherent steps in providing a comprehensive solution to the research questions (Collis & Hussey, 2013:68). The major concerns of a researcher in designing methodology to solve research problems, according to Biggam (2015:114), are listed below, highlighting the relationship between the research methodologies, data collection methods and techniques of data analysis:

- what data to be collected (concept of research);
- why data should be collected (significance of research);
- from whom to collect data (target population);
- when data will be gathered; and
- how data will be analysed.

The general principles of research methodology, although not exhaustible, are described in this section, while the specific method adopted for this research is presented in the research method of the study.

3.3.1 Quantitative research method

Quantitative research is a methodical process of using numerical data from a selected sample group of a population to generalise the findings to the study population (Pietersen & Maree, 2007a:145). Kothari (2004:30) posited that the measurement of quantities, numbers and amounts is fundamentally quantitative research; thus, the quantitative research method adopts the use of statistical analysis with results presented numerically. Similarly, Thomas (2003:52) opined that the qualitative research method allows researchers to obtain generalisable and foreseeable results from a large population within a short time and at minimum cost as the research method allows for significant indicators of credibility such as validity, reliability, generalisability, and reproducibility. However, O'Leary (2013:112) posited that the qualitative research method is usually considered an objective positivist undertaking with a large scale but little depth. Furthermore, Maree and Pietersen (2007a:145) buttressed that quantitative research method is characterised by three major elements:

- objectivity;
- numerical results; and
- generality.

The quantitative research method is a goal-oriented process of research that asserts inter-subjective realities as a standard for quality assurance (Thomas, 2003:53); hence, collection of quantitative data frequently involves the use of a close-ended questionnaire or checklist as this presents respondents with clear questions and answers in line with research objectives (Creswell & Clark, 2007; Dahlberg, 2010:28). Notably, Leedy (2010:179) identified the following methods for conducting a quantitative research:

- theoretical studies;
- descriptive research;
- developmental studies (case studies and surveys); and
- correlational studies.

To formulate questions in a quantitative research, Flick (2011:7) identified the following as fundamental concerns:

- the researcher's understanding on formulating questions;
- the kind of questions to be posed; and
- the actual questions to be posed.

In a like manner, Dahlberg and McCaig (2010:160) asserted that the following vital points be noted by a quantitative researcher:

- what to ask;
- why to ask;
- whom to ask;
- how to ask; and
- what the answer is.

The following are the advantages and disadvantages of quantitative research, as identified by Flick (2011:12) and Kumar (2005:155):

3.3.1.1 Advantages of quantitative research method

- The results obtained have a high degree of *generalisation*.
- The quantitative approach allows the study of a large number of cases for certain aspects in a relatively short time.
- The design of quantitative research is specific, well-structured and clearly defined and recognised.
- The quantitative approach possesses clarity and distinction between design and method of data collection.

3.3.1.2 Disadvantages of quantitative research method

- The aspects of research studied are not inevitably the relevant aspects of the participants.
- The distance between the researcher and the study population is relatively wide.
- The respondents may interpret questions differently from each other.

3.3.2 Qualitative research method

Qualitative research is an extensive method of research that encompasses several approaches, techniques and philosophies demanding inductive and deductive logic, embracing subjectivity, accepting multiple perspectives of realities, and recognising the power of search on both participants and researchers (Leedy & Ormrod, 2005:133). O' Leary (2013:114) explained that the qualitative research method is typically characterised by small numbers and in-depth cases. The qualitative research method involves the adoption and collection of different empirical data, including observational, interviews, life story and historical studies (Creswell & Clark, 2007:6). Moreover, qualitative research is a holistic process of eliciting in-depth descriptive data regarding a certain phenomenon with the aim of improving knowledge (O'Leary, 2013:114). Likewise, Flick (2011:12) posited that the qualitative research method is basically concerned with acquiring an intense understanding of the social, cultural and behavioural patterns of people in an environment by interacting with the participants of the study. Qualitative researchers demonstrate a common belief that

the research approach provides a more in-depth understanding of phenomena than the quantitative methodological approach (Silverman, 2016:56).

Qualitative research methodology is an 'umbrella term' that houses and reveals the relationship between a range of research paradigms (Nieuwenhuis, 2007:47) including ontology, epistemology, nomothetic, positivism and ethnography (Nieuwenhuis, 2007:76). However, Butler-Kisber (2010:13) argued that despite the advantages of the qualitative research method, researchers are still faced with research challenges that include the following:

- validity of results (trustworthiness);
- generality of results (vague and indefinite results);
- reflexivity of researcher;
- access and consent (participants' endorsement);
- voice interpretation (interpretation of participants' voices for authenticity and ethical purposes); and
- transparency.

The advantages and disadvantages of qualitative research as identified by Flick (2011:14) and Kumar (2005:156) are as follows:

3.3.2.1 Advantages of qualitative research method

- As the qualitative research method allows for detailed and exact analysis of a few cases, participants have more freedom to determine issues that are relevant in the context.
- The strength of qualitative research is the ability to study phenomena in-depth.

3.3.2.2 Disadvantages of qualitative research method

- The design of qualitative research projects are less specific, lacking in consistent structural depth.
- The analysis of qualitative data consumes more time with generated results not broadly generalisable.

3.3.3 Mixed method research

Mixed method research is the adoption of philosophical assumptions in the collection and analysis of both quantitative and qualitative data in a single research work (Creswell & Clark, 2007:5); hence, the implementation of this combination of quantitative and qualitative research methods provide a better understanding of the research focus (Creswell & Clark, 2007:5). Mixed method research increases the researcher's chance of achieving valid research results in the sense that one method overrides the mistakes of the other method,

thereby eliminating personal bias. Creswell and Clark (2011:4) posited that mixed method research enhances the integration of practical and theoretical perspectives that challenged the quantitative and qualitative method separately. Researchers choose to adopt a mixed methodological approach in the interest of combining quantitative and qualitative research pragmatically, with the aim of compensating the paradigmatic shortcomings in the different two approaches (Flick, 2011:12). Creswell and Clark (2007:9) stated the following as the importance of integrating both qualitative and quantitative research methods:

1. Mixed method research avails answers to questions that the qualitative or quantitative approach cannot answer unassisted.
2. Mixed method research gives the researcher an extensive view of the study.
3. Mixed method research encourages the researcher to utilise various paradigms associated with qualitative and quantitative research method.

Similarly, O'Leary (2013:116) suggests that the strategies of mixed method research are basically designed in three ways:

1. **Using a quantitative perspective with acceptance of qualitative data:** researchers who use this method accept more of the underlying assumptions of the quantitative approach but also accept that qualitative data might be helpful to validate the study.
2. **Using a qualitative perspective with acceptance of quantitative data:** researchers who adopt this methodological approach believe in quality rather than quantity, and hence subscribe more to the underlying assumptions of the qualitative traditions.
3. **Using a question-driven perspective:** researchers neither select this approach for quantitative nor qualitative interest areas; rather, researchers choose this approach because it favours the adoption of an examination of research questions and best answers the questions, irrespective of the research paradigm.

Conversely, in spite of the advantages of the mixed method research, Creswell *et al.* (2011:8) asserted that researchers are faced with several challenges:

1. Mixed method research requires an intricate data collection process.
2. The process of collecting and analysing multiple data is time and resource consuming.
3. Mixed method research requires multidisciplinary, specialised teamwork for data interpretation.

3.4 Research approach

3.4.1 Deductive approach

Walliman (2011:20) asserted that the *deductive approach* to research was initially masterminded by the ancient Greeks and afterwards modified by Aristotle, through the use of deductive syllogism. The author further explained that the deductive approach to research comprises logical arguments and valid reasoning that commence with general statements with the intent of attaining a specific conclusion. Dahlberg and McCaig (2010:28) opined that the deductive research approach involves the process of generating hypothesis from a general statement to reach a precise, explicit and clearly defined conclusion (a '*top-down' research approach*). In addition, Bryman (2015:44) posited that the results from a deductive research approach are obtained by testing hypotheses derived from experiment and observation rather than theory; therefore, the principles of the deductive approach can be adapted in qualitative research.

3.4.2 Inductive approach

The *inductive research approach* is mostly used in scientific research as it involves starting with a specific observation or survey and deriving general conclusions as results afterwards (Walliman, 2011:25). The approach is a '*bottom up' research approach* that contributes to comprehension of reality first and ultimately produces a theory (Mouton, 1996:77). The inductive research approach, as compared to the deductive approach, provides a particular quality or character to a general known truth about a theory, so the validity of the results is dependent on the strength of supporting evidences (i.e. the stronger the supporting evidence, the more likely the conclusions established are valid) (Mouton, 1996:77). However, Walliman (2011:37) argued that an inductive (generalised) result can only be regarded as valid if it meets the following conditions of inductive research approach:

1. a large population size for observation or survey;
2. an observation or survey coordinated repeated under different conditions; and
3. observed empirical data obtained corresponding with the general results.

3.4.3 Inductive/deductive approach

The *inductive/deductive research approach* is a combination of observatory reasoning and logical argument in research involving the process of developing and testing hypotheses to form a basis for potent additional knowledge (mostly scientifically-based) (Walliman,

2011:42). Noteworthy, the knowledge acquired after being tested can either be accepted or rejected, based on the aim of the research, as the combination of deductive/inductive research approach indicates the process of seeking valid result statements from the opposing schools of thought (Mouton, 1996:79).

Henn *et al.* (2009:32) opined that in a scientific research, researchers are required to start the research process with an inductive exploratory study to generate hypotheses that will be tested using the deductive exploratory approach to reach a valid conclusion, thereby, adopting the principles of both qualitative and quantitative methodology for research.

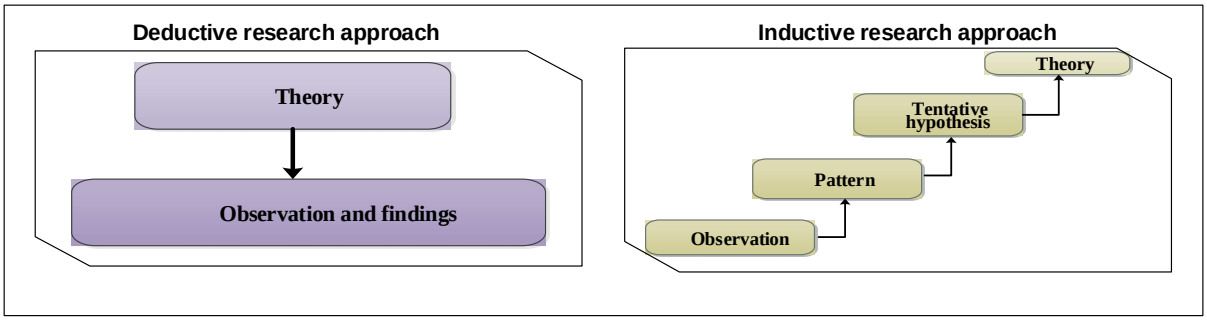

Figure 3.1: Deductive and Inductive research approach

(Source: Bryman, 2015)

3.5 Research strategies

Literature has revealed quite a number of research strategies for the adoption of qualitative, quantitative and mixed method research (Leedy & Ormrod, 2010:182; Walliman, 2011:40). These research strategies include case studies, structured interviews, phenomenological study, historical research, action research, experimental studies and theoretical research studies (Biggam, 2015:17; Bryman, 2015:46; Leedy & Ormrod, 2010:182; Creswell, 2011:13; Walliman, 2011:40)

3.5.1 Survey research

Pietersen and Maree (2007a:148) asserted that survey research is a systematic process requiring the selection of respondent samples by the researchers before the survey tools are administered (questionnaires or conducted interview) for data collection, based on values, beliefs and views. Similarly, O'Leary (2013:117) defined *survey research* as "the process of data collection by asking a selected number of individuals the same questions based on their characteristics, attitude, and ways of living or opinion through a questionnaire administration". Survey research is undertaken purposely to provide the researcher with

statistical information, either on particular subjects/challenges that require improvement or to test the robustness of an existing theory (Henn *et al.*, 2009:32). Noteworthy, the volume of information derived from survey participants is vital in determining the validity and reliability of the study (Dahlberg & McCaig, 2010:30).

Cohen, Manion and Morrison (2013:44) and Henn *et al.* (2009:32) expressly stated that the basic aim of the survey research is to "explore, understand and interpret phenomenon that exists presently". A survey researcher chooses the kind of population that best suits an investigation of the research topic, formulates a research instrument and devises a means of administering the instrument (Bryman, 2015:47). Dahlberg (2010:30) explained that the generalisation of research results in any study is dependent on the response rate of the research population; hence, survey research is characterised by the following as posed by Pietersen (2007a:149):

- large sample size;
- numerous variables measured to generate related hypothesis for testing; and
- generalisable results.

3.5.1.1 Cross-sectional studies

Cross-sectional study involves an observation of a study sample or cross section of a population or phenomenon that exists at a particular time (Babbie, 2015:243). Descriptive and exploratory studies are often cross-sectional in nature as this kind of research is undertaken for the purpose of obtaining variation in respect to people, organisations or event population (Pietersen & Maree, 2007a:149). Bryman (2015:48) was of the view that data obtained through a cross-sectional study may be validated by pre-testing, allowing for intervention and post-testing after days, weeks, months or years, to derive the needed variation in the study.

3.5.1.2 Longitudinal studies

Longitudinal studies are concerned with the observation of the same sample or phenomenon over an extended timeframe (Babbie, 2015:248). A significant quality of longitudinal studies is that the observer is involved for a specific period of time; therefore, changes and relationships can be observed (Bryman, 2015:48). Longitudinal studies are suitable for collecting data to derive factual information on a continuous basis (Walliman, 2011:48).

3.5.2 Experimental designs

O' Leary (2013:119) explained that *experimental design* requires researchers to purposely vary an independent variable (key determinant of the study) in determining the impact on the

dependent variable (the main object of study inquiry). The designs comprise goal-directed acts performed upon study groups for the purpose of analysing the impact of one on the other (Flick, 2011:17). Experimental design involves at least two experimental groups. Kumar (2005:160) enumerated challenges inherent in the experimental design:

- matching increase in difficulty when carried out on more than one variable;
- variables that are hard to measure, such as opinion or attitude, posing a challenge; and
- choosing a variable to serve as the basis of matching is sometimes challenging.

3.6 Historical research

Leedy and Ormrod (2010:186) defined *historical research* as an effort undertaken by a researcher to interpret historic events through the collection and analysis of relevant historic documents or oral histories. *Historical research* is a systematic holistic process of describing, analysing and interpreting past scenarios based on information derived from a selected population (Pietersen & Maree, 2007a:152). Similarly, Walliman (2011:50) explained historical research as a systematic and objective process of locating, evaluating and integrating research findings to reach a factual conclusion derived from past events. Walliman (2011:50) categorised the following as the importance of historic research to the researcher:

- It helps provide solutions to contemporary problems that occurred in the past.
- It stresses the relevancies and defects of interfaces in the culture of a selected population (asking '*why'* and '*how'* things happened).
- It provides an opportunity for the reappraisal of past collated data supporting theories, hypothesis or generalised conclusion to give further insight to present and future trends.

Historic research requires the researcher to give critical, analytical scrutiny of minutes, reports or documents about events or incidents (Nieuwenhuis, 2007:55). Niewenhuis further enumerated the following as the four types of historic research that are useful in general survey:

- the primary source (archived documents or other original sources);
- the secondary source (works of other scholars on the focus of the study);
- running records (documentaries maintained by organisations); and
- recollection (including oral histories and autobiographies).

3.7 Action research

An *action research* is denoted by Leedy and Ormrod (2010:188) as an applied research that is aimed at finding solutions to the indigenous problems of a specific group of people by using communal resources. McNiff and Whitebread (2011:10) described action research as "a form of analysis conducted by professional practitioners to evaluate and improve the existing work practices by resolving issues relating to their job". The fundamental aim of an action researcher as a mediator is to assist in planning and implementing effective solutions to problems suffered by participants; thus, action research is directed by the desire to take an action to improve a practice or resolve an issue (Nieuwenhuis, 2007:57).

Dahlberg (2010:42) posited that the main purpose of action research is to enable changes and to learn from experience. However, to successfully conduct action research, it is necessary that the researcher possess the ability to understand and interpret the problems faced and to proffer possible solutions (Kumar & Phrommathed, 2005:165). Notably, Ebersöhn, Eloff and Ferreira (2007:124) enumerated the following as characteristics of action research:

- Action research seeks to derive solutions to practical problems.
- It is aimed at effecting a change.
- It is an interactive strategy for knowledge development.
- It is a cyclic research process of planning, solution implementing and reasoning.
- It requires the participation of the research sample and the researcher.

3.8 Comparative research

Comparative research is a systematic process of search for the similarities and differences between phenomenon, over a specific period of time (Nieuwenhuis, 2007:58). Comparative research the process of defining research concepts, itemising the concepts as operational variables and generating the hypothetical relationships between the variables before carrying out a test on hypothesis (Yanow, 2014:132). As a result, it is necessary for a comparative researcher to compare the experiences of different people, from different backgrounds, based on situations at a particular time (Nieuwenhuis, 2007:58). Notably, Nieuwenhuis (2007:58) claimed that comparative research proffers first-hand accounts of events that are usually reported by the observers. He explained further that the content of information derived from comparative research is valid if it is not forgery or exaggerated facts.

3.9 Case study research

Case study research describes a unit of investigation that is studied at different levels by individuals within a community, group of people, organisations or phenomenon (Henn *et al.*, 2009:40). Case study research can involve the study of a single case, comparative studies (multiple cases) or respective studies, using historical sources, documentation and interviews (Flick, 2011:25). Barbour (2001:1115) has argued that the adoption of a single case study is significantly advantageous because of the possibility to closely scrutinize the case that is being studied. Arguably, Bryman (2015:52) posited that qualitative research may be comparatively suitable for a case study, due to the characteristics of the qualitative research to provide an in-depth study.

Nonetheless, Walliman (2011:52) opined that both qualitative and quantitative research approaches may be adopted for case study research.

3.10 Research design

Research design essentially implies the plan or strategy for conducting a research (Henn *et al.*, 2009:47). The design of research entails explaining the processes to plan for data collection and analysis, and to select empirical material (situation, cases and individuals) in order to provide answers to research questions within the time and resources available (Flick, 2011:27). Silverman, (2016:60) contended that rather than adopting the most attractive research design, research design should involve careful consideration of the appropriate research approach capable of providing answers to research questions in a valid, objective, accurate and economical method. Henn *et al.* (2009:47) identified three necessary qualities of research design as follows:

- The research design should be adequately structured.
- The method should be sufficiently reliable.
- The research design should aim to generate large scale, statistically-based studies.

Kumar (2005:168) maintained that competent research design provides adequate answers to the following questions:

- Who will constitute the study population?
- How will the study population be identified?
- Will a sample or the whole population be selected?
- How will a selected sample be contacted?
- What method of data collection will be used, and why?

- In the case of questionnaires, where will the responses be returned?
- How should respondents contact the researcher in case of queries?
- Where will interviews be conducted?
- How will ethical issues be addressed?

3.11 Research design for this study

Quite a number of research has been conducted over the years to evaluate and establish the contract procurement strategy most appropriate for housing project delivery in the construction industry, with the majority of research studies conducted to assess each strategy and establish the most appropriate procurement strategy for housing project delivery focusing mainly on clients achieving best value-for-money from their projects (Ashworth, 2006:65). Mathonsi and Thwala (2012:3583) highlighted the relevance of the architects, quantity surveyors, engineers and builders in an effort to promote best value-for-money for construction clients through advising the adoption of a procurement strategy that best addresses project objectives. However, the construction industry has yet to reach a consensus on the most appropriate strategy for contract procurement for housing projects. So a comparative analysis of identified contract procurement strategies within the construction industry must be conducted (Mathonsi & Thwala, 2012:3583).

This research adopted a mixed method approach to examine and establish the contract procurement strategies for housing project for the enhancement of housing sustainability, as the mixed method research approach aided the exploration of the perceptions of construction professionals on an appropriate procurement strategy that best addresses project objectives. A mixed research design, as explained, is a combination of the quantitative and qualitative research approaches. The mixed method approach was adopted for this study because it provides a broader and more complete perception of a phenomenon than either approach would separately (Leedy & Ormrod, 2010:190). The research design was adopted specifically because of the nature of the study to facilitate the success of the study. Most importantly, considering that the study is aimed at examining the contract procurement strategies for project delivery implemented in the construction industry and the results to be applied in enhancing housing sustainability, stakeholder satisfaction in terms of cost, time and quality is largely considered.

