STAKEHOLDER MANAGEMENT IN CONSTRUCTION PROJECTS: A LIFE CYCLE BASED FRAMEWORK

By

JURBE JOSEPH MOLWUS
B.Sc., M.Sc. (UniJos), MNIOB, Registered Bldr. (CORBON)

A thesis submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy in Construction, of Heriot Watt University, Edinburgh

October, 2014

ABSTRACT

Although stakeholder management has long been acknowledged as a means of increasing the propensity for successful delivery of construction projects, the full benefits of stakeholder management have yet to be tapped. Previous research efforts indicate lack of comprehensive stakeholder management process since the existing frameworks in construction either focussed on a particular construction stage or failed to incorporate important considerations such as the impact of procurement routes, internal stakeholder collaboration, responsibility for stakeholder management and project life cycle.

This research aims to develop a comprehensive framework for stakeholder management in construction projects in order to enable the industry tap the full benefits of stakeholder management. In order to achieve this aim, previous work on stakeholder management is reviewed. The current practice of stakeholder management within the construction industry, the effects of procurement routes and contract forms on stakeholder management process, the relationship among the critical success factors for stakeholder management in construction projects are investigated using an industry survey among construction professionals practicing within the United Kingdom. Data collected is analysed using a combination of qualitative approach and appropriate statistical techniques including structural equation modelling (SEM) to investigate the current practice of stakeholder management in construction projects, effects of procurement routes and contract conditions on stakeholder management process, and the interrelationships among the critical success factors for stakeholder management in construction projects.

Based on a combination of the findings from literature review and data analyses, a life cycle based framework for stakeholder management in construction projects is developed using Integrated Defiinition0 (IDEF0) modelling. The framework is validated by practising industry professionals and is identified as a comprehensive guide to construction industry practitioners for carrying out stakeholder management in construction projects.

DEDICATION

To the blessed memory of my late father Nde Joseph Kassem Pakgyit Molwus who laid the foundation for my education but could not live to see me achieve its peak and all others who have departed this world.

To all, whose lives have been cut short by acts of terrorism in different parts of the world.

To all, who do and promote the will of God Almighty in the entire human race.

ACKNOWLEDGEMENTS

One's efforts alone cannot achieve this research work and preparation of thesis. Many individuals and organisations have contributed directly or indirectly, knowingly and willingly or otherwise, acknowledging them therefore, is inevitably necessary.

I would like to start by expressing my sincere appreciation to my primary supervisor, Dr. Bilge Erdogan who through unconditional, sacrificial and untiring constructive criticisms, guided and encouraged me to accomplish this study. My sincere gratitude also goes to my second supervisor, Prof. S. O. Ogunlana, for his supportive guide including moral support and prayers. I am also grateful to Dr. Derek Thomson who got me started on the study.

I would like to thank the school of Built Environment, Heriot Watt University, Edinburgh, for funding my tuition throughout the study. I also thank the University of Jos for approving my study leave. I am also grateful to Dr. S. A. Oyegoke, Dr. Roshani Palliyaguru, Prof. Bayo Adeloye, Mr. Angus Kennedy, Rev. Dr. Alistair Donald, Rev. Frs: Giani, Kevin and Ian; Bldrs. D. D. Jambol, E. P. Datok and K. Attsar; Mrs Christy Wakjissa (my mother in-law), Prof. David L. Wonnang, Augustine Ajijelek, Isah Jabil, Yususf Nakaka and Smart Habila Bako for their support to me in different ways. I also thank the Head and entire staff of the Department of Building, University of Jos, Nigeria for their encouragement.

To the Nigerian community and other friends in Heriot Watt University and Edinburgh at large, I am grateful for your company, friendship and encouragement. To my colleagues in SBE who sincerely shared their experiences and encouraged me, I remain indebted in gratitude. To the administrative/support staff at SBE who were always there to help in times of need, many thanks for your help and smiles. To all my friends whose support and encouragement regardless of physical distance, never ceased, I am grateful.

My mother (Mrs Helen Nnang Joseph), Sisters, cousins, aunts, uncles and my entire extended family (including friends I consider part of my family) have been wonderfully supportive in different ways, I appreciate them all. To my loving Wife: Delmwa and kids: Jurritka and Nenrin, I appreciate your support, encouragement, patience and understanding throughout my absence on account of this study. I am grateful to my In-laws for their support to me in many ways.

Lastly but one, I whole heartedly appreciate all those whose names I have not mentioned here, even though their contributions have added up in making this work possible; especially those who helped in data collection.

Finally and above all, I give God Almighty the glory for His unfailing grace, love and mercies throughout the study period and my entire life.

DECLARATION STATEMENT

ACADEMIC REGISTRY

Research Thesis Submission

Stakeholder Management in Construction Projects: A life Cycle Based Framework

Name*:*	Jurbe Joseph Molwus		
School/PGI:	School of the Built Environment/CofEx		
Version: *(i.e. First, Resubmission, Final)*	Final	Degree Sought (Award **and** Subject area)	PhD (Construction)

Declaration

In accordance with the appropriate regulations I hereby submit my thesis and I declare that:

1) the thesis embodies the results of my own work and has been composed by myself
2) where appropriate, I have made acknowledgement of the work of others and have made reference to work carried out in collaboration with other persons
3) the thesis is the correct version of the thesis for submission and is the same version as any electronic versions submitted*.
4) my thesis for the award referred to, deposited in the Heriot-Watt University Library, should be made available for loan or photocopying and be available via the Institutional Repository, subject to such conditions as the Librarian may require
5) I understand that as a student of the University I am required to abide by the Regulations of the University and to conform to its discipline.

* *Please note that it is the responsibility of the candidate to ensure that the correct version of the thesis is submitted.*

Signature of Candidate*:*		Date:	

Submission

Submitted By *(name in capitals):*	JURBE JOSEPH MOLWUS
Signature of Individual Submitting:	
Date Submitted:	

For Completion in the Student Service Centre (SSC)

Received in the SSC by *(name in capitals):*			
Method of Submission *(Handed in to SSC; posted through internal/external mail):*			
E-thesis Submitted (***mandatory for final theses)***			
Signature:		Date:	

TABLE OF CONTENTS

3. CHAPTER THREE: LIFE CYCLE, SUCCESS, PROCUREMENT ROUTES; AND STAKEHOLDER COLLABORATION IN CONSTRUCTION PROJECTS 58

4. CHAPTER FOUR: RESEARCH METHODOLOGY 89

LIST OF TABLES

LIST OF FIGURES

1. CHAPTER ONE: INTRODUCTION

1.1 Background

Construction projects are traditionally divided into series of activities or operations undertaken by different individuals or groups who may have different levels of interest and or involvement in the project (Egan, 1998). Construction projects are generally unique in nature based on their fragmentation, processes and interaction with numerous parties; and just like any other venture, are constrained by time and resources (both human and material) which are needed for the projects to be delivered (Ibrahim and Nissen, 2003; Bourne, 2005; Olander, 2006). Therefore, the lengthy process of design and execution of construction projects constitutes a complex system which involves collaboration and negotiations among many stakeholders which may include but not limited to the clients, designers, contractors, local authorities and the general project environment (Cheeks, 2003; Winch, 2010). The different parties involved both directly and indirectly on the project are referred to as the project stakeholders whose management is vital to achieving project success (Cleland, 2002). Stakeholder management therefore, has been recognised as an important strategy for achieving project success in construction projects.

1.1.1 Who are construction project stakeholders

Knowing the stakeholders and their characteristics relative to the project is an important step in stakeholder management (Cleland, 2002) but this can only be achieved through an adequate definition of stakeholders. However, despite the recognition of stakeholder management as an important strategy for achieving project success, the definition of stakeholders is not clearly certain as project stakeholders have been defined in different ways (see section 2.2 for more details). While some definitions of project stakeholders are criticised for being too narrow (Smith, *et al*., 2001; Smith and Love (2004); Olander, 2007; Walker *et al*., 2008), others suffer criticisms for being too broad (Freeman, 1984; Juliano, 1995; Awakul and Ogunlana, 2002; PMI, 2004; Takim, 2009; Winch, 2010). Relying on the too narrow definition will expose the project management team to the risk of leaving out some important stakeholders. Similarly, relying on the too broad definition will expose the project management team to the risk of involving too many stakeholders including those who are not important to the project (Leung and

Olomolaiye, 2010). Therefore, the following definition has been coined out of the different definitions for the purpose of this study:

"Construction project stakeholders are individuals or groups/organisations who have some aspects of right or ownership in the project and can contribute to it; or will incur or justifiably perceive they will incur a direct benefit or loss as a result of either the works during the project or the outcome of the project."

This definition will be used for this study and the term "stakeholder" will be used to refer to stakeholders both as individuals and as group(s) of individuals.

Different classifications have also been adopted for stakeholders by scholars (Mitchell *et al*., 1997; Newcombe, 2003; Bourne and Walker, 2005; Olander, 2007; Aaltonen *et al*., 2008; Chinyio and Akintoye, 2008; Winch 2010) depending on their possession of certain attributes and disposition towards the project. Winch (2010) for instance, classify construction project stakeholders into two categories according to their relationship with the client: (1) internal stakeholders which are those who are in legal contract with the client and (2) external stakeholders which also have direct interest in the project though not necessarily having direct contracts with the client. He further broke them down as follows: internal stakeholders into those (stakeholders) clustered around the client on the demand side and those on the supply side, while external stakeholders are broken down into private and public actors. The stakeholder classification by Winch (2010) is used as a guide throughout the study.

1.1.2 Link between stakeholder management and project success in construction

The focus of construction project management over the years has been on the processes leading to the effective planning and management of the complex series of activities involved in delivering successful projects (Morris 1994). According to Takim (2009), the complex interaction and interrelationships that take place among the parties involved in a construction project determine the overall successful completion of the project. Furthermore, project success has been linked to the effective continuous engagement/management of all the project's stakeholders (Cleland, 1999; Bourne and Walker, 2005; Olander, 2007; Aaltonen *et al*., 2008; Ward and Chapman, 2008; Chinyio and Akintoye, 2008). The traditional perception of project success being judged based on cost quality and time has changed over time to include; micro and macro viewpoints, reduced conflicts and disputes, environmental friendliness and stakeholder satisfaction

(Lim and Mohamed, 1999; Cookie-Davies, 2002; Bryde and Brown 2005; Low and Chuan 2006; Toor and Ogunlana 2010). Previous researches have attributed project failures to either lack of or in adequate stakeholder management during the project (Black, 1995; Akintoye *et al*. 2003; Bourne, 2005; Olander and Landin, 2008). Therefore, in order to achieve project success and in line with the current perception of construction project success, it is important to engage/manage stakeholders effectively in the course of carrying out the project. The question however, still remains of how effective stakeholder management can be carried out in construction projects.

The following have been identified to be among the causes of project failure: poor scope and work definition; in adequate resources assigned to the project; unforeseen regulatory changes; and negative community reaction to the project (Black, 1995). Most of these could be associated with either uninformed or ineffective stakeholder management on the project; for instance, the early involvement and considerations of the interests of stakeholders is vital to being able to clearly define and set out the project scope and goals which could also help to avert negative community reaction to the project. Mere involvement of these key stakeholders is however, not a guarantee for achieving a successful project; it also needs to be properly done.

Furthermore, the success or failure of a project is influenced very strongly by the expectations and perceptions of the stakeholders involved on the project and failure to balance and or address the concerns of the stakeholders has resulted in many projects failing (Bourne, 2005; Chinyio, 2010). Similarly, differing or conflicting objectives among the project stakeholders are among the factors that impede the achievement of best value in construction projects (Akintoye *et al*. 2003). Therefore, involving the stakeholders at the front end planning and further integrating them into the project team can help to avoid/overcome problems associated with stakeholder issues. Such problems could be in the form of conflicts and controversies which can obstruct the project implementation process and consequently lead to delays, cost overruns, dissatisfaction and claims (Faniran *et al*., 1999; Jergeas *et al*., 2000; Karlsen, 2002; Olander and Landin, 2005; Yu *et al*., 2007; Yang *et al*., 2011). For instance, Jeargeas *et al*., (2000) found that problems caused by stakeholders due to their lack of involvement in the project could negatively affect projects in terms of budget, schedules and relationship with the stakeholders. Therefore, managing stakeholders becomes a vital skill for construction project management team since the successful completion of projects depends on among other things, meeting the expectations of the stakeholders and ensuring a smooth running of the project (Cleland, 1995; Vinten, 2000; Newcombe, 2003; Bourne 2005; Aaltonen *et al*., 2008).

Stakeholders' interests and influences are not constant and can vary from one stage to another and even from time to time in a particular stage of the project lifecycle (Cleland, 1995; Jergeas *et al*., 2000; Olander, 2007; Aaltonen *et al*., 2008; Ward and Chapman, 2008;). This is an indication of the dynamic relationships that exist among the stakeholders themselves as well as between the stakeholders and the project which also shows that events and actions are interdependent on each other (Pajunen, 2006; Olander, 2007; Nash *et al*., 2010). The stakeholders involved may have their respective expectations from the project and satisfying the expectations of project stakeholders throughout the life cycle of the project is instrumental to the successful completion of construction projects (Atkin and Skitmore, 2008). In pursuing their interests and expectations on projects, stakeholders can behave in different ways including cooperative potential, competitive threats, opposite position and neutral attitude (Yang *et al*., 2014). Therefore, stakeholder involvement and management should not stop at the front end project planning stage or at any stage at all but continue throughout the entire lifecycle of the project (Takim, 2009). Olander and Landin (2008) argued that "*if there is no clear strategy for how to manage and involve stakeholders in the project implementation process, the project manager will end up in a rearguard action, fending off claims from stakeholders*". However, the suggestion that the project manager is responsible for stakeholder management is arguable; as this will depend substantially on the procurement route being used, the stage at which the project is and other project characteristics.

1.1.3 Stakeholder management process

The main steps involved in stakeholder management in construction projects include stakeholder identification, stakeholder analysis, stakeholder classification and formulating/adopting stakeholder management strategy (Cleland, 1999). Moreover, the effective use of communication, negotiations, intuition, incentives, concessions, and workshops/meetings are useful operational principles for managing stakeholders (Chinyio and Akintoye, 2008). In line with these, scholars (Newcombe, 2003; Bourne and Walker, 2005; Olander, 2007; Reed *et al*., 2009 etc) have proposed approaches for stakeholder identification and analysis but less attention has been paid to the practical use of these approaches except in the works of (Smith and Love, 2004; Chinyio and Akintoye, 2008; Jepsen and Eskerod, 2009). Consequently, project managers for instance, have been reported to be having difficulties in analysing the stakeholders adequately before adopting a stakeholder management strategy (Jepsen and Eskerod, 2009). This indicates the need to study the current practice of stakeholder management in construction projects.

The emphasis of stakeholder management in construction projects has been on procurement and site management related activities which are mainly based on the internal stakeholder relationships (Atkin and Skitmore, 2008). Rwelamila (2010) suggested either the use of hybrid traditional procurement methods or a different procurement method that enables cooperation and collaboration between the teams and among the team members to improve stakeholder management in construction projects. However, there is a paucity of empirical evidence of studying the impact of procurement routes on the process of stakeholder management in construction projects.

1.1.4 Justification for the research

It is necessary to carryout stakeholder management from the inception stage and continue throughout the project in order to minimize problems of protest and delays in construction projects (Smith and Love, 2004; Chinyio and Olomolaiye 2010). The need for a formally coherent approach for stakeholder management in construction projects has been raised in previous research (Cleland, 1999; Karlsen, 2002; Olander and Landin, 2005; Chinyio and Akintoye, 2008) and has yet to be addressed. This coherent approach needs to span from the project inception stage to design and construction to operation stage focussing on ensuring collaboration between the design professionals and the construction management professionals as well as the facility management organisation.

Previous research efforts in the field of stakeholder management in construction projects have focussed on the aspects of identifying, analysing, classifying, visualising, predicting and managing the stakeholders. However, very little research has focused on the formulation of a comprehensive framework for stakeholder management in construction except the work of Yang *et al*. (2009) which is discussed in section 2.7.

Furthermore, previous studies have identified and studied the critical success factors (CSFs) for stakeholder management in construction projects (Jergeas *et al*., 2000; Chinyio and Akintoye, 2008; Olander and Landing, 2008; Yang *et el*., 2009; Jepsen and Eskerod, 2009; Li *et al*., 2011). For instance, Yang *et al*. (2009) explored and grouped

15 CSFs for stakeholder management and Li *et al*., (2011) studied the hierarchical groupings of 16 CSFs for stakeholder management. More details on these factors are given in section 2.6. It is hereby argued that to study the relationships (or interdependencies) among these factors in order to understand how they affect and or influence each other is necessary to inform a holistic and coherent stakeholder management.

The review of previous studies on stakeholder management in construction projects points to the existence of a number of problems (gaps) in stakeholder area management in construction projects including: Lack of continuity in the stakeholder management process, lack of clear definition or agreement as to who should be responsible for stakeholder management, lack of a comprehensive framework that covers all the stages in the construction process, lack of clear delineation of the relationships between the critical success factors for stakeholder management in construction projects, lack of recognition of the influence of procurement routes and form of contracts on stakeholder management process.

Therefore, it is necessary to explore the relationships amongst groups of critical success factors for stakeholder management in construction; to investigate the current practice of stakeholder management in construction projects; to investigate the impact of procurement routes and contracts on the stakeholder management process; to identify who should be responsible for stakeholder management; and to create collaboration between the internal stakeholders at all stages in carrying out stakeholder management in order to ensure continuity in the process.

1.2 Research Questions

The main research question is: How can stakeholder management be improved to enhance the propensity of achieving successful construction projects execution? The sub research questions are as follows:

1. What is the current practice (is stakeholder management done as a personal intuitive initiative or based on a conscious strategy for doing so) of stakeholder management in construction projects?
2. What are the critical success factors for stakeholder management and how could they be used to improve stakeholder management?

3. How are the critical success factors for stakeholder management in construction projects related?
4. What are the techniques and tools for stakeholder management in construction projects and to what extent are they used?
5. How do procurement route and contract forms affect stakeholder management in construction projects?
6. Who is (or should be) responsible for doing stakeholder management in construction projects?
7. How can stakeholder management be carried out throughout the project lifecycle in construction projects with multiple stakeholders?

1.3 Research Aim and Objectives

The overall aim of this study is to explore the formulation of a comprehensive framework for stakeholder management in construction projects with demanding stakeholder issues (projects with multiple and diverse stakeholders and interests), which integrates and links the different stages of the project life cycle considering the effects of the procurement route. In pursuing this aim, the following objectives which are related as shown in Figure 1.1 are set:

1. To review previous work on stakeholder management in construction projects.
2. To empirically investigate the current practice of stakeholder management within the construction industry.
3. To empirically assess the effect of procurement routes and contract conditions on stakeholder management process.
4. To model the relationship among the critical success factors for stakeholder management in construction projects.
5. To develop a comprehensive life cycle based framework for stakeholder management in construction projects.
6. To validate/evaluate the framework.

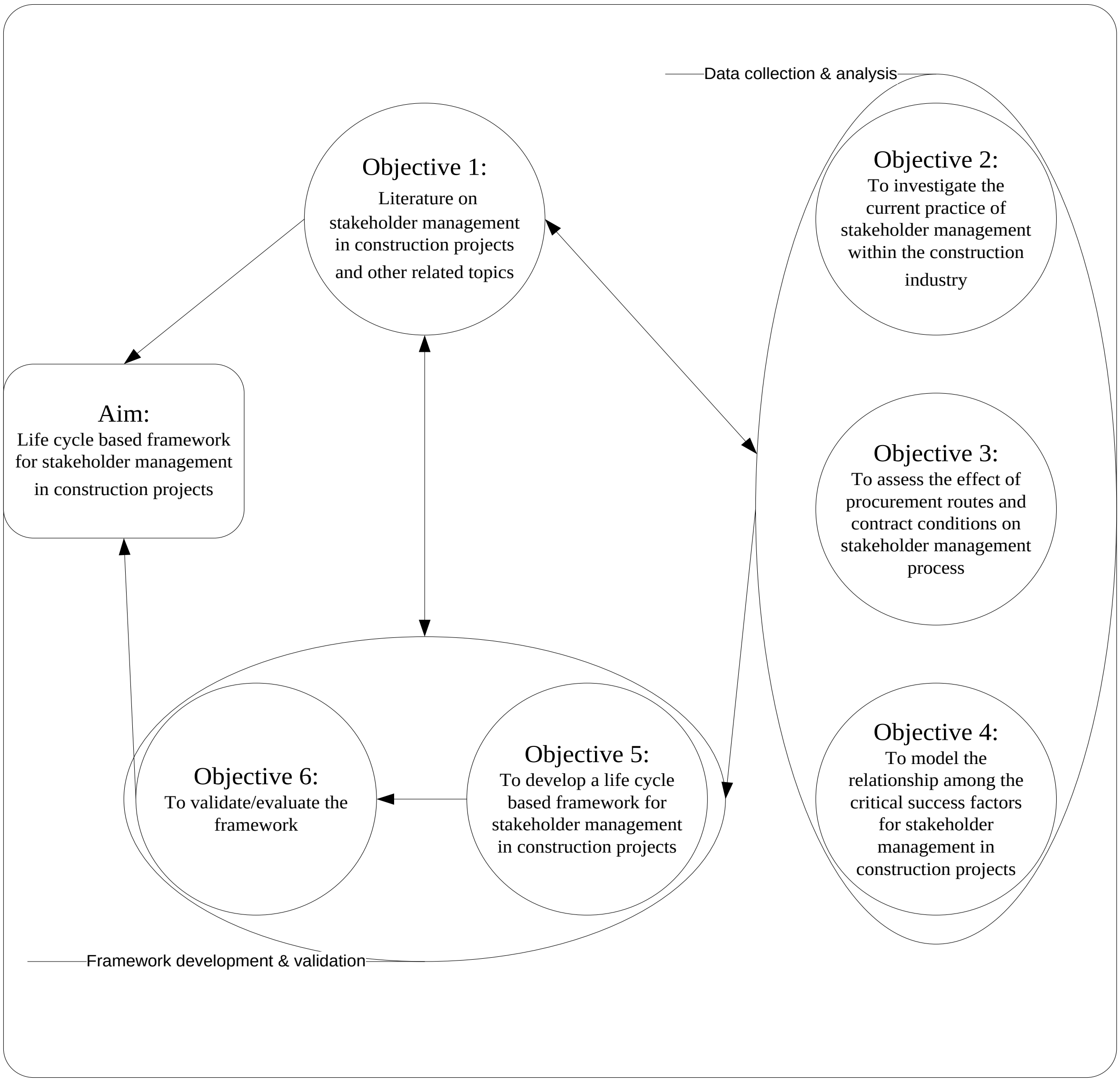

Figure 1.1 Relationships among the objectives of the study

1.4 Research Methodology

There are different ways to design research to achieve the aim and objectives of any research venture. According to Blaikie (2007), there are two ways to solving research problem(s); either to adopt one approach or explore a combination of appropriate approaches for the research depending on the nature of the problem(s) to be investigated. In other words, research problems can be addressed either by using qualitative, quantitative or mixed methods research design (Creswell, 2009).

Given the complex nature of the issues associated with construction project stakeholder management, it is difficult to adopt a single research strategy towards achieving the aim and objectives of this study. The issues to be addressed in this research are considered complex because they involve different interdependent aspects as shown in Figure 1.1 to be addressed. Moreover, in a complex system, sequences of interaction will normally involve feedback loops, on the long and short terms as well as positive and negative; while the positive feedbacks stimulate or enhance the activities of the system, the negative feedbacks inhibits or restricts the activities of the system (Cilliers, 2005). Similarly, complex systems have the potentials of producing unpredictable and novel outcomes from the interactions that take place between the parts that make them up to be complex (Blaikie, 2007). It is therefore necessary to adopt appropriate strategies as would enable the research objectives to be achieved leading to viable solutions to the research questions.

The methodology adopted to achieve the aim and objectives of this research (see Chapter four for more details) consist of the combination of the following methods: literature reviews, questionnaire survey, framework development and validation/evaluation.

The literature review consists of the following reviews: review of previous studies on construction stakeholder management, review of construction project success and key performance indicators (KPIs), procurement routes, the review of collaborative working in construction and review of literature on research methodology. These reviews were based mainly on secondary documentation and sources of information such as journal papers, conference papers, books; and primary sources of information such as PhD theses. The literature review was used to establish the research gaps and identify critical success factors (CSFs) for stakeholder management in construction projects.

In order to investigate the current practice of stakeholder management in construction, a questionnaire administered to practitioners in the industry within the United Kingdom was used to survey the opinions and experience of respondents regarding the current practice and who should be responsible for leading stakeholder management at the various stages of the construction project life cycle. The respondents were construction professionals with relevant industry experience of at least five years.

The identified critical success factors for stakeholder management in construction were evaluated through the same questionnaire. This was done with the view to ascertaining any causal or interdependent relationship among the critical success factors for stakeholder management in construction projects. The data obtained was analysed using structural equation modelling (SEM) to explore the interrelationships among the CSFs based on their groupings and between them and project success. The same questionnaire was used to explore the influence of procurement routes and contracts type as well as other project characteristics on stakeholder management process.

Based on the results obtained from the above processes (literature review and industry survey), a comprehensive framework for construction projects' stakeholder management was developed. The framework was developed using integrated definition (IDEF0) process modelling.

To evaluate/validate the framework, a survey was carried out with selected industry practitioners using structured interview and questionnaire. The quantitative and qualitative data collected from the validation interview sessions were analysed using appropriate statistical techniques and thematic analyses respectively.

Table 1.1 shows a mapping of the objectives of the study with their corresponding data collection techniques and analysis tools.