The quantitative method was used to collect data from construction professionals (consultants, contractors, architects, quantity surveyors, builders and engineers) to compare the effectiveness of the contract procurement strategies, and the factors influencing the

selection of a suitable procurement strategy. The qualitative method was adopted to evaluate the enhancement of housing sustainability, and to assess the influence of contract procurement strategies on construction stakeholder satisfaction in terms of cost, time and quality of housing projects in the construction industry. The research data were obtained with the aid of a structured questionnaire survey (quantitative method) that was validated by conducting semi-structured interviews (qualitative method) shortly after the questionnaire survey. The researcher purposely adopted the quantitative method with the intent of attaining reliable and generalisable conclusions.

3.11.1 Exploratory study

An exploratory study is an essential part of a research questionnaire design for gaining more insight into the research problem and to provide solutions (Dahlberg & McCaig, 2010:51). The questionnaire was the major data collection instrument used for the exploratory study. Prior to the exploratory study, the research instrument (questionnaire) was pre-tested amongst research post graduate students in the department of Construction Management and Quantity Surveying, at the Cape Peninsula University of Technology, and construction professionals to certify the relevance of the chosen research instrument. Neuman (2002:85) explained that the distribution of pre-test or pilot study questionnaires will improve the reliability of research work.

The exploratory study was undertaken to elicit the perceptions of construction professionals concerning the relevance of the research subject to the South African construction industry. The input of construction professionals through the questionnaires administered and interviews conducted resulted to necessary adjustments in the formulation of the main questionnaire to better achieve the purpose of the research. The process of questionnaire modification involved rephrasing research questions, removal of irrelevant questions, addition of relevant questions and overall restructuring of the research questionnaire. The pilot study undertaken aided the researcher in justifying the relevance of the research subject, the relevance of variables contained in the research questionnaire, and better acquainted the researcher with interview procedures.

Adler and Clark (2007:44) argued that undertaking practice interviews enhances interviewer preparation for the actual experience of developing conversation generators. The questionnaires retrieved from the sample population from the exploratory study were analysed using Statistical Package for the Social Sciences (SPSS) software 24.

3.11.2 Population and sample size

O'Leary (2013:120) defined *population* as the total unit of a particular class or group from which a sample is drawn. Bryman (2015:52) further described a *population* as a collection of people, items or animals considered for a research study, as the term *population* does not out-rightly refer to a group of people being considered for the study, but varies depending on the nature and field of study. The population of this study is comprised of contractors, architects, quantity surveyors, engineer and builders in the South African construction industry. Taking the large population size into consideration, a sampling technique was used to select respondents for the study. Flick (2011:34) explained that the sample of any population in research is a minimised depiction of the population. However, for the purpose of result validity and generalisation in qualitative research, it is considered that the larger the sample size, the higher the possibility of achieving the aim of the research unbiased (O'Leary, 2013:120).

The construction professionals who constitute the research sample as previously mentioned, directly or indirectly contribute to the factors that influence the selection of an appropriate contract procurement strategy for housing projects; therefore, the study sample is unarguably a suitable representation of construction stakeholders in South Africa.

3.11.3 Sampling technique

O'Leary (2013:141) described the process of selecting elements of a population to be included in research as *sampling.* Pietersen (2007b:37) buttressed that *sampling* is the process of making random selection from a population to derive a generalised finding from the entire population. When conducting sampling, it is important that how well a sample represents a population is dependent on the sampling design, sample size and sample frame (Leedy & Ormrod, 2010:182). Leedy and Ormrod explained further that a *sample frame* is a set of people likely to be selected depending on the sampling technique adopted.

Considering the complex nature of the construction industry in terms of operations, management and geographical distribution, construction professionals have been observed to operate on a very busy schedule; thus, construction professionals in Cape Town were selected by the adoption of "simple random sampling and convenience sampling technique". Biggam (2015:25) and Pietersen (2007b:42) defined *simple random sampling* as a subset of individuals (a sample) chosen from a larger set (a population) for data collection and result generalisation. The authors further explained that a simple random sample is an unbiased surveying technique. As aforementioned, taking into account the accessibility of construction sites and availability of construction professionals as a result of their busy

schedule, the questionnaires were hand administered to construction professionals in Cape Town. The simple random sampling technique was adopted in this phase of questionnaire administration for easy generalisation of findings.

Then, construction site supervisors were interviewed to validate the data obtained from the questionnaires. The construction site supervisors were selected for interviews using the convenience sampling technique. The interviews were conducted with the aim of determining the appropriate contract procurement strategy effective for housing project delivery toward enhancing housing sustainability. Biggam (2015:22) defined *convenience sampling* as a technique implemented in an exploratory research to derive ideas and insights based on facts that are conveniently available to the researcher. Convenience sampling, as the name implies, is a quick and inexpensive approach in research to validate information obtained in the course of the study (Pietersen & Maree, 2007a:45).

3.11.4 Data collection techniques

Data collection techniques entail the process of exploring a range of data sources to gather information for a research study (Struwig *et al.*, 2001:116). The choice of data collection technique adopted for a research study is directly dependent on the sample frame, nature of the sample, research topic and the facilities available for data collection (Leedy & Ormrod, 2010:210). The data types that are collected in a research study are both secondary and primary data (Struwig *et al.*, 2001:116). A *triangulation data collection technique* was adopted for this research (i.e. data was not collected through questionnaires alone but also through interviews and a literature review). Thomas (2003:57) explained that the process of triangulation views a research problem from different perspectives by using various data collection methods rather than just one. Literature reviews, questionnaires and interviews were used to obtain data for this study as subsets of secondary and primary data collection.

3.11.4.1 Secondary data collection

Secondary data are data available and readily accessible and obtained from research conducted by other researchers (Struwig *et al.*, 2001:119). Both quantitative and qualitative research adopts secondary sources as a method of data collection (Dahlberg & McCaig, 2010:53). The secondary data collection for this study was obtained through the review of past and present literature. Kumar (2005:170) asserted that a review of literature serves to improve and consolidate the researcher's knowledge base and assists in integrating the findings with the existing body of knowledge. Dahlberg and McCaig (2010:53) posited that the review of literature enables a researcher to explore the depth of evidence that has been gathered in a research area and reveals areas that are under-researched. O'Leary

(2013:152) also noted that for new knowledge to be generated, it is vital to consult past innovations. The sources of information for the review of literature included textbooks, journals, articles, conference proceedings, dissertations and theses.

3.11.4.2 Primary data collection

Primary data are new data generated for a research project (Struwig *et al.*, 2001:118). Primary data are the most valid information obtained in a research (Leedy & Ormrod, 2010:211). The collection of primary data entails eliciting information directly from a survey sample by a researcher; hence, it is vital that researchers structure questions in a clear and understandable format to obtain appropriate information from study respondents (Kumar & Phrommathed, 2005:175). The primary data collected for this study were through administration of quantitative close-ended questionnaires to survey respondents, as well as semi-structured qualitative interviews. The questionnaires were administered to respondents via hand delivery and survey monkey and retrieved through the same media, while the interviews were conducted face-to-face with construction site supervisors.

3.11.4.3 The questionnaire

Questionnaires are tools used for data collection containing questions and statements designed to elicit information from study respondents (Adler & Clark, 2007:47). Research questions may be observed from different perspectives but should address a relevant issue (Flick, 2011:40). Questionnaire design is extremely important because it assists in the realisation of the research objectives, while poorly designed questionnaires result in insufficient or irrelevant data that cannot be properly interpreted; therefore, it is required that the researcher consider the type to data to collect and the method of analysis to be implemented when designing the questionnaire (Dahlberg & McCaig, 2010:53).

Dahlberg and McCaig (2010:53) buttressed that the effect of poorly designed questionnaires results in obtaining irrelevant or insufficient information in research situation. Pietersen and Maree (2007b:48) identified the following vital requirements in the design of a questionnaire:

- the total appearance of the questionnaire (quality of paper used, font and font size, for example);
- the question sequence (questions should be easy to answer);
- response categories; and
- wording of questions (careful selection of clear words).

Pietersen and Maree (2007b:48) asserted that questionnaires are of various forms and are divided into two main categories:

- open-ended questions; and
- close-ended questions.

3.11.4.4 Open-ended questions

Open-ended questions are questions that are asked without providing a precise guide to possible answers as this form of question is usually designed with the respondents' undiluted opinions in mind (Kumar & Phrommathed, 2005:175). Hopkins (2014:132) affirmed that although the close-ended questions are usually used in testing hypothesis, the open-ended questions are most appropriate in generating the research hypothesis. He added that open-ended questions tend to explore and discover the validity and reliability of the questionnaire. Pietersen and Maree (2007b: 225) and Leedy and Ormrod (2010:215) highlighted the following as the advantages and disadvantages of open-ended questions:

Advantages of open-ended questions

- Participants respond to questions honestly with the assurance of remaining anonymous.
- The respondents' opinions are revealed.
- Complex questions are duly answered with detailed justification.

Disadvantages of open-ended questions

- Data coding tends to be difficult.
- It requires a great deal of time for respondent to complete (thinking and writing).
- Answers are variably in content as a result of the unstructured questions.
- The use of statistical analysis in this design has proven abortive.

3.11.4.5 Close-ended questions

Kumar (2005:176) described *close-ended questions* as questions that delineate possible responses in questionnaire design. Close-ended questionnaires provide a set of sequential questions requesting the respondents to choose the most appropriate answers (Pietersen & Maree, 2007b:52). Burns (1997:320) affirmed that the use of close-ended questions in research gives the researchers the benefits of obtaining sufficient information to reach a

more generalisable conclusion. Close-ended questions invoke the possibility of discouraging respondents who find none of the alternatives suitable, heightening the probability of inappropriate responses (Kumar & Phrommathed, 2005:176). Leedy and Ormrod (2010:218) identified the following as the advantages of close-ended questions:

- The questions are short, precise and easy to answer.
- Coding and statistical analysis are easily done.

However, despite the advantages of close-ended questions, Pietersen and Maree (2007b:52) stated the following disadvantages of close-ended questions:

- The answers are very simple with no background details.
- Answering the questions is too easy and answers given may mislead the researcher.
- The respondents' opinions might not be an option to choose from.
- The questionnaires are generally too lengthy.

3.11.5 Questionnaire design

Questionnaire design is the most essential aspect of a survey research, vital in data collection for quantitative research (Kumar & Phrommathed, 2005:156). Kumar and Phrommathed explained that to guarantee the validity and reliability of the research questions in a questionnaire design, the researcher must ensure a correlation between the research aim, research questions and research objectives of the study. The research questionnaire for this study was designed using close-ended questions, with questions adopting the four-point Likert scale to restrict the answers allowed by survey respondents. The questionnaire was designed based on the information derived from reviewed literature in correlation with objectives of the study.

The questionnaire for the study was designed in sections, with each section aiming at achieving a particular objective of the study. The first section of the questionnaire was used to elicit biographical information of survey respondents. The second section comprises three sub-sections that address the first objective of the research with the aim of examining the perceptions of respondents on the effectiveness of contract procurement strategies used for housing projects. The second sub-section identifies factors influencing the selection of a suitable procurement method for housing projects, purposely to address the second objective. The third sub-section of the questionnaire gives a comparative analysis of the contract procurement strategies and the influence of the strategies on housing projects delivery, taking construction stakeholder satisfaction into consideration, thereby addressing objective three.

The last section of the questionnaire addresses the benefits and shortfalls of contract procurement strategies on housing projects materials, manpower and machinery, aimed at addressing objective four. The majority of questionnaires were hand-delivered to respondents while the remainder were administered through electronic mail. The core purpose of selecting construction professionals (architects, quantity surveyors, engineers, builders and contractors) as participants for the quantitative survey of this study is due to the extensive experience of these professionals regarding factors responsible for the successful delivery of construction projects. The questionnaire for this study was designed under the following criteria stated by Adler and Clark (2007:52):

- Avoid loaded words, that is, avoid words that trigger an emotional response.
- Avoid ambiguous words – words that can be given more than one meaning.
- Avoid the use of double negative questions, that is, questions that require respondents to disagree with a negative statement.
- Avoid threatening questions – questions that make respondents feel frightened or embarrassed to give an honest answer.
- Avoid compound questions – more than two or more questions in a single question.
- Administer questions in the language of the respondents.

3.11.6 Interview

Interviews conducted in survey are usually designed in two forms – structured and semi-structured – depending on the purpose to be achieved from the study (Leedy & Ormrod, 2010:222). Flick (2011:142) opined that qualitative interviews should initiate dialogue between the interviewer and the interviewee. Kumar (2005:156) explained that interviews give the researcher a level of spontaneity, flexibility and power to dialogue and interact with survey respondents. Due to the probing power and flexibility advantage of semi-structured interviews, a qualitative method was adopted to explore the in-depth background knowledge of contract procurement strategies in South Africa significantly to validate quantitative data obtained on the effectiveness of contract procurement strategies for housing project delivery.

Plowright (2011:16) posited that a less structured interview design may be more appropriate to explore an interviewee's feelings and complete opinions on the subject being studied. Kumar (2005:156) asserts that flexibility, freedom and spontaneity make the unstructured interview one of the most commonly used methods of data collection in qualitative interviews. The study respondents were informed, prior to the meeting, of the focus of the interview and the relevance of the research study, thus giving the respondents ample time to prepare for the interview. A total of three construction sites were selected for the validation of

data and the interview for this study was phone-recorded with permission from the respondents.

The interview was restricted to site supervisors alone for validation of quantitative data. Serpell and Ferrada (2007:585) described the site supervisor as an agent responsible for communicating construction project objectives to labourers. Dingsdag *et al.* (2008:622) further posited that site supervisors are the most noticeable and approachable people on construction sites and generally believed by workers to be “the most visible people of the construction sites”. Moreover, site supervisors are in the position to discuss the effectiveness of the procurement strategy adopted for housing project delivery; hence, the interview explores the effectiveness and efficiency of the procurement strategies towards enhancement of housing sustainability.

3.11.7 Research aim and objectives

The aim of this study is to identify the most effective contract procurement strategy for project delivery towards enhancement of housing sustainability in the Western Cape, South Africa. The study objectives are outlined to achieve the aim of this research. Table 3.1 shows the medium through which the research objectives were achieved.

Table 3.1: Methods of achieving research objectives

Objectives	Achieving Objectives
To examine the effectiveness of contract procurement strategies used for housing projects	The objective is achieved through review of literature, semi-structured qualitative interviews and questionnaire administration
To identify the factors that influences the selection of a suitable procurement method for housing projects	The objective is achieved through review of literature, semi-structured qualitative interviews and questionnaire administration
To analyse the influence of contract procurement methods on the delivery of a sustainable housing in terms of cost, time and quality	The objective is achieved through review of literature, semi-structured qualitative interviews and questionnaire administration
To examine the benefits and shortfalls associated with each procurement method used on housing project resources (materials, manpower and machinery)	The objective is achieved through review of literature, semi-structured qualitative interviews and questionnaire administration
To establish the procurement strategy that is most effective for the delivery of sustainable housing	The objective is achieved through analysis of qualitative and quantitative data obtained

3.11.8 Data analysis for the study

Data analysis includes testing, tabulating, categorising and examining the results to address the purpose of a study (Yin, 2003:103). The quantitative data obtained from the structured questionnaire were analysed using Statistical Package for the Social Sciences (SPSS) 24 software and descriptive statistics, while the qualitative data gathered from interviewees were analysed using qualitative content analysis method. The core purpose of adopting the qualitative research approach is to validate quantitative data and ensure reliability of research findings. Frequency tables, bar charts and pie charts were drawn from analysed quantitative data and presented accordingly.

3.11.8.1 Descriptive statistics

Descriptive statistics is the act of describing or summarising quantitative data obtained in a study in a meaningful manner and understandable format (tables and charts, for example) (Lapan & Quartaroli, 2009:75). The descriptive statistics present a basic overview of each data variable by using descriptive statistical tools (O'Leary, 2013:58). Struwig and Stead (2001:132) explained that the purpose of statistical tools in data analysis is to provide an overall and straightforward picture of a large amount of data. Henn *et al.* (2009:44) identified the three measures of central tendency as mean, median and mode. The study variables are broadly described with mean values and respective percentages of the respondents. This study adopted mean, percentage and standard deviation in analysing the quantitative data obtained in the survey.

3.11.8.2 Content analysis

Content analysis is a detailed and systematic process of analysing the content of a body of knowledge with the aim of accessing the significance, theme, pattern and flaws study (Leedy & Ormrod, 2010:228). Content analysis basically involves the coding and transcribing of human communication (written or oral) or other means of communication: video tapes and internet blogs (Babbie, 2015:375). Flick (2011:62) added that a content analysis approach enables the researcher to omit irrelevant words and terms by paraphrasing and giving a summary of accounts. Content analysis is deeply rooted in the qualitative research strategy, with the aim of producing the quantitative accounts of the raw material in terms of the category specified (Bryman, 2015:62).

Notably, Thomas (2003:62) posits that content analysis is an effective method for answering a large set of questions with few lines of statement. However, when compared to the use of questionnaires, content analysis is more time-consuming in terms of data processing and transcribing (Thomas, 2003:62). Leedy and Ormrod (2010:228) claimed that the approach to

data analysis is usually not designed as a stand-alone method, as it adopts the principles of other methods to discover new theories. Content analysis is an inductive and iterative process where similarities and differences in text are explored to support or disconfirm a theory (Thomas, 2003:62). In this context, this study reported a summary of the relevant contents in the transcribed data obtained from the interviewees while less important information was discarded in the reporting process.

3.11.9 Data validity and reliability

Testing for validity and reliability of research instrument(s) is significant to the originality of a research project (Leedy & Ormrod, 2010:190). *Validity* refers to the ability of research instrument to demonstrate that the instrument fulfils the desired purpose of design, while *reliability* ensures consistency in findings when continually used (Struwig *et al.*, 2001:160). Leedy and Ormrod (2010:190) asserted that testing the validity and reliability of the survey tool significantly determines the probability of obtaining relevant data in drawing meaningful conclusions at the end of the study, thereby discarding the need to consider the validity and reliability of a study which might distort the validity of the research.

Struwig and Stead (2001:160) explained that the validity of a research tool denotes the extent to which the tool measures what it is designed for, while the reliability denotes the consistency of the results produced by the tool used with consistency, over a period of time. The principles of validity and reliability vary depending on the nature of the research (Biggam, 2015:160).

3.11.9.1 Validity

The validity of a research refers to the credibility of the research findings (Struwig *et al.,* 2001:160). The logic that underpins the formulation of research tools and statistical evidence gathered through the use of research instruments combines to form the basis of establishing the validity of research instruments (Kumar & Phrommathed, 2005:162). Plowright (2011:22) posited that *validity* is described as the quality of research to reflect the true report of a phenomenon that is being researched and ultimately confirms the accuracy of the results obtained. Furthermore, Denscombe (2014:367) noted that the validity of research can be addressed by the use of respondent validation, grounded data and triangulation.

For the purpose of this study, the validity of results was achieved through validation of quantitative data obtained from construction professionals with qualitative interviews conducted with construction site supervisors.

3.11.9.2 Reliability

Research *reliability* refers to the ability of future researchers to undertake the same research project and generate the same results, interpretations and claims (Leedy & Ormrod, 2010:192). In other words, research is denoted as *reliable* if the findings of the study remain constant when conducted by another researcher in steady conditions (Silverman, 2016:67). The purpose of conducting a reliability test is to minimise the errors and biases in a survey; the greater the degree of consistency and stability of an instrument, the greater the reliability of the instrument (Kumar & Phrommathed, 2005:163). For the purpose of this research, reliability was assured by testing scaled research questions using Cronbach's alpha coefficient in SPSS (24) software as it was noted that the closer the coefficient is to 1, the more reliable the survey instrument is. Tavakol and Dennick (2011:53) endorsed that the score values between 0.70-0.95 are standardized values for the reliability of a test to be proven, therefore; the optimal Cronbach's coefficient alpha value should be above 0.7.

Figure 3.2 presents the research method for the study. An exploratory study was taken through pre-test of open-ended questions and unstructured preliminary interview. The main study was tailored to the perceptions of the respondents explored through the exploratory study, hence, the main study adopted the quantitative (questionnaires) and qualitative (semi-structured interview) method of data collection. The quantitative data was descriptively analysed while the qualitative data was analysed using content analysis. The qualitative data was used to validate the quantitative data elicited from the study respondents to achieve the aim of the study.

The research method is shown in Figure 3.2:

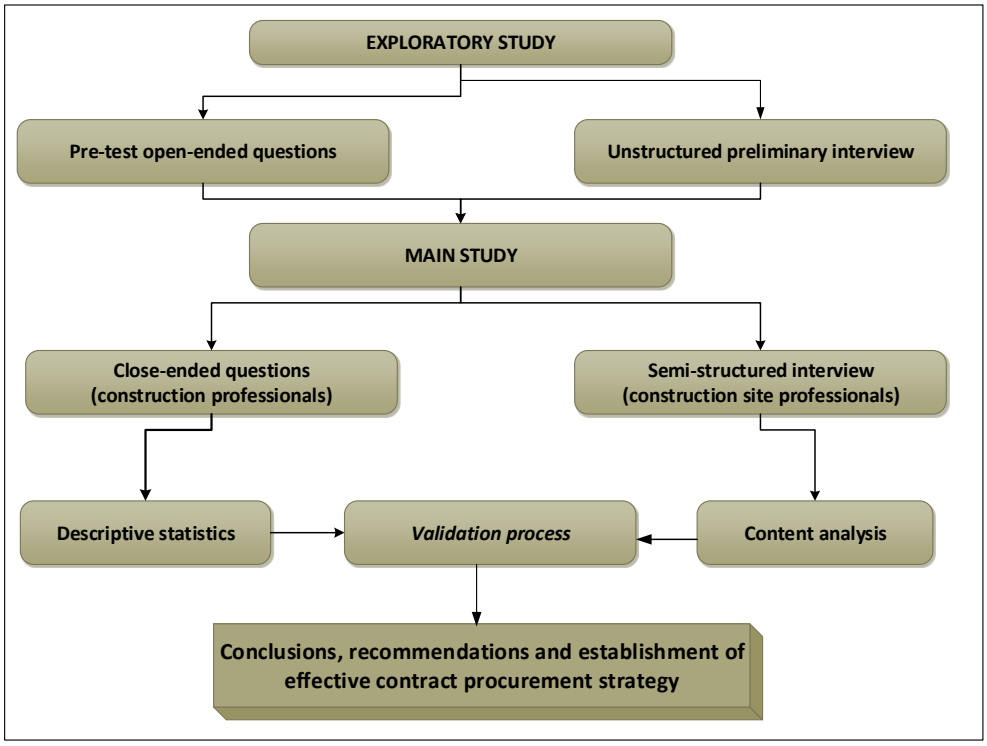

Figure 3.2: Research method

3.12 Chapter summary

This chapter provides a comprehensive overview of the research methodology adopted for the study. This study adopts a mixed methodological (quantitative and qualitative) approach to achieve the aim and objectives of the study. The quantitative research questionnaire was structured and designed to elicit information from construction professionals and stakeholders on the effectiveness of the identified contract procurement strategies for project delivery toward enhancement of housing sustainability in the Western Cape of South Africa. Literature reviews, oral interviews and administration of questionnaires were used in collecting the secondary and primary data for the study. Questionnaires were piloted amongst construction professionals on site and post-graduate students in the Department of Construction Management and Quantity Surveying, Cape Peninsula University of Technology, to ensure the validity of the research instruments. The reliability of the results was assured by testing scaled questions with Cronbach's alpha coefficient reliability test.

CHAPTER FOUR

DATA ANALYSIS

4.1 Introduction

This chapter presents the analysis of data elicited from the questionnaire disseminated to construction professionals, and interviews conducted with construction site managers. The chapter describes the response rate of the questionnaire, the biographical information of the respondents, pilot study undertaken for modification of research instruments and testing of research instruments for reliability purposes. Furthermore, the interview section was reported, summarised and presented in a table. The chapter subsequently presents the interpretation and discussion of findings in respect of effectiveness of contract procurement strategies used for housing projects, factors that influence the selection of a contract procurement method for housing project delivery, the influence of the contract procurement strategies on project key parameters (cost, time and quality) and the benefits of contract procurement methods on housing project resources (materials, manpower and machinery).

4.2 Exploratory study

To check the appropriateness and clarity of questionnaire used for this study, a total of twenty (20) questionnaires were administered to construction professionals in Cape Town, South Africa. It was required of the respondents to complete all sections of the questionnaire and make constructive comments, where applicable. Successively, the inputs and comments of the respondents (construction professionals) were considered and appropriate adjustments were made in the design of the questionnaire for the main study.

4.3 Questionnaire survey response rate

Quantitative data for the study were elicited through the administration of questionnaires. A total of two hundred and forty-eight (248) questionnaires were administered to construction professionals (architects, consultant quantity surveyors, contracting quantity surveyors, project managers, contractors and sub-contractors) in the Western Cape Province. One hundred and fifty-two (152) questionnaires were administered in person to the respondents, out of which sixty-two questionnaires were duly completed and retrieved.

Furthermore, ninety-six (96) questionnaires were administered via electronic mails: twenty-six (26) questionnaires were completed and returned electronically. The total of eighty-eight (88) questionnaires were duly completed, retrieved and analysed.

4.4 Biographical information of respondents

4.4.1 Participants' firms

The respondents in the study held different positions in various firms. As presented in Figure 4.1, the participants' firms include contracting firms (29%), architectural firms (22%), project management firms (17%), quantity surveying firms (23%) and sub-contracting firms (9%). Hence, the respondents were able to provide valid and reliable information based on the knowledge acquired from different firms.

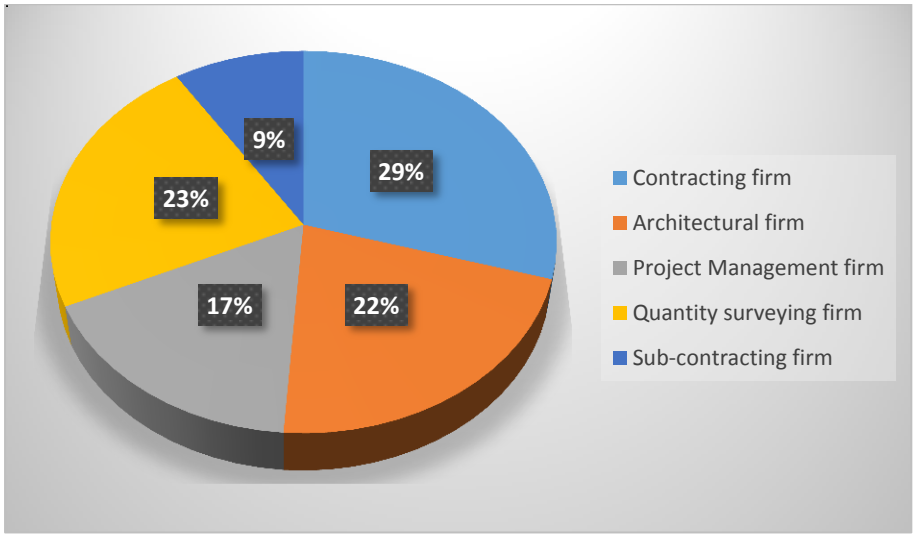

Figure 4.1: Participants' firms

4.4.2 Respondents' gender

Table 4.1 reveals that the majority (62.5%) of survey participants are male while female participants represent 37.5%. This gender distribution indicates that male participants are significantly higher than the female counterparts. However, the information provided by the respondents does not pose any gender discrimination for the purpose of the study.

Table 4.1: Respondents' gender

Category	Frequency	Percentage
Male	55	62.5
Female	33	37.5
Total	**88**	**100**

4.4.3 Highest educational qualifications

Figure 4.2 presents the educational qualification obtained by the study participants. The study shows that 43% of the respondents hold Bachelor degrees as the highest educational qualification, 26% hold Master's degrees, 13% hold Post Graduate Diploma, 9% also hold Honours degrees and 9% hold Diploma certificates, respectively; hence, the survey respondents are educated and qualified to provide reliable facts for the study.

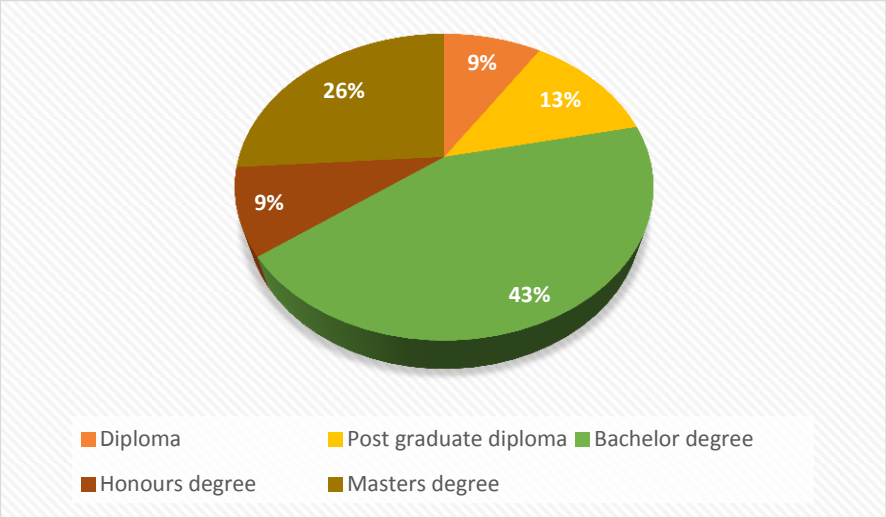

Figure 4.2: Highest formal qualification

4.4.4 Work experience of the respondents

Table 4.2 shows the work experience of respondents in the construction sector. The table presents 29.5% of the respondents have 10 years and less work experience in the construction industry and 70.5% of the respondents have over 10 years work experience in the construction industry. Nonetheless, this inference does not imply that the inputs of the

respondents with less than 10 years work experience is not significantly reliable for this research study.

Table 4.2: Experience of respondents in the construction industry

Category	Frequency	Percentage
1 – 5 years	15	17.0
6 – 10 years	11	12.5
11 – 15 years	35	39.8
16 – 20 years	18	20.5
20 years above	9	10.2
Total	**88**	**100**

4.4.5 Profession of the respondents in their organisations

Figure 4.3 presents the positions held by survey participants. The largest group of respondents (29.5%) were contractors, while 22.7% were quantity surveyors, 21.6% were architects, 17% project managers and 9.1% were sub-contractors; thus, the survey respondents are experienced in construction and could provide reliable information based on the various positions held in the construction industry.

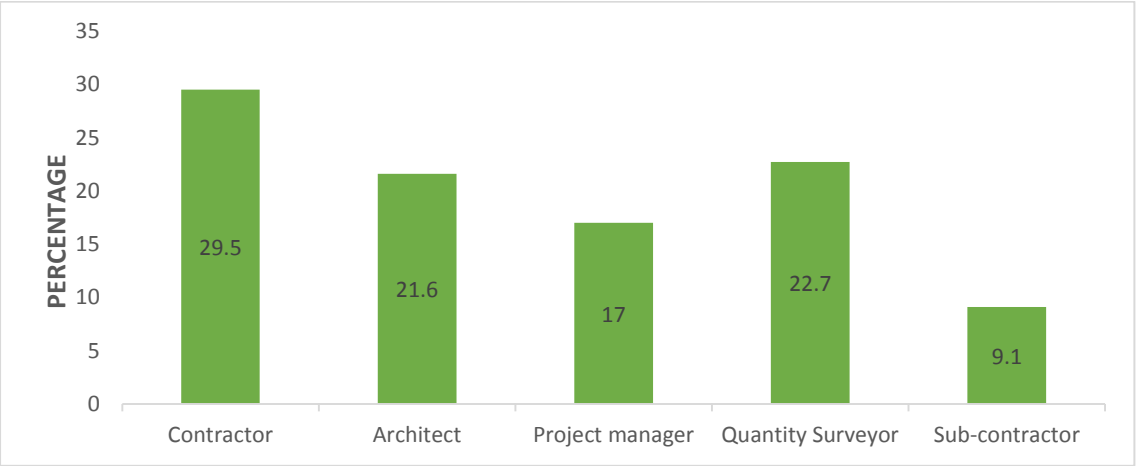

Figure 4.3: Position of respondents

4.4.6 Number of years in present position

Figure 4.4 presents that 23.9% of respondents had been in their current position between one and five years, 37.5% had been working in their position for six to ten years, 27.3% had been in their position for 11 to 15 years and 11.4% had been working in their position for 16 to 20 years. Figure 4.4 shows that the majority of survey respondents had worked more than five years in their current positions. Nonetheless, this inference doesn't imply that the inputs of the respondents with work experience of 10 years and less is not significantly reliable for this research study.

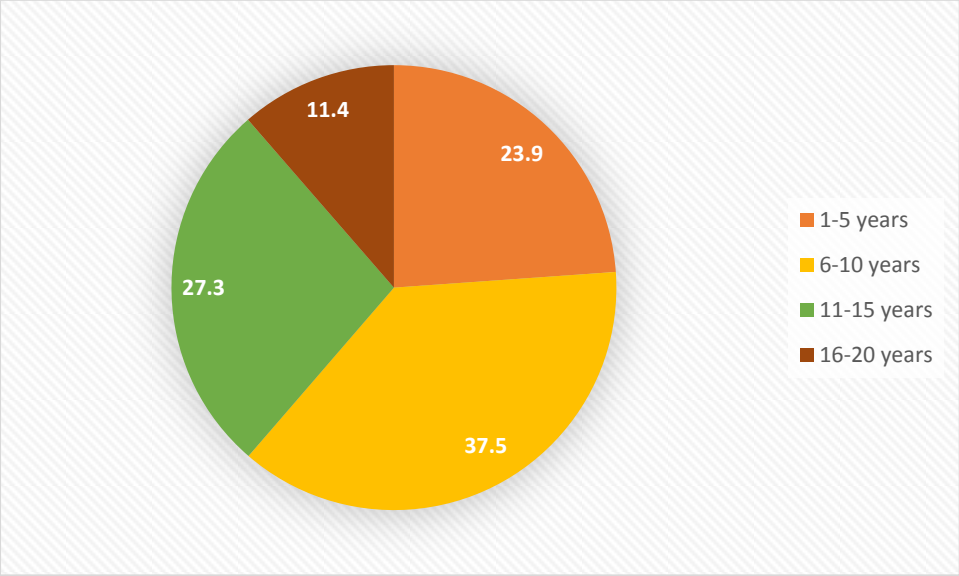

Figure 4.4: Years in present position

4.5 Reliability of research instrument

The scaled questions used in the study were tested with Cronbach's Alpha coefficient, using Statistical Package for the Social Sciences software (version 24) to determine the reliability of research questions. Cronbach's alpha reliability test is an estimate of the internal consistency associated with the scores that can be derived from a scale or composite score (Tavakol & Dennick, 2011:53).

Table 4.3 presents the summary of reliability tests conducted on the scale questions. From the table, it is observed that the Cronbach's alpha coefficient values are greater than 0.70 (>0.70). Tavakol and Dennick (2011:53) endorsed that the score values between 0.70-0.95 are standardized values for the reliability of a test to be proven. The results of the Cronbach's alpha coefficient tests were satisfactory in terms of reliability test requirements.

Table 4.3: Reliability of research instrument

Question Nr	Headings	Nr of items	Cronbach's alpha coefficient value
Section B1	Effectiveness of contract procurement strategies that are used for housing projects	68	0.8
Section B2	The extent to which the contract procurement strategies are used to deliver a private housing project?	17	0.7
Section B3	The extent to which the contract procurement strategies are used to deliver a public housing project?	17	0.8
Section C1	Project related factors	12	0.9
Section C2	Design related factors	7	0.9
Section C3	Client related factors	9	0.8
Section C4	Project management related factors	17	0.9
Section C5	Construction related factors	24	0.7
Section C6	Government policies related factors	9	0.8
Section C7	External factors	8	0.7
Section C8	Sustainability concerns	8	0.7
Section D1	The level of satisfaction of the contract procurement strategies in relation to project cost	17	0.7
Section D2	The level of satisfaction the contract procurement strategies in relation to project time	17	0.9
Section D3	The level of satisfaction the contract procurement strategies in relation to project quality	17	0.7
Section E1	The level of benefit of the contract procurement strategies in respect of project materials	17	0.8
Section E2	The level of benefit of the contract procurement strategies in respect of project manpower	17	0.9
Section E3	The level of benefit of the contract procurement strategies in respect of project machineries	17	0.9
	Total questions asked	**298**	**0.8**

4.6 Presentation of findings

The study is designed to establish the most effective contract procurement strategy for project delivery towards enhancement of housing sustainability in South Africa. From the findings, the effectiveness of the contract procurement strategies used for housing project, factors influencing the selection of a contract procurement method for housing project delivery, the influence of the contract procurement strategies on project key parameters (cost, time and quality) and the benefits of the contract procurement methods used in housing project resources (materials, manpower and machinery) are presented.

4.6.1 Effectiveness of contract procurement strategies used for housing project (cost effectiveness)

Table 4.4 presents the effectiveness of contract procurement strategies used for housing projects. Contract procurement strategy effectiveness was tested against project cost, project time, project quality, and stakeholder satisfaction. The effectiveness of the contract procurement strategies was rated by the respondents based on a four-point (4) Likert scale: Highly effective=4, Effective=3, Less effective=2 and Not effective=1. In Table 4.4, competitive contract under the design and build procurement strategy was identified by 68.1% of the respondents as a cost-effective contract procurement method, while 85.2% of the respondents identified direct contract, also under the design and build procurement method, as a cost-effective contract procurement method. Then, 84.1% of the respondents indicated that the Design-Build-Operate (DBO) approach under the Public-Private Partnership (PPP) procurement method is also a cost-effective method, and 75% of the respondents identified Develop-Operate-Transfer (DOT) approach, also under the PPP contract procurement strategy, as a cost-effective method. Moreover, 68.2% of the respondents indicated that the lump sum contract, under the traditional contract procurement method, is also cost effective. However, the effectiveness of the contract procurement strategies was ranked, based on the mean values of 3.12, 3.01, 2.99 2.97 and 2.93, respectively.

Table 4.4: Effectiveness of contract procurement strategies used for housing projects (cost effectiveness)

Contract Procurement Strategies	No.	Highly effective (%)	Effective (%)	Less effective (%)	Not effective (%)	Mean value (mv)	Std. D	Rank (r)
Competitive contract (D&B)	88	51.1	17.0	28.4	3.4	3.12	0.96	**1**
Direct contract (D&B)	88	15.9	69.3	14.8	0.0	3.01	0.56	**2**
Design-Build-Operate (PPP)	88	14.8	69.3	15.9	0.0	2.99	0.56	**3**
Develop-Operate-Transfer (PPP)	88	21.6	53.4	25.0	0.0	2.97	0.69	**4**
Lump sum contract (Traditional)	88	30.7	37.5	26.1	5.7	2.93	0.89	5
Cost reimbursement contract (Traditional)	88	23.9	43.2	33.0	0.0	2.91	0.75	6
Project management (Management based)	88	2.3	76.1	19.3	2.3	2.78	0.51	7
Measurement contract (Traditional)	88	18.2	48.9	25.0	8.0	2.77	0.84	8
Lease-Renovate-Operate-Transfer (PPP)	88	5.7	60.2	34.1	0.0	2.72	0.57	9
Construction management (Management based)	88	3.4	69.3	20.5	6.8	2.69	0.65	10
Buy-Build-Operate (PPP)	88	5.7	53.4	40.9	0.0	2.65	0.59	11
Package deal contract (D&B)	88	12.5	38.6	48.9	0.0	2.64	0.70	12
Build-Lease-Operate-Transfer (PPP)	88	3.4	55.7	40.9	0.0	2.63	0.55	13
Management contracting (Management based)	88	0.0	60.2	39.8	0.0	2.60	0.49	14
Build-Operate-Transfer (PPP)	88	5.7	53.4	34.1	6.8	2.58	0.71	15
Labour only (Labour based)	88	8.0	15.9	76.1	0.0	2.30	0.62	16
Direct labour (Labour based)	88	3.4	15.9	78.4	2.3	2.20	0.53	17

***D&B=Design and Build; PPP=Public-Private-Partnership**

4.6.2 Effectiveness of contract procurement strategies used for housing project (time effectiveness)

Table 4.5 presents findings on the effectiveness of contract procurement strategies on project time. The respondents were asked to rank the methods based on level of effectiveness. A four (4) point Likert scale was applied: Highly effective=4, Effective=3, Less effective=2 and Not effective=1. Findings reveal that 77.3% of the respondents identified

lump sum contract (mv=3.08) under the traditional method of contract procurement strategy as a time effective method.