Table 1.1 Mapping of objectives with corresponding data collection and analysis Techniques

Methods / Objectives	Literature Review	Questionnaire	Structured Interview	Descriptive Statistics	Thematic analysis	Parametric and non-Parametric Statistics	CFA	SEM	IDEF0 Process Modelling
Objective 1	√								
Objective 2		√		√	√				
Objective 3		√		√		√			
Objective 4		√				√	√	√	
Objective 5	√	√							√
Objective 6		√	√	√	√				

1.5 Thesis structure

The thesis is presented in ten chapters. This section gives a brief introduction of the chapters in order to outline the chronological flow (Figure 1.2) of the different parts of the thesis.

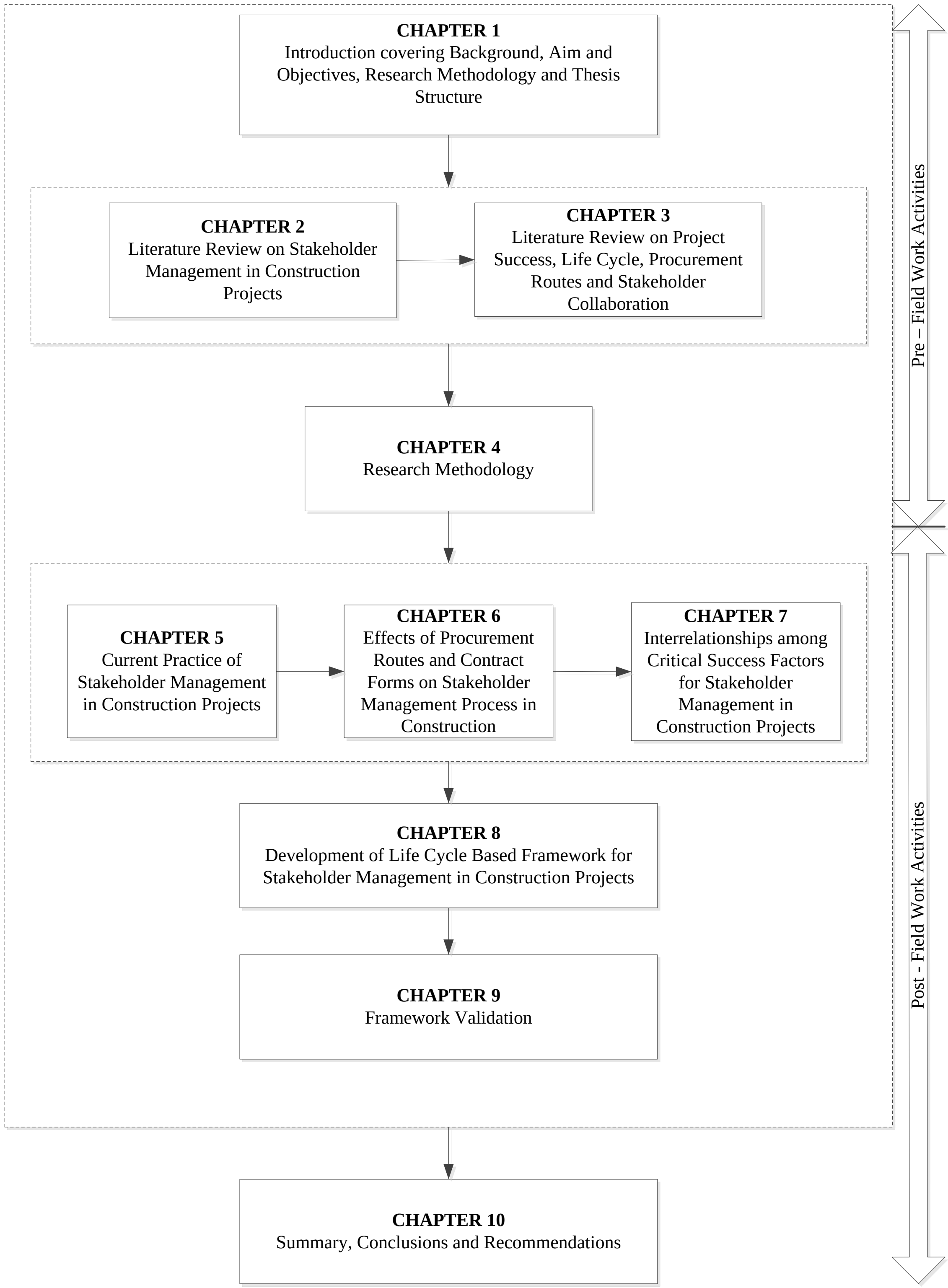

Figure 1.2 Thesis Structure

Chapter One: Introduction

This chapter presents an introduction to the study by giving background to the research topic; research questions; aim and objectives; brief statement of methodology and structure of the thesis.

Chapter Two: Stakeholder management

This chapter presents the findings of a literature review on stakeholder management in construction covering: stakeholder definition; stakeholder classification; need to manage stakeholders in construction projects; critical success factors for successful stakeholder management in construction; and stakeholder management approaches.

Chapter Three: Project success, procurement routes, project life cycle and stakeholder collaboration

This chapter presents a literature review on construction project life cycle, construction project success, construction procurement routes and stakeholder collaboration in construction. It also presents the conceptual models of CSF for stakeholder management in construction identified in chapter 2.

Chapter Four: Research methodology

This chapter discusses the research methodology for this study. It starts by giving a general background and comparison of the concepts guiding research design, explains the main components of the research design model found most suitable and adopted in this study for guiding research design and then presents the research design and methodology adopted for the study reported in this thesis as well as research validity and reliability.

Chapter Five: Current practice of stakeholder management in construction projects

This chapter presents data analysis results obtained in respect of investigation the current practice of stakeholder management in construction projects covering stakeholder management decision, responsibilities, collaboration and techniques. Data obtained from the questionnaire about stakeholder management decisions and responsibilities; change in stakeholder interests/disposition towards the project; stakeholder collaboration; stakeholder dynamics; techniques for stakeholder engagement/management; and general comments of respondents were analysed and presented. Finally, a summary of findings and conclusions drawn from these results are highlighted.

Chapter Six: Effects of procurement routes related characteristics on stakeholder management in construction projects

This chapter presents the results of data analyses in respect of investigating the effects of procurement routes alongside contract forms on stakeholder management in construction projects. Firstly, the extent to which procurement routes related characteristics of stakeholder management can influence stakeholder management process in projects is analysed and presented followed by relationships between client type and procurement routes related characteristics, relationships between contract forms and procurement route related characteristics and effects of forms of contracts on stakeholder management in construction projects.

Chapter Seven: modelling the relationships among CSFs for stakeholder management in construction projects

This chapter addresses the evaluation of the conceptual measurement and structural models of the critical success factors for stakeholder management developed in chapter 3.

Chapter Eight: Development of life cycle based framework for stakeholder management in construction projects

This chapter presents the development of the framework for stakeholder management in construction resulting from this study. The chapter starts with an overview of the framework for stakeholder management followed by framework development approach, features of the framework, IDEF0 process models of framework for stakeholder management and then chapter summary.

Chapter Nine: Framework validation/evaluation

This chapter presents the validation/evaluation of the life cycle based framework for stakeholder management in construction projects presented in chapter 8. It begins with an explanation of the aim and objectives of validating/evaluating the framework followed by an explanation of the methodology adopted for the validation/evaluation.

Next is presentation of the analyses of the data collected during the framework validation/evaluation process. Following this, the suggested improvements, barriers to the use of the framework and further development of the framework are presented. The results obtained are then discussed and the chapter summary is presented.

Chapter Ten: Conclusions, Limitations and Recommendations for further research

This chapter summarises the overall research undertaken in pursuing the research aim and evaluates it against the specific research objectives set out. The conclusions reached are then presented and the research limitations are discussed. The Chapter also presents recommendations for practice and further research.

2. CHAPTER TWO: LITERATURE REVIEW ON STAKEHOLDER MANAGEMENT IN CONSTRUCTION PROJECTS

2.1 Introduction

This chapter presents the findings of a literature review on stakeholder management in construction covering: stakeholder definition; stakeholder classification; need to manage stakeholders in construction projects; critical success factors for successful stakeholder management in construction; and stakeholder management approaches.

2.2 Stakeholders Definition

This section critically reviews different views on the meaning and definitions of "stakeholders" and coins a definition for this study.

In seeking to improve project delivery and success/performance, stakeholder management offers a great opportunity; hence it is an important consideration. However, despite its growing popularity, there is no common definition for "stakeholders" agreed by all researchers. Different authors have defined stakeholders differently, though mostly similar, depending on the nature of their stakes. According to Freeman (1984) stakeholders are any group or individual who can affect or are affected by the achievement of the cooperation's purpose. He traced this back to a memo of Stanford research institute in 1963, which states that stakeholders are those groups without whose support the organisation will cease to exist. Similarly, Juliano (1995) argued that stakeholders could be an individual, individuals, team or teams affected by the project. Smith, *et al*. (2001) define stakeholders as representatives, direct and indirect, who may have an interest and can contribute to the proposed project. Awakul and Ogunlana (2002) defined construction project stakeholders in similar vein but they argued, non-governmental organisations, government officials, academics and other interested stakeholders should be added to the list of parties that are likely to be involved in a large construction project. Smith and Love (2004) are of the view that stakeholders are direct and indirect representatives of interests who can make contributions to the proposed project, and may include:

- Owner/client,

- Senior managers/executives, facilities managers, project managers,
- Staff or employees,
- Purchasers, subcontractors, suppliers, and other process or service providers,
- Tenants, residents, community representatives, neighbours,
- Visitors, customers (potential and future), users, partners, or other interest groups,
- Design team members (if appropriate) and
- Others, depending on the project and attitude of the organization to participation and involvement in the process.

Olander (2007) defined project's stakeholders as a person or group of people who has a vested interest in the success of the project and the environment within which the project operates. He further referred to them as, representatives of the various interests that will be affected during the different stages of the construction project from initiation to handover both positively and negatively. Walker *et al*. (2008) defined stakeholders as individuals or groups who have an interest or some aspect of rights or ownership in the project, and can contribute to or be impacted by, either the work or the outcomes of the project. The PMI (2004) refer to stakeholders as individuals or organisations who are actively involved in the project or whose interests may be affected as a result of the project execution or completion.

Takim (2009) define stakeholders as those who can influence the activities/final results of the project, whose life or environment are positively or negatively affected by the project, and who receive direct and indirect benefits from it. He limited these to five groups namely: client, consultant, contractor, end-users and the community of the project.

Winch (2010) defined it as those actors which will incur or perceive they will incur a direct benefit or loss as a result of the project. Li *et al*. (2012) defined stakeholders as "those who can influence the project process and/or final results, whose living environments are positively or negatively affected by the project and who receive associated direct and indirect benefits and or losses".

The definitions of (Freeman, 1984; Juliano, 1995; Awakul and Ogunlana, 2002; PMI, 2004; Takim, 2009; Winch, 2010) can be criticized for being broad because they merit everyone at all to be considered as stakeholders on a project. On the other hand, the definitions of (Smith, *et al*., 2001; Smith and Love (2004); Olander, 2007; Walker *et al*., 2008) can be criticized for being narrow because they tend to exclude some relevant group of stakeholders. The narrow definition of stakeholders is only useful for identifying those stakeholders with direct stakes and economic relationships with the project and excludes those without direct economic relationships but may be capable of influencing the project implementation process (Leung and Olomolaiye, 2010). This means that relying on the broad definitions alone for identifying project stakeholders will lead to including those who do not really have any stake in the project and relying on the narrow definitions alone will also lead to the exclusion of some important stakeholders both of which situations can be dangerous to the smooth running of the project. With both views having their strengths and weaknesses, it is important for this study to adopt a definition that will guide further considerations of who stakeholders are. The following definition is therefore coined:

"Construction project stakeholders are individuals or groups/organisations who have some aspects of right or ownership in the project and can contribute to it; or will incur or justifiably perceive they will incur a direct benefit or loss as a result of either the works during the project or the outcome of the project."

This definition combines the features of both the narrow and broad definitions of stakeholders. The next section discusses the different classification of stakeholders.

2.3 Stakeholders' Classification

This section discusses different stakeholders' classifications according to their possession of certain attributes, contractual relationships with the project and with each another and attitudes towards the project; these are discussed in the following sub sections:

2.3.1 Classification according to Stakeholders' attributes (Power, Legitimacy, Proximity and Urgency)

Stakeholders possess certain attributes that determine their relationship and ability to make claims and impose their will on the project. These are power, legitimacy, proximity and urgency (Mitchell *et al*., 1997; Walker *et al*., 2008). These attributes are defined as follows:

1. Power: The capacity of a stakeholder to influence the action of other stakeholders either positively or negatively or the decision making process of the project. This can be acquired and it can also be lost.

2. Legitimacy: The perceived validity of stakeholders' claim. It can also be defined in terms of stakeholders bearing some risks in relation to the project which could either be beneficial or detrimental to the project.

3. Proximity: this refers to the level of association of the stakeholders with the project. Depending on their proximity, they can have direct involvement on the project or operate remotely from the project.

4. Urgency: The degree to which stakeholders' claim requires immediate attention.

The use of the attribute of proximity instead of legitimacy could be more helpful because proximity as an attribute is easier to operationalise whereas the attribute of legitimacy is imprecise and difficult to explain (Yang *et el*., 2009).

Mitchell *et al*. (1997) categorised stakeholders (Figure 2.1) based on whether or not they possess the power to influence decision and progress, legitimacy in relation to other stakeholders and Urgency of claim on the project. They classify stakeholders in terms of their possession of any one or combination of these attributes as follows:

- Power only: Dormant;
- Legitimacy only: Discretionary;
- Urgency only: Demanding;
- Power and Legitimacy: Dominant;
- Power and Urgency: Dangerous;
- Urgency and Legitimacy: Dependent and
- Power, Legitimacy and Urgency: Definitive.

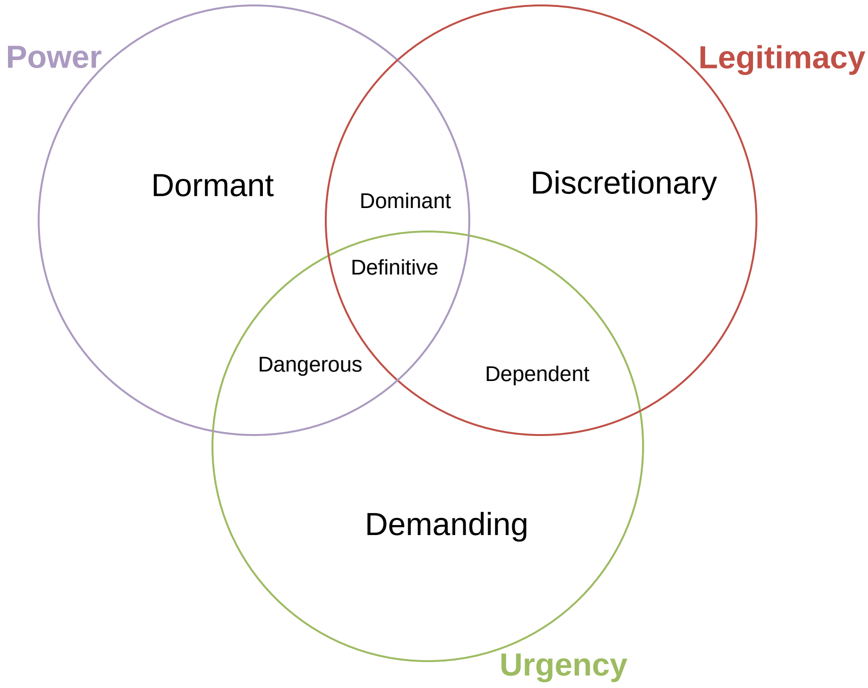

Figure 2.1 Categories stakeholders based on their attributes (Mitchell et al., 1997)

These different classes of stakeholders are defined as follows:

1. Dormant stakeholders: Although they have the power to exert their will, they lack the legitimacy and urgency to make any claim on the project. Their power therefore will remain unused and may not exert any pressure on the project.

2. Discretionary stakeholders: They have the attribute of legitimacy but do not have power and urgency hence cannot mount pressure on the project management team to actively engage them. However, when they form alliance with other stakeholders, they could mount some pressure on the project.

3. Demanding stakeholders: This class of stakeholders have the attribute of urgency but lack the attributes of power and legitimacy. The demanding nature of their stakes makes them to require management attention because they could become more problematic when they are able to form alliance with other stakeholders.

4. Dominant stakeholders: These stakeholders have the attributes of both power and legitimacy and lack the attribute of urgency of claim, thereby making them to occupy an important place in management's consideration of stakeholders' needs.

5. Dangerous stakeholders: They have the attributes of power and urgency but lack that of legitimacy. This places them in the position of having the possibility to not only seek alliance but also to be coercive and violent in opposing the project.

6. Dependent stakeholders: These stakeholders have the attributes of urgency and legitimacy but lack that of power. This makes them to be dependent on other stakeholders for the necessary power they need to impose their will on the project.

7. Definitive stakeholders: These are the stakeholders that have all three attributes of power legitimacy and urgency. These will already be members of the dominant decision making group for the project and their definitive character makes it possible for them to influence/win managers' immediate priority and attention. They are very capable of imposing their will on the project.

Newcombe (2003) categorized stakeholders by judging their likelihood to try to enforce their expectations on the project referred to as 'predictability' which could be high or low and whether they have the means to do so, referred to as 'power' which could also be high or low. He argues (Figures 2.2a and 2.2b) that stakeholders with low power and low predictability are manageable; those with low power and high predictability may present few problems while those with high power and low predictability pose the greatest danger or opportunity to the project. Although, it is noticed that most scholars have used legitimacy in their classification of stakeholders, this study will also consider proximity of stakeholders to the project as an attribute.

2.3.2 Classification according to vested interest-impact index (viii)

Bourne and Walker (2005) categorized stakeholders based on the vested interest-impact index (viii) calculated by quantitatively assessing the vested interest level (v) and the influence impact level (i) on five point scale with 5= very high and 1= very low.

The classification bases by Mitchell *et al*. (1997) and Bourne and Walker (2005) were combined by Olander (2007) in a four steps process to classify stakeholders and obtain a stakeholder impact interest for projects. The steps which are based on assigning values on a scale of 1 to 5 with 1 = very low and 5 = very high include: first to determine the stakeholder vested interest-impact index (viii), secondly, assess the nature of the stakeholder impact through an attributes value (A) based on the possession of power, legitimacy and urgency (i.e. A=[P+L+U]), the third step is to assess a position value

(Pos) and fourth is to calculate the impact index for each stakeholder using Viii*A*Pos and then sum up the overall for stakeholders to obtain the stakeholder impact index for the project. They classified them based on their final position value as follows: active opposition- Pos = -1; passive opposition- Pos = -0.5; not committed- Pos = 0; passive support- Pos = 0.5 and active opposition- Pos = 1. This means that stakeholders that are found to have position values less than zero (0) are likely to oppose the progress of the project whereas, stakeholders with position values above zero (0) are likely to support the project.

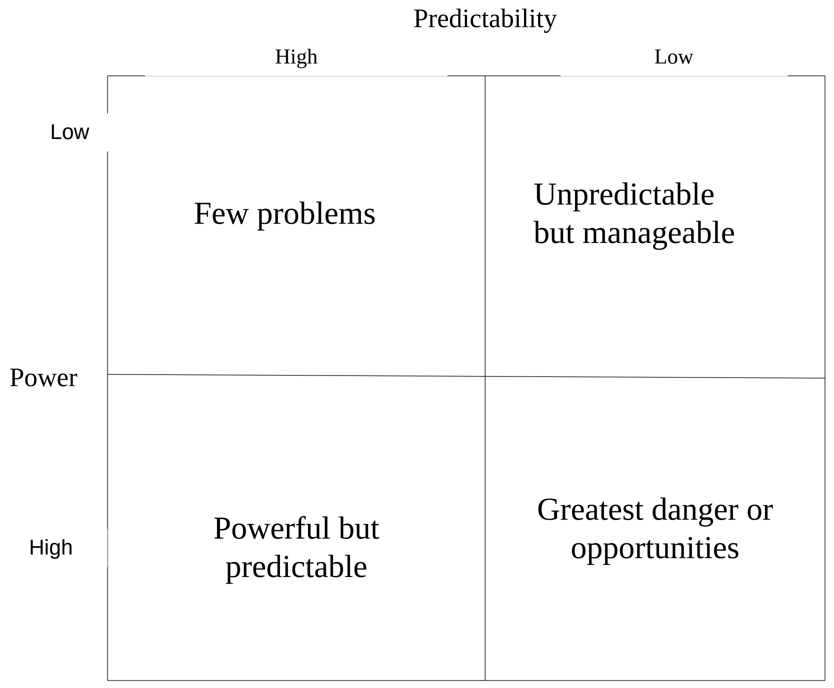

Figure 2.2a: Stakeholder power/predictability matrix (Newcombe, 2003).

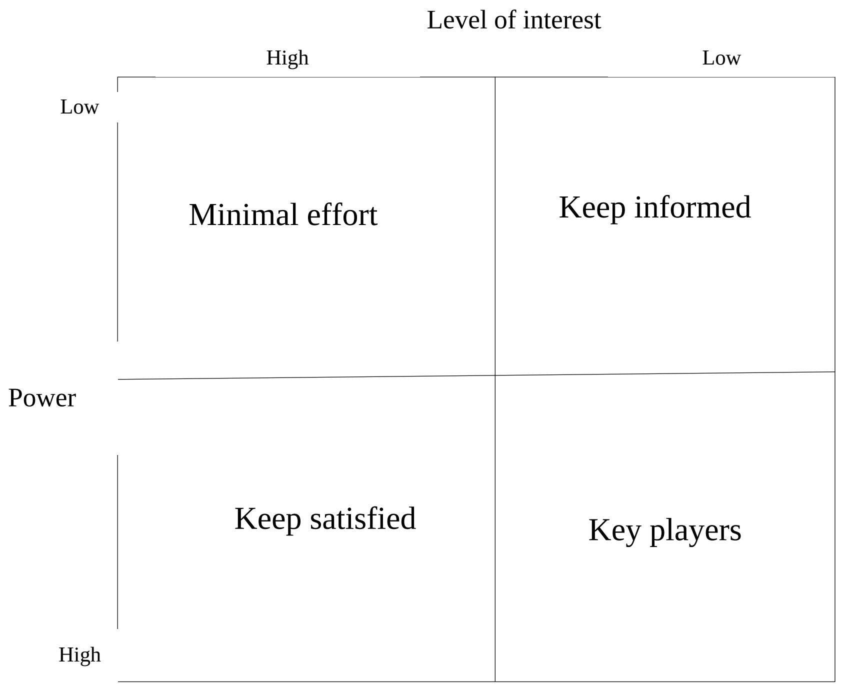

Figure 2.2b: Stakeholder power/interest matrix (Newcombe, 2003).

Figure 2.2 Stakeholder matrices

2.3.3 Classification according to contractual relationship

Winch (2010) uses the contractual relationship between them and the client to classifying construction project stakeholders into internal and external stakeholders (Figure 2.3). Internal stakeholders are those who have legal contractual relationship with the project owner and are grouped into demand and supply sides stakeholders. External stakeholders do not have any contractual relationship with the project owner, but have some rights and interests in the project and are grouped into private and public sides' stakeholders. Stakeholders can also be classified based on their relationships with and proximity to the project: Those directly involved in the decision making and operations of the project are considered as primary or direct stakeholders whilst those who do not have any direct relationship and are operating remotely from the project are considered secondary or indirect or outside stakeholders (Newcombe, 2003; Smith and Love, 2004).

2.3.4 Classification according to stakeholder attitudes towards the project

Olander (2007) view stakeholders as being either proponents or opponents of the project and similarly (Aaltonen *et al*., 2008; Chinyio and Akintoye, 2008) consider stakeholders as being supportive, neutral or anti to the project. These are very important for the purpose of decision making and resource allocation by the project management especially to be able to convert the neutral, opponents/anti to supportive stakeholders.

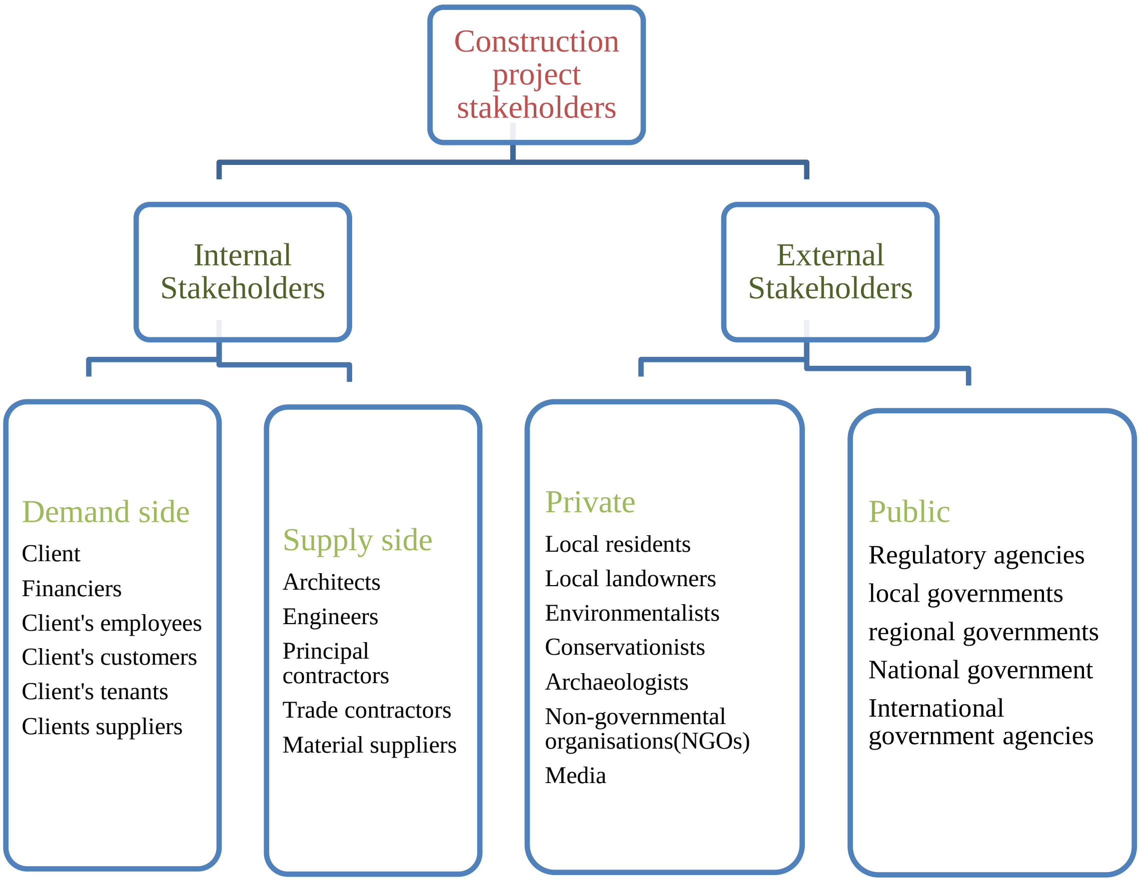

Figure 2.3 Categorisation of stakeholders (Winch, 2010).