Table 4.5: Effectiveness of contract procurement strategies used for housing project (time effectiveness)

Contract Procurement Strategies	No.	Highly effective (%)	Effective (%)	Less effective (%)	Not effective (%)	Mean value (mv)	Std. D	Rank (r)
Lump sum contract (traditional)	88	34.1	43.2	19.3	3.4	3.08	0.82	**1**
Build-Lease-Operate-Transfer (PPP)	88	6.8	83.1	10.1	0.0	3.07	0.25	**2**
Package deal contract (D&B)	88	39.8	27.3	29.5	3.4	3.03	0.92	**3**
Management contracting (Management based)	88	9.1	78.4	12.5	0.0	2.97	0.47	**4**
Measurement contract (traditional)	88	13.6	70.5	13.6	2.3	2.95	0.60	5
Direct contract (D&B)	88	5.7	72.7	19.3	2.3	2.82	0.56	6
Build-Operate-Transfer (PPP)	88	13.6	53.4	33.0	0.0	2.81	0.66	7
Project management (Management based)	88	4.5	76.1	12.5	6.8	2.78	0.63	8
Lease-Renovate-Operate-Transfer (PPP)	88	6.8	70.5	15.9	6.8	2.77	0.67	9
Competitive contract (D&B)	88	34.1	18.2	37.5	10.2	2.76	1.04	10
Develop-Operate-Transfer (PPP)	88	9.1	44.3	46.6	0.0	2.63	0.65	11
Buy-Build-Operate (PPP)	88	6.8	46.6	46.6	0.0	2.60	0.62	12
Construction management (Management based)	88	2.3	50.0	47.7	0.0	2.55	0.54	13
Design-Build-Operate (PPP)	88	6.8	42.0	44.3	6.8	2.49	0.73	14
Cost reimbursement contract (Traditional)	88	4.5	28.4	63.6	3.4	2.34	0.62	15
Labour only (Labour based)	88	3.4	15.9	73.9	6.8	2.16	0.58	16
Direct labour (Labour based)	88	1.1	15.9	83.0	0.0	2.18	0.42	17

***D&B=Design and Build; PPP=Public-Private-Partnership**

A significant percentage (89.9%) of the respondents identified Build-Lease-Operate-Transfer (BLOT) approach under the PPP procurement strategy, with a mean value of 3.07, as a time effective method. Furthermore, 67.1% of the respondents also identified package deal contract (mv=3.03) under the design and build procurement method, as a time effective method. Management contracting approach under the management based procurement

system was also indicated by 87.5% of the respondents (mv=2.97) as a time effective method. These findings imply that lump sum contract, Build-Lease-Operate-Transfer, package deal contract and management contracting are the highly effective contract procurement approaches in terms of project time.

4.6.3 Effectiveness of contract procurement strategies used for housing project (quality effectiveness)

The perceptions of respondents were explored on the effectiveness of contract procurement strategies on project quality, as presented in Table 4.6. Respondents were requested to indicate and rank the effectiveness of the procurement methods. A four (4) point Likert scale was adopted, where Highly effective=4, Effective=3, Less effective=2 and Not effective=1. Package deal contract, under the design and build procurement method, was ranked by 81.8% of the respondents as a quality effective method with a mean value of 3.09. However, 8.0% of the respondents indicated that package deal contract is a less effective approach on project quality, while 10.2% of the respondents indicated the same option as not effective upon project quality. Also under the design and build procurement strategy, direct contract (mv=3.03) and competitive contract (mv=3.01) were indicated as a quality effective option by the respondents. Furthermore, Build-Operate-Transfer (BOT) approach under the PPP procurement system was also identified by respondents as a quality effective option, with a mean value of 3.01. The respondents perceived lump sum contract (mv=2.94), under the traditional contract procurement strategy, as a quality effective method.

Table 4.6: Effectiveness of contract procurement strategies used for housing project (quality effectiveness)

Contract Procurement Strategies	No.	Highly effective (%)	Effective (%)	Less effective (%)	Not effective (%)	Mean value (mv)	Std. D	Rank (r)
Package deal contract (D&B)	88	37.5	44.3	8.0	10.2	3.09	0.93	**1**
Competitive contract (D&B)	88	37.5	33.0	25.0	4.5	3.03	0.90	**2**
Direct contract (D&B)	88	9.1	83.0	8.0	0.0	3.01	0.42	**3**
Build-Operate-Transfer (PPP)	88	8.0	85.2	6.8	0.0	3.01	0.39	**3**
Lump sum contract (Traditional)	88	18.2	62.5	14.8	4.5	2.94	0.72	**4**
Cost reimbursement contract (Traditional)	88	9.1	72.7	18.2	0.0	2.91	0.52	5
Construction management (Management based)	88	3.4	84.1	12.5	0.0	2.90	0.39	6
Build-Lease-Operate-Transfer (PPP)	88	8.0	73.9	18.1	0.0	2.90	0.50	6
Buy-Build-Operate (PPP)	88	8.0	70.5	21.6	0.0	2.86	0.53	7
Management contracting (Management based)	88	5.7	75.0	19.3	0.0	2.86	0.48	7
Project management (Management based)	88	3.4	77.3	19.3	0.0	2.84	0.45	8
Measurement contract (Traditional)	88	3.4	77.3	15.9	3.4	2.81	0.54	9
Design-Build-Operate (PPP)	88	8.0	63.6	21.6	6.8	2.72	0.71	10
Develop-Operate-Transfer (PPP)	88	8.0	38.6	53.4	0.0	2.55	0.64	11
Lease-Renovate-Operate-Transfer (PPP)	88	14.8	19.3	65.9	0.0	2.49	0.74	12
Labour only (Labour based)	88	2.3	11.4	86.4	0.0	2.16	0.43	13
Direct labour (Labour based)	88	2.3	0.0	97.7	0.0	2.04	0.30	14

***D&B= Design and Build; PPP=Public-Private-Partnership**

4.6.4 Effectiveness of contract procurement strategies used for housing project (stakeholder satisfaction)

Table 4.7 reveals the perception of respondents on the contract procurement strategy that best meets involved construction stakeholder satisfaction. A four (4) point Likert scale was adopted, where Highly effective=4, Effective=3, Less effective=2 and Not effective=1. From the table, 60.2% of the respondents indicated that lump sum contract (mv=2.67) under the traditional contract procurement strategy best meets construction stakeholder satisfaction, while 37.5% of the respondents indicated that the lump sum contract is less effective at meeting stakeholder satisfaction, while a further 2.3% of the respondents perceived lump sum contract as not effective. Build-Lease-Operate-Transfer (BLOT) approach under the PPP procurement system was identified by the respondents as an approach that satisfies involved construction stakeholders (mv=2.66). Moreover, direct contract and competitive contract, both under the design and build procurement system, have been perceived by the respondents as approaches that meet construction stakeholder satisfaction (mv=2.65). Nonetheless, the Buy-Build-Operate (BBO) (mv=2.60) and Design-Build-Operate (DBO) (mv=2.60) approaches under the PPP procurement system were identified by respondents as approaches that meet stakeholder satisfaction.

Table 4.7: Effectiveness of contract procurement strategies used for housing project (stakeholder satisfaction)

Contract Procurement Strategies	No.	Highly effective (%)	Effective (%)	Less effective (%)	Not effective (%)	Mean value (mv)	Std. D	Rank (r)
Lump sum contract (Traditional)	88	9.1	51.1	37.5	2.3	2.67	0.67	**1**
Build-Lease-Operate-Transfer (PPP)	88	2.3	61.4	36.4	0.0	2.66	0.52	**2**
Direct contract (D&B)	88	5.8	53.5	40.7	0.0	2.65	0.59	**3**
Competitive contract (D&B)	88	12.5	42.0	43.2	2.3	2.65	0.73	**3**
Buy-Build-Operate (BBO)	88	2.3	55.7	42.0	0.0	2.60	0.54	**4**
Develop-Operate-Transfer (PPP)	88	2.3	55.7	42.0	0.0	2.60	0.54	**4**
Package deal contract (D&B)	88	5.7	42.0	51.1	1.1	2.52	0.62	5
Construction management (Management based)	88	2.3	47.7	52.3	6.8	2.52	0.55	5
Build-Operate-Transfer (PPP)	88	2.3	54.5	36.4	6.8	2.52	0.66	5
Cost reimbursement contract (Traditional)	88	4.5	37.5	58.0	0.0	2.47	0.59	6
Design-Build-Operate (PPP)	88	2.3	48.9	42.0	6.8	2.47	0.66	6
Lease-Renovate-Operate-Transfer (PPP)	88	2.3	48.9	42.0	6.8	2.47	0.66	6
Measurement contract (Traditional)	88	2.3	51.1	36.4	10.2	2.45	0.71	7
Project management (Management based)	88	2.3	40.9	56.8	0.0	2.45	0.54	7
Management contracting (Management based)	88	2.3	38.6	50.0	0.0	2.36	0.65	8
Direct labour (Labour based)	88	0.0	25.0	75.0	0.0	2.25	0.44	9
Labour only (Labour based)	88	2.3	25.0	65.9	6.8	2.22	0.60	10

***D&B=Design and Build; PPP=Public-Private-Partnership**

4.6.5 Extent of use of contract procurement methods for public housing project delivery

The survey requested that the respondents appraise the extent to which the contract procurement methods are used to deliver a public housing project. A four (4) point Likert scale was adopted, where: Highly used=4, Used=3, Rarely used=2 and Not used=1. Table 4.8 shows that lump sum contract, under the traditional contract procurement method, is used by 93.2% of the respondents to deliver a public housing project (mv=3.34). The

findings also show that competitive contract (mv=3.03), under the design and build procurement method, and project management approach (mv=2.84), under the management based contractual arrangement, and construction management (mv= 2.65), also under the management based contractual arrangement, are used to deliver public housing projects.

Table 4.8: Extent of use of the contract procurement methods for public housing project delivery

Contract Procurement Strategies	No.	Highly used (%)	Used (%)	Rarely used (%)	Not used (%)	Mean value (mv)	Std. D	Rank (r)
Lump sum contract (Traditional)	88	40.9	52.3	6.8	0.0	3.34	0.60	**1**
Competitive contract (D&B)	88	44.3	34.1	2.3	19.3	3.03	1.11	**2**
Project management (Management based)	88	20.5	22.7	50.0	6.8	2.84	0.83	**3**
Construction management (Management based)	88	19.3	33.0	42.0	5.7	2.65	0.86	4
Measurement contract (Traditional)	88	0.0	52.3	47.7	0.0	2.52	0.50	5
Direct contract (D&B)	88	0.0	64.8	19.3	15.9	2.49	0.76	6
Management contracting (Management based)	88	29.5	0.0	38.6	31.8	2.27	1.20	7
Cost reimbursement contract (Traditional)	88	0.0	33.0	23.9	43.2	1.89	0.87	8
Package deal contract (D&B)	88	0.0	53.4	0.0	46.6	2.07	1.00	8
Design-Build-Operate (PPP)	88	3.4	36.4	0.0	60.2	1.82	1.04	9
Lease-Renovate-Operate-Transfer (PPP)	88	0.0	17.0	22.7	60.2	1.57	0.77	10
Build-Operate-Transfer (PPP)	88	0.0	19.3	17.0	63.6	1.56	0.80	11
Develop-Operate-Transfer (PPP)	88	0.0	12.5	27.3	60.2	1.52	0.71	12
Build-Lease-Operate-Transfer (PPP)	88	6.8	15.9	0.0	77.3	1.52	0.99	12
Buy-Build-Operate (PPP)	88	6.8	0.0	29.5	63.6	1.50	0.81	13
Direct labour (Labour based)	88	0.0	20.5	6.8	72.7	1.47	0.82	14
Labour only (Labour based)	88	0.0	0.0	39.8	60.2	1.40	0.49	15

***D&B=Design and Build; PPP=Public-Private-Partnership**

4.6.6 Extent of use of contract procurement methods for private housing project delivery

The respondents were required to rate the extent to which the contract procurement methods are used to deliver a private housing project. A four (4) point Likert scale was adopted, where: Highly used=4, Used=3, Rarely used=2 and Not used=1. Table 4.9 shows that lump sum contract, under the traditional contract procurement method, with mean value 3.63, is used by 93.2% of the respondents to deliver a private housing project.

Table 4.9: Extent of use of the contract procurement methods for public housing project delivery

Contract Procurement Strategies	No.	Highly used (%)	Used (%)	Rarely used (%)	Not used (%)	Mean value (mv)	Std. D	Rank (r)
Lump sum contract (Traditional)	88	70.5	22.7	6.8	0.0	3.63	0.61	1
Competitive contract (D&B)	88	33.0	34.1	29.5	3.4	2.97	0.88	2
Construction management (Management based)	88	15.9	40.9	39.8	3.4	2.69	0.78	3
Management contracting (Management based)	88	12.5	35.2	48.9	3.4	2.57	0.75	4
Measurement contract (Traditional)	88	8.0	54.5	6.8	30.7	2.40	1.01	5
Project management (Management based)	88	17.0	36.4	10.2	36.4	2.34	1.14	6
Cost reimbursement contract (Traditional)	88	19.3	23.9	19.3	37.5	2.25	1.16	7
Direct contract (D&B)	88	0.0	28.4	62.5	9.1	2.19	0.58	8
Direct labour (Labour based)	88	26.1	0.0	13.6	60.2	1.92	1.29	9
Build-Lease-Operate-Transfer (PPP)	88	17.0	15.9	6.8	60.2	1.90	1.20	10
Build-Operate-Transfer (PPP)	88	15.9	6.8	17.0	60.2	1.78	1.13	11
Lease-Renovate-Operate-Transfer (PPP)	88	0.0	33.0	6.8	60.2	1.72	0.93	12
Package deal contract (D&B)	88	0.0	15.9	29.5	54.5	1.61	0.75	13
Design-Build-Operate (PPP)	88	0.0	15.9	23.9	60.2	1.56	0.76	14
Develop-Operate-Transfer (PPP)	88	0.0	17.0	22.7	60.2	1.56	0.77	14
Labour only (Labour based)	88	0.0	17.0	15.9	67.0	1.50	0.77	15
Buy-Build-Operate (PPP)	88	3.4	0.0	6.8	89.8	1.17	0.59	16

***D&B=Design and Build; PPP=Public-Private-Partnership**

In addition, competitive contract under the design and build contractual arrangement, is used by 67.1% of the respondents to deliver a public housing project (mv= 2.97). Construction management (mv=2.69) and management contracting (mv=2.57) under the management based procurement system are also used to deliver a private housing project.

4.6.7 Project related factors

The perceptions of the respondents were explored on project-related factors that influence the selection of a contract procurement strategy, as presented in Table 4.10. The respondents were required to rank the extent to which they agree with the identified factors. A four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1, was adopted. Size of the project with mean value 3.62 was ranked by respondents as the most significant project related factor influencing the selection of a contract procurement strategy. Findings reveal that 93% of the respondents strongly agreed that the size of the project influences the selection of a contract procurement method; however, a minority of 7.0% of the respondents disagreed that the size of a project does not influence the selection of a contract procurement method. A significant percentage (93.4%) of the respondents also agreed that the scope of a project (mv=3.53) influences the selection of a contract procurement method, while 83% of the respondents agreed that the nature of a project (mv=3.35) is also an influential factor to be considered in the selection process of a contract procurement method. In addition, 60.3% of the respondents also affirmed that the type of the project (mv=3.09) should be taken into consideration during the selection process.

Table 4.10: Project related factors

Factors	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Size of the project	88	62.5	30.5	7.0	0.0	3.62	0.49	**1**
Scope of the project	88	53.4	40.0	6.6	0.0	3.53	0.5	**2**
Nature of the project	88	52.3	30.7	17.0	0.0	3.35	0.76	**3**
Type of the project	88	48.9	11.4	39.8	0.0	3.09	0.94	**4**
Project innovation (making new prescriptive specifications rather than comparing performance of past similar completed projects)	88	58.0	6.8	15.9	19.3	3.03	1.24	5
Site conditions	88	60.2	9.1	0.0	30.7	2.99	1.36	6
Complexity of the project	88	50.0	8	21.6	20.5	2.87	1.24	7
Budgeted project cost	88	22.7	58	0.0	19.3	2.84	0.99	8
Project quality delivery	88	20.5	40.9	38.6	0.0	2.81	0.75	9
Involved stakeholder' expectations	88	22.7	37.5	22.7	17	2.66	1.02	10
Involved stakeholder needs	88	22.7	37.5	22.7	17	2.66	1.02	10
Forecasted project duration (time)	88	19.3	42.0	21.6	17	2.64	0.94	11

4.6.8 Design related factors

Table 4.11 presents findings on the design related factors that influence the selection of a contract procurement strategy. A four (4) point Likert scale was adopted to explore the perceptions of the respondents: Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1. The majority of respondents (93.2%) agreed that design team experience (mv=3.80) is a major factor influencing the selection of a contract procurement system, while a minority (6.8%) of respondents disagreed. A significant percentage of respondents (93.2%) affirmed that mistakes in producing design documents (mv=3.65) is also a factor that should be considered during the selection process. Furthermore, project design complexity with a mean value of 3.43 was identified by 93.2% of the respondents as a significant factor that influences the selection of a procurement method, while 83% of the respondents indicated that delay in producing design documents (mv=3.28) is an influential factor to be put into consideration during the selection process.

Table 4.11: Design related factors

Factors	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Design team experience	88	86.4	6.8	6.8	0.0	3.80	0.55	1
Mistakes in producing design documents	88	71.6	21.6	6.8	0.0	3.65	0.61	2
Project design complexity	88	56.8	36.4	0.0	6.8	3.43	0.81	3
Delay in producing design documents	88	62.5	20.5	0.0	17.0	3.28	1.11	4
Inadequate coordination among design team	88	44.3	38.6	17.0	0.0	3.27	0.74	5
Revision and changes order by client	88	58.0	5.7	19.3	17.0	3.05	1.21	6
Design approval delay by client	88	42.0	18.2	39.8	0.0	3.02	0.91	7

4.6.9 Client related factors

The perceptions of the respondents on client related factors that influence the selection of a contract procurement method are presented in Table 4.12. A four (4) point Likert scale was adopted to explore the perceptions of the respondents: Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1. From table 4.12, client emphasis on low construction cost and client emphasis on timely project delivery (with mean value of 3.55, respectively) were ranked by respondents as the most significant factor influencing the selection of a procurement method. In addition, 80.7% of the respondents affirmed that client experience in construction (mv=3.41) is also a significant factor to be given careful consideration during the selection exercise of a procurement strategy. A significant percentage (96.6%) of respondents identified that client emphasis on high quality delivery (mv=3.38) is a major factor that influences the selection of a contract procurement method, while 93.2% of the respondents indicated that the type of client funding (mv=3.24) is also a factor to be considered.

Table 4.12: Client related factors

Factors	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Client emphasis on low construction cost	88	54.5	45.5	0.0	0.0	3.55	0.50	1
Client emphasis on timely project delivery	88	54.5	45.5	0.0	0.0	3.55	0.50	1
Client experience in construction	88	60.2	20.5	19.3	0.0	3.41	0.80	2
Client emphasis on high quality delivery	88	40.9	55.7	3.4	0.0	3.38	0.55	3
Type of client funding	88	37.5	55.7	0.0	6.8	3.24	0.77	4
Size of client's organisation	88	56.8	3.4	0.0	39.8	3.17	0.97	5
Client's ability to brief	88	33.0	50.0	17.0	0.0	3.16	0.69	6
Client's ability to make decisions	88	33.0	44.3	17.0	5.7	3.05	0.86	7
Client contribution to design and construction	88	36.4	25.0	36.4	2.3	2.95	0.91	8

4.6.10 Project management-related factors

Table 4.13 presents findings on project management-related factors that influence the selection of a contract procurement strategy. A four (4) point Likert scale was adopted to explore the perceptions of the respondents: Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1. From the table, project scope management (mv=3.75) was identified by the majority of respondents as a key factor influencing the selection of a contract procurement strategy; project risk management (seen and unforeseen), with a mean value 3.56, was indicated by 97.7% of the respondents as a significant influential factor, and 77.3% of the respondents agreed that effective cost management is a further major factor influencing the selection of a contract procurement strategy (mv=3.39), while 77.3% of the respondents indicated that efficient time management is a vital factor to be carefully considered during the selection of a contract procurement method.

Table 4.13: Project management related factors

Factors	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Project scope management	88	75.0	25.0	0.0	0.0	3.75	0.44	**1**
Project risk management (seen and unforeseen)	88	60.2	37.5	2.3	0.0	3.56	0.54	**2**
Effective cost management	88	77.3	0.0	6.8	15.9	3.39	1.16	**3**
Efficient time management	88	77.3	0.0	0.0	22.7	3.32	1.26	**4**
Project quality management	88	60.2	17	15.9	6.8	3.31	0.98	5
Project team leader's experience	88	60.2	5.7	34.1	0.0	3.26	0.94	6
Adequate communication management	88	31.8	58.0	10.2	0.0	3.22	0.61	7
Timely decision-making process	88	21.6	75.0	3.4	0.0	3.18	0.47	8
Project team leader's working relationship with others	88	43.2	22.7	34.1	0.0	3.09	0.87	9
Coordination effectiveness	88	27.3	42.0	30.7	0.0	2.97	0.76	10
Project organisation structure	88	21.6	55.7	5.7	17.0	2.82	0.97	11
Project team leader's commitment to meet project cost, time and quality	88	21.6	27.3	51.1	0.0	2.7	0.8	12
Adequate project monitoring	88	21.6	42.0	19.3	17.0	2.68	1.0	13
Technical skills of the project team leader	88	21.6	38.6	22.7	17.0	2.65	1.01	14
Motivating skills of the project team leader	88	21.6	36.4	21.6	20.5	2.59	1.05	15
Feedback capabilities	88	21.6	8.0	70.5	0.0	2.51	0.83	16
Organising skills of the project team leader	88	21.6	8.0	67.0	3.4	2.45	0.87	17

4.6.11 Construction material related factors

Factors associated construction materials that influence the selection of a contract procurement method are presented in Table 4.14. The opinion of respondents was obtained with a four (4) point Likert scale, where Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1. The table data show that the majority of respondents (94.3%) agreed that shortage of construction materials is a significant factor influencing the selection of a

procurement method (mv=3.34) while a minority (5.7%) of respondents disagreed. Wastage of construction materials (mv=3.20) was indicated by the respondents as an influential factor. In addition, 60.2% of the respondents identified that late order of construction materials (mv=2.89) influences the selection process, while availability of construction materials (with a mean value of 2.84) was indicated by 80.7% of the respondents as a key factor.