These classifications (summarised in Table 2.1) indicate the various views that exist on how scholars perceive project stakeholders. Their diversities notwithstanding, each of the classifications is vital to stakeholder management as they are mostly based on the stakeholders' interests and relationship with the project. The next section presents **c**onstruction stakeholders and their interests.

Table 2.1 Summary of stakeholder classification

According to	Categories	Defining Characteristics
Stakeholder attributes	• Dormant • Discretionary • Demanding • Dominant • Dangerous • Dependent • Definite	• Power only • Legitimacy only • Urgency only • Power and Legitimacy • Power and Urgency • Legitimacy and Urgency • All three attributes
Stakeholder vested interest-impact index (viii)	• Active opposition • Passive opposition • Not committed • Passive support • Active support	• Pos = -1 • Pos = -0.5 • Pos = 0 • Pos = 0.5 • Pos = 1
Contractual relationship on the project	• Internal • External	• Having a contractual link with the project • Having no contract but could affect or be affected by the project
Attitudes towards the project	• Proponent • Neutral • opponent	• In support of project • Indifferent • Against the project

2.4 Construction Projects' Stakeholders and Their Interests

The specific groups of stakeholders involved in construction and their interests may differ with some projects. However, Leung and Olomolaiye, (2010) considered construction projects stakeholders under five main groups and interests as follows:

1. Clients: these include public and private clients. The interests of the public clients include: to ensure the project will support the organisation's strategy; to ensure the effective and economic use of resources; provide financial support;

and to ensure the construction product is successfully and profitably procured. The interests of the clients include: to ensure public funds is properly used; to allocate funds to the project; to serve the public interest in line with the organisation's objectives; ensure it can be financed and there will be return on investment; and ensure the construction product is successfully procured.

2. Consultants (project professionals): these could either be in-house or out-of-house and they include: Architect, Quantity surveyor, Engineer, construction manager and other consultants relevant to the requirements of the project. Their primary interest is carrying out their respective professional duties to their employers.

3. Contractors: these usually include the main and sub-contractors and their employees; and the suppliers. The primary interest of the main contractor is to carry out the work successfully as designed and perform other contractual duties assigned to them in the contracts. The sub-contractors carry out work assigned by the main contractor and or the client depending on the contract terms and conditions. Similar to the sub-contractor, the suppliers' primary interest is to supply and install all materials and equipment as required of them. In the end, the main interest of the contractors is to get the job done, get paid and move on to the next job.

4. External public parties: these include Government authorities, consultation bodies such as district board, labour union (employers' association), General public, the media, and institutional forces/nationalised industries (professional bodies). Government authorities ensures that the project complies with established laws and regulations; consultation bodies ensure that the project reflects the local communities' requirements; labour union protect the rights and influence the conducts of its members; general public contribute to the governance process by participating directly or indirectly; the media inform and influence the perception of people about the reputation of the project; and institutional forces influence professional bodies and the activities of their members through education, rules of conduct, conditions of engagement and scales of fees.

5. External private parties: these include local residents/neighbouring communities, local landowners, archaeologists, environmentalists/conservationists,

competitors, the media, and others. The primary interest of local residents is how the project affects their amenity and immediate environment; local land owners are interested in making sure that their interest will not be hurt by the project; the environmentalists are interested in protecting the environment from pollution and or destruction; the competitors try to gain competitive advantage by their actions; the media influence the perception of people about the reputation of the project; and others include those whose connection to the project is not immediately clear but whose support may be helpful to the success of the project.

These five groups of interests which are similar to the classification of Winch, (2010) discussed in section 2.3.3, are also divided into internal and external stakeholders: the clients, consultants and contractors are considered as the internal stakeholders whereas the external public and external private parties are considered as the external stakeholders in construction projects. However it is possible for a government authority to be an internal stakeholder on one project for which it is the procuring entity; and at the same time an external stakeholder on another project which it is only regulating through policy and control.

In summary, construction projects involve a diverse range of stakeholders all or some of which may have differing interests throughout the project life cycle. These interests may conflict given their diversity; therefore stakeholder management is necessary for construction projects. The next section reviews the need to carry out stakeholder management in construction projects.

2.5 Need to Manage/Engage Stakeholders in Construction Projects

The previous section discusses construction projects stakeholders and their interests. Given the diversity of stakeholders and their interests in construction projects; the aim of stakeholder management in projects is to attain the desired and successful implementation of the project and avoid unnecessary conflicts and controversies with the project stakeholders (Olander and Landin, 2008). The PMI (2004) defines project stakeholder management as "*the systematic identification, analysis and planning of actions to communicate with and influence stakeholders*". Almost every word in this definition is a key word requiring careful consideration in the process of stakeholder management. Identification, evaluation and analysis of stakeholder demands and influence should be considered as necessary and important steps in the planning, implementation, and completion of any construction project. But stakeholders' base of influence is not static, hence there is need to conduct and update stakeholder analysis during the entire life cycle of the project (Cleland, 2002; Olander and Landin, 2005). This can be useful in gaining knowledge about the potential influence various stakeholders have at different stages of the project. Stakeholders related issues/problems have been reported in construction management research. These issues are either within or around the projects and range from delay in planning and execution of projects, cost and conflicts escalating to litigation and claims (Karlsen, 2002; Olander and Landin, 2005; Olander, 2007; Smyth, 2008; Chinyio and Akintoye, 2008; Ward and Chapman, 2008; Winch, 2010). Most of these are either because the stakeholders' interests and inputs were not considered from the inception of the project or they changed in the course of the project which could also be due to the inadequacy of stakeholder management strategies.

The need has been raised for stakeholders to be engaged at the very inception of every construction project (Faniran *et al*., 1999; Smith and Love, 2004; Aaltonen and Kujala, 2010); and they must be involved in the design process so that the values relevant to each construction project can be identified and understood so that assumptions are not made about stakeholders' requirements or expectations (Thomson *et al*., 2003). Stakeholder engagement focus should be on identifying those who are affected (or likely to be affected) by the project and actively involving them in project design and delivery in order to ensure that the project is sensitive and responsive to the local needs and conditions (Mathur *et al*., 2008). This could, in addition to being sensitive and responsive to the local needs, engender a sense of ownership among the project stakeholders and attract their supports thereby fostering smooth running of the project.

Furthermore, the fact that stakeholders are dynamic and their influences on the project change over time depending on the issues being considered, can lead to uncertainties in any project if the stakeholders and their needs and potential influence are not carefully indentified and managed (Freeman, 1984; Newcombe, 2003; Chinyio, 2010). The failure to acknowledge the concerns of opposing external stakeholders will result in a prolonged and delayed planning and design process due to the combined powerbase of opposing stakeholders working against the progress of the project as a result of perceived non-involvement and consideration of their interests (Olander, 2007). It is worth noting that the dynamism of stakeholders' interest has resulted in delays in the planning and implementation of some major construction projects such as the BAA's London Heathrow Airport Terminal 5 and the Ilisu Dam in the Kurdish region of Turkey (Winch, 2010). The London Heathrow Airport Terminal 5 which was proposed on a 121-ha green belt site faced opposition from various groups including: Local inhabitants; community groups; Local councils; west London friends of the earth (WLFoE); and Heathrow association of control of aircraft noise (HACAN). The issues advanced ranged from noise and environmental pollution to increased levels of traffic which lead to a long planning period starting from May 1995 to March 1999. The Ilisu Dam proposal of which started in 1954 was to flood 15 towns and 52 villages displacing approximately 78,000 Kurdish people. The Ilisu Dam project has gone through a lot of power play between proponents and opposition such that it never got underway. It was revived in 2005 and is still subjected to opposition.

Similarly, Smith and Love (2004) based on a study on stakeholder management during project inception using strategic needs analysis in a case study, concluded that if stakeholder management/engagement is to be of significant benefit; then it must identify and involve all stakeholders and continue through all the stages of the project. They found that the delay encountered in the planning process of the project was due to objections relating to local planning issues from neighbours and local council who were not involved in the workshops/meetings at the strategic needs analysis (inception) stage. Major decisions about the project were made at the inception stage but unfortunately, the stakeholder management process did not continue to the design and subsequent stages attracting criticisms and actions leading to delay of the project completion.

Managing construction project stakeholders has become much more challenging over the last few decades due to two reasons (Winch, 2010):

1. Because external stakeholders now have more powers in the process as manifested in both the growing institutionalisation of external stakeholders' rights through an ever tightening regulatory context, and, the rise of environmental activism which followed the collapse of socialist mass movements.

2. Because there is a shift to concession contracting securing finance on the asset being created by the project, due to which financiers now pay much more attention to the definition of the project mission to ensure that their investment will actually yield the desired return.

This lends support to the need for stakeholders to be engaged with throughout the entire project life cycle in order for project mission definition to be given the much desired attention. This will require that, all relevant stakeholders must come on board early enough and remain as much as they have some contributions to make towards the project goal. This means that the design and construction team will need to work together right from the start of the project while the external stakeholders are also carried along where and when necessary.

Therefore, there is need to identify, recognise and honour the expectations of construction project stakeholders in order to minimise their negative impact for the project to run smoothly to successful completion and where it is not possible for the expectations of stakeholders to be respected and honoured, trade-offs could be used (Chinyio and Akintoye, 2008). The reasons therefore, for undertaking stakeholder management on projects includes obtaining the support and contributions of stakeholders towards the project, achieving the best possible results, and making efforts to pay attention across a range of stakeholders rather than limit attention to a few stakeholders (Jepsen and Eskerod, 2009).

This section focused on discussing the need to manage stakeholders in construction projects revealing that stakeholders' base of influence changes with time in the course of the project. It also revealed the need to start the stakeholder management process early enough and carry on till the end of the project. The question however still remains of how stakeholder management should be done to enhance the likelihood of achieving success in construction projects. The design and construction teams need to work in collaboration with each other in engaging/managing the project stakeholders, part of which they are. However, it is not enough to do stakeholder management, it needs to be done effectively; the next section will then focus on identifying from literature, the critical success factors for stakeholder management/engagement in construction projects.

2.6 Critical Success Factors (CSFs) for Stakeholder Management/ Engagement in Construction Projects

The preceding section reviewed the need and justification to undertake stakeholder management in construction projects and points to the need for the critical success factors for stakeholder management to be identified as they constitute important ingredients of stakeholder management in construction projects. Critical success factors according to Rockart, (1979) are "*areas, in which results, if they are satisfactory, will ensure successful competitive performance for the organisation; they are the few key areas where things must go right for the business to flourish*". Similarly, understanding of stakeholder related factors can enable appropriate decision making strategies during project execution (Yang *et al*., 2014). Therefore, CSFs should be given constant and careful attention. Past studies (Jepsen and Eskerod, 2009; Olander and Landin, 2008; Chiyio and Akintoye, 2008; Jerges *et al*., 2000) have identified some factors considered to be critical to the success of stakeholder management in construction projects. For example Jepsen and Eskerod, (2009) found; stakeholder identification and classification as well as predicting the expectations of stakeholders through stakeholder analysis to be critical to the stakeholder management process. Similarly, Olander and Landin, (2008) identified four factors affecting stakeholder management process: Analysis of stakeholders' concern and needs; communication of both potential benefits and negative impacts to stakeholders; evaluation of alternative solutions; project organisation and relationship with the media. Stakeholder management process can be improved in construction projects through effectively communicating with stakeholders and setting of common goals and priorities among them for the project (Jerges *et al*., 2000). Furthermore, providing top level management support; responding to power interest dynamism; maintaining existing relationship; being proactive; negotiations and tradeoffs among others are necessary considerations for stakeholder management/engagement to be successfully carried out (Chinyio and Akintoye, 2008). In summary, Table 2.2 presents a list of identified CSFs for stakeholder management in construction. Moreover, other past studies have focussed on studying the critical success factors for stakeholder management in construction projects. Notable and most recent are the studies of Yang *et al*., (2009) and Li *et al*., (2011): Yang *et al*., explored and grouped 15 critical success factors for stakeholder management in construction using factor analysis into five principal components (see Fig. 2.5) namely: precondition, information inputs, stakeholder estimation, decision making and sustainable support. Li *et al*. (2011) in addition identified flexible project organisation as a critical success factor for stakeholder management in construction projects.

From the review of extant literature on stakeholder management/engagement in construction, the following factors (Table 2.2) have been found to have significant influence on stakeholder engagement/management and are considered as critical to the success of stakeholder management in construction projects:

Table 2.2 Critical Success Factors (CSFs) for Stakeholder Management in Construction Projects

S/N	CSF	Source
1	Clearly formulating the project mission	Jerges *et al*., (2000); Akintoye *et al*. (2003) Thomson *et al*., (2003); Chinyio and Akintoye, (2008)
2	Ensuring the use of a favourable procurement method	Atkin and Skitmore, (2008); Rwelamila, (2010)
3	Carefully identifying and listing the project stakeholders	Mathur *et al*., (2008); Jepsen and Eskerod, (2009)
4	Ensuring flexible project organisation	Olander and Landin, (2008); Chinyio and Akintoye, (2008); Li *et al*., (2011)
5	Identifying and understanding stakeholders' areas of interests in the project	Jepsen and Eskerod, (2009); Olander and Landin, (2008); Yang *et al*., (2009)
6	Determining and assessing the power (capacity to influence the actions of other stakeholders); urgency (degree to which stakeholders' claims requires immediate attention); legitimacy (perceived validity of claims); and proximity (level of association or closeness with the project) of stakeholders	Mitchell *et al*., (1997); Yang *et al*., (2009); Aaltonen and Kujala, (2010)
7	Appropriately classifying stakeholders according to their attributes/characteristics	Karlsen, (2002); Mitchell *et al*., (1997)
8	Predicting and mapping stakeholders' behaviours (supportive, opposition, neutral etc)	Freeman (1984)Yang *et al*., (2009); Aaltonen and Kujala, (2010)
9	Predicting stakeholders' potential influence on each other	Pajunen, (2006); Jepsen and Eskerod, (2009)
10	Predicting stakeholders' potential influence on the project	Pajunen, (2006); Jepsen and Eskerod, (2009)
11	Identifying and analysing possible conflicts and coalitions among stakeholders	Jepsen and Eskerod, (2009); Yang *et al*., (2009)
12	Resolving conflicts among stakeholders effectively	Yang *et al*., (2009) Chinyio and Akintoye, (2008)
13	Managing the change of stakeholders' interests	Jergeas *et al*., (2000); Jepsen and Eskerod, (2009)
14	Managing the change of stakeholders' influence	Jergeas *et al*., (2000); Olander (2006)
15	Managing the change of relationship among stakeholders	Pajunen, (2006); Chinyio and Akintoye, (2008)
16	Managing change of stakeholders' attributes	Mitchell, *et al*., (1997) Olander (2006)
17	Managing how project decisions affect stakeholders	Chinyio and Akintoye, (2008); Aaltonen and Kujala, (2010)
18	Predicting stakeholders' likely reactions for implementing project decisions	Chinyio and Akintoye, (2008); Yang *et al*., (2009)
19	Involving relevant stakeholders to redefine (refine) project mission	Jerges *et al*., (2000); Yang *et al*., (2009); Aaltonen and Kujala, (2010)
20	Formulating appropriate strategies to manage/engage different stakeholders	Chinyio and Akintoye, (2008); Yang *et al*., (2009)
21	Keeping and promoting positive relationships among the stakeholders	Olander and Landin, (2008); Yang *et al*., (2009); Aaltonen and Kujala, (2010)

S/N	CSF	Source
22	Communicating with stakeholders properly and frequently (instituting feedback mechanisms)	Jergeas *et al*., (2000); Olander and Landin, (2008); Chinyio and Akintoye, (2008); Yang *et al*., (2009)
23	Considering corporate social responsibilities (paying attention to economic, legal, environmental and ethical issues)	Mathur *et al*., (2008); Yang *et al*., (2009)

These will be discussed briefly to underscore the influence they each have on stakeholder management/engagement process. An attempt has been made here to present these factors in the perceived order in which they should be considered, it is however not conclusive as this may change as the study proceeds and it becomes needful for adjustment.

1. Clearly formulating the project mission: The clear identification and definition of the overall project mission at the very onset of the project is very vital for a successful stakeholder management. To this end Winch (2010) advocated for the project manager to have very good knowledge and understanding of the tasks and objectives at every stage of the project life cycle. This is like a precursor for all the other steps that the project management team will take in the course of delivering the project. It is important to arrive at common project goals and objectives to effectively carry out stakeholder management (Jergeas *et al*., 2000; Chinyio and Akintoye, 2008).

2. Ensuring the use of a favourable procurement route: Procurement system is an organizational system that assigns specific responsibilities and authorities to people and organizations and defines the relationships of the various elements (or parties) in the construction of a project. A project is considered to be successful if it is delivered on time, at the appropriate price and quality standards such that it satisfies stakeholders. However, one important factor on which this depends, is the type of procurement method used (Love, *et al*., 1998). According to Anumba and Evbuomwan (1997), the choice of the procurement route for construction work is one of the many decisions that are important for the clients to make. Procurement routes in which contractors and other stakeholders are engaged early enough and involved in design lead to greater commitment to the project for which reason it is important to identify who is going to work on the project and get them involved especially in the decision making process (Ankrah *et al*., 2009). Poor performance in construction has

been attributed to the continued use of procurement practices that do not encourage integration, coordination and communication among the parties involved (Love *et al*., 1998). Procurement route and contract agreement involving all the project stakeholders is the basis for how project stakeholders relate, hence it plays a vital role in determining how stakeholder management should be done on projects (Atkin and Skitmore, 2008; Rwelamila, 2010).

3. Carefully identifying and listing the project stakeholders: The number of stakeholders in a construction project can be large presenting numerous interfaces that have to be managed. The significant importance of identifying project stakeholders at the beginning (initiation) of the project have been pointed out in studies relating to stakeholder management/engagement (Mathur *et al*., 2008; Faniran *et al*., 1999). A conceptual scheme for identifying stakeholders should have recognition for a player's power to influence the legitimacy of relationship between players, and the urgency of a stakeholder's claim such that a detailed identification of project stakeholders is achieved (Mitchell *et al*., 1997; Jepsen and Eskerod, 2009).

4. Ensuring the use of a flexible project organisation: A flexible project organisation is necessary within a dynamic process such as stakeholder management in construction projects. This is coupled with the complex and uncertain nature of construction projects generally (Olander and Landin, 2008). This will enable easy adjustment of responsibilities in responding to any changes encountered as a result of change in stakeholders' stance within the project.

5. Identifying and understanding stakeholders' areas of interests in the project: Due to the various and divergent stakeholders' interests in a typical construction project arising from the fragmented and complex nature of construction it is important to identify and assess stakeholders' areas of interests (Jepsen and Eskerod, 2009; Karlsen, 2002; Freeman *et al*. 2007; Reed *et al*., 2009). For example, the interest of the project contractor may be to complete the project as quickly as possible and the construction method they adopt may be a noisy one which will attract the attention of members of the immediate community of the project who otherwise may have very low or no interest in the project. Similarly, the contractor may be interested in completing the project on schedule to deploy their staff and equipment to another project hence may not be positively inclined

to any variation orders from the client (Olander and Landin, 2008; Nash and Chinyio, 2010). It is therefore, necessary for construction stakeholders to be engaged in a dialogue of value delivery in order to expose stakeholders' personal values which are reflected in their beliefs, attitudes and behaviours and to understand what they need from their product and or role in the project (Thomson *et al*., (2003).

6. Determining and assessing stakeholders' attributes: Stakeholders have been said to possess the attributes of 'power', 'urgency' and 'legitimacy' which they rely on and use to control resources, gain attention and impact the project (Mitchell *et al*., 1997). Power is the capacity to influence the actions of other stakeholders; urgency is the degree to which stakeholders' claims require urgent attention; and legitimacy is the perceived validity of stakeholders' claims. 'Proximity' to the project is also an important attribute of stakeholders which could be rated based on stakeholders' proximity in terms of either working directly in the project or remote from the project (Bourne, 2005; Kujala, 2010).

7. Appropriately classifying stakeholders according to their attributes: After identifying and understanding the various stakeholders and their areas of interests, they need to be classified in order to enable a successful stakeholder management/engagement during the project (Karlsen, 2002). Scholars in stakeholder management support the view that properly classifying project stakeholders is important in stakeholder management and have proposed some classification models (Mitchel *et al*., 1997; Olaner, 2007; Walker *et al*., 2008; Winch, 2010); these are discussed in section 2.3.

8. Predicting and mapping stakeholders' behaviours: There are different ways in which stakeholders behave to express their concerns and exert their importance to the project. Freeman (1984) categorised stakeholders' behaviour into: Observed behaviour, cooperative potentials and competitive threats. Stakeholders generally have the tendency to act as proponents, neutral or opponents to the project objectives. They in order to exert their salience to the project, exhibit their behaviour or stand towards the project through the following strategies: Direct withholding strategy, indirect withholding strategy, resource building strategy, coalition building strategy, conflict escalation strategy, creditability building strategy, communication strategy and direct

action strategy (Table 2.3) (Aaltonen *et al*., 2008). They could do so by mobilising in support, against or remain indifferent to the project (Olaner, 2007; Aaltonen *et al*., 2008). The need for project managers or whoever is responsible for stakeholder management to clearly understand the different ways stakeholders behave and how they react in the process of project execution has been emphasized (Freeman *et al*., 2007).

Table 2.3 Stakeholder salience shaping strategies (adopted from Aaltonen *et al*., 2008)

Type of strategy	Description
Direct withholding strategy	Stakeholders restrict project's access to critical resources which are controlled by the stakeholder to increase their perceived power
Indirect withholding strategy	Stakeholders influence project's access to resources that are not directly controlled by the specific stakeholder to increase their perceived power
Resource building strategy	Stakeholders acquire and recruit critical and capable resources to their group to increase their perceived power
Coalition building strategy	Stakeholders build alliances with other project stakeholders to increase their perceived power or legitimacy
Conflict escalation strategy	Stakeholders attempt to escalate the conflict beyond initial project related causes (e.g. political). Through this process the project may become an arena for non-project related battles. This may introduce a new institutional environment in which stakeholders' claims are perceived as more legitimate
Credibility building strategy	Stakeholders increase their perceived legitimacy by acquiring credible and capable resources, for example, capable individuals with good reputation or networks
Communication strategy	Stakeholders use different types of media to communicate and increase the perceived legitimacy and urgency of their claims
Direct action strategy	Stakeholders organize protests, road blockades, etc. to increase the perceived urgency of stakeholder claims

9. Predicting stakeholders' potential influence on each other: The fact that the different individuals and groups of stakeholders can influence the outcome of projects is no longer in doubt and scholars have pointed out the need to recognize the different stakeholders' base of influence so as to plan and execute a successful stakeholder management (Karlsen, 2002; Olander and Landin, 2005; Chinyio and Akintoye, 2008).

10. Predicting stakeholders' potential influence on the project: Since stakeholders' base of influence is not static, there is need to conduct and update stakeholder

analysis during the entire life cycle of the project, with the purpose of among other things, gaining knowledge about the potential influence various stakeholders have at different stages of the project (Pajunen, 2006; Jepsen and Eskerod, 2009). Furthermore, an evaluation of stakeholder demands and influence on the project should be considered as a necessary and important step in the planning, implementation, and completion of any construction project (Olander and Landin, 2005). This further supports the need for project managers to predict stakeholders influence base in order to evolve appropriate measures to handle them.

11. Identifying and analysing possible conflicts and coalitions among stakeholders: According to Freeman (1984) analysing the conflicts and coalitions that exist or are likely to occur among the project stakeholders is a very important step in stakeholder management process. Different types of conflicts have been acknowledged in literature which range from conflicts among stakeholders to conflicts between the stakeholders' and the project's objectives (Awakul and Ogunlana, 2002; Jepsen and Eskerod, 2009). According to Newcombe (2003) a powerful individual stakeholder may have a significant influence on project decisions but it is usually groups of stakeholders, who combine to form temporary coalitions, who are the most influential in shaping the strategy of the project. These groups have expectations which the project is under pressure to fulfil; and these often conflict with the expectations of different groups of stakeholders (Yang *et al*., 2009). For example the needs of the local authority may conflict with that of the designer and client of a proposed project in the same way as the construction methods and techniques adopted in the project may not be acceptable to the local residents and general public.

12. Resolving conflicts among stakeholders effectively: It is very necessary in stakeholder management to strive to strike a balance between conflict resolution and stakeholder satisfaction of the overall outcome thereof at the same time compromising conflicts among stakeholders is important for project managers to achieve (Freeman 1984). The use of incentives, trade-off and the institution of a no blame culture has been advocated by (Yang *at al*., 2009; Chinyio and Akintoye, 2008) in recognition of this factor.

13. Managing the change of stakeholders' interests: The dynamism of stakeholders and their interest is a source of serious concern in construction projects such that previous researches have advocated the need for a continuous stakeholder engagement throughout the project's life cycle (Jergeas *et al*., 2000; Walker *et al*., 2008; Newcombe, 2003; Chinyio and Akintoye, 2008). Due to the fact that stakeholders are dynamic and their interests on the project change over time depending on the issues being considered and how they relate to their powers to influence projects either positively or negatively (Freeman, 1984). Therefore, the interests of stakeholders should not be assumed from previous projects but should be analysed based on the current project (Nash and Chinyio, 2010; Jepsen and Eskerod, 2009). Being sensitive and responsive to stakeholders' expectations/interests is a skill that managers will need to develop to manage construction projects successfully (Jergeas *et al*., 2000; Newcombe, 2003).

14. Managing the change of stakeholders' influence: As the interests of stakeholders change during the project, their influence on one another and on the project is likely to change so also their relationship with one another and with the project (Jergeas *et al*., 2000). Since stakeholders' base of influence is not static, there is the need to conduct and update stakeholder analysis during the entire life cycle of the project (Olander and Landin, 2005, Olander, 2006). For instance some project stakeholders can be in the supporting side of the project at the beginning and then become either indifferent or in the opposing side as the project progresses.

15. Managing the change of relationship among stakeholders: The relationships amongst stakeholders and between stakeholders and the project could be either adversarial or cooperative (Pajunen, 2006). And this can change from time to time as the project progresses. It is important to ensure that good relationships are kept not only among the stakeholders but also between the stakeholders and the project (Chinyio and Akintoye, 2008). The introduction of collaborative climate amongst the key stakeholders can help to achieve a cooperative relationship between the stakeholders and the project (Erikson and Westerberg, 2011).

16. Managing change of stakeholders' attributes: stakeholder attributes change as the project progresses (Mitchell, *et al*., 1997). The need to analyse and estimate

these attributes continuously to enhance the understanding of the changes in stakeholders attributes and drive towards successful stakeholder management has been raised (Mitchell et al., 1997; Bourne, 2005; Bourne and Walker, 2005; Olander, 2007; Yang *et al*., 2009). Specifically deciding the appropriate stakeholder management processes depend on what attributes the stakeholders have (Olander, 2007) and this could change as the project progresses. The stakeholders' attributes should not be assumed from previous projects but should be assessed based on the current project (Nash and Chinyio, 2010).

17. Managing how project decisions affect stakeholders: it is important to make sure project decisions do not affect stakeholders and cause them to oppose the progress of the project (Aaltonen and Kujala, 2010). For instance if some stakeholders know that they have been classified as having low interest, influence, power or legitimacy on the project, it may stir up ill feelings and cause them to begin to form coalitions with other stakeholders in other to exert themselves (Chinyio and Akintoye, 2008). Moreover the construction methods adopted could cause some stakeholders to protest against the project. These could in addition to affecting the project, create a bad publicity for the project.

18. Predicting stakeholders' likely reactions for implementing project decisions: As it is the case with every human endeavour, stakeholders are likely to react in protest to the so formulated stakeholder management/engagement strategies, it is therefore necessary for project managers to be able to predict stakeholders' likely reactions in this respect (Yang *et al*., 2009). This would enable stakeholder management to minimise stakeholders' negative impacts and ensure that they do not hinder the successful completion of the project (Chinyio and Akintoye, 2008; Chinyio and Olomolaiye, 2010).

19. Involving relevant stakeholders to redefine (refine) project mission: Good project management at the early stages of a project has been found to provide potentially significant opportunities for eliminating several problems that prevent the achievement of project success. It is therefore important to adjust the project mission to reflect on the knowledge obtained on stakeholders and their stakes/interests, influence, attributes etc (Faniran *et al*. 1999; Jergeas *et al*., 2000). This can be achieved by making sure that their most important and achievable expectations are adequately captured and reflected in the project

mission. Stakeholders should therefore, be involved in the design process so that the values relevant to each construction project can be identified and understood and assumptions should not be made about stakeholders' requirements or expectations about the project (Thomson, *et al*., 2003; Yang *et al*., 2009; Aaltonen and Kujala, 2010).

20. Formulating appropriate strategies to manage/engage stakeholders: The PMI (2004) defines project stakeholder management as "the systematic identification, analysis and planning of actions to communicate with and influence stakeholders". The importance of formulating appropriate strategies to manage/engage stakeholders has been emphasized by different scholars (Karlsen, 2002; Chinyio and Akintoye, 2008; Aaltonen and Sivonen, 2009; Yang *et al*., 2009). Mathur *et al*., (2008) observed that stakeholder engagement process, if designed appropriately, can deliver a wide range of outcomes ranging from the capture of different forms of knowledge to social learning in addition to enhancing project success.

21. Keeping and promoting positive relationships among the stakeholders: positive relationship among project stakeholders would deliver a smooth running of the project through consensus decision making (Eriksson and Westerberg, 2011). This can be achieved through building trust and commitment with the stakeholders throughout the project and the use of incentives when necessary (Chinyio and Akintoye, 2008, Aaltonen and Kujala, 2010). Maintaining good relationships among stakeholders and between stakeholders and the project can help to build trust, commitment and loyalty which enable project managers to meet stakeholders' expectations (Jergeas *et al*., 2000; Bourne, 2005; Karlsen *et al*., 2008).

22. Communicating with stakeholders properly and frequently (instituting feedback mechanisms): Communication is a basic ingredient needed to maintain the support, commitment and loyalty of the project stakeholders. It is important for a project management team to manage their differing demands through good communication in the early stages of a project once the stakeholders have been identified (Olander and landin 2008, Yang *et al*., 2009). This could provide potentially significant opportunities for eliminating several problems that could prevent the achievement of project success as well as averting or reducing the

effect of stakeholder interests' related conflicts which is likely to be more costly if allowed to occur when the project is already underway (Faniran *et al*., 1999). Communication is so important that it will require communicating to the stakeholders both beneficial and detrimental effects of the proposed project and associated actions and progress being made as the project get underway (Jergeas *et al*., 2000). The use of different appropriate means of communication for stakeholders or groups of stakeholders is very important (Chinyio and Akintoye, 2008). Stakeholders could be communicated as deemed appropriate through the media, project website, newsletters, signpost/flyers, public engagement etc.

23. Considering corporate social responsibilities (paying attention to economic, legal, environmental and ethical issues): Project managers have been implored to always try to manage stakeholders with corporate social responsibilities covering economic, environmental, legal and ethical issues (Mathur *et al*., 2008; Yang *et al*., 2009). It was recommended by Smyth (2008) for stakeholder management theory to move away from the approaches of power based analysis towards recognition of responsibilities for ethical care employing proactive management. According to Bourne (2005), stakeholder management needs to balance competing claims on resources between different parts of the project, between the project and other projects and between the project and the organisation. Economic, environmental, legal and ethical issues are sources of influence on the stakeholders' competing demands on the project.

2.7 Stakeholder Management Approaches/Frameworks

The previous section identified and explained a list of critical success factors for stakeholder engagement/management in construction projects and points to the need for a more in-depth understanding of the relationships among them. This section reviews the proposed stakeholder management approaches in construction focusing on their strengths and weaknesses and suggesting improvement needs.

Scholars have proposed stakeholder management approaches by indicating different actions that should be involved in the process; this is summarized in Table 2.4. It shows the stakeholder management process actions recommended by the scholars as ticked under their columns against the process actions: for instance, identifying stakeholders, analysing the characteristics of stakeholders and then communicating and sharing information with stakeholders are the basic actions required for stakeholder management (Karlsen, 2002). Similarly, identification of stakeholders, gathering information about stakeholders and analysing the influence of stakeholders are basic steps/actions for stakeholder management in construction (Young, 2006). Table 2.4 shows how the recommendations of selected scholars continued to improve by being more detailed over the years.

Table 2.4 Summary of Stakeholder management processes actions in construction projects

	Scholars and Years of publication						
Stakeholder management process actions.	Karlsen (2002)	Young (2006)	Bourne and Walker (2005)	Olander (2006)	Walker et al. (2008)	Chinyio and Akintoye (2008)	Yang et al (2011)
Identification of stakeholders	√	√	√	√	√	√	√
Analysing the characteristics of stakeholders	√		√				√
Communicating and sharing information with stakeholders	√			√		√	√
Gathering information about stakeholders		√		√			
Prioritizing stakeholders			√		√		
Determining stakeholder strength and weaknesses				√			√
Monitor stakeholder saliency continuously						√	
Analysing the influence of stakeholders		√					√
Put in place a stakeholder forum to measure feedback periodically						√	
Institute a no-blame culture and dispute resolution agreement						√	
Identifying stakeholder mission				√			√
Predicting stakeholder behaviour				√			
Monitoring effectiveness of communication.					√		
Visualising stakeholders					√		
Engage stakeholders through “frontline”&“underlying” approaches						√	
Identifying stakeholder management strategy				√		√	
Develop stakeholder management/engagement strategy strategies			√				
Implementing stakeholder management strategy			√	√		√	√
Carry out analyses of the							√

impact of stakeholder relationship network on the project							

Although all the scholars cited in Table 2.4 recognise stakeholder identification as an important step, it appears there is no agreement on the best set of approaches to use. Stakeholder management needs to balance competing claims on resources between different parts of the project, between the project and other projects and between the project and the organisation (Bourne, 2005). These approaches need to be carefully harnessed in order to carry out stakeholder management in construction projects effectively.

There are three distinct approaches for conceptualizing stakeholder management/engagement in construction projects (Mathur, *et al*., 2008). These relate to viewing stakeholder engagement as; a management technique, an ethical requirement, or a forum for dialogue to facilitate mutual social learning. Stakeholder engagement/management process, if designed appropriately, can deliver a wide range of outcomes ranging from the capture of different forms of knowledge to social learning. Stakeholder management should ensure collaboration but bringing about collaboration between project managers and influential stakeholders depends a lot on the workers ability and willingness to share knowledge which requires a great amount of team effort to be engendered (Bourne, 2005). Furthermore, knowledge should be sought on the activities at all stages and corresponding stakeholders; types of decision that need to be made at each stage; and the consequences of change in decision on the process. This will help in forming a formidable team by appreciating the efforts needed for each stage and allocating appropriate resources and responsibilities to them (Tzortzopoulos *et al*., 2006).

Furthermore, the appropriate stakeholder management processes depend on what attributes the stakeholders possess. First, to the legitimate stakeholders there is a moral obligation to include their interest in the decision-making process. Secondly, there is a necessary obligation to the powerful stakeholders, who must be monitored in the stakeholder management process in order to be proactive in managing the potential impact that they may have. Thirdly, there is a timely obligation to attend to the need of the urgent stakeholders. Furthermore, these obligations will consequently be combined for those stakeholders that possess two or more attributes. To the definitive stakeholders, the project manager has all of the obligations of moral, necessary and timely considerations of the stakeholders' interests (Olander, 2007). Smyth (2008 pg. 641) recommended that "*stakeholder management theory needs to move away from approaches underpinned by skewed utility and from self-interested power-based analysis towards recognition of responsibilities for ethical care employing proactive management, which for projects would most easily be achieved in practice by making the transition from relational contracting to relationship management*". This means that attention will also need to be focussed on the relationships that influence the stakeholders rather than rely only on the attributes of the stakeholders.

Based on a study of the management of stakeholders needs and expectations , Takim (2009) found that government and consultants are of the view that social and political matters are of great importance, whereas the private sector puts a great deal of emphasis on forming project coalitions and lobby tactics mechanisms in managing the stakeholders needs and expectations. Takim suggested the involvement of project stakeholders throughout the project life cycle, particularly in the front end project planning and that overall communication with the various stakeholders are to be emphasised in order to achieve alignment and feedback between them. Similarly, good project management at the early stages of a project has been found to provide potentially significant opportunities for eliminating several problems that prevent the achievement of project success (Faniran *et al*. 1999). However, in order for this to be effectively done, it is necessary for the project managers to identify and analyse the various stakeholders they need to manage.

Project managers are facing some challenges in using the current guidelines for stakeholder analysis at the construction stage the result of which is vital for deciding stakeholder management approach. It takes them very long time to conduct stakeholder analysis due to the difficulty in accessing some of the stakeholders who have been identified to be important to the project, hence they end up deciding and implementing a stakeholder management strategy without gathering the much needed information (Jepsen and Eskerod, 2009). The difficulty may be because they did not carry out stakeholder analysis at the preceding stages before the construction stage. In other to overcome this challenge, there is the need to investigate the reason why it is difficult to carryout stakeholder analysis focusing not only on the construction stage but also from the initial stages of the project.

Relying on the forgoing discussions, scholars (Manowang and Ogunlana, 2010; Chinyio and Akintoye, 2008; Yang *et al*., 2009; Yang and Shen, 2014; Bourne, 2005; El-Gohary *et al*., 2006) have proposed frameworks for carrying out stakeholder management. These are discussed as follows:

Manowang and Ogunlana (2010) developed a strategic stakeholder management chart (Fig 2.4) in which stakeholder management objectives are considered to include: to do a formalised stakeholder analysis (SA); strengthen stakeholders' relationships (SR); sustain stakeholders' commitment (SC); and increase stakeholders' satisfaction (SS).

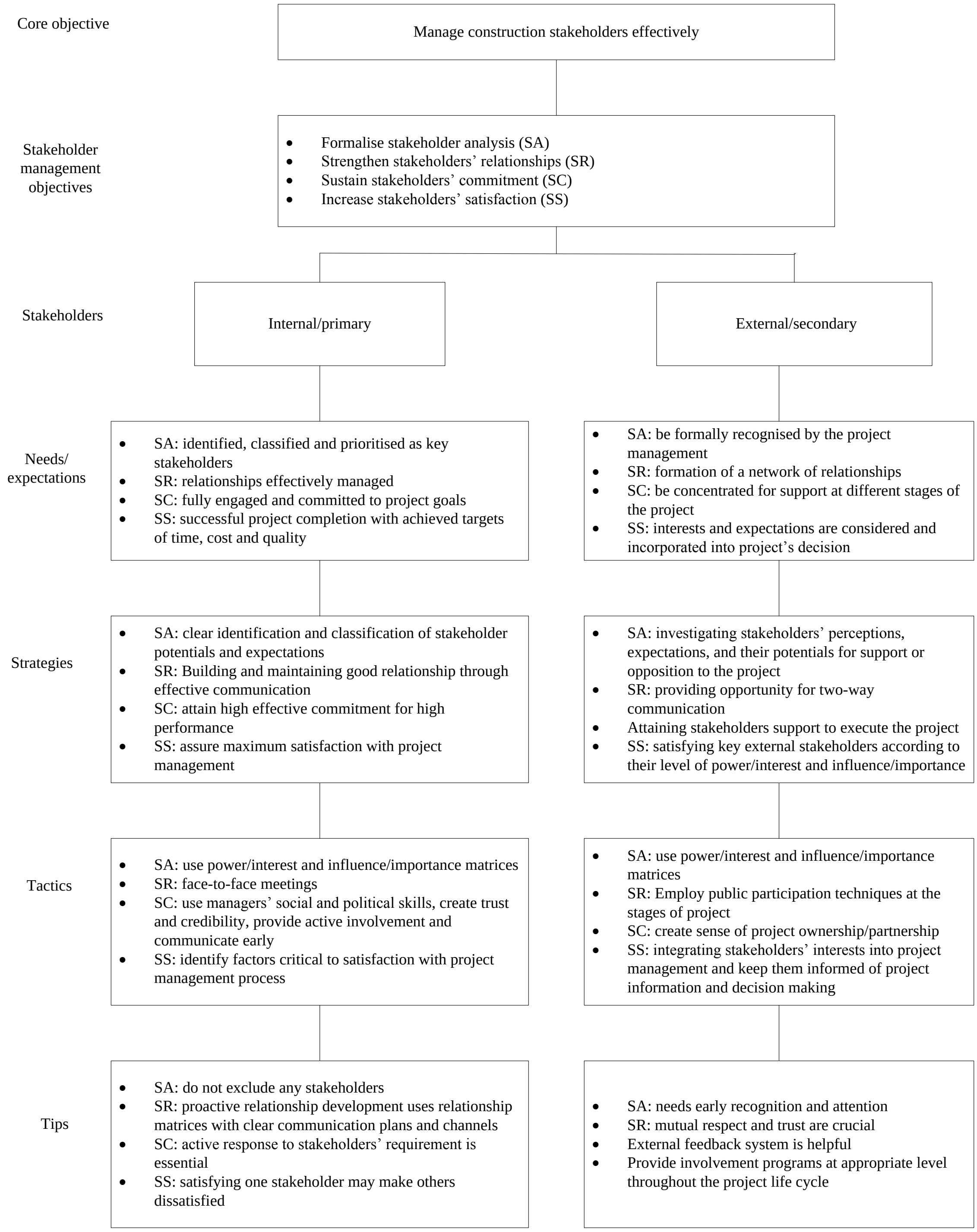

Figure 2.4 Strategic stakeholder management chart (Manowang and Ogunlana, 2010)

The chart indicates the strategies, tactics and tips to use in order to attend to the needs/expectations of both internal/primary and external/secondary stakeholders. Most of these are directly related to the critical success factors for stakeholder management in construction projects.

Chinyio and Akintoye (2008) in a study of practical approaches for managing/engaging stakeholders identified several approaches for managing construction stakeholders. They grouped them under the two categories of underlying (overarching) and frontline (operational) approaches shown in Table 2.5. They describe the underlying approaches as relatively medium to long-term guides that influence the actions of employees and can be viewed as '*overarching*', '*higher order*' or '*behind-the-scene*' principles that inform practice and are used constantly. While the frontline approaches are the operational techniques that are used regularly depending on the prevailing circumstances. For example, from the operational approaches, effective communication can be used to maintain existing relationships, understand the expectations of stakeholders from the project and to keep them adequately informed. The means for communication can vary from time to time and from stakeholder to stakeholder, depending on the stakeholders' attributes. Negotiation can in turn play a vital role in resolving differences and settling claims whenever they arise in the course of the project. Project managers' ability to have the intuition to assess the power and interest of stakeholders can inform them on the stakeholders becoming either less or more interested than they previously were in imposing their will on the project as the project progresses. Furthermore, incentives and concessions can be used separately or together to douse or counteract the concerns of opposing/protesting stakeholders. Workshops and meetings can be used to engage with stakeholders in the course of the project. They argue that project managers should be capable of using these principles to ensure successful projects. Their study also concentrated on how issues with external stakeholders are handled which may only work if all is well among the internal stakeholders. But project managers may not be around early enough in the course of the project depending on the procurement route of the project. This brings to the fore the need to connect the design and construction stages and consider the concerns of both internal and external stakeholders in formulating and adopting stakeholder management strategy.

Although, the identified approaches could be useful, this study concentrated on the relationship dealing with external stakeholders and did not pay attention to the interactions among the internal stakeholders. The study also did not establish any coherent interconnections between the identified approaches which are necessary for an effective practical application of the approaches.

Table 2.5 Approaches for engaging stakeholders (Chinyio and Akintoye 2008)

Overarching approaches	Operational approaches; Use of:
-Systematic approach -Providing top-level support -Being proactive -Maintaining existing relationship -Responding to power-interest dynamism	-Effective communication -People skills - management -People skills - negotiations -Trade offs -Incentives -Concessions -Workshops and meetings -Intuition

Yang *et al*. (2011), proposed a framework (Figure 2.5) for successful stakeholder management in construction projects based on the grouping of critical success factors for stakeholder management into 5: precondition factor, information inputs, stakeholder estimation, decision making and sustainable support. It is suggested in the framework that, information should be obtained first based on which stakeholders could be estimated to enable decisions to be made about the appropriate strategies for stakeholder management and sustainable support (from top management) is needed throughout the stakeholder management process. This framework is a very useful contribution in the area of stakeholder management research however; it fell short of considering the procurement route and the need to classify the stakeholders in the factors that formed the basis for the framework. The study also did not obtain information from design professionals and hence may not have considered the issues relating particularly to stakeholder management at the inception and design stages. This is necessary because the activities and level of involvement of stakeholders are different across the stages depending also on the procurement route adopted for the project. More so, if stakeholders are not adequately involved at the early stages of the project, it could portend danger at the later stages of the project.

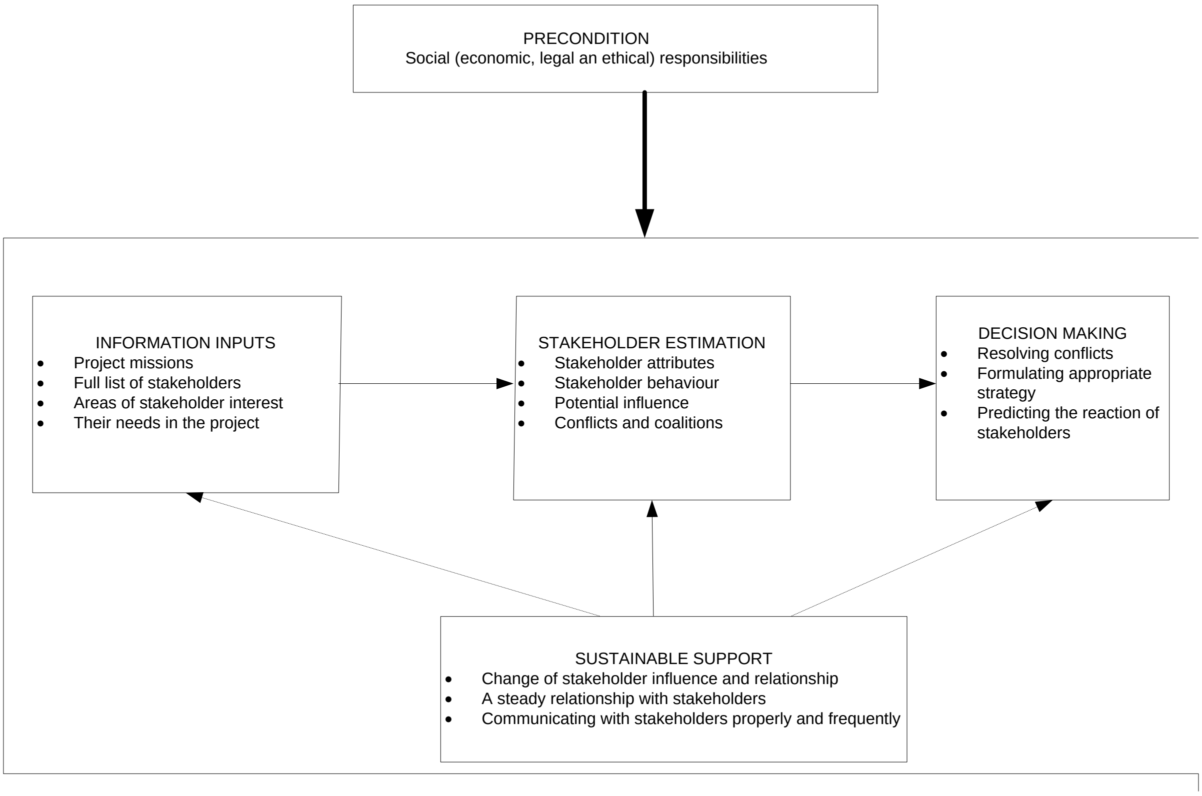

Figure 2.5 Framework for successful stakeholder management in construction (Yang et al., 2009)

Yang and Shen (2014) building on the framework (Fig. 2.5) developed by Yang *et al*. (2011) presented a framework known as “systematic framework for stakeholder management in construction” in which they added a box for “action and evaluation”. Their framework is more detailed than Yang *et al*.’s but did not capture the construction life cycle perspective as well as responsibility for stakeholder management. It assumes the project manager is responsible disregarding the different stages, peculiarity of construction projects and effects of procurement routes.

Bourne (2005) developed a tool referred to as the stakeholder management cycle for identifying, visualising and mapping stakeholder influence on projects. The stakeholder cycle is made up of five steps:

- Step 1 – identification of stakeholders;
- Step 2 – prioritize the stakeholders;
- Step 3 – visualize the stakeholders;

- Step 4 – engage the stakeholders; and
- Step 5 – monitor the outcome.

The stakeholder cycle however, is a general tool that could be used to trigger proactive stakeholder management approach in any project and not meant specifically for construction project. It acknowledges the need to pay attention to the different phases involved in the project by repeating the steps depending on the outcome from monitoring and especially when progressing from one phase to another. The *stakeholder circle* is made of concentric circle lines that indicate the distance of stakeholders from the project; patterns of stakeholder entities which indicate their homogeneity or heterogeneity in presenting an interest; the size and relative area covered by the stakeholder block of the circle, which is an indication of their scale and scope of influence on the project; and the colour density which is an indication of the degree of impact. This tool is not specifically for construction project but is meant to be used for any project with appropriate adjustment or modification. The "*stakeholder circle*" tool has been tested using case studies (Bourne and Walker, 2006; Walker *et al*., 2008) and found to be useful for project stakeholder analysis. Although this has been accepted as an important contribution, it leaves the project managers or whoever is responsible for stakeholder management on the project with the task of deciding how to carryout stakeholder management. It also assumes that the project manager is responsible for stakeholder management which may not be applicable for all construction projects depending on the procurement routes and other project characteristics.

El-Gohary *et al*., (2006) developed a semantic model for capturing and incorporating stakeholder inputs in the design of project. The model which is for public private partnerships (infrastructure) projects consist of five major entities: process, products, constraints, actors and resources. Each of these major entities is made up of different processes and considerations of inputs leading to the final project design. Although this model which has the potential to act as a means for knowledge representation is an important contribution within the domain of stakeholder management in construction, it is limited to the events and considerations preceding and leading to the final design of the project.