Table 4.14: Construction material related factors

Construction materials related factors	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Shortage of construction materials	88	39.8	54.5	5.7	0.0	3.34	0.58	1
Wastage of construction materials by workers	88	19.3	80.7	0.0	0.0	3.20	0.40	2
Late order of construction materials	88	30.7	29.5	37.5	2.3	2.89	0.88	3
Availability of construction materials	88	22.7	58.0	0.0	19.3	2.84	0.99	4
Increase in cost of construction materials	88	17.0	48.9	34.1	0.0	2.83	0.70	5
Unsuitable locations for material storage on site	88	0.0	83.0	17.0	0.0	2.83	0.38	5
Difficulties in obtaining materials from store due to excessive paper works	88	4.5	71.6	23.9	0.0	2.81	0.50	6
Late delivery of construction materials	88	0.0	80.7	19.3	0.0	2.80	0.40	7
Market conditions	88	23.9	28.4	30.7	17.0	2.59	1.04	8

4.6.12 Construction machinery related factors

Table 4.15 presents construction machinery related factors that influence the selection of a contract procurement method. A four (4) point Likert scale was adopted to explore the perception of the respondents: Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1. Findings reveal that 69.3% of the respondents agreed that increase in hiring cost of construction machinery (mv=3.01) is a significant influential factor that needs careful consideration during the selection process of a procurement method. However, 30.7% of the respondents disagreed with this factor. A significant percentage (83%) of the respondents opined that poor maintenance of construction tools and machinery (mv=2.92) influences the selection process, while difficulties in hiring construction tools and machinery (with mean value 2.68) was also indicated by the respondents.

Table 4.15: Construction machinery related factors

Construction machinery related factors	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Increase in hiring cost of construction machinery	88	31.8	37.5	30.7	0.0	3.01	0.8	1
Poor maintenance of tools and machinery	88	11.4	71.6	14.8	2.3	2.92	0.59	2
Difficulties in hiring construction tools and machinery	88	6.8	55.7	36.4	1.1	2.68	0.62	3
Obsolete machinery used in construction operations	88	12.5	33.0	54.5	0.0	2.58	0.71	4
Inadequate skills of machinery operator	88	8.0	42	50.0	0.0	2.58	0.64	4
Complexities in operation of machinery	88	4.5	44.3	48.0	3.4	2.5	0.64	5
Damage to tools and machinery	88	4.5	29.5	46.6	19.3	2.19	0.8	6
Insufficient number of machinery available for site operations	88	2.3	11.4	79.5	6.8	2.09	0.52	7

4.6.13 Construction manpower related factors

Construction manpower related factors that influence the selection of a contract procurement strategy is presented in Table 4.16. A four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1 was adopted to obtain the opinion of the respondents. From the table, respondents identified insufficient wage payment of construction labourers (mv=3.17) as the major manpower related factor influencing contract procurement method selection. A significant 76.1% of respondents agreed that a communication problem between labourers and supervisors is also key concern, while 20.5% of the respondents disagreed to this, and 3.4% strongly disagreed. Delay in payment of construction labourers and transportation problem for labourers (with mean values of 2.68 and 2.61 respectively) were rated by respondents as a notable factor influencing the selection of a procurement method.

Table 4.16: Construction manpower related factors

Factors	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Insufficient wages payment of construction labourers	88	19.3	79.5	0.0	1.1	3.17	0.46	1
Communication problems between labourers and supervisors	88	6.8	69.3	20.5	3.4	2.80	0.61	2
Delay in payment of construction labourers	88	6.8	72.7	2.3	18.2	2.68	0.85	3
Transportation problem for labourers	88	2.3	56.8	40.9	0.0	2.61	0.53	4
Lack of discipline among labourers	88	0.0	76.1	6.8	17.0	2.60	0.77	5
Pilfering of handy construction materials by labourers	88	0.0	59.1	40.9	0.0	2.60	0.50	5
Adamantly aged construction workers	88	0.0	56.8	43.2	0.0	2.57	0.50	6

4.6.14 Government policies related factors

Table 4.17 presents government policy related factors that are taken into consideration during the selection process of a contract procurement strategy. A four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1 was adopted to obtain the opinion of the respondents. The majority (94.3%) of the respondents agreed that fair, equitable and transparent contract procurement systems (mv=4.72) is a key policy that should be vital during the selection process. However, a minority (3.4%) of the respondents disagreed, and 2.3% strongly disagreed. Corruption and related activities associated with tenders and contracts (mv=3.77) was identified by respondents as a significant policy that should be taken note of. Moreover, competitive and cost-effective procurement systems and sustainable economic growth (with mean values of 3.74 and 3.17 respectively) were rated by the respondents as a major factor that also influences the selection process.

Table 4.17: Government policies related factors

Policies	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Fair, equitable and transparent contract procurement systems	88	81.8	12.5	3.4	2.3	4.72	6.04	**1**
Corruption and related activities relating to tenders and contracts	88	80.7	15.9	3.4	0.0	3.77	0.50	**2**
Competitive and cost-effective procurement systems	88	77.3	19.3	3.4	0.0	3.74	0.51	**3**
Sustainable economic growth	88	39.8	37.5	22.7	0.0	3.17	0.78	**4**
Sustainable employment creation	88	39.8	18.2	21.6	20.5	2.77	1.81	5
Percentage of value added tax to be paid	88	9.1	68.2	5.7	17.0	2.7	0.86	6
Municipal finance management	88	3.5	54.5	42.0	0.0	2.61	0.56	7
Public finance management	88	3.5	60.2	19.3	17.0	2.50	0.82	8
Government's role in promoting an enabling environment for industry and private sector development	88	9.1	48.9	19.3	22.7	2.44	0.95	9

4.6.15 External factors

External factors that influence the selection of a contract procurement method are presented in Table 4.18. Respondents' perceptions were explored, with the adoption of a four (4) point Likert scale, where Strongly agree=4, Agree=3, Disagree=2, and Strongly disagree=1. Level of advanced technology (mv=3.52) emerged as the highest rated external factor influencing the selection of a contract procurement method, as the majority of respondents agreed that this factor must be significantly considered. Physical environment consideration (mv=3.47) was identified by respondents as yet another key factor. Industrial environment consideration (mv=3.14) and effects of rainfall on construction work (depending on the nature of work being executed), with a mean value of 2.98, were also identified by respondents as significant factors.

Table 4.18: External factors

Factors	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Level of advanced technology	88	52.3	47.7	0.0	0.0	3.52	0.50	1
Physical environment consideration	88	50.0	46.6	3.4	0.0	3.47	0.57	2
Industrial environment consideration	88	18.2	78.4	3.4	0.0	3.14	0.44	3
Effects of rainfall on construction works	88	17.0	63.6	19.3	0.0	2.98	0.61	4
Political interference	88	3.4	80.7	15.9	0.0	2.88	0.42	5
Change in government policies and regulations	88	4.5	76.2	19.3	0.0	2.85	0.46	6
Public holidays effect on progress of work	88	1.1	46.6	48.9	3.4	2.45	0.59	7
Effect of sunlight on construction operations	88	0.0	30.7	67.0	2.3	2.28	0.50	8

4.6.16 Sustainability concerns

Sustainability concerns that are given careful consideration during the selection process of a contract procurement method is presented in Table 4.19. A four (4) point Likert scale of Strongly agree=4, Agree 3, Disagree=2, Strongly disagree=1 was adopted to ascertain the opinions of the respondents. Findings showed that sustainable construction under the economic concern (mv=3.53), as agreed by the majority of respondents, is a key concern influencing the selection of a contract procurement method. The respondents identified that aesthetically acceptable housing (mv=3.31) and transportation of hazardous material (mv=2.95), under the environmental concern, are also vital factors to be considered, while 77.3% of the respondents indicated that feasible and viable construction cost (mv=2.94) under the economic concern is a significant concern to be taken note of during the selection process.

Table 4.19: Sustainability concerns

Concerns	No.	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree (%)	Mean value (mv)	Std. D	Rank (r)
Sustainable construction	88	53.4	46.6	0.0	0.0	3.53	0.5	1
Aesthetically acceptable housing	88	52.3	27.3	20.4	0.0	3.31	0.80	2
Transportation of hazardous materials	88	33.0	46.6	3.4	17.0	2.95	1.03	3
Feasible and viable construction cost	88	36.4	40.9	3.4	19.3	2.94	1.09	4
Efficient land use	88	21.6	61.4	0.0	17.0	2.87	0.94	5
Sustainable housing delivery	88	33.0	25.0	21.5	20.5	2.70	1.14	6
Sustainable construction	88	5.7	46.6	47.7	0.0	2.58	0.60	7
Equitable housing project delivery	88	3.4	28.4	48.9	19.3	2.16	0.77	8

4.6.17 Satisfaction of contract procurement methods on project cost (affordability)

Table 4.20 presents the perception of the respondents on the contract procurement method satisfactory on project cost. The opinion of the respondents was obtained with a four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2 and Strongly disagree=1. From the table, competitive contract (mv=3.84) under the design and build procurement method was identified by 97.7% of the respondents as a contractual arrangement that is cost satisfactory, while a minority (2.3%) of the respondents indicated this as not satisfactory. A highly significant percentage of the respondents affirmed that lump sum contract (mv=3.42) under the traditional procurement method is a cost satisfactory procurement approach. Direct contract (mv=3.33) under the design and build procurement system and construction management (mv=2.75) under the management based procurement system were also identified by respondents as approaches that are satisfactory on project cost.

Table 4.20: Satisfaction of contract procurement methods on project cost (affordability)

Contract Procurement Strategies	No.	Highly satisfactory (%)	Satisfactory (%)	Less satisfactory (%)	Not satisfactory (%)	Mean value (mv)	Std. D	Rank (r)
Competitive contract (Traditional)	88	86.3	11.4	2.3	0.0	3.84	0.43	1
Lump sum contract (Traditional)	88	42.0	58.0	0.0	0.0	3.42	0.50	2
Direct contract (D&B)	88	36.4	60.2	3.4	0.0	3.33	0.54	3
Construction management (Management based)	88	5.7	65.9	26.1	2.3	2.75	0.59	4
Project management (Management based)	88	0.0	54.5	45.5	0.0	2.55	0.50	5
Measurement contract (Traditional)	88	0.0	52.3	47.7	0.0	2.52	0.50	6
Cost reimbursement contract (Traditional)	88	3.4	44.3	52.3	0.0	2.51	0.57	7
Buy-Build-Operate (PPP)	88	19.3	23.9	40.9	15.9	2.47	0.98	8
Package deal contract (D&B)	88	19.3	6.8	71.6	2.3	2.43	0.83	9
Build-Lease-Operate-Transfer (PPP)	88	5.7	37.5	40.9	15.9	2.33	0.82	10
Build-Operate-Transfer (PPP)	88	19.3	4.5	60.2	15.9	2.27	0.96	11
Management contracting (Management based)	88	0.0	38.6	42.0	19.3	2.19	0.74	12
Develop-Operate-Transfer (PPP)	88	2.3	20.5	61.4	15.9	2.09	0.67	13
Design-Build-Operate (PPP)	88	2.3	20.5	58.0	19.3	2.06	0.70	14
Lease-Renovate-Operate-Transfer (PPP)	88	2.3	18.2	60.2	19.3	2.03	0.69	15
Labour only (Labour based)	88	2.3	20.5	20.5	56.8	1.68	0.88	16
Direct labour (Labour based)	88	0.0	19.3	6.8	73.9	1.45	0.80	17

***D&B=Design and Build; PPP=Public-Private-Partnership**

4.6.18 Satisfaction of contract procurement methods on project completion time

Table 4.21 presents the perception of the respondents on the contract procurement method satisfactory on project time. The opinion of the respondents was obtained with a four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2 and Strongly disagree=1. From the table, direct contract (mv=3.08) under the design and build procurement system was ranked as the most satisfactory approach on project time by 88.6% of the respondents, while a minority (11.4%) of respondents disagreed. Significantly, 88.6% of the respondents indicated project management (mv=3.06), under the management based procurement method, as a satisfactory approach with regards to project time, while 71.6% of the respondents identified lump sum contract (mv=2.75) under the traditional procurement

strategy as satisfactory on project time; similarly, 71.6% of the respondents rated management contracting (mv=2.72) under the management based procurement system as a time satisfactory contract procurement approach.

Table 4.21: Satisfaction of contract procurement methods on project completion time

Contract Procurement Strategies	No.	Highly satisfactory (%)	Satisfactory (%)	Less satisfactory (%)	Not satisfactory (%)	Mean value (mv)	Std. D	Rank (r)
Direct contract (D&B)	88	19.3	69.3	11.4	0.0	3.08	0.55	1
Project management (Management based)	88	17.0	71.6	11.4	0.0	3.06	0.53	2
Lump sum contract (Traditional)	88	3.4	68.2	28.4	0.0	2.75	0.51	3
Management contracting (Management based)	88	0.0	71.6	28.4	0.0	2.72	0.45	4
Labour only (Labour based)	88	19.3	34.1	44.3	2.3	2.70	0.8	5
Construction management (Management based)	88	2.3	59.1	38.6	0.0	2.63	0.53	6
Competitive contract (D&B)	88	2.3	55.7	42.0	0.0	2.60	0.54	7
Direct labour (Labour based)	88	0.0	53.4	46.6	0.0	2.53	0.5	8
Build-Operate-Transfer (PPP)	88	36.4	12.5	18.2	33.0	2.52	1.29	9
Package deal contract (D&B)	88	17.0	19.3	61.4	2.3	2.51	0.80	10
Measurement contract (Traditional)	88	0.0	40.9	59.1	0.0	2.41	0.50	11
Cost reimbursement contract (Traditional)	88	0.0	54.5	14.8	30.7	2.24	0.90	12
Design-Build-Operate (PPP)	88	22.7	9.1	35.2	33.0	2.22	1.14	13
Build-Lease-Operate-Transfer (PPP)	88	3.4	45.5	18.2	33.0	2.19	0.95	14
Buy-Build-Operate (PPP)	88	19.3	9.1	38.6	33.0	2.15	1.09	15
Develop-Operate-Transfer (PPP)	88	0.0	45.5	21.6	33.0	2.13	0.88	16
Lease-Renovate-Operate-Transfer (PPP)	88	0.0	9.1	55.7	35.2	1.74	0.62	17

***D&B=Design and Build; PPP=Public-Private-Partnership**

4.6.19 Satisfaction of contract procurement methods on project quality

Table 4.22 shows the perception of respondents on the contract procurement method satisfactory on project quality. The opinion of the respondents was obtained with a four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1. From the table, data show a significant percentage (80.7%) of respondents affirmed that lump sum contract (mv=3.03) under the traditional contract procurement method is an approach that satisfactorily meets project quality. However, only 19.3% of the respondents opined that the

approach is less satisfactory on project quality. Then, 71.6% of the respondents indicated that package deal contract (mv=2.99) under the design and build contract procurement system best satisfies project quality requirement. Cost reimbursement contract (mv=2.87) under the traditional procurement strategy, and competitive contract (mv=2.83) under the design and build procurement system, were also rated as satisfactory approaches by the respondents.

Table 4.22: Satisfaction of contract procurement methods on project quality

Contract Procurement Strategies	No.	Highly satisfactory (%)	Satisfactory (%)	Less satisfactory (%)	Not satisfactory (%)	Mean value (mv)	Std. D	Rank (r)
Lump sum contract (Traditional)	88	22.7	58.0	19.3	0.0	3.03	0.65	1
Package deal contract (D&B)	88	30.7	40.9	25.0	3.4	2.99	0.84	2
Cost reimbursement contract (Traditional)	88	2.3	81.8	15.9	0.0	2.87	0.41	3
Competitive contract (D&B)	88	5.7	71.6	22.7	0.0	2.83	0.51	4
Measurement contract (Traditional)	88	1.1	79.5	19.3	0.0	2.82	0.42	5
Project management (Management based)	88	2.3	75.0	22.7	0.0	2.80	0.46	6
Construction management (Management based)	88	0.0	77.3	22.7	0.0	2.77	0.42	7
Direct contract (D&B)	88	19.3	55.7	2.3	22.7	2.72	1.03	8
Build-Operate-Transfer (BOT)	88	19.3	46.6	3.4	30.7	2.55	1.12	9
Direct labour (Labour based)	88	20.5	19.3	53.4	6.8	2.53	0.9	10
Management contracting (Management based)	88	0.0	46.6	51.1	2.3	2.44	0.54	11
Build-Lease-Operate-Transfer (PPP)	88	19.3	29.5	20.5	30.7	2.38	1.12	12
Design-Build-Operate (PPP)	88	0.0	33.0	64.8	2.3	2.31	0.51	13
Labour only (labour based)	88	19.3	20.5	25.0	35.2	2.24	1.13	14
Develop-Operate-Transfer (PPP)	88	20.5	29.5	2.3	47.7	2.23	1.25	15
Lease-Renovate-Operate-Transfer (PPP)	88	0.0	46.6	31.8	21.6	2.25	0.79	16
Buy-Build-Operate (PPP)	88	0.0	29.5	42	28.4	2.01	0.77	17

***D&B=Design and Build; PPP=Public-Private-Partnership**

4.6.20 Benefit of contract procurement methods on housing project resource (construction materials)

Table 4.23 shows the perception of the respondents on the contract procurement method satisfactory on housing project resource. The opinion of the respondents was obtained with a four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2, Strongly disagree=1. From the table, 72.7% and 88% of the respondents opined that labour only (mv=2.88) and

direct labour (mv=2.81) approaches under the labour based contract procurement strategy are of benefit to construction materials, in terms of effective utilisation of materials for construction works. However, 27.2% and 11.4% of the respondents expressed that these approaches are less beneficial. Direct contract (mv=2.70), under the design and build procurement system, was perceived by 72.7% of the respondents as an approach that is beneficial on construction materials, while cost reimbursement contract (mv=2.68) was opined by 52.3% of the respondents to be beneficial on construction materials.

Table 4.23: Benefit of contract procurement methods on housing project resource (construction materials)

Contract Procurement Strategies	No.	Highly beneficial (%)	Beneficial (%)	Less beneficial (%)	Not beneficial (%)	Mean value (mv)	Std. D	Rank (r)
Labour only (Labour based)	88	19.3	53.4	22.7	4.5	2.88	0.77	1
Direct labour (Labour based)	88	0.0	88.6	3.4	8.0	2.81	0.56	2
Direct contract (D&B)	88	0.0	72.7	25.0	2.3	2.70	0.51	3
Cost reimbursement contract (Traditional)	88	21.6	30.7	42.0	5.7	2.68	0.88	4
Competitive contract (D&B)	88	2.3	51.1	46.6	0.0	2.56	0.54	5
Package deal contract (D&B)	88	0.0	53.4	44.3	2.3	2.51	0.55	6
Project management	88	0.0	50.0	46.6	3.4	2.47	0.57	7
Lump sum contract (Traditional)	88	2.3	55.7	22.7	19.3	2.41	0.83	8
Measurement contract (Traditional)	88	2.3	22.7	69.3	5.7	2.22	0.58	9
Management contracting (Management based)	88	0.0	38.6	44.3	17.0	2.22	0.71	9
Buy-Build-Operate (PPP)	88	0.0	55.7	9.1	35.2	2.20	0.94	10
Construction management (Management based)	88	0.0	30.7	50.0	19.3	2.11	0.70	11
Build-Lease-Operate-Transfer (PPP)	88	0.0	38.6	26.1	35.2	2.03	0.86	12
Build-Operate-Transfer (PPP)	88	0.0	35.2	29.5	35.2	2.00	0.84	13
Develop-Operate-Transfer (PPP)	88	0.0	35.2	29.5	35.2	2.00	0.84	13
Design-Build-Operate (PPP)	88	0.0	38.6	9.1	52.3	1.86	0.95	14
Lease-Renovate-Operate-Transfer (PPP)	88	0.0	19.3	9.1	71.6	1.48	0.80	15

***D&B=Design and Build; PPP=Public-Private-Partnership**

4.6.21 Benefit of contract procurement methods on housing project resource (construction manpower)

Table 4.24 shows the perception of respondents on the contract procurement method satisfactory on construction manpower. The opinion of the respondents was obtained with a four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2 and Strongly disagree=1. From the table, the respondents identified lump sum contract (mv= 3.30), cost reimbursement contract (mv= 2.93) and measurement contract (mv= 2.80), under the traditional contract procurement method, as approaches that are of benefit to construction manpower (labourers), in respect of hard work and wage payment when due. Construction management method (mv=2.64) under the management based method was also affirmed by the respondents as a procurement approach that is beneficial to construction manpower.