Although it is evident that previous research acknowledges the need to carryout stakeholder management throughout the project lifecycle in construction projects, there is little research covering how this can be achieved. Consequently, previous researches observe the need to develop a coherent framework for stakeholder management in construction. Towards this, previous frameworks have either concentrated on specific stages of the construction project or failed to incorporate the other stages in the research leading to the development of the frameworks. To carryout stakeholder management throughout the project lifecycle, there is the need for a comprehensive framework for stakeholder management that spans the entire lifecycle of the project. This research therefore, will address this need by considering and incorporating all the stages of a construction project in a new framework for stakeholder management in construction projects. Following the review of the existing approaches for stakeholder management in construction projects, the next section will discuss the tools and techniques that could be applied for stakeholder management.

2.8 Tools and Techniques for Stakeholder Management

Some tools and techniques have been identified as useful for carrying out stakeholder engagement/management in construction projects. They include design charrette, contingent valuation method, Delphi technique, strategic needs analyses and stakeholder cycle. These are discussed as follows.

2.8.1 Design Charrette

A charrette is a series of workshop held at the pre-design stage of projects in order to obtain and integrate the interests and contributions of the project stakeholders into the eventual design of the project. The aim of the charrette is to seek to understand all design related issues from the stakeholders' perspective and identify solutions all of which are presented in the form of a report to guide the final design of the project (Sutton and Kemp, 2006). It can take varying length of time depending on the nature and scope of the project, level of understanding of the stakeholders involved and resources available. The duration of a design charrette could range from half-day to two or more days.

The charrette sessions require some human and material resources to be effectively carried out, these include; a facilitator, an agenda for the session(s), project summary and or brief, site plan, etc. The role of the facilitator who is normally expected not to be involved with the design is very important for the success of charrette. Participants at the design charrette should be drawn from the following: members of the design team, project owner or competent representative(s), representatives of relevant interest groups, users/occupants if different from the owners, any relevant specialists, etc.

Design charrettes have been successfully used in construction projects. For example, the Scottish sustainable communities initiative (SSCI) is led by the Scottish government to encourage the creation of places in different locations in Scotland, which are designed and built to last, where a high quality of life can be achieved to the satisfaction of all stakeholders (Scottish sustainable communities initiative charrette series, 2008).

2.8.2 Contingent Value Method

This is a widely accepted method in environmental economics and urban planning for evaluating the monetary value of assets and or infrastructure which cannot be traded in the market (Portney, 1994). It seeks to achieve a common ground between the organisation and its stakeholders by capturing the total economic value (TEV) which is composed of the direct use value (DUV) and non-use value (NUV) of the proposed project. DUV is the market value such as in: access fees, adjacent property value, and people who use but do not pay for the facility directly whereas the NUV is the value that cannot be captured in the market which include the future use potential and existence value of the asset. The total economic value therefore, is the sum of the direct use value and the non-use value (TEV=DUV+NUV). Before this, the value of the project is assessed in two dimensions from the users' perspective. Prior to the commencement of the project, the users' willingness to pay (WTP) is assessed; whereas, willingness to accept (WTA) is assessed when the project is completed. WTP is a measure of how much the user is willing to pay for the service rendered by the project and WTA is a measure of how much the user is willing to accept for not having the facility or service of the project.

The basic steps involved in the CVM include:

1. Setting up a hypothetical market;
2. Obtaining bids

This has been used to obtain stakeholder buy in for infrastructure construction projects (Fonta *et al*., 2007) and has proven to be a very useful tool especially for engaging with and securing the support of project stakeholders at the early stages of the project when the investment decision is being made.

2.8.3 Delphi Technique

This is a technique for obtaining stakeholders' interests/inputs in the formulation of proposed project design. It fosters communication and interaction among project stakeholders and helps to incorporate stakeholders' interests through representation of the diverse interest groups which are drawn from different disciplines and backgrounds. The Delphi process normally runs in a series of three rounds (Figure 2.7) involving different set of groups in each of the rounds (Orndorff, 2005). The same set of questions (survey instrument) is given to the participants (stakeholders) who are adequately informed about what it takes and what is required of them in each of the rounds. The Delphi technique is usually expected to produce either a consensus or an entirely new (alternative) proposal for the project being developed. The Delphi Technique has been used for construction investment decisions (Orndorff, 2005).

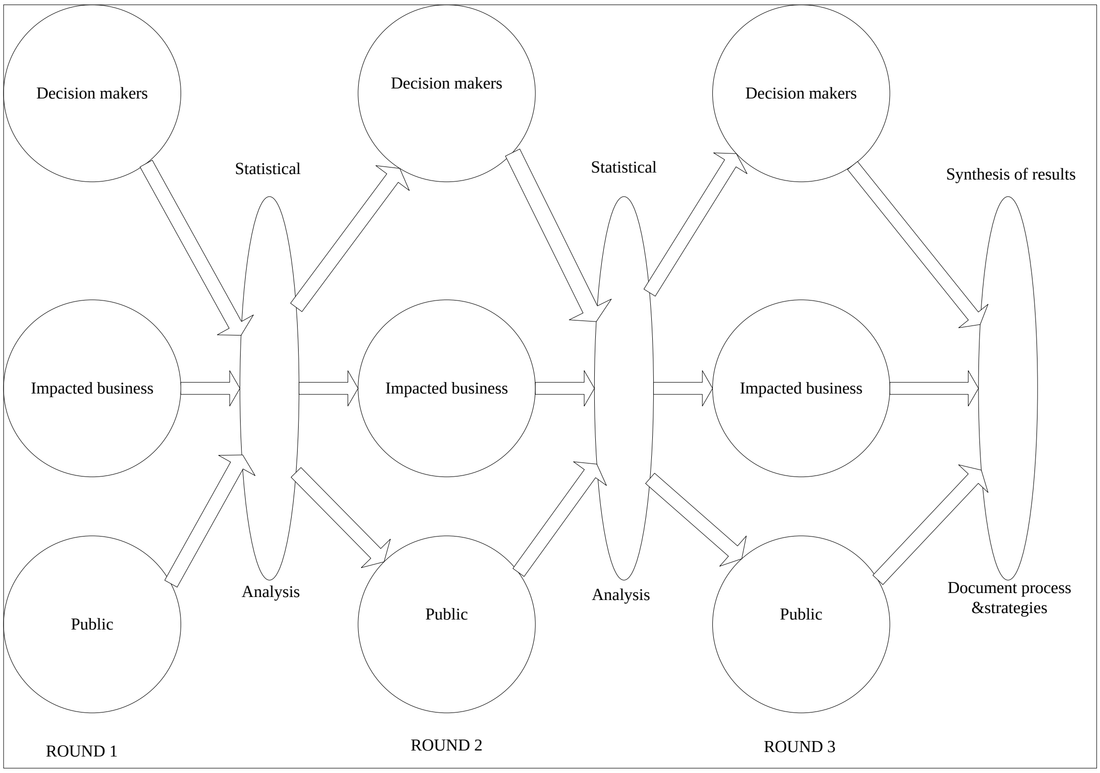

Figure 2.6 Diagram of Delphi Technique process (Orndorff, 2005)

2.8.4 Strategic Needs Analysis

The strategic needs analysis involves the use of workshops and meetings to collate information about stakeholders' needs regarding the project and analyse them using software (strategizer) to decide on the preferred strategy (Smith and Love, 2004). The strategic needs analysis process which involves five major stages is shown in Figure 2.8. These stages are as follows:

1. Collection of information to understand the nature of the problem (preliminary information seminar);
2. Discuss and analyse the problem (stage two, workshop one);
3. Develop options for solving the problem(stage two, workshop one) ;
4. Choose a preferred option (stage two, workshop two) and
5. Recommend the implementation of the decision based on the workshop activities (stage two, workshop two).

In a study that focussed on stakeholder management during project inception, Smith and Love (2004) explored the use of strategic needs analysis at the briefing stage of the project to involve stakeholders in identifying and proposing a range of strategic options for a proposed project.

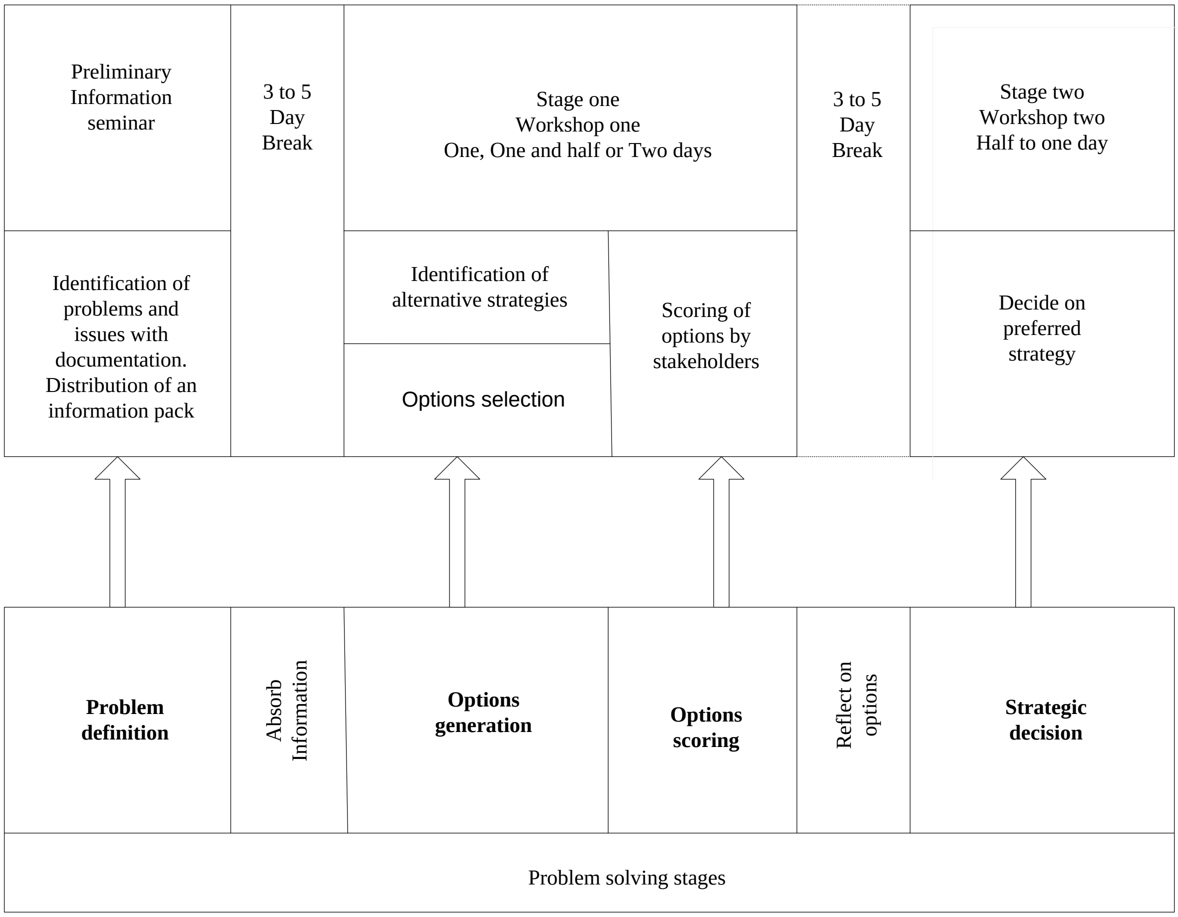

Figure 2.7 Problem solving stages and the Strategic Needs Analysis process (Smith and Love, 2004)

The work of Smith and Love (2004) which is limited to briefing, found that stakeholder management at the briefing stage of construction projects is useful although it observed but failed to capture the need for continuity and sustenance of the process which effect was felt in the case used for the research. The assumption that once some stakeholders have been involved at the briefing stage leading to the final decision on the project is sufficient to address stakeholder related issues could be misleading as evidenced in the concerns expressed by some of the stakeholders at the later stages in the case project.

2.8.5 Stakeholder cycle

Bourne (2005) developed a tool referred to as the stakeholder management cycle for identifying, visualising and mapping stakeholder influence on projects. The stakeholder cycle is made up of five steps:

- Step 1 – identification of stakeholders;
- Step 2 – prioritize the stakeholders;

- Step 3 – visualize the stakeholders;
- Step 4 – engage the stakeholders; and
- Step 5 – monitor the outcome.

The stakeholder cycle can be used for stakeholder identification and engagement in construction. This has been tested in construction projects (Yang and Shen, 2014).

2.8.6 Public hearing

Public hearing is a means of bringing stakeholders together to exchange views, negotiate different interests and identify mutual goals in construction projects. It can further be used to decide rights, obligations and arrangements for decision making in the project (Rowe and Frewer, 2005). Although public hearing has proven beneficial in stakeholder engagement it can be problematic if not properly carried out. Public hearing involves engaging the general public together with all key stakeholders of the project in an open forum where views are freely and systematically exchanged and captured in the project's final scheme (Li *et al*., 2012). This is mostly applicable for projects of public interests.

2.9 Chapter Summary

This chapter has presented the outcome of a literature review on stakeholder management in construction projects. Previous research has indicated the need for a life cycled based stakeholder management in construction projects as lack of or inadequate stakeholder management have been found to be directly responsible for project failure in construction. Other gaps identified from the literature review include:

- Important steps in stakeholder management include stakeholder identification and classification. The identification of stakeholders is guided by stakeholder definition but there is need to coin a definition that combines the broad and narrow definitions found in the current literature on stakeholder management.
- Furthermore, 23 critical success factors for stakeholder management in construction projects have been identified with the need to gain deeper understanding of how they are related and can be used to improve stakeholder

management in construction projects as well as how they are related to project success.

- Stakeholders and their interests in projects are dynamic hence there is need to understand why stakeholders' interests change and track same during the execution of projects.

- The current frameworks for stakeholder management in construction projects do not address the need for a life cycle based stakeholder management framework.

- There is the need for the assignment of responsibility for leading the stakeholder management process, internal stakeholder collaboration, understanding the effect of procurement route on the stakeholder management process and the current understanding of project success in construction projects. An understanding of the effectiveness of the tools and techniques for stakeholder engagement is also needed.

The next chapter presents literature review on construction project life cycle; project success; effects of procurement routes on stakeholder management process; stakeholder collaboration; and the conceptual model of critical success factors for stakeholder management in construction projects.

3. CHAPTER THREE: LIFE CYCLE, SUCCESS, PROCUREMENT ROUTES; AND STAKEHOLDER COLLABORATION IN CONSTRUCTION PROJECTS

3.1 Introduction

As necessitated by some of the findings in chapter two, this chapter presents a literature review on construction project life cycle, construction project success, construction procurement routes and stakeholder collaboration in construction. It also presents the conceptual models of CSF for stakeholder management in construction identified in chapter 2.

3.2 Project Life Cycle

Understanding the different stages involved in construction projects is vital to the current study owing to the need for stakeholder management to be carried out throughout the project's life cycle. In this section, project life cycle is discussed in terms of construction investment project and specific stages involved in generic construction projects.

Researchers have distinguished between the project and the product life cycle; while the project life cycle refers to the construction period from conception to completion, the product life cycle refers to the entire service life of the created facility up to close down (Jugdev and Muller, 2005; Bordass and Leaman, 2005). Aaltonen and Kujala (2010) in their study of project lifecycle perspective on stakeholder influence strategies in global projects divided the lifecycle of an investment project (construction) into three main phases: the investment preparation, project execution and the operation phases. The main decisions (proposals and design) relating to the project are made at the investment preparation phase after which follows the project execution phase during which works are carried out on site to realise the project objectives based on the decisions and choices made during the design. After the execution phase is the operation phase during which the benefits of the project are expected to be derived. The different phases of the project no doubt will see stakeholders coming and going as well as having one thing or the other to do with either the project or other stakeholders, involved in the project. Furthermore, the investment preparation phase includes: feasibility, planning and design phases. At the feasibility phase, decisions are made on the project size, funding, location, organisation and schedule of activities. While at the planning and design phases, technical definition is widened, and schedule of activities, budget and funding are refined. Particular technology and specification are also decided and permit applications are made. Similarly, Kagioglou *et al*. (2000) presented the stages of construction project to include preproject stage, preconstruction stage, construction stage and post completion/construction stage.

Specific Stages Involved in Construction Projects:

The RIBA outline plan of work 2007, organizes the process of designing and managing building projects into a number of key work stages. It should be noted that the RIBA plan of work 2013, provides an updated coverage of procurement routes without changing the work stages. However, the work stages are the main focus of this review. These include; preparation, design, pre-construction, construction and use. Under each of the work stages there are further breakdown of specific tasks to be undertaken: under the preparation stage, there are the appraisal and design brief; the design stage includes the concept, design development and technical design; the pre-construction stage includes production information, tender documentation and tender action; the construction stage includes mobilisation and construction to practical completion; the use stage involves the post practical completion considerations. The key tasks involved in these are discussed under their respective headings.

1. Preparation stage

    A. Appraisal: the tasks involved at this stage include; identification of the clients' needs and objectives including business case and possible constraints to the proposed development. It also involves feasibility studies and assessment of options to guide the clients' decision of whether or not to go ahead with the development.

    B. Design brief: this task is to prepare a general outline of requirements and constraints as well as planning of future actions needed by the client or on behalf of the client with the client's confirmation. It also involves identifying the appropriate/suitable procurement method, procedures, organisation structure and range of consultants and others to be engaged in the project.

2. Design stage

C. Concept: here the design brief is implemented alongside preparation of additional data which leads to the preparation of concept design together with outline proposal for structural and building services systems, outline specifications and preliminary cost plan. The procurement method is also reviewed here.

D. Design development: at this stage the concept design is developed to include structural and building services systems, updated outline specifications and cost plan. By this the project brief is completed, therefore *application is made for detailed planning permission.*

E. Technical design: this involves the preparation of technical design(s) and specifications, sufficient to coordinate the different components and elements of the project and information for *statutory standards and construction safety*

3. Pre-construction stage

F. Production information: the first step here is the preparation of detailed production information that will enable tender(s) to be obtained. Application is also made for *statutory approvals*. Secondly, it involves the preparation of *further information* for the construction works required under the building contract.

G. Tender documentation: this involves the preparation and collation of tender documentation in sufficient detail to enable tender(s) to be obtained for the project. It should be noted that this is more relevant to traditional form of procurement.

H. Tender action: here potential contractors including specialist contractors of necessary are identified for the project. Tenders are then *obtained and appraised* based on which recommendations are submitted to the client.

4. Construction stage

I. Mobilisation:

J. Mobilisation: here the contractor is appointed and issued information and arrangements are made to hand over site to the contractor.

K. Construction to practical completion: this stage involves the administration of the building contract to practical completion, provision of further information to the contractor as and when reasonably required and review of information provided by contractors and specialists.

5. Use stage

L. Post practical completion: this stage is in three phases; first is the administration of the building contract after practical completion and making final inspections; second is to assist the occupants or building user during initial occupation period and third is to review the project performance in use.

In view of this, the current research will pay attention to the inception, design, construction and operation stages of construction projects in considering stakeholder engagement/management. The inception stage will cover the preparation phase in the RIBA plan; the design stage will cover the design and pre-construction phase of the RIBA plan; the construction stage will cover the construction phase of the RIBA plan; and the operation stage will cover the use stage in the RIBA plan. This is because not all construction projects follow the RIBA plan and the activities and parties involved in a construction project depend on the procurement route adopted for executing the project.

3.3 Project Success and Key Performance Indicators in Construction Projects

The ultimate goal of stakeholder management in construction projects is to achieve successful projects but the meaning and measure of project success in construction have transformed over the years. This section therefore, reviews how previous studies have viewed the transformation of project success in terms of criteria for measuring it and what the key performance indicators are for construction projects.

A project is usually regarded as successful if it is completed on time, within budget and to the specified standard of quality by the client at the beginning of the project (Chan and Kumaraswami, 1997; Chan, *et al.*, 2003). This has however been criticized as not adequate, since it is possible for a project to fail its intended purpose(s) and yet be considered successful from the project management point of view (Ojiako *et al.*, 2008). Similarly, a project that failed in terms of project management (not completed within time, budget and specified quality) can still serve its intended purpose(s).

Limiting project success indicators to time, cost and conformance to specifications takes success as providing the solutions to the briefing and design problems and ignores the differing interests of the project stakeholders (Winch, 2010). Further, this is an execution based approach not a total life cycle approach, hence, there is a need to develop a more sophisticated(all encompassing) definition that allows for the differing interests of project stakeholders and places the project mission at the heart of the definition of success (Winch, 2010; Long *et al*., 2004).

The debate on construction project success has been ongoing but unfortunately due to many reasons, high project performance and project success are not commonplace in the construction industry. Key among the reasons are lack of definitive model for either predicting or explaining performance and lack of a strong consensus as to the factors to be used , what their definition should be, how best to express outcomes for them, or what the relationship among factors is, if any (Korde, *et al*., 2005). Moreover, success in construction has meant different things to different stakeholders involved on the project (Bryde and Brown 2005; Toor and Ogunlana 2008). The traditional perception of project success being judged based on cost quality and time has changed over time to include; micro and macro viewpoints, stakeholder satisfaction, reduced conflicts and disputes and environmental friendliness (Lim and Mohamed, 1999; Cookie-Davies, 2002; Bryde and Brown 2005; Low and Chuan 2006; Toor and Ogunlana 2010).

However, there is some level of agreement among researchers that a successful construction project performance is achieved when stakeholders meet their requirements, individually and or collectively (Takim, 2009; Long *et al*., 2004; Wateridge, 1998; Atkinson *et al*., 1997). Similarly, project success is attained in construction when the project outcome (realised asset) fully matches the client's needs at the time of realisation. Project mission should therefore, be well defined because among other benefits, a well-defined project mission enables the communication of strategic intent to the diverse project stakeholders; both those whose active participation is required to realise the facility and those who have the power to disrupt the project delivery process (Winch, 2010). To achieve this, it is necessary for an effective stakeholder management process to be used from the start of the project. It is important to note that previous research efforts have suggested what managers need to do to achieve success in construction projects (Jugdev and Muller, 2005); grouped construction project success factors (Long *et al*., 2004); and developed a conceptual framework of factors affecting project success in construction (Chan *et al*., 2004). These are discussed in the succeeding paragraphs.

Projects are about managing expectations, and these expectations have to do with stakeholders' perceptions on success but project success is a complex and ambiguous concept and it changes over the project and product life cycle. Therefore, project managers may be more effective at managing projects to successful completion when they effectively do the following (Jugdev and Muller, 2005):

1. Think about critical success factors (CSFs) at the onset and consider using the categories within a specific framework to guide the development of appropriate indicators to use for various project and product phases.

2. Develop a list of key stakeholders at the beginning of the project and determine which success category each stakeholder fits into.

3. Avoid using single point indicators of project success and ensure that their project success indicators include both efficiency and effectiveness measures over the span of the project/product life cycle and that there are CSFs that address all key stakeholders needs and wants. They noted here that this does not mean that all stakeholder wants will be addressed over the course of the project, but helps to discuss them and place appropriate boundaries on what is reasonably manageable on the project.

4. Remain mindful that success measures change over the project and product life cycle and that some of the indicators used at the initial project phases may not be the ones assessed at the closeout phase. The indicators identified should be assessed/measured using simple and appropriate measures. It is better to use a few measure and measure them well than to have a laundry list and not address them properly.

5. Develop and maintain good relationships and effective communications with key stakeholders, and in particular, project sponsors because their understanding, involvement, commitment and appropriate decisions for the project will be essential to achieve project success.

Long *et al*. (2004) grouped construction project success factors into five principal components (Fig. 3.1) comprising: comfort, competence, commitment and communication which they refer to as the four COMs. They argue that the comfort components emphasizes that resources in terms of money, efforts and leadership should be available throughout the project in other for construction projects to run smoothly. This was presented in a table by the authors and stakeholder involvement and feedback mechanisms have been added to the factors under communication. The need for constant cash flow cannot be overemphasized but it needs to be balanced with adequate efforts and leadership in terms of continuing involvement of the project stakeholders to ensure proper control and support. The component of competence emphasizes the need for capable manpower to carry out all the tasks involved in the project if success is to be attained at the end of the project. The component of commitment points out that all project stakeholders should be interested in the goals of the project. Lastly, an effective communication system is required and is essential to ensure good decision and integration throughout the project. The modifications made to the four COMs are in the "competence" component in which adopting the right procurement route is introduced and in the "communication" component in which community involvement is changed to community/stakeholder involvement and feedback mechanism is introduced.