Table 4.24: Benefit of contract procurement methods on housing project resource (construction manpower)

Contract Procurement Strategies	No.	Highly beneficial (%)	Beneficial (%)	Less beneficial (%)	Not beneficial (%)	Mean value (mv)	Std. D	Rank (r)
Lump sum contract (Traditional)	88	36.4	58.0	4.5	1.1	3.30	0.61	1
Cost reimbursement contract (Traditional)	88	36.4	23.9	36.4	3.4	2.93	0.93	2
Measurement contract (Management based)	88	19.3	44.3	33.0	3.4	2.80	0.79	3
Construction management (Management based)	88	22.7	21.6	52.3	3.4	2.64	0.87	4
Competitive contract (D&B)	88	0.0	43.2	51.1	5.7	2.50	0.87	5
Package deal contract (D&B)	88	0.0	53.4	40.9	5.7	2.47	0.61	6
Direct contract (D&B)	88	19.3	17.0	58.0	5.7	2.34	0.59	7
Management contracting (Management based)	88	0.0	58.0	8.0	34.1	2.24	0.93	8
Buy-Build-Operate (PPP)	88	0.0	39.8	33.0	27.3	2.13	0.82	9
Labour only (Labour based)	88	19.3	5.7	38.6	36.4	2.08	1.1	10
Build-Lease-Operate-Transfer (PPP)	88	0.0	36.4	30.7	33.0	2.03	0.84	11
Project management (Management based)	88	3.4	26.1	33.0	37.5	1.95	0.88	12
Direct labour (Labour based)	88	0.0	28.4	37.5	34.1	1.94	0.79	13
Build-Operate-Transfer (PPP)	88	0.0	19.3	53.4	27.3	1.92	0.68	14
Design-Build-Operate (PPP)	88	0.0	19.3	53.4	27.3	1.92	0.68	14
Lease-Renovate-Operate-Transfer (PPP)	88	0.0	19.3	20.5	60.2	1.59	0.8	15
Develop-Operate-Transfer (PPP)	88	0.0	3.4	50.0	46.6	1.57	0.56	16

***D&B=Design and Build; PPP=Public-Private-Partnership**

4.6.22 Benefit of contract procurement methods on housing project resource (construction machinery)

Table 4.25 shows the perception of the respondents on the contract procurement method satisfactory on construction machinery. The opinion of the respondents was obtained with a four (4) point Likert scale of Strongly agree=4, Agree=3, Disagree=2 and Strongly disagree=1. Findings reveal that competitive contract (mv=2.88) under the design and build contractual arrangement was perceived by 71.6% of the respondents to be an approach that is of benefit in respect of construction machinery; however, 28.4% of the respondents suggested that this approach is less beneficial.

Table 4.25: Benefit of contract procurement methods on housing project resource (construction machinery)

Contract Procurement Strategies	No.	Highly beneficial (%)	Beneficial (%)	Less beneficial (%)	Not beneficial (%)	Mean value (mv)	Std. D	Rank (r)
Competitive contract (D&B)	88	19.3	52.3	25.0	3.4	2.88	0.76	1
Cost reimbursement contract (Traditional)	88	19.3	21.6	58.0	1.1	2.59	0.81	2
Measurement contract (Traditional)	88	0.0	58.0	42.0	0.0	2.58	0.50	3
Package deal contract (D&B)	88	19.3	21.6	56.8	2.3	2.58	0.83	3
Lump sum contract (Traditional)	88	21.6	34.1	23.9	20.5	2.57	1.05	4
Direct contract (D&B)	88	17.0	25.0	55.7	2.3	2.57	0.89	4
Construction management (Management based)	88	0.0	64.8	12.5	22.7	2.42	0.84	5
Project management (Management based)	88	0.0	20.5	79.5	0.0	2.24	0.41	6
Build-Operate-Transfer (PPP)	88	17.0	22.7	27.3	33.0	2.24	1.09	6
Management contracting (Management based)	88	0.0	17.0	83.0	0.0	2.17	0.38	7
Labour only (Labour based)	88	0.0	42.0	27.3	30.7	2.11	0.85	8
Buy-Build-Operate (PPP)	88	17.0	5.7	45.5	31.8	2.08	1.03	9
Design-Build-Operate (PPP)	88	17.0	3.4	46.6	33.0	2.05	1.03	10
Direct labour (Labour based)	88	3.4	0.0	96.6	0.0	2.01	0.37	11
Develop-Operate-Transfer (PPP)	88	0.0	19.3	48.9	31.8	1.85	0.71	12
Build-Lease-Operate-Transfer (PPP)	88	0.0	17.0	47.7	35.2	1.82	0.70	13
Lease-Renovate-Operate-Transfer (PPP)	88	0.0	0.0	63.6	36.4	1.64	1.48	14

***D&B=Design and Build; PPP=Public-Private-Partnership**

Cost reimbursement contract (mv=2.59) under the traditional contract procurement method was identified by the respondents as a beneficial approach to construction machinery. Package deal contract (mv=2.58), measurement contract (mv=2.58), direct contract (mv= 2.57) and lump sum contract (mv=2.57) were indicated by respondents as approaches that are of benefit to construction machinery.

4.7 Discussion of findings

4.7.1 Effectiveness of contract procurement strategies used for housing projects

In this section, the findings of the effectiveness of contract procurement strategies used for housing projects are discussed. The analysis was based on how effective the contract procurement strategies are on project cost, project time, project quality and involved project stakeholder satisfaction. Tables 4.4, 4.5, 4.6 and 4.7 present a comprehensive report on the perception of the respondents in terms of project cost, project time, project quality and involved project stakeholder satisfaction.

4.7.1.1 Effectiveness of contract procurement strategies used for housing projects (cost effectiveness)

The study conducted an analysis of the contract procurement strategies used in the construction industry for housing projects. The findings (Table 4.4) show that the majority of respondents believed that competitive contract under the design and build contractual arrangement is the most effective approach on project cost. A competitive contract is an arrangement whereby tenders that are prepared by the client team are sent to different contractors to compete in design and construction prices (Love, 1998:82). The findings also show that the majority of respondents (Table 4.4) identified direct contract as an effective approach on project cost. A direct contract is a contractual arrangement whereby no tenders are obtained from contractors by competition (Davis, 2008:14).

4.7.1.2 Effectiveness of contract procurement strategies used for housing projects (time effectiveness)

Lump sum contract under the traditional contract procurement method is believed by the respondents to be a time effective contract procurement approach, as shown in Table 4.5. Abdul Rashid *et al.* (2006:62) claimed that the traditional procurement strategy is preferable to the other alternative strategies in the sense that it provides accountability and better design and construction control by the client (i.e. there is ample time for the client and the project team to examine and evaluate the design before construction). As presented in Table 4.5, Build-Lease-Operate-Transfer approach (BLOT) (under PPP) is also regarded by the

respondents as a contractual approach effective on project time. Hall (1998:128) posits that PPP model enhances project time saving because it accelerates project development by avoiding unnecessary delays in project delivery. Furthermore, a packaged deal contract under the design and build contractual arrangement was perceived by the respondents as a time effective contract procurement approach. Griffith and Watson (2003:83) collaborated this view by asserting that design and build procurement method is primarily referred to as a 'build-it-fast' project delivery system, as the design and construction phases are integrated, ensuring timely project completion.

4.7.1.3 Effectiveness of contract procurement strategies used for housing projects (quality effectiveness)

Package deal contract, direct contract and competitive contract (design and build) are considered quality effective contract procurement approaches (Table 4.6). A study undertaken by Abdul Rashid *et al.* (2006:89) showed that the design and build method allowed design and construction processes to run parallel, thereby reducing the overall construction period considerably. Furthermore, Table 4.6 shows that the Build-Operate-Transfer (BOT) approach (under PPP) is a procurement system that is effective upon project quality. Gounden (2000:99) opined that OT projects are mostly used in developing a discreet facility and refurbishment services, thus promoting project quality.

4.7.1.4 Effectiveness of contract procurement strategies used for housing projects (stakeholder satisfaction)

Findings of the current study also reveal that lump sum contract (traditional procurement method) is a contractual arrangement that assuages involved construction stakeholder satisfaction (Table 4.7). Woodward (2001:288) alluded that the traditional contract procurement strategy aids stakeholder satisfaction in the sense that there is a single point of responsibility and the client has a direct relationship with the contractor, facilitating a high level of material, manpower and machinery functionality and improving the quality in the overall design. In addition, direct contract and competitive contract (design and build) are perceived as approaches that aid construction stakeholder satisfaction. Kumaraswamy and Dissanayaka (1998:27) posited that close inter-communication between the contractor's design and construction team promotes cooperation in achieving smooth execution of the contract and prompt resolution of site problems, providing a fair and satisfying balance for parties involved in the contract. Build-Lease-Operate-Transfer (BLOT) model (under PPP) is indicated as a procurement approach that meets construction stakeholder satisfaction. Hall (1998:128) argued that the PPP model facilitates creative and innovative approaches, thereby enhancing involved stakeholder satisfaction through integrated solution capacity.

4.7.2 Extent of use of the contract procurement methods for public and private housing delivery.

Findings in Tables 4.8 and 4.9 reveal that lump sum contract (traditional contract procurement strategy) is used frequently to deliver both public and private housing projects. Mathonsi and Thwala (2012:3583) asserted that around 43% of all housing projects in South Africa are being executed using the traditional method of contract procurement, as it is the favoured form of contract procurement. Olabode (2013:3) supports further that the traditional contract procurement method is a 'tried and tested' method of procurement on construction projects with which the construction market is very familiar.

4.7.3 Project related factors

The level of complexity of a project is the most significant factor that influences the selection of a contract procurement method. The study reveals that the size of a project, the scope of a project, the nature of a project and the type of a project (Table 4.10) are the major project-related factors that influence the selection of a procurement method. Thanh Luu *et al.* (2003:215) assert that it is vital to address the level of complexity of a project so as to help the client and involved stakeholders select the right procurement strategy.

4.7.4 Design related factors

The study explores the perception of construction professionals regarding design related factors influencing the selection of a contract procurement method. Members of the design team considered for the study are architects, design engineers, clients, quantity surveyors and other design-related agents. Table 4.11 reveals that design team experience, mistakes in producing design documents, project design complexity and delay in producing design documents are the major design related factors influencing the selection of a procurement method. Several studies acknowledge the impact of client/design professionals on construction project performance. Zakeri *et al.* (1996:417); Makulsawatudom *et al.* (2004:3); Enshassi *et al.* (2007:245); Dai *et al.* (2009:217); Ameh and Osegbo (2011:56); Jarkas and Bitar (2012:811); and Soham and Rajiv (2013:583) report delay in producing design documents and late response of design professionals on production information as design challenges on construction projects.

4.7.5 Client related factors

Client emphasis on low construction cost (with a mean value of 3.55) is ranked as the primary client related factor influencing the selection of a contract procurement method (Table 4.12). Cost is a major constraint on every construction project. Skitmore and Marsden (1998:5) held that constraints are aspects of a project that influence the key objectives of a

project in several ways. Client emphasis on timely project delivery, client emphasis on high quality delivery, and type of client funding are also identified as client related factors that influence the selection of a contract procurement method.

4.7.6 Project management related factors

Findings reveal project scope management (with a mean value of 3.75) as the most significant project management related factor influencing the selection of a contract procurement method (Table 4.13 & Table 4.10). PMI (2008:16) described the scope of a project as work that needs to be accomplished to deliver a product, service, or result with specified features and functions; therefore, project managers must have knowledge and understanding of project scope management techniques, to allow for intelligent allocation of the right construction resources to complete a project successfully. Project risk management, effective cost management and efficient time management are also identified as key project management-related factors.

4.7.7 Construction material related factors

Construction materials undoubtedly constitute an important resource in the construction sector and construction market, and attract a significant share of project cost. Exploring the influence of material related factors that influence the selection of a contract procurement method in the Western Cape shows that shortage of construction materials (with a mean value of 3.34) is the most important factor to consider (Table 4.14). Donyavi and Flangan (2009:11) noted the availability of construction materials at the right time and at the specified location as important factor to project success. Unavailability and shortage of construction materials is also agreed by Olomolaiye *et al.* (1987:321); Kaming *et al.* (1997:26); Enshassi *et al.* (2007:252); Dai *et al.* (2009:221); and Makulsawatudom *et al.* (2004:3) as a significant factor contributing to the selection process of a contract procurement method. Late order and delivery of construction materials is also one of the principal challenges regarding construction materials. Cooke and William (2013:401) acknowledged the need to establish good communication practices between construction site mangers and construction material suppliers, open and frequent communication with adequate feedback.

4.7.8 Construction machinery related factors

Table 4.15 shows the construction machinery related factors influencing contract procurement strategy selection. Survey respondents identified that increase in hiring cost of construction machinery is a major factor, as cost is a project constraint and all clients place emphasis on low project cost. Poor maintenance of construction tools and machinery is also perceived by the respondents as a significant factor. Edwards *et al.* (2005:243) posited that

poor maintenance and inadequate utilisation of construction machinery negatively influence project success. Rivas *et al.* (2001:312) identified that construction tools and machinery related factors are substantial challenges to construction project performance.

4.7.9 Construction manpower related factors

The findings reveal insufficient wage payment and delay in payment of construction labourers (Table 4.16) are major factors to be considered. Chen, Liaw and Lee (2003:299) asserted that manpower is the twenty-first century's most valuable asset, so construction workers are the only productive resource in the construction industry, as worker effectiveness demands contributions from all stakeholders in the construction sector. Due to the significant contribution of the construction workforce to successful construction project productions, Kazaz and Ulubeyli (2007:2132) argued that adequate compensation of construction labourers will enhance efficiency of construction products and as such, render an organisation's set goals more achievable. Transportation problem for labourers is also considered a major factor. Manpower is the source of more risk than construction machinery and materials (Hanna *et al.,* 2005:734).

4.7.10 Government policies related factors

Findings show that a fair, equitable, transparent, competitive and cost-effective contract procurement system is the major requirement on every construction project (Table 4.17). Jeselski and Talukhaba (1998:185) posited that this would meet the needs of a decentralized public construction contract procurement system and be attractive to, and serve the needs of the private sector. In addition, every construction project needs to bear in mind the development of sustainable economic growth. Myers (2013:222) asserted that the construction industry is an economic investment and its relationship with economic development is well-posited with the significant contribution of the construction industry to national economic development.

4.7.11 External factors

The external factors that influence the selection of a contract procurement strategy are the factors that are not attributed to individual participants in the construction sector; hence, measures must be established to reduce the effect of external factors influencing a contract procurement method selection. Table 4.18 shows that a level of advanced technology (mv=3.52) is the most significant factor that should be considered, thus new project innovations must be introduced, rather than making prescriptive specifications (Davis, Love & Baccarini, 2008:29). Physical and industrial environment considerations, as well as effects of rainfall on construction works, are also identified.

4.7.12 Sustainability concerns

Table 4.19 reveals the perception of respondents on sustainability concerns. Sustainable construction (with a mean value of 3.53) is identified as a major concern. Sutton (2000:online) posited that the concept of building sustainability is a means to avoid conflict between economic development and environmental protection. This entails applying economically viable and eco-friendly techniques to sustainable construction as a solution to environmental issues, finding ways to save and protect the environment and inflict minimal harm to natural resources. Aesthetically acceptable housing, transportation of hazardous materials and feasible construction costs are also concerns to be noted.

4.7.13 Satisfaction of contract procurement methods on project cost, time and quality

Table 4.20, 4.21 and 4.22 reveal the perception of the respondents on the extent of satisfaction of the contract procurement strategies on project key parameters – cost, time and quality. Table 4.20 reveals that design and build and traditional contract procurement methods are both ranked as cost satisfactory approaches. Management based approach (construction management) is also identified as an approach satisfactory in regard to project cost. Table 4.21 shows that design and build (direct contract), management based (management contracting and project management) and traditional contract procurement methods (lump sum contracts) are approaches ranked by survey respondents as time effective on construction projects. Table 4.22 reveals traditional (lump sum and cost reimbursement contract) and design and build (competitive and package deal contract) contract procurement methods ranked by survey respondents as construction project quality effective approaches.

4.7.14 Benefit of contract procurement methods on housing project resources (construction materials)

Table 4.23 shows that the labour based (labour only and direct labour) procurement approach is beneficial in respect of construction materials. Saha and Hardie (2010:38) and Adenuga (2013:22) posited that the labour based contract procurement approach provides huge financial savings on construction materials and on the project as a whole, as the project rules, conditions and effective utilisation of construction resources are set by the client, therefore the labour employed provides positive input, knowing the client's specific needs. However, Oladiran *et al.* (2007:17) argued that the labour based approach is time consuming and extremely stressful and serves as a minefield for the inexperienced. Design and build (direct contract) and the traditional contract procurement strategy (cost reimbursement contract) are also perceived as approaches of benefit with respect to construction materials.

4.7.15 Benefit of contract procurement methods on housing project resources (Construction manpower)

Table 4.24 shows that traditional contract procurement (lump sum contract, measurement contract and cost reimbursement contract) approach is beneficial in respect of construction manpower. Ramus, Birchall and Griffiths (2006:85) opined that variations (alterations or modifications) to the contract are relatively easy to arrange and manage and have no significant influence on construction manpower. However, Akram *et al.* (2012:32) argued that the separation of design and construction often times lead to contractual disputes on defects in design (for which the client is responsible) and on construction manpower (for which the contractor is responsible). The management based contract procurement approach (construction management) is also identified as an approach of benefit to construction manpower. Ashworth (2006:57) supported that since works packages are let competitively at current market prices, a degree of price certainty is allowed.

4.7.16 Benefit of contract procurement methods on housing project resources (construction machinery)

Table 4.25 reveals that the traditional contract procurement (lump sum contract, measurement contract and cost reimbursement contract) approach is beneficial in respect of construction manpower. Woodward (2001:288) supported that the traditional contract procurement method provides a single point of responsibility: the client has a direct relationship with the contractor and therefore facilitates a high level of machinery functionality. Design and build procurement method (direct contract, competitive contract and package deal contract) is also identified as a beneficial approach to construction machinery.

In pursuant of the research objectives, the study identified the effectiveness of contract procurement strategies, factors that influence the selection of a procurement strategy, the influence of contract procurement methods on project cost, time and quality, the benefits and shortfalls of contract procurement strategies on construction resources (materials, manpower and machinery), as perceived by the study respondents and presented in table 4.26. With reference to the study findings presented in table 4.5 to table 4.25, the five highest-rated findings in each table were selected and considered as the most significant, in table 4.26.