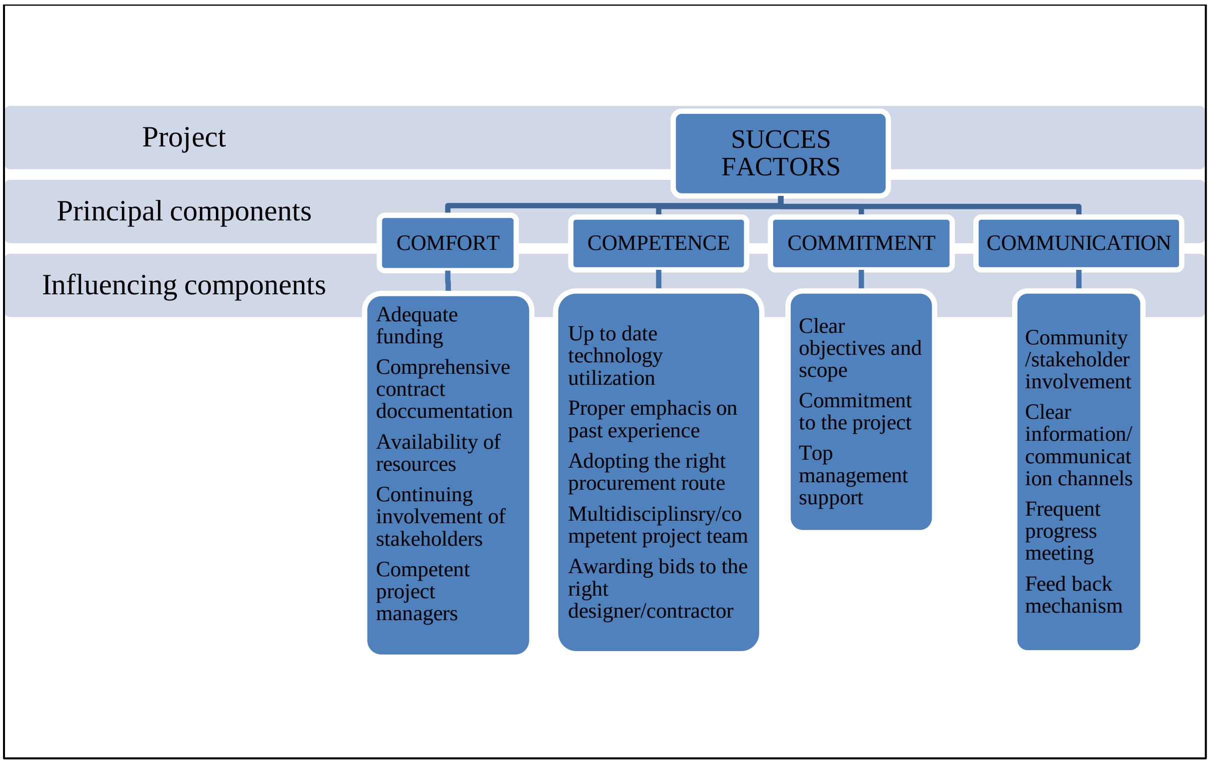

Figure 3.1 Grouping of Construction project success factors (adopted and modified from Long et al., 2004)

Chan *et al*. (2004) developed a conceptual framework of factors affecting project success after identifying and grouping the factors into five: project management actions, project related factors, external environment, project procedures and human related factors. Variables in each group are interrelated and interrelated such that variables in one group influence themselves and can influence variables in the other groups. This framework is adopted with slight modification and presented in Figure 3.2; the modification done is the introduction of arrows to show the directions of influence between the major groups of factors. The external environment and project procedures are modified by the addition of external stakeholders and local planning issues respectively. The study however did not suggest to what extent these factors affect project success but it is important that it presents a detailed idea of the factors. In each of the five groups, at least there is a factor that hinges on stakeholder related considerations to influence project success.

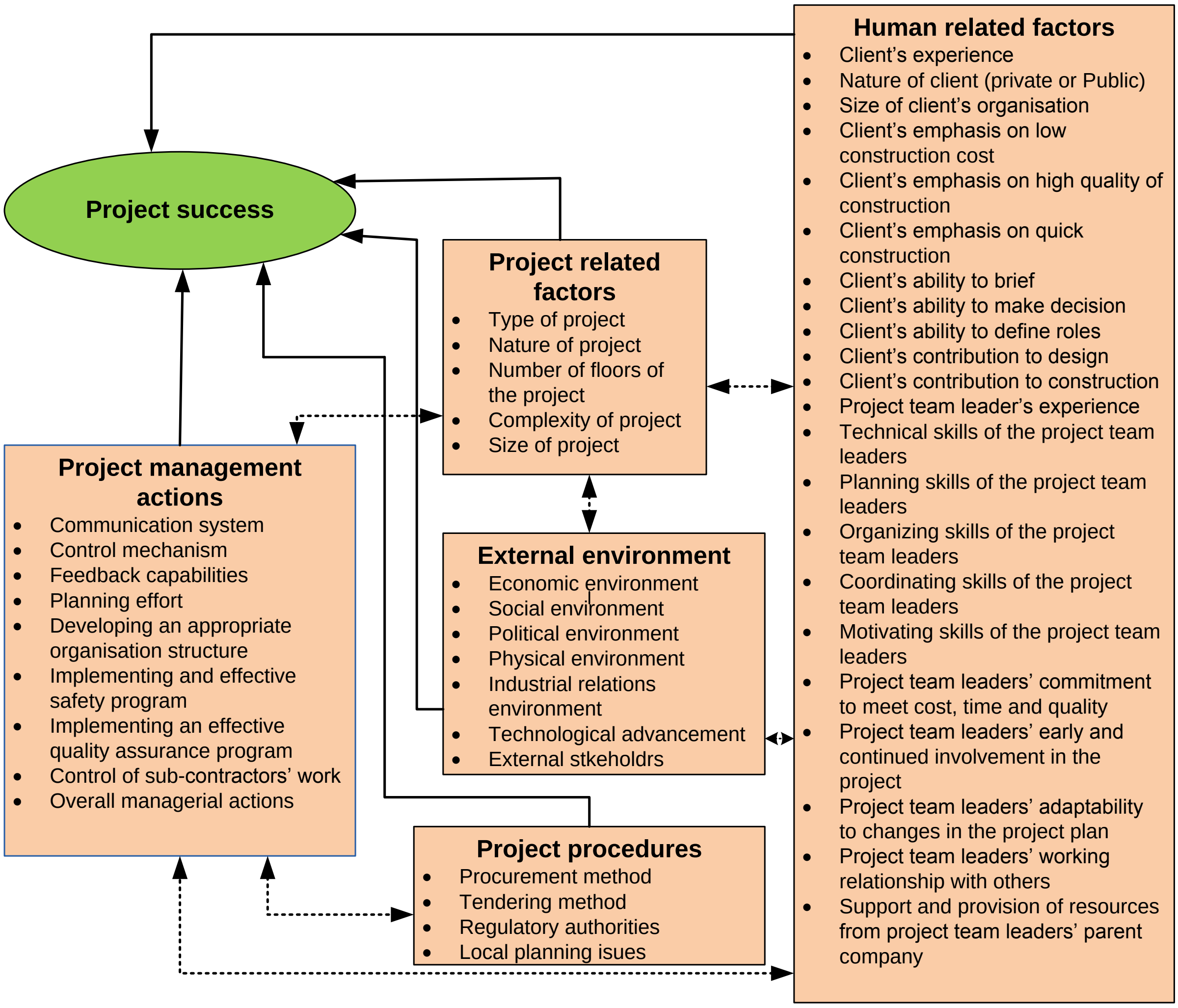

Figure 3.2 Framework for factors affecting project success (adopted and modified from Chan et al., 2004).

***Key Performance Indicators (KPIs)*:**

The group of factors that comprise the success criteria in the construction industry are currently called key performance indicators (KPIs). Key performance indicators provide a useful framework for measuring and comparing the performance of projects and furnish project managers, clients and other stakeholders with useful information needed to implement a project to a successful completion (Chan and Chan 2004).

Egan's report 'Rethinking Construction', which was prepared in response to the challenging state of the UK construction industry where projects were observed to be consistently running over time, over budget, and short of meeting client expectations, presented the first set of KPIs (Egan, 1998).

Although, initially focused on cost and on-time performance, the KPIs have been expanded to include benchmarks for environmental performance, employee satisfaction, and project safety, to name just a few (Glenigan, 2011). All of these are strongly related to the latest thinking of construction projects' success which includes meeting the time cost and quality (the golden triangle) as well as stakeholders' satisfaction criteria.

Furthermore, the ultimate goal of procuring any construction project is to achieve strategic fit between the client's primary business objectives and secondary procurement strategy. There is need to meet KPIs in order to achieve strategic fit between client business need and procurement strategy which will in turn result into project success (Winch, 2010).

The KPIs are used by construction firms as a benchmark to monitor and improve overall project performance, continuously improve client satisfaction, and in the case of government to measure the effectiveness of contractors in the construction industry. Glenigan (2011) reports among others a slight decline in the level of client satisfaction with services received from contractors indicative of failure to attain project success within the construction industry in the UK.

Based on the review of the current perception of project success and key performance indicators in construction projects, the main success indicators in construction projects include completion of project on time, completion on budget, completion to specified standards/qualities and completion to the satisfaction of a majority of the project stakeholders. An effective stakeholder management should therefore be able to deliver on these indicators.

3.4 Procurement Routes in Construction

The choice of the procurement route for construction work is one of the many decisions that are important for project clients to make since project success depends among other factors on the procurement route used (Anumba and Evbuomwan, 1997; Love, *et al*., 1998). Moreover, construction KPIs are concerned with the predictability of design cost and time as well as construction cost and time which can be regarded as procurement oriented (Takim and Akintoye, 2002). Stakeholders are likely to have different perception about the performance of a project when different procurement strategies are adopted (Toor and Ogunlana, 2010). Therefore, the appropriateness and/or effectiveness of the procurement method adopted for any construction project plays a vital role in the success or failure of the project. For example, Chan and Chan (2004) in a study of key performance indicators for measuring construction success found that the completion time as it relates to speed of a project depended on the procurement method adopted for the project. They attributed the slow speed (delay) observed in one of the projects studied to be due to the use of the traditional procurement method. They however, acknowledge the possibility of other factors playing a part as it was observed that the project which suffered delay, performed better in terms of cost compared to those procured through the design and build method. Similarly, Newcombe (1996) compared the traditional and construction management procurement paths in terms of the power base and the process used by the project manager. He argues that the traditional system represents the old class-based division between management and workers where position power based on a hierarchy of command is exercised by the project manager, i.e., the Architect; while the construction management is based on the modern management principle of empowerment or power equalisation and reflects the trend towards a more pluralistic project environment. These however depend on many factors such as the form of contract used, the people involved, the environment of the project, the nature of and complexity of the project, the client (public or private), etc. Furthermore, procurement routes where contractors and other key stakeholders are engaged early enough and involved in design lead to greater commitment to the project hence it is important to identify who is going to work on the project and get them involved especially in the decision making process (Ankrah *et al.*, 2009).

Past research (Cheung *et al*., 2001; Ng *et al*., 2002; Fewings, 2005) suggest procurement selection criteria to include: desired project completion speed; cost certainty; time certainty, level of quality required of the end product; complexity relating to the suitability of the procurement route in executing the project; risk avoidance/allocation by the parties involved on the project; the level of clarity in the delineation of responsibilities; the degree of price competition associated with the procurement options; the ability and authority of the client to effect changes on the project; tendering process(single or two stage, open or selective, close or negotiated); degree of collaborative practice or partnering required. All of these are concerned mainly and more directly with the internal stakeholders those who are directly involved in the project execution process. None the less, it is important to understand the different procurement routes that are being used for construction projects.

Past studies, for example (Oyegoke, 2001; Dorsey, 2004) have shown that most project use the traditional procurement route from the early 1900s through to most part of the first half of the twentieth century; this was followed by the emergence of the construction management (CM) procurement route between the 1960s and 1970s; the design and build (D&B) and programme management method came to lime light between the 1970s and 1980s. Other management oriented approaches such as partnering and framework agreements (FA) which are based on and geared towards integrated teamwork and collaborative arrangements emerged between the 1990s and 2000s (McDermott and Khalfan, 2006). In the bid for the continuous improvement of procurement process, the evolving construction procurement routes have been modified.

Over the years, different categorisations of procurement routes have been advanced by different scholars. Recently, Oyegoke *et al*. (2009) based on an extensive literature review, categorised construction projects procurement routes into four groups which include: categorisation based on the ways project are organised; categorisation based on financial issues; categorisation based on the conditions of contracts; and categorisations based on management process, relational contracting and integrated working arrangement (Table 3.1). Although this represents a good picture of the various construction procurement routes, it does not provide clear points of demarcation between the different categorisations for example between categorisation based on project organisation and categorisation based on management process.

For a more comprehensive presentation, the procurement routes have been grouped into: separated procurement routes; integrated procurement routes and management based procurement routes (Figure 3.3). Separated procurement routes: these are unique for the separation of design and construction processes, allow full completion of design and project documentation (in most cases) before tendering, take longer time and guarantee cost certainty. Variants include: two stage selective tendering contracts, negotiated contracts and cost-reimbursable contracts which is further divided into cost plus and target cost contracts. Integrated procurement routes: these basically seek to improve the level of integration among the internal stakeholders and reduce the level of conflicts in projects. Therefore, an integrated procurement route ensures that the design, construction, operation and maintenance of projects are considered as a whole; it also ensures that the delivery team work together as an integrated project team (OGC, 2008). These include design and build (package deal, turnkey, and develop and construct) and public private partnership (DBO, DBOM, BOT, BOO, DBOT, BOOT, BBO, LDO, DBFO, PFI, PSI). Management based procurement routes: this provides a single point of contact in the project manager (management organisation) for the project. These include management contracting, construction management and design and manage.

Table 3.1 Categorisation of construction procurement routes

Scholar(s)/Year	Categorisation bases	Categories
Mohsini (1993), Masterman (2002), Walker and Hampson (2003)	Project organisation	Traditional, D&B, MC & CM
Cox (2001), Graham (2001), Best and Valence (2002), Miller (2002)	Financial issues	DBO, DBOM, BOT, BOO, DBOT, BOOT, BBO, LDO, DBFO, PPP/PFI, PSI
Akintoye (1994), RICS (2004)	Conditions of contract	JCT-DB
Oyegoke (2001), Masterman (2002), Walker and Hampson (2003), McDermott and Khalfan (2006), Rwelamila (2010)	Management process	Partnering & strategic alliance, FA, PC, MC, CM, D&B

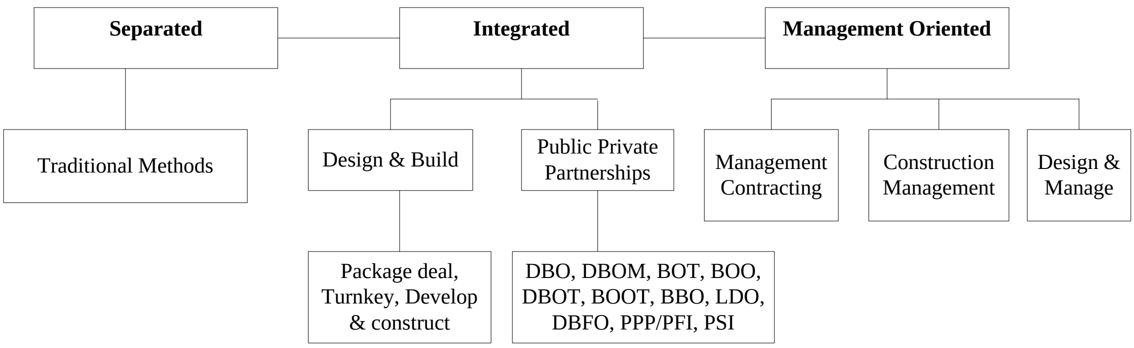

Figure 3.3 Grouping of construction procurement routes

Delineation of responsibilities depends to a large extent on the procurement route adopted for the project which is what determines when the project manager comes in and raises and or try to answer the question of who does stakeholder management especially at the design stage if the project manager is not involved yet and after the project have been completed and handed over or is put to use. Understanding the relationships between stakeholder management and construction procurement routes is therefore very important and to this we now turn in the next section.

3.5 Relating Stakeholder Management (SM) to the Procurement Routes

This section presents a comparison of different procurement routes against stakeholder management process. It is important before going into the comparison, to note that procurement route and contracts have been interchangeably used, while procurement route is the means of 'purchasing' the project, contract is the legal framework that guide the procurement process and clearly assign responsibilities to the different stakeholders (especially internal) of the project (Harris, 2010). However, the scope and therefore, focus of this section is not contract but procurement, although reference will be made to contracts type from time to time when necessary for the sake of clarity and ease of understanding.

It has been found from previous research that the following characteristics of procurement routes are necessary for stakeholder management to be effectively done: Early involvement of contractor, Contractor involvement in design, Single point of responsibility, Integration of design and construction process, Separation of design and construction roles, Clear line of control and communication, Easy stakeholder identification, Cooperation among the internal stakeholders, External stakeholders identification/involvement, Opportunities for dispute avoidance/resolution, Opportunities to accommodate changes, Clear assignment of responsibility. A comparison is therefore, done based on these stakeholder management related characteristics with the three groups of procurement routes (Figure 3.3).

3.5.1 Stakeholder Management vs. Traditional method

The traditional method is unique for the separation of design and construction responsibilities which inhibits cooperation among the professionals involved in the process. Although the variants may enable cooperation between the design and construction teams, they do not change the separated nature of the design and construction responsibilities. It allows full completion of design before tenders are invited. This may aid or give sufficient time for stakeholder (internal and external) identification as well as aid their inputs and assessment of the project. The big question for this procurement route about stakeholder management is that of connecting design and construction and hence ensuring continuity of the process. Rwelamila (2010) suggested either the use of hybrid traditional procurement methods or a different procurement method that enables cooperation and collaboration between the teams and among the team members. The other options under the traditional procurement method include: two stage selective tendering; negotiated contracts; cost-reimbursable contracts (cost plus or target cost).

The structure of the two stage selective tendering helps to reduce variations and helps to secure earlier involvement of the contractor where works commence on site before detailed design is completed.

For the negotiated contracts, there is the possibility of appointing the contractor early enough in the design which facilitates clear statement of the construction method and buildability as well as value engineering of the entire project. While this is likely to lead to stakeholder satisfaction, it could also facilitate conflicts as work may already have been underway before some issues will manifest during negotiation (Chan and Chan, 2004).

Cost-reimbursable contracts enable the equitable sharing of financial and practical risks among the key stakeholders of the project but there is no contractual commitment from the contractor(s). Although this may secure the commitment of the stakeholders through their assigned risks and responsibilities, it could negatively affect efficient use of resources and public accountability thereby affecting the relationship among the project stakeholders negatively (Oyegoke *et al*., 2009).

3.5.2 Stakeholder Management vs. Integrated procurement methods

Design and build (D&B): here one contractor takes the responsibilities for design and construction processes in the project. Stakeholder identification could be made easier and the possibilities of the project stakeholders working as a team are high due to the single point of responsibility. Lines of communication and control could be more easily defined but there is the question of who will be responsible for stakeholder management since the design and construction teams though within the same organisation are likely to be separated (Oyegoke, 2001).

Package deals (PD): this is similar to the D&B in relating to SM but involves in-house designers.

Turnkey method (TM): this also involves one organisation undertaking the whole process leading to the project outcome. This also has the tendencies to facilitate smooth relationship among the project stakeholders but again the design and construction responsibilities could still differ within the same contracting organisation.

Develop and construct (D&C): this differs from the D&B in the sense that the client's consultant prepares the conceptual drawings (sketch design) and site layout based on which the contractors produce detailed design with specifications and submit along with their bids. This may enable early stakeholder involvement but just as in most other procurement routes does provide for the consideration of external stakeholders (Chan and Chan, 2004).

3.5.3 Stakeholder Management vs. Management oriented procurement methods

Management contracting (MC): here the management contractor is appointed as a consultant early in the project to be involved in the design providing construction expertise as well as to coordinate and manage the work packages at the design and construction. This method is very flexible hence enables cooperation and easy handling of issues and changes when they arise (Toor and Ogunlana, 2010). Because of the single point of responsibility assumed by the management contractor, this may enable effective communication and control of the project execution process leading to stakeholders' satisfaction in the end. However the contractors responsible for the various work packages having not been involved in the design could negatively affect cost and quality control and hence relationship among the stakeholders involved (Rwelamila, 2010).

Construction management (CM): here the construction manager instead of management contractor as in (MC) is appointed as client's consultant at the initial stage with equal status as the other internal stakeholders involved in the design of the project. This enables the client and designers to make collective timely decisions towards the project goal. Teamwork is made possible here but still there is the question of not involving the external stakeholders and depending on the nature of the project, this could be dangerous (McDermott and Khalfan, 2006).

Design and mange D&M): here a single organisation is appointed to undertake both design and management of the construction operations employing package contractors to carry out the actual works. This method allows works to commence on site before final design is completed and design personnel to be present on site to ensure further detailed design and clarify existing design details as well as cooperate with works contractors for buildability in liaison with the client's representative. There could be enhanced communication among the internal stakeholders. Except guaranteed maximum price (GMP) which itself could be breached, financial accountability can be a problem among the internal stakeholders which will make it more difficult for external stakeholders to be managed (Rwelamila, 2010).

From the foregoing review and comparison between stakeholder management process and procurement routes, it can be concluded that there is no single procurement route that provides an adequately conducive environment for stakeholder management in construction projects, as they mostly focussed on the relationship among the internal stakeholders. Table 3.2 (where: √ represents enable, ± represents neutral and no selection means it does not enable) shows which procurement routes enable the different procurement route related characteristics of stakeholder management in construction projects. However, it can be said that the integrated and management oriented approaches are more disposed to supporting internal stakeholder management, the traditional approach may give more room for identifying and involving external stakeholders in projects especially at the inception stage. There may also be need for collaboration among the project stakeholders, especially the internal stakeholders who are directly involved in and responsible for the project execution/management process in order to ensure the continuity of the stakeholder management process. The next section will therefore review stakeholder collaboration in construction projects.

It should be noted before moving to the next section that after adopting procurement route for projects, the appropriate contract conditions also need to be adopted. The contract conditions define the contractual relationships among the parties involved. It describes their duties and obligations on the project, the allocation of risks, how problems will be overcome, how the parties will work together to influence their relationship and ultimately the success of the project (OGC, 2007). The contract conditions are capable of influencing stakeholder management process on the project hence it is necessary to adopt the most stakeholder friendly contract conditions applicable to the project. The major forms of contract commonly used include the joint contract tribunal suits (JCT), new engineering contract suits (NEC) and bespoke contracts (Oyegoke, *et al*., 2009).

Furthermore, the professional bodies regulating the practice of construction professional seek to regulate their relationships with one another, with the general public and with the project environment. These are in line with the principles of stakeholder management and would enable the professionals to carry out stakeholder management in construction projects. For example, the Royal Institute of British Architects (RIBA, 2005) code of professional conduct mandates them to: respect the beliefs and opinions of others, recognise social diversity and treat everyone fairly, have proper concern and due regards for the effects of their work on its end users and the local community, be aware of the environmental impact of their work and put in place procedures for dealing with disputes and complain promptly and appropriately. Similarly members of the Royal Institute of Chartered Surveyors (RICS) shall at all times act with integrity and avoid conflict of interests when discharging their professional duties (RICS, 2013). Moreover, The Chartered Institute of Building’s Code of Practice for Project Management for Construction and Development provides instructive guide on the principles of strategic planning, detailed programming and monitoring, range of possible procurement options resource allocation and effective risk management, to guide its members in their professional practice (CIOB, 2008).

Table 3.2 Summary of stakeholder management related characteristics of procurement routes

Procurement routes / Stakeholder management related characteristics	Traditional method	2-stage selective tendering	Negotiated contracts	Cost-reimbursable	Design & Build	Package deals	Turnkey	Develop & construct	PPP/PFI	Management contracting	Construction management	Design & manage
Early involvement of contractor		√	√	√	√		√	√	√	√	√	
Contractor involvement in design		√	√		√		√	√		±	±	±
Single point of responsibility					√	√	√			√		√
Integration of design and construction process				√	√	√	√	√		±	±	√
Separation of design and construction roles	√	√	√							±	±	
Clear line of control and communication	√				√		√	√	√	√		
Easy stakeholder identification					√				√	√		
Cooperation among the internal stakeholders					√				√	√		
External stakeholders identification/involvement	√								√	±	±	±
Opportunities for dispute avoidance/resolution	√		√							√	√	√
Opportunities to accommodate changes	±	√			√				±	√	√	√
Clear assignment of responsibility	√	√	√	√		√	√		±	±	±	±

3.6 Stakeholders' Collaboration in Construction

Managing construction project stakeholders to achieve successful project requires team work- collaboration between the client, design and construction teams and sharing of individual skills and expertise to elicit support from all available sources. This section therefore starts by reviewing collaborative working in construction in general before moving into stakeholder collaboration in particular. The main aim of this section is to identify the enablers and barriers of stakeholder collaboration.

Collaboration is a creative process embarked upon by two or more individuals or groups, sharing their collective skills, expertise, information (knowledge) and understanding in an atmosphere of openness, mutual respect, honesty and trust to jointly deliver the best solution that meets their common goal (According to Wilkinson, 2005). In other words, collaboration means joint working by two or more stakeholders of a venture to achieve a common goal that neither can achieve individually (Gray, 1985). From these definitions, it is clear that certain conditions need to be satisfied by all involved in the collaboration in order for the desired goal of the venture to be achieved. Even though this definition talks only about individuals and not groups, it is considered very comprehensive because it touches on most of the important factors that any collaborative venture relies upon.

The multi organizational and geographically dispersed nature of construction make the requirement for collaboration in construction very high and there is need for a detailed organizational change in management approach in order to control all the factors affecting the success of collaboration environments (Erdogan *et al.*, 2008). They identified the following reasons for the failure in achieving the full benefits expected from the implementation of collaboration systems: Poor capture of user requirements, lack of strategic approaches, lack of proper planning/project management, user resistance to change, lack of user involvement and technical characteristics. They however noted that failure in the implementation of collaboration environments for construction are scarcely due to technical issues but mainly due to organizational and people related issues. Therefore, apart from being able to successfully execute the project in terms of cost, quality and time, project partners should be able to effectively mobilize their capabilities to interact, coordinate and collaborate to effectively deliver the project both individually and as a team (Rahman and Kumaraswamy, 2005).

However, the success or failure of collaboration in construction projects is contingent upon certain factors.

Akintoye and Main (2007) identified the success and failure factors for collaborative relationships in construction within the construction environment. The main success factors are commitment of adequate resources from the parties involved, equity of relationship, recognition of the importance of non – financial benefits and clarity of objectives whereas the failure factors are lack of trust and consolation and lack of experience and business fit. Furthermore, collaborative relationships are important for dealing with conflicts and adversarial relationships in the construction environment and for attaining and maintaining a competitive advantage. There is need to combine trust building arrangements, price control and clearly defined lines of authority in order to achieve efficient procurement transactions (Eriksson and Laan, 2007). However, the fragmented approach to construction project procurement have led to project teams having lack of transparency, adversarial relationship and mistrust leading to a situation in which the various team members try to minimise their level of exposure to the project risks instead of working together as a team with the spirit of cooperation, trust and collaboration (Baiden *et al*., 2005). Therefore, for any genuine collaborative working to succeed there is the need for significant changes to both the culture of the teams involved and the tools they use to manage their information and communications (Wilkinson, 2005).

It can be summarised that the enablers of collaborative working include: having shared vision on the project; clearly defining lines of authorities and responsibilities; having mutual trust and respect for each other; being able to communicate effectively; being able to use the available process and technologies. And the barriers include: poor capture of user requirements which may be a result of their lack of or inadequate involvement; lack of strategic approaches; lack of proper planning/project management; user resistance to change especially when they are not adequately informed about the changes. Although these barriers were identified for construction collaboration environment in general (Erdogan *et al*., 2008) their application in the current study will be within the context of collaboration among the internal stakeholders and where necessary with key external stakeholders to ensure smooth stakeholder management process in construction projects. It is argued that collaboration between the design and construction teams will improve and sustain the process of stakeholder management.

This could facilitate better management of both internal and external stakeholders of construction projects leading to more successful delivery of projects.

Construction projects involve many stakeholders, some internal and some external. Owing to the fragmented nature of construction projects, the stakeholders play different roles at different stages during and after the project execution. The project Architect or designers, construction manager, facilities manager, client, regulatory bodies, media, etc all play different roles on the project. Collaboration between these stakeholders is essential for projects to be delivered successfully.

According to Jamal and Getz, (1995) stakeholder collaboration is a process of collective decision making among key internal stakeholders of a project to avoid or address stakeholder issues in the project. The aim of stakeholder collaboration is to build a consensus among internal stakeholders. It should however be noted that the right to participate in stakeholder collaboration does not automatically translate to the ability to perform effectively. It would be necessary to determine when stakeholders should be involved and who should coordinate stakeholder management process at different stages of the project.

The need for stakeholder collaboration in construction can be described using the following metaphor: "*imagine a group of people putting up a tent (the phenomenon of interest) on a hill-side, each with a different kind of peg or stake (metal ones, different coloured plastics ones, wooden ones, angled ones, etc.). each person is holding a different stake (their interest), and trying to drive their points home as they push their stakes into the ground. But the stakeholders who have mallets have the power to drive their points home more effectively than others. Working alone, the tent might take on the shape determined by the guy-ropes secured by the mallet-holders, and is likely to collapse in the first wind. But knowing who they are working with, the mallet-holders can work together to position their stakes so the tent stays up. They may even be able to help some of the other stakeholders who do not have mallets to secure their stakes. By working together in this way it is more likely that the tent will withstand the storm.*" (Reed *et al*., 2009 Pg 1947). Similarly, stakeholders involved in a construction project can have different stakes. The client and Architect may be interested in an aesthetic and functional product; with the client being additionally interested in obtaining this within the lowest possible cost they are likely to disagree with the Architect on any aspects of the design that unnecessarily add to the total cost of the project. The project Quantity

Surveyor is likely to align with and work towards the clients' interest of achieving their goal with the lowest cost. Also, the construction method adopted by the contractor or project manager may not be acceptable or favourable to the residents around the project site who may not be having anything directly to do with the project; this may arouse their interest and possible conflicts with the project. Furthermore, the introduction of any time adding variations to the project may not be acceptable to the contractor who would like to finish and move on to the next project unless the variations adds significantly to their profit and does not adversely affect their future plans. In the same vein, government control agencies at different levels would be interested in seeing that the project design and construction meet established standards and regulations. Working alone may lead to only the powerful stakeholders being able to achieve their interest with disregard to the others in which case the project may end up failing; but by working together and accommodating each other's interest, they would be able to define an all-encompassing project mission and be more likely to achieve a successful project "withstand the storm".

From the foregoing review on collaborative working in construction projects, internal stakeholders in construction projects can collaborate to carryout stakeholder management. To achieve the aim of carrying out stakeholder management they need to build mutual trust and respect, share their individual knowledge and expertise, share a common goal in the project and be committed to their assigned responsibilities throughout the process.

3.7 Conceptual Measurement and Structural Models of Critical Success Factors for Stakeholder Management in Construction

Identifying the critical success factors for stakeholder management in construction and grouping them are good initial steps towards ensuring successful stakeholder management in construction projects (Yang *et al*., 2009). Clear understanding of the relationships among the groupings of these factors is necessary to further inform and equip industry practitioners to carryout stakeholder management. This section discusses the conceptual (theoretical) model of the interrelationships among the CSFs for stakeholder management in construction and their latent variables (constructs) drawn from the extant literature. During the development of the conceptual model, the following assumptions were made: 1) Obtaining detailed information about the projects and its stakeholders is considered the first major step of stakeholder management which in turn informs stakeholder analysis (Chinyio and Akintoye, 2008; Yang *et al*., 2009). 2) Being able to obtain such information entails knowing the characteristics of the project and its stakeholders. 3) The outcome of an informed stakeholder analysis/estimation would lead to the understanding of possible stakeholder dynamism and prediction of their likely behaviours on the basis of which appropriate stakeholder management/engagement strategies can be decided (Jepsen and Eskerod, 2009).

As shown in Figure 3.4, the measurement model based on the above theoretical relationships proposes a positive correlation between the four constructs (SCPC, SA, SD and SE; explained in the sub-sections below) and direct positive measurement of the constructs by their indicators.

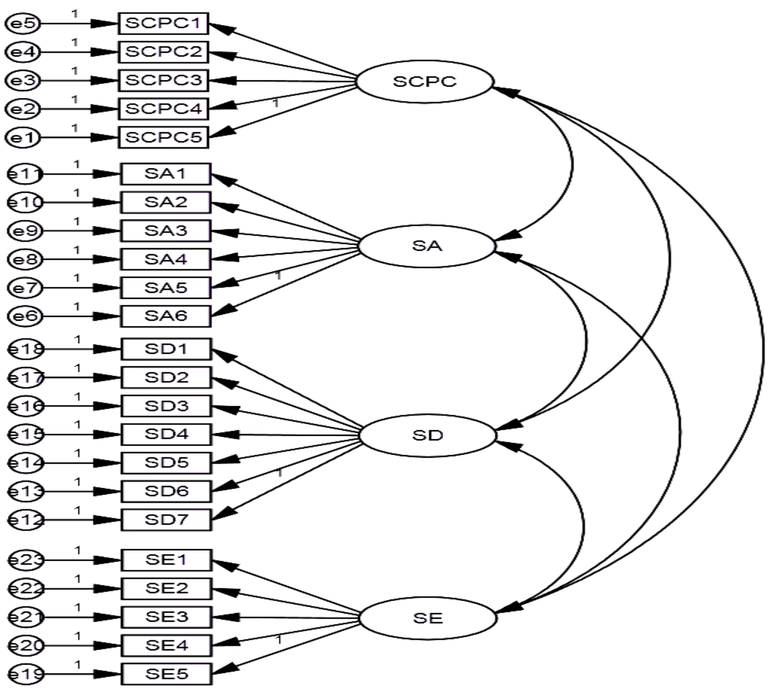

Figure 3.4 Conceptual Measurement Model of CSFs for Stakeholder Management in Construction

The four constructs are individually and collectively considered as enablers of stakeholder management. These four enablers (constructs or latent variables) of stakeholder management process are measured by the CSFs for stakeholder management in construction projects identified in chapter 2. The four latent variables (constructs) and their indicators are presented in Table 3.3 and explained in the following sub sections. The last row of Table 3.3 also shows the project success (PS) construct which is part of the structural model with its indicators identified in Section 3.3. Furthermore, the hypotheses based on which the structural model of the interrelationships among CSFs for stakeholder management in construction is built are stated under the relevant constructs.

Table 3.3 Constructs and indicators of conceptual measurement model of CSFs for stakeholder management in construction

Constructs	Indicators
Stakeholder characteristics and project characteristics (SCPC)	• Clearly formulating the project mission; • Ensuring the use of a favourable procurement method; • Carefully identifying and listing the project stakeholders; • Ensuring flexible project organisation; • Identifying and understanding stakeholders' areas of interests in the project.
Stakeholder analysis (SA)	• Determining and assessing the power (capacity to influence the actions of other stakeholders); urgency (degree to which stakeholders' claims requires immediate attention); legitimacy (perceived validity of claims); and proximity (level of association or closeness with the project) of stakeholders; • Appropriately classifying stakeholders according to their attributes/characteristics; • Predicting and mapping stakeholders' behaviours (supportive, opposition, neutral etc); • Predicting stakeholders' potential influence on each other; • Predicting stakeholders' potential influence on the project; • Identifying and analysing possible conflicts and coalitions among stakeholders;
Stakeholder dynamics (SD)	• Resolving conflicts among stakeholders effectively; • Managing the change of stakeholders' interests; • Managing the change of stakeholders' influence; • Managing the change of relationship among stakeholders; • Managing change of stakeholders' attributes; • Managing how project decisions affect stakeholders; • Predicting stakeholders' likely reactions for implementing project decisions.
Stakeholder engagement/empowerment (SE)	• Involving relevant stakeholders to redefine (refine) project mission; • Formulating appropriate strategies to manage/engage different stakeholders; • Keeping and promoting positive relationships among the stakeholders; • Communicating with stakeholders properly and frequently (instituting feedback mechanisms); • Considering corporate social responsibilities (paying attention to economic, legal, environmental and ethical issues).
Project Success (PS)	• Completion of project on time; • Completion on budget; • Completion to specified standards/qualities; • Completion to the satisfaction of a majority of the project stakeholders.

Stakeholder Characteristics and Project Characteristics (SCPC)

Clear understanding of projects' and stakeholders' characteristics would avail the project management team sufficient information concerning the project and its stakeholders. Project characteristics include size, location, type of client, funding source, procurement issues, and objectives of the projects. Project characteristics as well as its potential impact should be clearly identified and documented at the early stages of the project in order to inform adequate stakeholder identification and analysis (Olander and Landin, 2005; Aaltonen *et al*., 2008; Jepsen and Eskerod, 2009). Stakeholder characteristics refer to stakeholders' stakes and interests, bases of involvement (direct or indirect), sources of power and other attributes (Mitchell, *et al*., 1997; Winch, 2010). Without such information, it would be very difficult to proceed with stakeholder management (Mitchell *et al*., 1997; Bourne and Walker, 2005). Therefore, the conceptual measurement model hypothesised that stakeholder characteristics and project characteristics is dependent upon the project management team's ability to clearly formulate the project mission; adopt a favourable procurement route for the project; carefully identify and list the project stakeholders; ensure the use of flexible project organisation; and identifying and understanding stakeholder areas of interest.

Under this construct, the following hypotheses are stated:

Hypothesis 1: Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) influences the impact of stakeholder management on construction project success (PS).

Hypothesis 2: Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) enables stakeholder analysis (SA).

Hypothesis 3: Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) enables the understanding of stakeholder dynamism (SD).

Stakeholder Analysis (SA)

Stakeholder analysis consists of systematically determining stakeholders' areas and levels of interests; expected contributions; expected levels of power and influence; and level of importance; with respect to the project (Karlsen, 2002; Jepsen and Eskerod, 2009). It is important for project managers or responsible professionals to analyse the powers, needs and concerns of all project stakeholders, both internal and external to the project. If the needs and concerns of project stakeholders are not carefully analysed and addressed, conflicts and confrontations can arise among the stakeholders or between the stakeholders and the project and consequently hamper the successful delivery of the project (Aaltonen *et al*., 2008; Olander and Landin, 2008; Li *et al*., 2012). The results of stakeholder analysis will inform and shape decisions on stakeholder management for the project (Jepsen and Eskerod, 2009). Therefore, this construct (latent variable) is hypothesised to be indicated by the project management's ability to determine and assess stakeholders' attributes; appropriately classifying stakeholders according to their attributes; predicting and mapping stakeholders' behaviours; predicting stakeholders' potential influence on each other and on the project; and identifying and analysing possible conflicts and coalition among stakeholders.

Under this construct, the following hypotheses are stated:

Hypothesis 4: Stakeholder analysis (SA) influences the overall impact of stakeholder management on construction project success (PS).

Hypothesis 5: Stakeholder analysis (SA) enables effective stakeholder engagement/empowerment (SE).

Stakeholder Dynamics (SD)

The stakes and interests of construction stakeholders can be as diverse as the stakeholders themselves and these are dynamic over the life cycle of projects (Chinyio and Akintoye, 2008). For example the primary interest of local residents is how the project affects their amenity and immediate environment; local land owners are interested in making sure that their interest will not be hurt by the project; the environmentalists are interested in protecting the environment from pollution and or destruction; the competitors try to gain competitive advantage by their actions; the media influence the perception of people about the reputation of the project; and others include those whose connection to the project is not immediately clear but whose support may be helpful to the success of the project (Leung and Olomolaiye, 2010). These interests can change as the project progresses because stakeholders' ability to influence and control project decisions and actions depend on their level of power and other associated attributes in the project. These can change from stage to stage and even from time to time within the same stage during the projects' life cycle (Nash *et al*., 2010). Unless appropriate strategies are adopted for engaging and managing stakeholders based on their prevailing stance throughout the project's life cycle, they can spring up with surprises and hinder the progress of the project (Olander and Landin, 2005). In order to adopt the appropriate strategy for engaging stakeholders, it is necessary to understand the changing (dynamic) nature of stakeholders' attributes during the project. It should be noted that understanding stakeholders' dynamism depends largely on careful stakeholder analysis (Aaltonen *et al*., 2008). Therefore, this construct is indicated by project management's ability to effectively resolve conflicts among stakeholders; manage change of stakeholders' interest and influence; manage change of stakeholders' attributes; manage change of relationships among stakeholders; predict stakeholders' likely reaction for implementing project decisions and manage how project decisions affect stakeholders.

Under this construct, the following hypotheses are stated:

Hypothesis 6: Understanding stakeholder dynamism (SD) influences the overall impact of stakeholder management on construction project success (PS).

Hypothesis 7: Stakeholder analysis (SA) enables the understanding of stakeholder dynamism (SD).

Hypothesis 8: Understanding stakeholder dynamism (SD) enables effective stakeholder engagement/empowerment (SE).

Stakeholder Engagement/Empowerment (SE)

Given their dynamic nature and lengthy process of construction, stakeholders adopt different strategies at different stages of project to exert their interests on the project (Aaltonen *et al*., 2008), hence different appropriate strategies should be used for engaging/managing stakeholders at different stages of the project depending on the prevailing circumstances. Using the most appropriate strategies for engaging project stakeholders will enable project success to be achieved (Chinyio and Akintoye, 2008). For instance, while some stakeholders can be communicated to using letters/flyers about project decision others must be contacted directly through meetings/workshops or project website to get their inputs about the project depending on their classification in the project. Therefore, this construct is indicated by the project management's ability to involve relevant stakeholders in refining project mission whenever necessary; formulate appropriate strategies to manage/engage different stakeholders; keep and promote positive relationships among the stakeholders; communicating with stakeholders properly and frequently with feedback mechanisms; and considering all social responsibility issues surrounding the project.

Under this construct, the following hypotheses are stated:

Hypothesis 9: Effective stakeholder engagement/empowerment (SE) influences the impact of stakeholder management on construction project success (PS).

Hypothesis 10: Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) enables effective stakeholder engagement/empowerment (SE).

The conceptual structural model of the relationships among the critical success factors based on the hypotheses stated is shown in Figure 3.5.

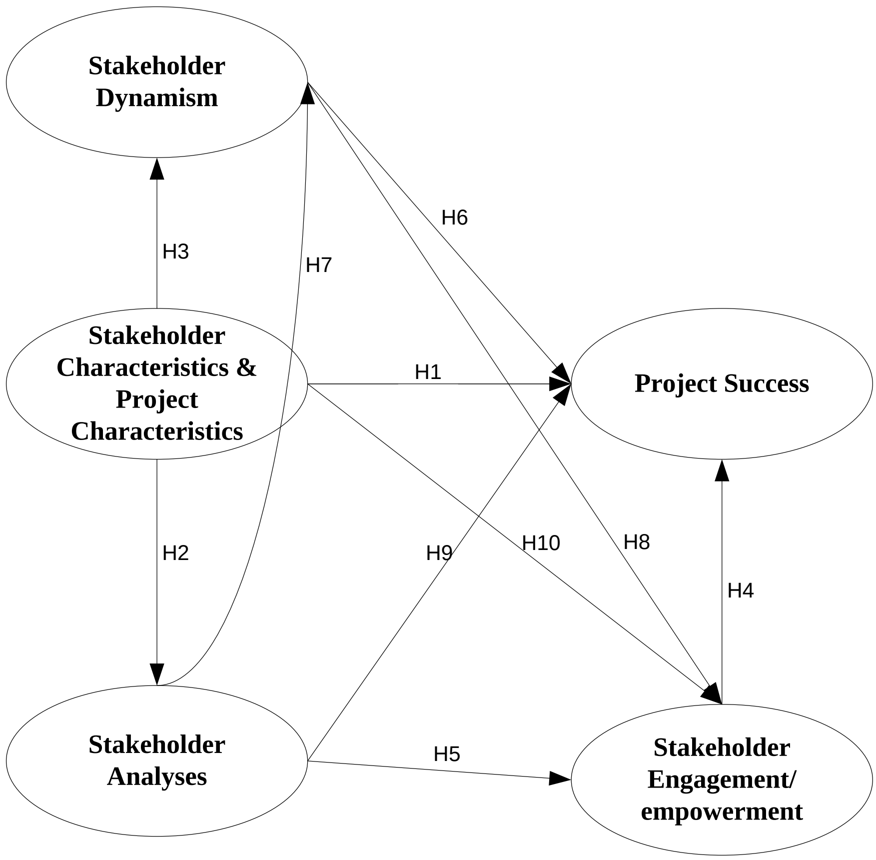

Figure 3.5 Hypothesised structural model of critical success factors for stakeholder management in construction

3.8 Chapter Summary

This chapter has reviewed topics necessitated by the review on stakeholder management in construction projects presented in chapter 2. They include project life cycle, construction project success, construction procurement routes and stakeholder collaboration in construction.

The review identified a distinction between project and project life cycle which hitherto have been confused, one for another. The project life cycle refers to the period from inception to practical completion and the product life cycle refers to the entire service life (operation) of the created facility up to close down. It was decided to combine these two views in developing a life cycle based framework for stakeholder management in construction projects. Therefore, four stages including inception, design, construction and operation are used.

The review on construction project success perception revealed that project success and project management success have been used interchangeably. While project management success refers to the achievement of completion to cost quality and time (the golden triangle), project success encompasses the golden triangle and stakeholder satisfaction with the created facility. Project management can be successful and yet the project may be considered a failure if it fails to serve its purpose to stakeholders' satisfaction. Conversely, project management can fail and yet the created facility is able to serve its intended purpose to stakeholders' satisfaction. Four key success indicators have been identified including completion of project on budget, completion on schedule, completion to specified standards/qualities and completion to stakeholders' satisfaction.

The review also identified procurement route as an important consideration in stakeholder management. Three groups of procurement routes including traditional, integrated and management based procurement routes have been related with stakeholder management process. 12 procurement routes related characteristics of stakeholder management have been identified with the need to investigate how they influence the stakeholder management process.

The review on stakeholder collaboration in construction projects revealed that it is necessary for internal stakeholder to collaborate in carrying out stakeholder management in construction projects. Internal stakeholders need to build mutual trust and respect with themselves and other stakeholders, share their individual knowledge and expertise, share in the common goal of stakeholder management and be committed to their assigned responsibilities throughout the process.

Using the findings of the review on stakeholder management presented in Chapter 2 combined with the review presented in this chapter, conceptual measurement and structural models have been developed to enable the investigation of the interrelationships among the critical success factors for stakeholder management in construction projects and how they are related to project success. The next chapter presents the research methodology adopted for the overall study presented in this thesis.

4. CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Introduction

Research practices are generally influenced by knowledge bases underpinned by philosophical ideas or philosophical worldviews based on which there are different options of research methods available for researchers of different disciplines (Creswell, 2009). It is necessary for researchers to choose from these to explain the choices they make in designing their research. This chapter discusses the research methodology for this study. It starts by giving a general background and comparison of the concepts guiding research design, explains the main components of the research design model found most suitable and adopted in this study for guiding research design and then presents the research design and methodology adopted for the study reported in this thesis as well as research validity and reliability.

4.2 Research Design Concepts

Researches generally are characterised by diversity of approaches to identifying and solving problems and there exist an extensive literature on the strengths and weaknesses as well as adoptability/suitability of these approaches for addressing research questions. Therefore, there are different ways to go about research design to achieve the aim and objectives of any research venture. According to Blaikie (2007), there are two ways to solving this problem of research design; either to adopt one approach or explore a combination of appropriate approaches for the research. It is important for researchers to instead of focussing on method only, focus on the problems in order to employ the most or all suitably available approaches ("tailor made design") to address the research question(s) (Rossman and Wilson, 1985; Patton, 1990; Morgan, 2007).

Therefore, for the purpose of adopting appropriate research design for this study, a comparison of four research design models including Nested model (Kagioglou, *et al*., 2000); Research 'onion' (Saunders, *et al*., 2009); 'Choices' (Blaikie, 2007); and research design 'framework' (Creswell, 2009) is presented.

Kagioglou *et al*. (2000) proposed a nested approach to modelling research design shown in Fig. 4.1. The nested design model is based on three circles in a ring with the research techniques and research approaches respectively forming the inner and middle circles which are guided by research philosophy in the outer circle. While research philosophy is the bases for the development of knowledge, research approach is the method used to generate and test theory such as case study, survey, action research and experiment and research techniques refer to the data collection means which include interview, questionnaire, observation or focus group workshop.

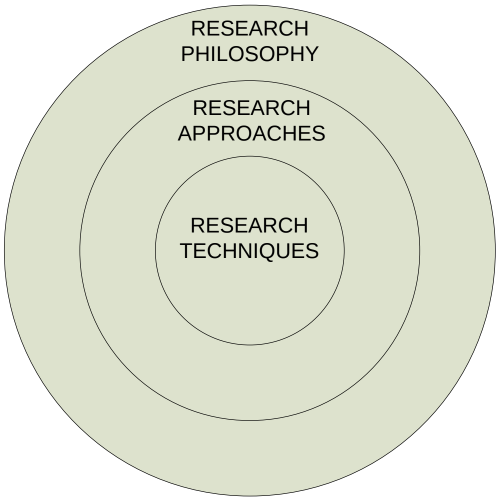

Figure 4.1 Nested research model (Kagioglou et al., 2000)

The research 'onion' (Saunders, *et al*., 2009) shown in Fig. 4.2, has six layers and is referred to as the research 'onion' because the six layers constituting the model resemble the rings of an onion. Each of these layers (research philosophies, research approaches, research strategies, time horizons, choices and data collection and data analysis offers a number of options from which to choose in order to achieve the aim and objectives of the research. While research philosophies form the outer ring, data collection and data analysis form the innermost (core) ring of the research 'onion' suggestive of the need to gradually peal the layers of the 'onion' one after the other starting from the outer (research philosophies) ring before arriving at appropriate research design.

According to Blaikie (2007), research strategies or logic of inquiries are associated to one or more research paradigms based on which researchers have to make some basic 'choices' in carrying out any research project (Fig. 4.3). Figure 4.3 shows, as indicated by the vertical arrows, that decision and choices on the research problem, questions, strategies and paradigms are interrelated such that it may become necessary for researchers to move back and forth between them before final decisions are made on which option(s) or combination(s) to adopt. The horizontal arrows indicate the basic categories among which to choose for each step in designing and conducting research.