Table 4.26: Summary of findings of analysed quantitative data

CONCEPTS	ISSUES ADDRESSED	FINDINGS
1.0 To examine the effectiveness of contract procurement strategies for housing projects	1.1 Cost effectiveness	1. Competitive contract (D&B) 2. Direct contract (D&B) 3. Design-Build-Operate (PPP) 4. Develop-Operate-Transfer (PPP) 5. Lump sum contract (Traditional)
	1.2 Time effectiveness	1. Lump sum contract (Traditional) 2. Build-Lease-Operate-Transfer (PPP) 3. Package deal contract (D&B) 4. Management contracting (management based) 5. Measurement contract (traditional)
	1.3 Quality effectiveness	1. Package deal contract (D&B) 2. Competitive contract (D&B) 3. Build-Operate-Transfer (PPP) 4. Lump sum contract (Traditional) 5. Cost reimbursement contract (Traditional)
	1.4 Stakeholders' satisfaction	1. Lump sum contract (Traditional) 2. Build-Lease-Operate-Transfer (PPP) 3. Direct contract (D&B) 4. Competitive contract (D&B) 5. Buy-Build-Operate (PPP)
	1.5 Extent of use of contract procurement methods for public housing project delivery	1. Lump sum contract (Traditional) 2. Competitive contract (D&B) 3. Project management (Management based) 4. Construction management (management based) 5. Measurement contract (Traditional)
	1.6 Extent of use of contract procurement methods for private housing project delivery	1. Lump sum contract (Traditional) 2. Competitive contract (D&B) 3. Construction management (Management based) 4. Management contracting (management based) 5. Measurement contract (Traditional)
2.0 To identify the factors that influence the selection of a suitable procurement method for housing projects	2.1 Project related factors	1. Size of the project 2. Scope of the project 3. Nature of the project 4. Type of the project 5. Project innovation
	2.2 Design related factors	1. Design team experience 2. Mistakes in producing design documents 3. Project design complexity 4. Delay in producing design documents 5. Inadequate coordination among

		design team
	2.3 Client related factors	1. Client emphasis on low construction cost 2. Client emphasis on timely project delivery 3. Client experience in construction 4. Client emphasis on high quality delivery 5. Type of client funding
	2.4 Project management related factors	1. Project scope management 2. Project risk management 3. Effective cost management 4. Effective time management 5. Project quality management
	2.5 Construction material related factors	1. Shortage of construction materials 2. Wastage of construction materials by workers 3. Late order of construction materials 4. Availability of construction materials 5. Increase in cost of construction materials
	2.6 Construction machinery related factors	1. Increase in hiring cost of construction machinery 2. Poor maintenance of tools and machinery 3. Difficulties in hiring construction tools and machinery 4. Obsolete machinery used in construction operations 5. Inadequate skills of machinery operator
	2.7 Construction manpower related factors	1. Insufficient wages payment of construction labourers 2. Communication problems between labourers and supervisors 3. Delay in payment of construction labourers 4. Transportation problem for labourers 5. Lack of discipline among labourers
	2.8 Government policies related factors	1. Fair, equitable and transparent contract procurement systems 2. Corruption and related activities relating to tenders and contracts 3. Competitive and cost effective procurement systems 4. Sustainable economic growth 5. Sustainable employment creation
	2.9 External factors	1. Level of advanced technology 2. Physical environment consideration 3. Industrial environment consideration 4. Effects of rainfall on construction works 5. Political interference

	2.10 Sustainability concerns	1. Sustainable construction 2. Aesthetically acceptable housing 3. Transportation of hazardous materials 4. Feasible and viable construction cost 5. Efficient land use
3.0 To analyse the influence of contract procurement methods on the delivery of sustainable housings in terms of cost (affordability), time an quality	3.1 Cost satisfaction	1. Competitive contract (Traditional) 2. Lump sum contract (Traditional) 3. Direct contract (D&B) 4. Construction management (Management based) 5. Project management (Management based)
	3.2 Time satisfaction	1. Direct contract (D&B) 2. Project management (Management based) 3. Lump sum contract (Traditional) 4. Management contracting (Management based) 5. Labour only (Labour based)
	3.3 Quality satisfaction	1. Lump sum contract (Traditional) 2. Package deal contract (D&B) 3. Cost reimbursement contract (Traditional) 4. Competitive contract (D&B) 5. Measurement contract (Management based)
4.0 To examine the benefits and shortfalls associated with each procurement method on housing project resources (materials, manpower and machinery)	4.1 Benefits on construction materials	1. Labour only (Labour based) 2. Direct labour (Labour based) 3. Direct contract (D&B) 4. Competitive contract (D&B) 5. Package deal contract (D&B)
	4.2 Benefits on construction manpower	1. Lump sum contract (Traditional) 2. Cost reimbursement contract (Traditional) 3. Measurement contract (Traditional) 4. Construction management (Management based) 5. Competitive contract (D&B)
	4.3 Benefits on construction machinery	1. Competitive contract (D&B) 2. Cost reimbursement contract (Traditional) 3. Measurement contract (Traditional) 4. Package deal contract (D&B) 5. Lump sum contract (Traditional)

4.8 Validation of findings

The purpose of the qualitative data collection is to validate the quantitative data elicited from construction professionals. The research sub-questions used for the quantitative data collection were used to conduct a semi-structured interview to confirm if the quantitative results answered what they portray to answer in regard to the research aim and objectives. Four (4) construction sites were selected for the oral interviews. The researcher scheduled appointments for each interview with the respondents to ensure efficient research time management. Four (4) constructional professionals (A, B, C and D) were interviewed on construction sites and in consulting offices. The interview session conducted with each interviewee commenced with an introduction of the researcher and the researcher explaining the underlying purpose of the study to the respondents. The interview discussion was recorded with a recording device and subsequently transcribed. A copy of the interview questions is found in Appendix B. Table 4.26 presents the demography of the respondents.

Table 4.27: Demography of qualitative respondents

Respondent	Qualification	Position	Years of experience in construction industry	Years of experience in present position
A	Bachelor's degree	Site manager	Twenty-two (22)	Eight (8)
B	Master's degree	Project manager	Sixteen (16)	Seven (7)
C	Bachelor's degree	Site supervisor	Twelve (12)	Eight (8)
D	Bachelor's degree	Site supervisor	Twenty (20)	Seven (7)

Respondent A

The first interview was conducted with a construction site manager on May 19, 2017, at 11h45min in the consulting office. The interviewed site manager holds a Bachelor's degree, with twenty-two (22) years' work experience in the construction industry and eight (8) years' experience in his present position. The interview lasted for thirty-five minutes as the interviewee responded to each question read out by the interviewer. The site manager stated the following:

- Based on experience of successfully executed construction projects, traditional (lump sum and cost reimbursement contracts) and design and build (competitive contracts)

procurement methods are cost satisfactory. Traditional (lump sum contract) and design and build (direct contract) are time satisfactory procurement methods.

- Design and build contract procurement method is a contractual approach that is satisfactory on project quality.
- Traditional contract procurement strategy adoption meets involved construction stakeholder satisfaction on project performance.
- The design and build (direct and competitive contract) approach is mostly used to deliver both private and public housing projects, as the respondent's firm is comprised of a consortium of construction professionals.
- Nature and type of a project, a client's inability to make timely decisions, mistakes in the production of design documents and working drawings are the major challenges faced when deciding on the contract procurement arrangement to adopt.
- Fair and transparent contract procurement system is borne in mind when deciding on what procurement arrangement to adopt, as the parties involved in the contract need to be satisfied and receive best value-for-money.
- The immediate environment is always taken into consideration before the execution of any construction project, as an industrial building cannot be constructed in a residential area.
- Housing sustainability is being promoted, as every construction project is being executed with reasonable construction costs, and no substandard construction materials whatsoever, are used.
- Availability of construction materials, difficulties in hiring construction equipment and communication problems between construction site manager and construction workers are major challenges faced on construction sites.
- The adoption of an appropriate contract procurement method that transparently satisfies the need of the parties to the contract would promote more sustainable housing productions in not only the Western Cape, but South Africa as a whole.

Respondent B

The second interview was conducted with a construction project manager on May 19, 2017, at 15h30min in the construction site office. The interviewed project manager holds a Master's degree with sixteen (16) years' work experience in the construction industry and seven (7) years' experience in his present position. The interview session lasted for thirty minutes as the interviewee responded to each interview question read out by the interviewer. The respondent opined the following, based on personal experience:

- Traditional (lump sum, measurement and cost reimbursement contracts) and design and build (direct and competitive contracts) procurement methods are cost satisfactory.
- Traditional (cost reimbursement contract) and design and build (direct and package deal contracts) are time satisfactory procurement methods.
- Project management (management based approach) contract procurement method is a contractual approach that is satisfactory in regard to project quality.
- Traditional contract procurement strategy adoption satisfies involved construction stakeholders' needs on project objectives.
- Project management and construction management contractual arrangements (management based approach) are frequently used to deliver private construction projects.
- The nature, scope and complexity of a project, delay in the production of design documents, client experience and contribution to construction, lack of communication and lack of smooth working relationships are some of the challenges faced in deciding on a contract procurement strategy to adopt.
- A fair, cost effective and transparent contract procurement system is always put into consideration and corruption related activities during tender phases are always eliminated.
- The physical environment is always taken cognizance of so that no harm arising from the construction activity whatsoever would be inflicted.
- Housing sustainability is promoted through equitable and acceptable housing system delivery and sustainable construction.
- Availability of construction materials, late order of construction materials, delay in payment of construction workers, poor maintenance of construction equipment, difficulties in hiring construction equipment and communication problems between construction manager and construction workers are major challenges besetting construction sites.
- The adoption of an appropriate contract procurement method that best addresses clearly defined project objectives and balances fairness on the project would enhance sustainable housing productions in South Africa.

Respondent C

The third interview was conducted with a construction site supervisor on May 23, 2017, at 12h38min in the construction site office. The interviewed site supervisor holds a Bachelor's degree, with twelve (12) years' work experience in the construction industry and eight (8) years' experience in his present position. The interview lasted for forty-two minutes as the

interviewee responded to each interview question read out by the interviewer. The respondent postulated the following, based on experience:

- Design and build procurement method (all variants) is the best contractual approach that is cost, time and quality satisfactory.
- Design and build and traditional contract procurement strategies satisfy involved construction stakeholder expectations on construction projects.
- A design and build procurement system is mainly used to deliver private housing projects while the traditional (measurement and cost reimbursement contracts) contract procurement system is seldom used to deliver public construction projects.
- The cost, type, duration and complexity of a project, lack of communication skills and lack of feedback are some of the challenges faced in deciding on which contract procurement strategy to adopt.
- It is regulated in all facets of government, including private and state-owned industrious undertakings, that all construction practices adopt the basic processes and the standard usual procedures and strategies for fair procurement systems.
- Environmental, social and economic value of housings cannot be underestimated; particularly housing that has been specially designed to improve the liveability of the immediate environment, and with that borne in mind, sustainable practices on construction works are put in place.
- Wastage of construction materials, increase in cost of construction materials, market conditions, inadequate skills of machinery operator and lack of discipline among construction workers are challenges encountered on construction sites.
- All contract procurement systems have unique attributes, benefits and constraints and as such, it is rare for a single system to suit all kinds of clients and projects. It is advised that it is vital for all project teams, including the client, to carefully select a procurement system that addresses each particular project's needs (at least to a significant extent) as this will enhance sustainable housing delivery in South Africa.

Respondent D

The fourth interview was conducted with a construction site supervisor on May 24, 2017, at 14h15min in the consulting office. The interviewed site supervisor holds a Bachelor's degree, with twenty (20) years' work experience in the construction industry and seven (7) years' experience in his present position. The interview lasted for thirty-five minutes as the interviewee responded to each interview question read out by the interviewer. The site supervisor stated the following, based on experience:

- Traditional (lump sum and cost reimbursement contracts) and design and build (competitive contracts) procurement methods are cost satisfactory.
- The cost reimbursement contract, particularly the cost-plus-percentage fee hybrid, is also cost satisfactory.
- Measurement contract (traditional method) isn't favourable most of the time to the contracting party, but is favourable to the consulting party (client team).
- The traditional (lump sum and cost reimbursement) contracts and design and build (direct) contract are time satisfactory procurement methods.
- The design and build contract procurement method is a contractual approach that is satisfactory on project quality.
- Traditional contract procurement strategy adoption meets involved construction stakeholder satisfaction on project performance.
- Design and build (competitive contract) is primarily used to deliver both private and public construction projects.
- The scope, complexity and type of a project, a client's financial capability, mistakes and delay in the production of architectural and structural drawings are some challenges faced when deciding on which contract procurement strategy to adopt.
- Sustainable practices are ensured and the environmental impact of every construction project is considered before executing any construction project, no matter how small.
- Availability of construction materials, wastage of construction materials, lack of discipline among workers and communication problems between construction site supervisors and construction workers are the kinds of challenges encountered on construction sites.
- South Africa has the essential capacity to undertake both public and private sector construction projects, but it is crucial to put into use the basic psychological result of perception, learning and reasoning process of universal contract procurement systems. It is therefore imperative to decide on and adopt a fair contract procurement system that will make housing products more readily available in the South African construction market and sector.

Table 4.28 presents the summary of the perceptions of the study respondents explored through a semi-structured interview, based on the framed research sub-questions.

Table 4.28 Summary of qualitative interview

Factors	Respondent A	Respondent B	Respondent C	Respondent D
Construction cost satisfaction	Adoption of traditional and design and build CPS	Adoption of traditional and design and build CPS	Adoption of design and build contract procurement system	Adoption of traditional and design and build CPS
Construction time satisfaction	Adoption of traditional and design and build CPS	Adoption of traditional and design and build CPS	Adoption of design and build contract procurement system	Adoption of traditional and design and build CPS
Construction quality satisfaction	Adoption of design and build contract procurement system	Adoption of project management system	Adoption of design and build contract procurement system	Adoption of traditional and design and build CPS
Construction stakeholders' satisfaction	Adoption of traditional contract procurement system	Adoption of traditional contract procurement system	Adoption of traditional and design and build CPS	Adoption of traditional contract procurement system
CPS selection influential factors	Majorly project objectives and clients' needs	Majorly project objectives and clients' needs	Project constraints and lack of communication	Project constraints and clients' expectations
Government policy	Fair and transparent procurement system	Fair, cost effective and competitive procurement system	Fair contract procurement systems	Consideration of environmental impact on construction projects
Sustainable housing enhancement	Adoption of appropriate CPS that best address project needs and objectives	Adoption of appropriate CPS that clearly defines project objectives	Careful selection of CPS that best addresses project needs	Put the basic psychological reasoning process of universal CPS into use

***CPS=Contract procurement strategy**

4.9 Operational framework

Figure 4.5 presents the operational framework to enhance sustainable housing delivery through the adoption of appropriate contract procurement strategies in the Western Cape of South Africa, though the framework may be tested beyond the province. Effective communications must be established among construction stakeholders, construction site managers, construction supervisors, construction workers and construction suppliers of materials and machineries, and adequate feedback capabilities must be ensured. Regular review of project drawings by project design team will enhance construction operations according to plan and minimise unnecessary delays that could arise on projects due to drawing ambiguity.

Furthermore, adequate management and maintenance of construction resources (materials, manpower and machinery) will help enhance smooth construction activities. Clients should be enlightened that different projects have different needs; therefore, an appropriate contract procurement strategy that best address the particular needs and objectives of a project must be adopted for successful delivery of that project while clients achieve the best value for money and involved construction stakeholders' satisfaction met.

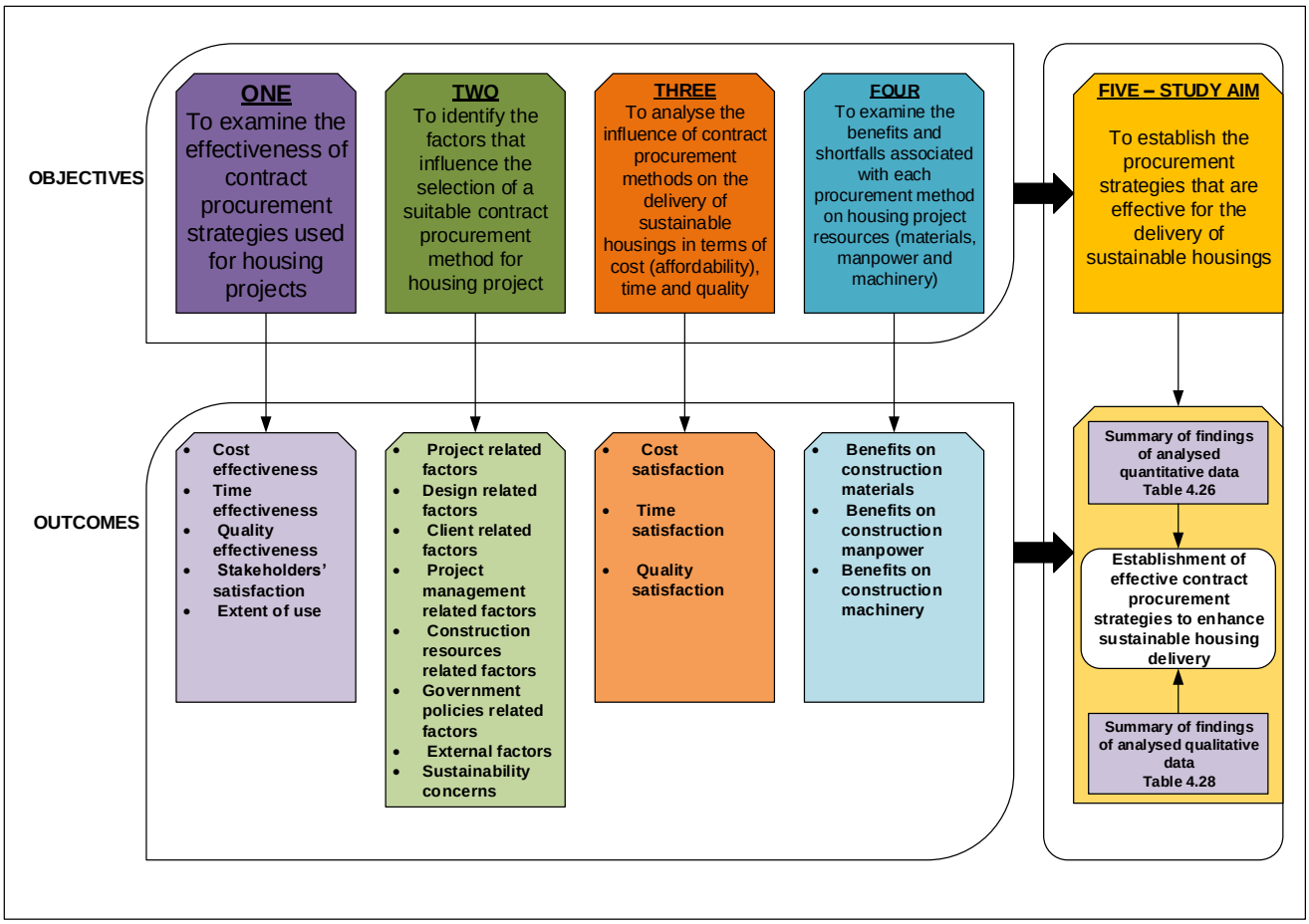

Figure 4.5: Operational framework for the enhancement of sustainable housing delivery

4.10 Chapter summary

The chapter presents the analysis of quantitative and qualitative surveys conducted, including the findings and a discussion of results.

The quantitative data elicited was analysed with the use of the Statistical Package for the Social Sciences (SPSS) software, version 24. Descriptive statistics were employed in this study. The survey questions were scaled and tested for reliability with the use of Cronbach's alpha. The average Cronbach's alpha coefficient was 0.8, indicating that the questions are reliable.

Findings reveal that traditional and design and build contract procurement strategies are cost, time and quality effective and satisfactory. The findings indicate that the traditional contract procurement system is a contractual approach that meets involved construction stakeholder satisfaction to a significant extent. Construction project objectives, such as project scope, project cost, time and quality, and housing sustainability, and project constraints such as time constraints, cost constraints, site conditions, market conditions, and government policy constraints, are the major project-related factors influencing the selection of a reasonable contract procurement strategy. A fair, equitable, transparent, competitive and cost-effective contract procurement system is the key government policy on contract procurement strategy selection. Design team experience, mistakes and delay in producing design documents are the key design related factors that influence the selection of a contract procurement strategy. Sustainable construction, feasible and viable construction costs and aesthetically acceptable housing are the major economic, social and environmental sustainability concerns, as determined by this study. Findings reveal that project scope, type, nature and complexity are the major project management related factors influencing contract procurement strategy selection. Major construction resource (material, machinery and manpower) challenges encountered are shortage of construction materials, availability of construction materials, increases in hiring costs of construction equipment, poor maintenance of construction tools, inadequate payment of construction workers and lack of indiscipline among construction workers, as revealed in the study.

Essentially, the study posits that the careful selection and adoption of a contract procurement method that clearly defines a particular construction project objective and best addresses a project need should be adopted for clients to receive the best value-for-money on their projects, as well as to also enhance sustainable housing delivery in the construction market in the Western Cape, and South Africa is general.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter revisits the aim and objectives of the study, presents the conclusion of the study and highlights the limitations of the study. This chapter also presents recommendations and suggested areas for further research toward the enhancement of housing sustainability in the Western Cape of South Africa, through the selection and adoption of appropriate contract procurement strategy. As discussed in previous chapters, the aim of this study is to establish contract procurement strategies effective for the delivery of sustainable housing in the Western Cape, South Africa. The objectives of achieving the aim of this study are as follows:

- to examine the effectiveness of contract procurement strategies used for housing projects;
- to identify factors that influence the selection of a suitable procurement method for housing projects;
- to analyse the influence of contract procurement methods on the delivery of sustainable housing in terms of cost (affordability), time and quality;
- to examine the benefits and shortfalls associated with each procurement method used in housing projects resources (materials, manpower and machinery); and
- to establish the procurement strategies that are most effective for the delivery of sustainable housing.

5.2 Summary

Based on literature reviewed and findings obtained through mixed method of data collection, table 5.1 presents the summary of the research outcomes.

Table 5.1: Summary of research study

S/N	CONCEPT	REFERENCE	PAGE
I.	Conceptual framework for the study	Figure 1.1	8
II.	Theoretical framework for the study	Figure 2.12	55
III.	Research method	Figure 3.3	82
IV.	Summary of findings of quantitative study	Table 4.26	120
V.	Summary of findings of qualitative study	Table 4.28	128
VI.	Operational framework for the study	Figure 4.5	130

5.3 Conclusion

5.3.1 Effectiveness of contract procurement strategies used for housing projects

One of the objectives designed to achieve the aim of the study is the examination of the contract procurement strategies used for housing projects. This objective was achieved through the review of literature, pilot study, administration of survey questionnaires to construction professionals, and semi-structured interviews with construction site managers and supervisors. The effectiveness of the contract procurement methods was tested against key project parameters – project cost, time and quality and involved construction stakeholder satisfaction. The majority of respondents asserted that traditional and design and build (with their variants) contract procurement strategies are cost, time, quality and stakeholder satisfaction. It could therefore be concluded that the perceived contract procurement approaches are effective and satisfactory project cost, time, quality, and stakeholder satisfaction. Findings reveal that traditional and design and build contract procurement systems are primarily used in delivering construction projects in the Western Cape of South Africa.

5.3.2 Factors that influence the selection of a suitable procurement method for housing projects

The second objective of the study is to identify factors that influence the selection of a suitable contract procurement method used for housing projects. This objective was achieved through the review of literature, a pilot study, administration of survey questionnaires to construction professionals and semi-structured interviews with construction site managers and supervisors. Project related factors, design related factors, client related factors, project management related factors, government policies, construction resource (materials, machinery and manpower) related factors, external factors and sustainability concerns were analysed as factors influencing the selection of a suitable contract procurement strategy. Findings reveal that these factors significantly influence the selection process of contract procurement strategies in the Western Cape of South Africa.

5.3.3 The influence of contract procurement methods on the delivery of sustainable housing in terms of cost (affordability), time and quality

The analysis of the influence of contract procurement methods on the delivery of sustainable housing in terms of cost, time and quality (project parameters) is the third objective of this study. This objective was achieved through the review of literature, a pilot study, the administration of survey questionnaires to construction professionals and semi-structured interviews with construction site managers and supervisors. Findings from study respondents in the Western Cape, South Africa, revealed that traditional and design and build contract procurement systems are satisfactory on project cost time and quality. In other words, it can be concluded that construction clients in the Western Cape of South Africa receive best value-for-money on construction projects with the adoption of either the traditional method of contract procurement or the design and build method.

5.3.4 The benefits and shortfalls associated with each procurement method used on housing projects resources (materials, manpower and machinery)

This objective examines the benefits and shortfalls of the contract procurement strategies in respect of housing projects construction resources – materials, manpower and machinery. This objective was achieved through the review of literature, a pilot study, administration of survey questionnaires to construction professionals and semi-structured interviews with construction site managers and supervisors. Findings revealed that the labour based (direct labour and labour only) contractual approach is beneficial in respect of construction materials in the Western Cape, South Africa. Findings also revealed that the traditional contract procurement approach is beneficial in respect of construction manpower. Design and build and traditional contract procurement systems were identified by study respondents

as contractual approaches beneficial in respect of construction machinery in the Western Cape, South Africa.

5.4 Limitations

The study was conducted in the Western Cape of South Africa. The collection of data from construction professionals and construction sites was a challenging and hectic task in the course of the study due to the busy schedules of study respondents. The majority of professionals complained about tight time schedules, site meetings to be attended and pressure to meet certain project completion time lines and milestones; as a result, they were unable to complete the questionnaires as promised. Due to time constraints, a significant number of questionnaires were returned incomplete and were therefore discarded by the researcher; hence, the findings of the study as applicable to contract procurement strategies cannot be generalised.

5.5 Recommendations

The supply of housing products that are durable, obtained at optimum cost and available within the shortest time possible is described as sustainable housing; hence, the enhancement of sustainable housing delivery requires the integration of a number of factors such as project management skills (on the part of construction professionals), effective integration of construction project resources (construction material, manpower and machinery), adequate and unambiguous project briefings from the client and client team, and effective communication and feedback capabilities between the design and construction teams. Failure to effectively integrate these factors will likely result in unsuccessful project delivery in terms of time and cost overruns, leaving involved construction stakeholders dissatisfied.

Contract procurement systems in South Africa, as a developing country, are being regulated in all facets of government by the adoption of the basic processes, the standard usual procedures and strategies for procurement systems that are fair, equitable, transparent, competitive and cost-effective when executing construction projects within the construction industry. The critical understanding of clients' needs and expectations for particular construction project objectives requires a careful selection of an appropriate contract procurement strategy; thus, the adoption of a contract procurement system that best addresses project objectives must be implemented. By adopting an appropriate contract procurement method, clients can expect to achieve best value-for-money outcomes, as risks

will be most effectively minimised and the occurrence of contractual disputes, and cost and time overruns, will also be minimised.

To achieve the best value-for-money with construction products (housing projects, in particular), this study recommends the following:

- Traditional (regardless of its aged existence) and design and build contract procurement systems are cost, time, quality and stakeholder satisfaction effective and satisfactory; thus, the delivery models should be adopted. Of note, however, client emphasis on low construction cost, timely project delivery, high quality and client experience in construction are client-related factors that affect the selection of a contract procurement system.
- The client is the sole financer of the project and therefore holds the predominant position to determine the pace of the construction project based on decisions made. Clients should be financially enlightened on the actual construction cost and associated running costs on the project.
- Quantity surveyors are construction financial solicitors for clients, recommended to advise clients on the finance mode of the project so clients can decide if they are actually "costing to a design" or "designing to a cost" in respect to the project to be executed.
- Design team experience, mistakes and delays in producing design documents and design complexity are the preeminent design-related factors that influence a contract procurement strategy selection, as determined by the study. Construction design ambiguity, obscurity, and errors and omissions can be avoided among design and construction teams through effective communication and adequate feedback capabilities.
- Level of advanced technology, physical and industrial environment considerations and effects of rainfall on construction works are the top external factors influencing the selection process of a contract procurement system. Consistent tracking of weather forecasts could help reduce the adverse effect of weather conditions on construction projects as necessary preparations can be made.
- It is advised that construction professionals and stakeholders familiarise themselves with advancing technology systems available today, as this could help ease the management of a project and reduce excessive paperwork.
- Sustainable construction, feasible and viable construction costs for aesthetically acceptable housing are vital sustainability concerns that are to be taken cognizance of, as determined by this study. Clients, construction professionals, stakeholders, construction site managers and supervisors should adopt sustainable development practices on all construction products, present and future.

- This study concluded that construction stakeholders in the building sector of the South African construction industry should consider the findings obtained in this study as the results will further enhance the delivery of affordable, sustainable housing. In essence, the findings obtained in the study aid the development of the framework presented in Figure 4.5 as a model to be made operational in the construction sectors of the Western Cape, South Africa.

5.6 Areas for further research

This research study recommends the following:

- The comparison of the effectiveness of contract procurement strategies on project performance on a site-by-site basis through work study.
- Other available strategies to further enhance sustainable housing delivery in the South African construction industry.

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APPENDICES:APPENDIX A - SURVEY QUESTIONNAIRE

CONTRACT PROCUREMENT STRATEGIES FOR PROJECT DELIVERY TOWARDS ENHANCEMENT OF HOUSING SUSTAINABILITY IN SOUTH AFRICA

Dear Sir/Madam,

RE: PARTICIPATION IN A QUESTIONNAIRE SURVEY

We hereby solicit your assistance and support to participate in a survey research that examines the effectiveness of contract procurement strategies for project delivery, towards the enhancement of housing sustainability in South Africa. We humbly request your participation in this study to achieve the desired objectives, as this study is primarily undertaken for academic purposes by a “Master of Construction degree” student from the department of Construction Management and Quantity Surveying at Cape Peninsula University of Technology, Bellville Campus, Cape Town.

Kindly endeavour to answer all the questions and be assured that every piece of information provided by you for this study will be kept with utmost confidentiality and will only be used for research purposes.

Kindly complete the survey and return to:

Iyiola Bolumole
Cape Peninsula University of Technology
Department of Construction Management and Quantity Surveying
Faculty of Engineering
E-mail:folahansheny@gmail.com
Mobile: 061-905-5238.

Thanks for your cooperation, understanding and assistance.

CONTRACT PROCUREMENT STRATEGIES QUESTIONNAIRE

SECTION A: **BIOGRAPHICAL INFORMATION OF RESPONDENTS**

Kindly answer all questions, as you are implored to tick (**x**) in the **CORRECT** box.

A1. Kindly specify which of the following categories your firm belong:

Contracting firm	
Architectural firm	
Project management firm	
Quantity surveying consulting firm	
Sub-contracting firm	
Others (please specify)	

A2. Kindly specify your gender:

Male	
Female	

A3. Please indicate the highest formal qualification you obtained:

Matric Certificate	
Diploma	
Post Graduate Diploma	
Bachelor's degree	
Honours degree	
Master's degree	
Other (please specify)	

A4. Kindly specify your year of work experience in the construction industry……

A5. Kindly indicate your present position in your firm……

A6. How long have you been working in this position? ……..……

SECTION B: **EFFECTIVENESS OF CONTRACT PROCUREMENT STRATEGIES USED FOR HOUSING PROJECTS**

B1. The following are the typical types of contract procurement strategies that are used for housing projects. Please, write in the level of effectiveness (in numeric between 1 - 4) for each of the listed procurement strategies used in the construction industry, **Where:4=Highly effective, 3=Effective, 2=Less effective, 1=Not effective.**

Contract Procurement Strategies	**Cost**	**Time**	**Quality**	**Stakeholder's satisfaction**
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
Management contracting				
Construction management				
Project management				
Labour based Method				
Direct labour				
Labour only				
Public Private Partnership Method				
Build-Lease-Operate-Transfer (BLOT)				
Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				

Lease-Renovate-Operate-Transfer (LROT)				

B2. To what extent are the following methods used to deliver a public housing project? Kindly "**tick as appropriate**", using the below scale; **Where 4=Highly used, 3=Used, 2=Rarely used, 1=Not used.**

Contract Procurement Strategies	**4**	**3**	**2**	**1**
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
Management contracting				
Construction management				
Project management				
Labour based Method				
Direct labour				
Labour only				
Public Private Partnership Method				
Build-Lease-Operate-Transfer (BLOT)				
Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				
Lease-Renovate-Operate-Transfer (LROT)				

B3. To what extent are the following methods used to deliver a private housing project? Kindly "**tick as appropriate**", using the below scale; **Where 4=Highly used, 3=Used, 2=Rarely used, 1=Not used.**

Contract Procurement Strategies	4	3	2	1
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
Management contracting				
Construction management				
Project management				
Labour based Method				
Direct labour				
Labour only				
Public Private Partnership Method				
Build-Lease-Operate-Transfer (BLOT)				
Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				
Lease-Renovate-Operate-Transfer (LROT)				

SECTION C: **FACTORS THAT INFLUENCE THE SELECTION OF A CONTRACT PROCUREMENT METHOD FOR HOUSING PROJECT DELIVERY**

C1. The following are **project related factors** that influence the selection of a contract procurement method. Kindly "**tick as appropriate**", using the scale below: **Where 4=Strongly agree, 3=Agree, 2=Disagree, 1=Strongly disagree.**

PROJECT RELATED FACTORS	4	3	2	1
Scope of the Project				
Budgeted project cost				
Forecasted project duration (time)				
Project quality delivery				
Nature of the project				
Type of the project				
Size of the project				
Complexity of the project				
Site conditions				
Involved stakeholders' needs				
Involved stakeholders' expectations				
Project innovation (making new prescriptive specifications rather than comparing performance of past similar completed projects)				

C2. The following are **design related factors** that influence the selection of a contract procurement method. Kindly "**tick as appropriate**", using the scale below: **Where 4=Strongly agree, 3=Agree, 2=Disagree, 1=Strongly disagree.**

DESIGN RELATED FACTORS	4	3	2	1
Design team experience				
Project design complexity				
Mistakes in producing design documents				
Delay in producing design documents				
Revision and changes order by client				
Design approval delay by client				

Inadequate coordination among design team				

C3. The following are **client related factors** that influence the selection of a contract procurement method. Kindly "**tick as appropriate**", using the scale below: **Where 4=Strongly agree, 3=Agree, 2=Disagree, 1=Strongly disagree.**

CLIENT RELATED FACTORS	4	3	2	1
Client's experience in construction (Sophisticated / specialized)				
Client's emphasis on low construction cost				
Client's emphasis on timely project delivery				
Type of client funding (Public / private funding)				
Client's emphasis on high quality project delivery				
Size of client's organisation				
Client's ability to brief				
Client's contribution to design and construction				
Client's ability to make decision				

C4. The following are **project management related factors** that influence the selection of a contract procurement method. Kindly "**tick as appropriate**", using the scale below: **Where 4=Strongly agree, 3=Agree, 2=Disagree, 1=Strongly disagree.**

PROJECT MANAGEMENT RELATED FACTORS	4	3	2	1
Efficient time management				
Effective cost management				
Project quality management				
Project scope management				
Project risk management (seen and unforeseen)				
Adequate communication management				
Coordination effectiveness				
Feedback capabilities				
Timely decision-making process				

Adequate project monitoring				
Project organisation structure				
Technical skills of the project team leader				
Motivating skills of the project team leader				
Organising skills of the project team leader				
Project team leader's commitment to meet project cost, time and quality				
Project team leader's working relationship with others				
Project team leader's experience				

C5. The following are **construction related factors** that influence the selection of a contract procurement method. Kindly "**tick as appropriate**", using the scale below: **Where 4=Strongly agree, 3=Agree, 2=Disagree, 1=Strongly disagree.**

CONSTRUCTION RELATED FACTORS	**4**	**3**	**2**	**1**
CONSTRUCTION MATERIALS				
Availability of construction materials				
Shortage of construction materials				
Late delivery of construction materials				
Increase in cost of construction materials				
Market conditions				
Difficulties in obtaining materials from store due to excessive paper works				
Late order of construction materials				
Wastage of construction materials by workers				
Unsuitable locations for material storage on site				
CONSTRUCTION MACHINERY				
Obsolete machinery used in construction operations				
Damage to tools and machinery				
Poor maintenance of tools and machinery				

Difficulties in hiring construction tools and machinery				
Complexities in operation of machinery				
Increase in hiring cost of construction machinery				
Inadequate skills of machinery operator				
Insufficient number of machinery available for site operations				
CONSTRUCTION MANPOWER				
Insufficient wages payment of construction labourers				
Delay in payment of construction labourers				
Adamantly aged construction workers				
Lack of discipline among labourers				
Pilfering of handy construction materials by labourers				
Communication problems between labourers and supervisors				
Transportation problem for labourers				

C6. The following are **Government Policy related factors** that influence the selection of a contract procurement method. Kindly "**tick as appropriate**", using the scale below: **Where 4=Strongly agree, 3=Agree, 2=Disagree, 1=Strongly disagree.**

GOVERNMENT POLICY RELATED FACTORS	4	3	2	1
Fair, equitable and transparent contract procurement systems				
Competitive and cost-effective procurement systems				
Corruption and related activities relating to tenders and contracts				
Public finance management				
Municipal finance management				
Sustainable economic growth				
Sustainable employment creation				
Government's role in promoting an enabling environment for industry and private sector development				
Percentage of value added tax to be paid				

C7. The following are **external factors** that influence the selection of a contract procurement method. Kindly "**tick as appropriate**", using the scale below: **Where 4=Strongly agree, 3=Agree, 2=Disagree, 1=Strongly disagree.**

EXTERNAL FACTORS	4	3	2	1
Physical environment consideration				
Level of advanced technology				
Political interference				
Industrial environment consideration				
Rainfall on construction works				
Effect of sunlight on construction operations				
Change in government policies and regulations				
Public holidays effect on progress of work				

C8. The following are **sustainability concerns** that influence the selection of a contract procurement method. Kindly "**tick as appropriate**" using the scale below: **Where 4=Strongly agree, 3=Agree, 2=Disagree, 1=Strongly disagree.**

SUSTAINABILITY CONCERNS	4	3	2	1
ENVIRONMENTAL CONCERN				
Efficient land use				
Transportation of hazardous materials				
Sustainable housing delivery				
Aesthetically acceptable housing				
SOCIAL CONCERN				
Equitable housing project delivery				
Sustainable construction				
ECONOMIC CONCERN				
Feasible and viable construction cost				
Sustainable construction				

SECTION D: **CONTRACT PROCUREMENT STRATEGIES' INFLUENCE ON PROJECT KEY PARAMETERS – COST, TIME AND QUALITY**

D1. Kindly use the scale below to "**tick as appropriate"**, the level of satisfaction of the contract procurement methods in relation to project **COST** (final construction cost). **Where 4=Highly satisfactory, 3=Satisfactory, 2=Less satisfactory, 1=Not satisfactory**

Contract Procurement Strategies	4	3	2	1
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
Management contracting				
Construction management				
Project management				
Labour based Method				
Direct labour				
Labour only				
Public Private Partnership Method				
Build-Lease-Operate-Transfer (BLOT)				
Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				
Lease-Renovate-Operate-Transfer (LROT)				

D2. Kindly use the scale below to "**tick as appropriate"**, the level of satisfaction of the contract procurement methods in relation to project completion **TIME**. **Where 4=Highly satisfactory, 3=Satisfactory, 2=Less satisfactory, 1=Not satisfactory.**

Contract Procurement Strategies	4	3	2	1
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
Management contracting				
Construction management				
Project management				
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Direct labour				
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Public Private Partnership Method				
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Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				
Lease-Renovate-Operate-Transfer (LROT)				

D3. Kindly use the scale below to "**tick as appropriate"**, the level of satisfaction of the contract procurement methods in relation to project **QUALITY**. **Where 4=Highly satisfactory, 3=Satisfactory, 2=Less satisfactory, 1=Not satisfactory.**

Contract Procurement Strategies	4	3	2	1
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
Management contracting				
Construction management				
Project management				
Labour based Method				
Direct labour				
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Public Private Partnership Method				
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Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				
Lease-Renovate-Operate-Transfer (LROT)				

SECTION E: **BENEFITS OF THE PROCUREMENT METHODS USED ON HOUSING PROJECT RESOURCES (MATERIALS, MANPOWER AND MACHINERY)**

E1. Kindly use the scale below to "**tick as appropriate"**, the level of benefit of the contract procurement methods in respect of construction project **materials**. **Where 4=Highly beneficial, 3=Beneficial, 2=Less beneficial, 1=Not beneficial**

Contract Procurement Strategies	**4**	**3**	**2**	**1**
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
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Public Private Partnership Method				
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Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				
Lease-Renovate-Operate-Transfer (LROT)				

E2. Kindly use the scale below to "**tick as appropriate"**, the level of benefit of the contract procurement methods in respect of construction project **manpower**. **Where 4=Highly beneficial, 3=Beneficial, 2=Less beneficial, 1=Not beneficial**

Contract Procurement Strategies	4	3	2	1
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
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Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				
Lease-Renovate-Operate-Transfer (LROT)				

E3. Kindly use the scale below to "**tick as appropriate"**, the level of benefit of the contract procurement methods in respect of construction project machinery. **Where 4=Highly beneficial, 3=Beneficial, 2= Less beneficial, 1=Not beneficial**

Contract Procurement Strategies	4	3	2	1
Traditional method				
Lump sum contract				
Measurement contract				
Cost reimbursement contract				
Design and Build Method				
Direct contract				
Competitive contract				
Package deal contract				
Management Method				
Management contracting				
Construction management				
Project management				
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Public Private Partnership Method				
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Build-Operate-Transfer (BOT)				
Buy-Build-Operate (BBO)				
Design-Build-Operate (DBO)				
Develop-Operate-Transfer (DOT)				
Lease-Renovate-Operate-Transfer (LROT)				

Thanks for the time spent

APPENDIX B: INTERVIEW QUESTIONS

1. Based on your experience, what contract procurement method(s) is/are cost, time and quality satisfactory?
    - What contract procurement method(s) meet construction stakeholder satisfaction?
    - What contract procurement method(s) do you adopt in delivering private and/or public housing projects?
2. Based on your experience, what are the factors that influence or challenge the selection of a contract procurement strategy?
3. What government policy(ies) must be taken cognisance of during the selection process of a contract procurement strategy?
4. What are the major challenges faced on construction sites in respect of:
    - Construction materials
    - Construction manpower
    - Construction machinery
5. In your own opinion, do you think the adoption of an appropriate contract procurement method would enhance housing sustainability in South Africa?