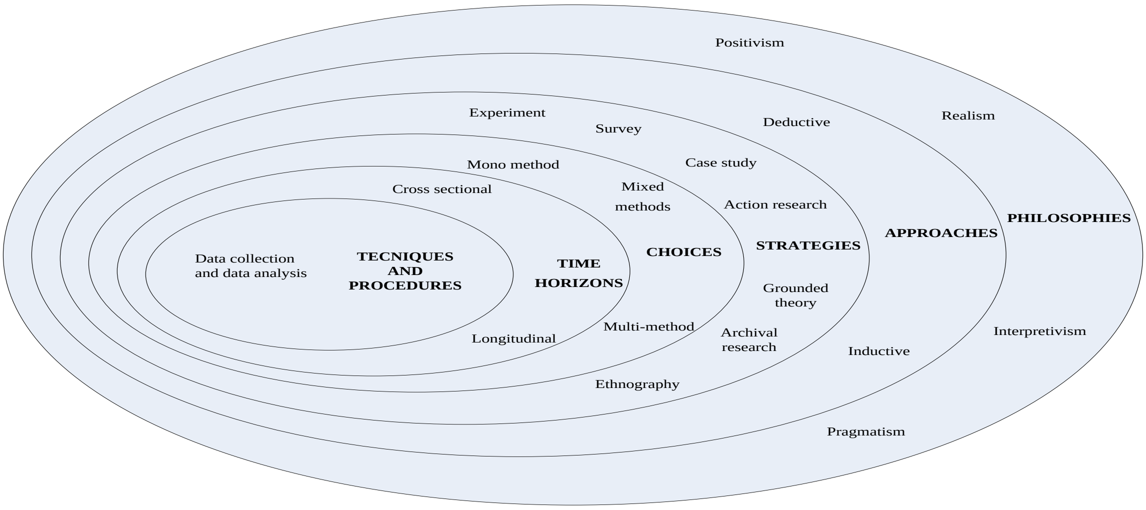

Figure 4.2 The research 'onion' (Saunders, et al., 2009)

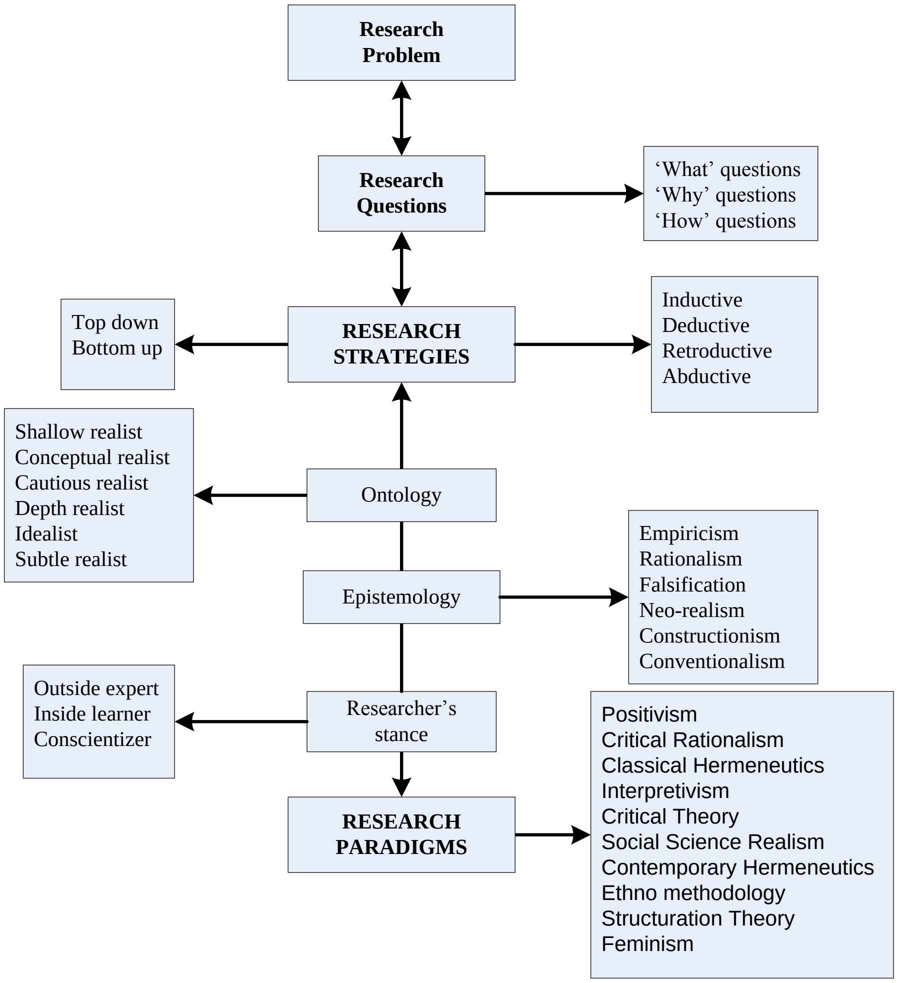

Figure 4.3 Research 'Choices' (Blaikie, 2007)

Creswell (2009) proposed a framework for research design based on the interconnection of worldviews, strategies of enquiry and research methods. Based on this framework (Fig. 4.4), arriving at research design involves determining the intersection of philosophies (philosophical world views), strategies of inquiry and specific methods in relation to the research question(s) to be addressed. Worldview refer to the basic set of beliefs that guides action otherwise referred to as epistemology and ontology (Crotty, 1998); research paradigms (Blaikie, 2007) while strategies are the types of qualitative, quantitative and mixed method that specifically direct procedures in research design and research methods are the specific steps involved in data collection, analysis and interpretation. This framework is hinged on the need for researchers to think through the philosophical worldview assumptions they rely upon, the strategies of inquiry that are related to this worldview and the specific research methods or procedures that put the approach into practice.

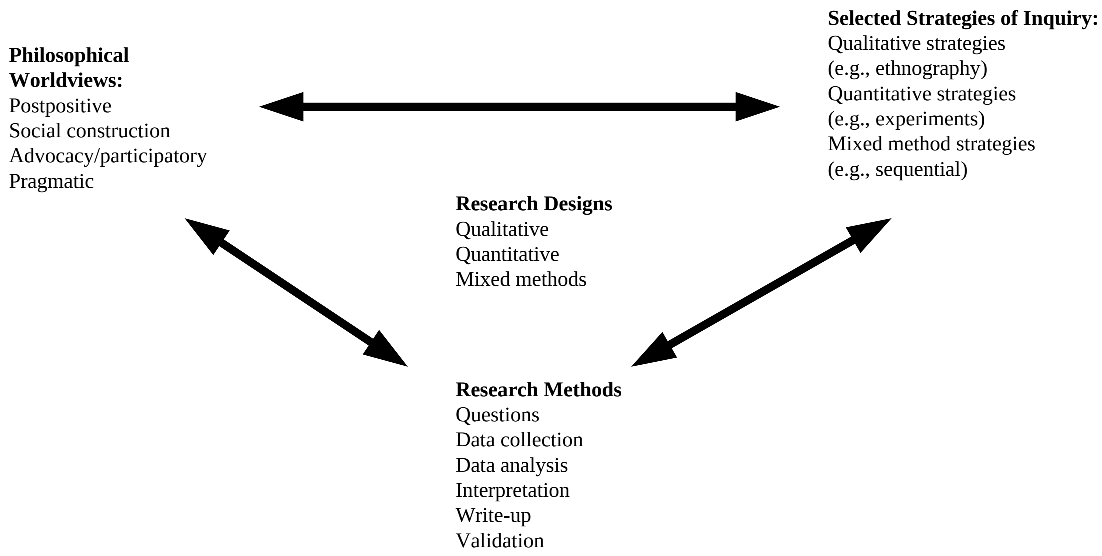

Figure 4.4 Framework for research design (Creswell, 2009)

The comparative features of these propositions for research design are shown in Table 4.1. All four of them have the research philosophy consideration included, although Creswell and Blaikie considered them under different names. Both the nested research model and the research onion have the research approaches, but they present slightly different options under them. The research approaches in the nested research model and the selected strategies of inquiry in the research design framework correspond to the research strategy layer in the research onion. Further, the research methods in the framework for research design is similar to the data collection methods layer of the research onion, just as the choices layer in the research onion is similar to the research design options in the research design framework. Also, the research paradigms (ontology and epistemology) in the choices are similar to the research philosophy in the three other models and the research strategies in the choices are similar to the research approaches in the research onion.

From this comparison, the research onion and research design framework are similarly more comprehensive and instructive in providing a base for formulating a research design. However, given the importance of time consideration in a research study, the time horizon layer makes the research onion the most detailed research design model among the four research design models compared (Table 4.1). Therefore, the research 'onion' by Saunders *et al*. (2009) is used to explain the research design outline for this study in the following sub-sections.

Table 4.1 Comparison of consideration in the four research design models

Research Design Framework (Creswell, 2009)	**Research Choices (Blaikie, 2007)**	**The Research 'Onion' (Saunders *et al*., 2009)**	**Nested Research Model (Kagioglou *et al*., 2000)**
Philosophical worldviews	Research paradigms (ontology and Epitemology)	Research philosophies	Research philosophies
	Research strategies	Research approaches	
Selected strategies of inquiry		Research strategies	Research approaches
Research design		Choices	
		Time horizons	
Research methods		Data collection and data analysis	Research techniques

4.2.1 Research philosophy

Research philosophy is concerned with the development of knowledge and the nature of the knowledge developed. It is important to understand the philosophical thoughts that underline the research methodology leading to the development of knowledge. Researchers philosophically make claims about what knowledge is (ontology), how knowledge is known (epistemology), what values go into knowledge (axiology), how knowledge is written (rhetoric), and the process of studying knowledge (methodology) (Creswell, 2003). Nonetheless, the main branches of philosophical thoughts in social science research include: Ontology, Epistemology and Axiology (Saunders *et al.*, 2009).

Ontology is the study of the nature of what exists. It is concerned with the state of being and it answers the question of what the nature of social reality is (Blaikie, 2007). Ontology is the starting point of all research, after which epistemological and methodological positions logically follow (Grix, 2004). This position was corroborated by Blaikie (2007) who posited that all research paradigms embody a world view underpinned by ontologically driven assumptions. Furthermore, while ontology embodies understanding what is, epistemology tries to understand what it means to know (Gray, 2009). Therefore, it is important to note that ontological and epistemological issues tend to emerge together (Crotty, 2003). There are two main ontological assumptions namely: Objectivism (realism) and Subjectivism (idealism) (Saunders *et al*., 2009; Blaikie, 2007). Objectivism is based on the believe that the existence of social entities is in reality external to the social actors concerned with their existence; and subjectivism is based on the believe that social phenomena are created by the perceptions, thoughts and consequent actions of the social actors concerned with their existence. Similarly, Blaikie (2007) explains the idealist and realist ontological assumptions as follows: "*An idealist theory assumes that what we regard as the external world is just appearances and has no independent existence apart from our thoughts. In a realist theory, both natural and social phenomena are assumed to have an existence that is independent of the activities of the human observer*."

Epistemology, is the theory or science of the nature of knowledge; which deals with its possibility, scope and general basis (Crotty, 2003; Blaikie, 2007). In other words, epistemology is concerned with what is considered as acceptable knowledge in a given field of study (Saunders *et al*., 2009). Furthermore, epistemology is concerned with the provision of philosophical bases for establishing what kinds of knowledge are possible to be known and how to decide that what have been known are both adequate and legitimate knowledge (Crotty, 2003). Similarly, Vogt *et al*., (2012) argued that epistemology is the study of the origin and justification of knowledge and its claims. Epistemology determines the stance of the researcher in the development of knowledge. The main epistemological stances a researcher can take include positivist and interpretivist stance. Positivism is based on the idea that only observable phenomena can lead to acceptable data, collection of which is based on hypotheses derived from existing theory. The positivist researcher is concerned with facts and that the conduct of research should be value-free such that neither the subject of the research nor the researcher influences each other. Interpretivism advocates the need for the researcher to understand differences between humans in their roles as social actors. The interpretivist researcher armed with the view that the world is subjective and socially constructed is actively involved in what is being studied (Saunders *et al*., 2009).

Axiology, the third main branch of philosophy is concerned with the study of value judgements. It may cover aesthetical and ethical values but the main concern of axiology as a branch of philosophy is the process of social enquiry linked with the role the researcher(s)' values play throughout the research process (Saunders *et al*., 2009).

In addition to the ones discussed under ontology and epistemology, there is a research philosophy (pragmatism) which is neither based on ontological nor epistemological knowledge claims alone. Pragmatism advocates that the most important consideration for deciding the appropriate knowledge claim for research should be the research question(s) since some knowledge claims may be more suitable than others for addressing different research questions or objectives. Moreover, the research questions to be addressed within a single study may be such that require a heterogeneous combination of different knowledge claims to be adequately addressed (Saunders *et al*., 2009). Adding the pragmatist philosophical position, a comparison of four research philosophies mostly used in management research is presented in Table 4.2 showing their ontological, epistemological, axiological stance as well as data collection techniques they most commonly use.

Table 4.2 Comparison of four branches of research philosophies (Saunders et al., 2009)

	Positivism	Realism	Interpretivism	Pragmatism
Ontology: the researcher's view of the nature of reality or being	External, objective and independent of social actors	Is objective. Exists independently of human thoughts and knowledge of their existence (realist), but is interpreted through social conditioning (critical realist)	Socially constructed, may change, multiple	External, multiple, view chosen to best enable answering of research question
Epistemology: the researcher's view of what constitutes acceptable knowledge	Only observable phenomenon can provide credible data, facts. Focus on causality and law like generalisations, reducing phenomena to simplest elements	Observable phenomena provide credible data, facts. Insufficient data means inaccuracies in sensations (direct realism). Alternatively, phenomena create sensations which are open to misinterpretation (critical realism). Focus on explaining within a context or contexts	Subjective meanings on social phenomena. Focus upon the details of situation, a reality behind these details, subjective meanings motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question. Focus on practical applied research, integrating different perspectives to help interpret the data
Axiology: the	Research is	Research is value	Research is value	Values play a

	Positivism	Realism	Interpretivism	Pragmatism
researcher's view of the role of values in research	undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	laden; the researcher is biased by world views, cultural experiences and upbringing. These will impact on the research	bound, the researcher is part of what is being researched, cannot be separated and so will be subjective	large role in interpreting results, the researcher adopting both objective and subjective points of view
Data collection techniques most often used	Highly structured, large samples, measurement, quantitative but can use qualitative	Methods chosen must fit the subject matter, quantitative or qualitative	Small samples, in-depth investigations, qualitative	Mixed or multiple methods designs, quantitative and qualitative

4.2.2 Research Approaches

The research approaches that guide and direct the procedures in a research design occupy the second layer of the research 'onion' (Fig 4.2). It is important for researchers to after adopting research philosophy decide which research approach is suitable for their research (Saunders *et al*., 2009). There are two research approaches; these include *inductive* and *deductive* approaches the logics of which are shown in Table 4.3. *Inductive* approach to research aims to establish a universal generalisation to be used as pattern of explanations; by first accumulating data to produce generalisations which are then used as patterns to explain further observations. *Deductive* approach to research on the other hand, aims to test existing theories, to eliminate false ones and corroborate the survivor; by identifying a regularity to be explained, constructing a theory and or deducing hypotheses which are then tested by matching them with empirical data (Blaikie, 2007). In other words, while the inductive approach is aimed at building theory and is based mainly on the collection of qualitative data; the deductive approach is aimed at testing theory and is based mainly on the collection of quantitative data. Furthermore, inductive approach requires a prolonged period of data collection and analysis as ideas emerged gradually; whereas, deductive approach takes shorter time provided care is taken to adequately set up the study before going into data collection and analysis (Saunders *et al*., 2009).

Table 4.3 The logics of Inductive and Deductive research approaches (Blaikie, 2007)

	Inductive	Deductive
Aim:	To establish universal generalisation to be used as pattern explanations	To test theories to eliminate false ones and corroborate the survivor
Start:	Accumulate observations or data	Identify a regularity to be explained
	Produce generalisations	Construct a theory and deduce hypotheses
Finish:	Use these 'laws' as patterns to explain further observations	Test the hypotheses by matching them with data

Research approaches have elsewhere, been referred to as qualitative and quantitative approaches instead of inductive and deductive approaches respectively; and mixed method when both qualitative and quantitative approaches are used (Tashakkori and Teddlie, 1998; Creswell, 2009; Walker, 2010; Creswell and Clark, 2011). Inductive (qualitative) and deductive (quantitative) approaches to research each have their weaknesses hence, it is possible to use a combination of these in a single research and take advantage of their strengths thereby minimizing their weaknesses (Blaikie, 2007). Some possible combinations (Figure 4.5) are discussed in section 4.2.4.

4.2.3 Research Strategies

There are seven different research strategies from which researchers can chose to use to answer their research questions and meet their research objectives (see the third layer of the research 'onion'- Figure 4.2). These include: experiment; survey; case study; action research; grounded theory; ethnography and archival research strategies (Saunders *et al*., 2009). The choice of appropriate research strategies should be guided by the research questions and aim, the extent of existing knowledge on the subject, the amount of time and other resources available to the researcher, and the researcher's philosophical standpoint. It is also important to note that the use of these strategies is not mutually exclusive and a suitably appropriate combination of two or more strategies can be adopted for one research. The different research strategies outlined in the research 'onion' are explained as follows.

a) Experiment

Experiment is a research strategy that is rooted in natural science laboratory-based research but is occasionally used in social science research if found applicable.

Experimental researches aim to ascertain the influence of a specific treatment on the behaviour of the study population or sample. This could be either based on random or non-random sampling and simple or complex (Walker, 2010). Whereas simple experiments consider whether there is a link between two or more variables, more complex experiments consider the type of link between them and the relative importance of two or more variables. Experiment research strategy can be used to answer the 'how' and 'why' questions in exploratory and explanatory research (Saunders *et al*., 2009).

b) Survey

The survey strategy is usually associated to the deductive approach to research and is mostly used to answer the 'who', 'what', 'where', 'how much' and 'how many' research questions (Saunders *et al*., 2009). Survey researches quantitatively or numerically describe the opinions, trends or attitudes of a population after studying a sample of the population. Survey strategy allows the collection of data in a representative sample in a highly economical way (Fellows and Liu, 2003). Data collection in survey strategy can be by questionnaire, structured observation or structured interviews (Newman, 2006; Saunders *et al*., 2009). All of these could allow the collection of quantitative data which can be analysed using inferential and descriptive statistics. It can be used to suggest possible relationships between different variables as well as produce models of these relationships. It is important to invest time in designing and piloting data collection instruments when using survey research strategy to avoid the need to collect another set of data for lack of the luxury of time (Saunders *et al*., 2009).

c) Case Study

In case studies research, the researcher set out to explore in depth, a particular program, event, activity, process, project, or one or more individuals. Researchers use different procedures to obtain detailed information about the case(s) over sustained period of time (Creswell, 2009). Case study research strategy enables researchers to answer the 'why', 'what' and 'how' questions in their research and is most often employed in exploratory and explanatory research. Different data collection techniques including interviews, observations, documentary analysis and if necessary, questionnaires can be used in case study research. They could be used either separately or in combinations to address research question(s) in a single research (Saunders *et al*., 2009). There are two two-dimensional categories of case studies, depending on either the number of cases or unit of analysis used. These include single case or multiple cases; and holistic case or embedded case (Yin, 2003). A *single case* is selected to study a phenomenon when it represents a critical case or alternatively an extreme or unique case. Additionally, a single case may be used if it justifiably gives the researcher a unique opportunity to study a scarcely considered phenomenon. *Multiple cases* is a case study strategy in which more than one case studies are used in order to establish whether or not the findings from the first case occur in the subsequent cases and consequently generalise the findings or otherwise. If the researcher's only concern is the organisation as a whole, the case study strategy is referred to as a holistic case. Whereas, if the researcher, even though, using a single organisation, examines a number of logical sub-units within the organisation, then the strategy is referred to as an embedded case. Case study is a very worthwhile strategy for exploring existing theory and can enable the researcher to challenge existing theory if well-constructed (Saunders *et al*., 2009).

d) Action Research

Action research strategy begins with the aim of finding a tentative solution to an already defined problem. It is distinct from other research strategies due to its explicit focus on action aimed at promoting change within an organisation. Here, the researcher is directly involved in the action and subsequent application of knowledge gained. Furthermore, action research strategy draws strength from its focus on change, recognition of the need to devote time for diagnosing, planning, taking action, evaluating and involvement of employees (practitioners) throughout the research process (Fellows and Liu, 2003; Saunders *et al*., 2009).

e) Grounded Theory

Grounded theory involves the collection of data across multiple stages and the refinement and interrelationship of the different categories of information obtained. The information so obtained is then used to derive a general abstract theory of the process, action or interactions grounded in the views of the research participants (Creswell, 2009). Grounded theory is concerned with in-depth systematic investigation of phenomena with the aim of constructing a theory inductively (from the ground). It follows a process of iterative data collection and analysis at multiple stages during the research in order to gradually construct a theoretical understanding of the data set (Vogt *et al*., 2012). Grounded research strategy starts to collect data without building an initial theoretical framework to guide the process. The data so generated from all stages of the research are then used to develop theories which are then tested in further observations (Saunders *et al.*, 2009). Collection of data in grounded theory research can be done using any or a combination of interviews, observations, documents, historical information, videotapes and any other sources of information relevant to the research question(s).

f) Ethnography

Ethnography primarily involves the collection of data using interviews and observations over a prolonged period of time within a social/cultural group in a natural setting (Creswell, 2007). In ethnographic research, the researcher is completely immersed in the social world being studied as much as possible in order to enable extensive observation and description as well as explanation of the phenomenon being studied (Saunders *et al.*, 2009). The researcher being part of the social world being studied enables the collection of all available data relating to the research question(s) (Flick, 2006). Before using the ethnographic research strategy, it is necessary for the researcher to first identify a suitable setting and secure the trust of the participants as well as prepare to spend the much needed time for the research questions to be adequately addressed (Saunders *et al,*. 2009).

g) Archival Research

Archival research strategy is that in which research questions that focus on the past as well as changes over time are answered. Archival research strategy principally, uses administrative records and documents as sources of data to address research questions which may be exploratory, descriptive or explanatory in nature (Saunders *et al*., 2009).

4.2.4 Research Choices

Research choices which occupies the fourth layer of the research 'onion', refers to how researchers chose to combine the use of quantitative and qualitative data collection and analysis techniques and tools in the same research. Researchers can choose to use a single data collection technique and corresponding data analysis tool or use more than one techniques and tools to collect and analyse data in addressing their research problem(s) (Saunders *et al*., 2009). A comparison of single and mixed methods is presented in Table 4.4, indicating how qualitative and quantitative methods converge into mixed methods.

Table 4.4 Quantitative, Mixed and Qualitative methods (Creswell, 2009)

Quantitative methods →	Mixed methods	← Qualitative methods
• Pre-determined • Instrument based questions • Performance data, observation data, and census data • Statistical analysis • Statistical interpretation	• Both pre-determined and emerging methods • Both open- and closed-ended questions • Multiple forms of data drawing on all possibilities • Statistical and text analysis • Across databases interpretation	• Emerging methods • Open-ended questions • Interview data, observation data, document data and audio-visual data • Text and image analysis • Themes, pattern interpretation

More detailed possible options of research choices are shown on Figure 4.5. The use of a single technique is called mono method and the use of more than one technique is called multiple methods. The multiple methods are further divided into multi-method and mixed-methods. It is referred to as multi-method when researchers decide to use more than one quantitative or alternatively, qualitative data collection and analysis techniques and procedures restrictively (see Figure 4.5) in a single research design. When both quantitative and qualitative techniques and procedures are used for data collection and analysis, the research design choice made is referred to as mixed methods approach. Mixed methods research choices are further subdivided into mixed-method research and mixed-model research. Mixed method research is when quantitative and qualitative data collection techniques and analysis tools are used either at the same time (in parallel) or in turns (sequentially) (Tashakkori and Teddlie, 1998; Saunders *et al*., 2009). Depending on what the research seeks to achieve, the researcher using mixed-methods is able to switch between qualitative and quantitative methods or use both of them at the same time do achieve different and or related aspects of the research (Walker, 2010). On the other hand, mixed-model research is that in which, combinations of quantitative and qualitative data collection techniques and analysis tools are used such that; quantitative data can be converted to narratives and be analysed qualitatively or qualitative data can be operationally converted to numerical codes and be analysed statistically.

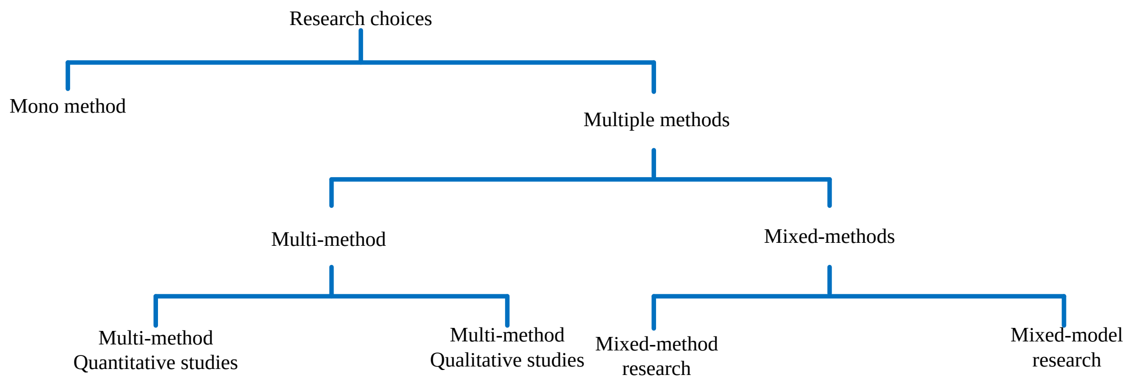

Figure 4.5 Research choices (Saunders et al., 2009)

Furthermore, there are three major types of mixed methods research namely: sequential mixed methods, concurrent (parallel) mixed methods and transformative mixed methods. In sequential mixed methods, the researcher uses qualitative and quantitative methods in sequence with each of them helping to achieve different aspects of the same study. For example, "*the study may begin with a quantitative method in which a theory or concept is tested, followed by a qualitative method involving detailed exploration with a few cases or individuals*" (Creswell, 2009).

In concurrent (parallel) mixed methods, as the name implies, the researcher combines both qualitative data and quantitative data at the same time in order to comprehensively address the research question(s). The researcher using concurrent mixed methods, simultaneously collects both form of data and then integrates the available information to interpret the overall research outcome or embeds one smaller form of data within a major form of data collection in order to address different aspects of the research questions (Creswell, 2009; Creswell and Clark, 2011).

Transformative mixed methods involve the use of theoretical bases for a research design that contains both qualitative and quantitative approaches. The theoretical lens according to Creswell (2009) "*provides a framework for topics of interest, methods for collecting data and outcome or changes anticipated by the study*". This could involve collecting data based on either sequential or concurrent approaches.

4.2.5 Time Horizons

The last but one layer of the research 'onion' is 'Time horizon'. Time horizons consideration in research design determines whether the research is carried out at a particular time or over a given period of time. It always depends on the research questions the researcher seeks to address and the amount of time available, regardless of which research strategies are methods are chosen. Time horizon can be considered to be either cross-sectional or longitudinal (Saunders *et al.*, 2009). Cross-sectional time horizon is said to be the case if the research is undertaken at a particular point in time (i.e as a ‘snapshot’). On the other hand, longitudinal time horizon is said to be the case if the research is carried out over a given period of time.

4.2.6 Data Collection and Data Analysis

Occupying the last layer but at the centre of the research ‘onion’ are the data collection and data analysis considerations in research design. There are many techniques and tools for collecting and analysing data respectively depending on the nature of questions to be addressed in the research (Saunders *et al*., 2009; Cresswell, and Clark, 2011). Data collection techniques include observation, questionnaires, interviews, experiments, etc and the corresponding data analysis tools will depend on the type of data collected, whether it is quantitative or qualitative. These are discussed in section 4.3.

4.3 Research Design (Methodology) Adopted

The current research is aimed at developing a framework for carrying out stakeholder management in construction projects. In order to achieve this aim, six objectives (presented in section 1.3 of chapter 1) constituting major stages were set out for the study. The first is to review previous research on stakeholder management in construction projects, in order to identify research gaps and define the focus of the study. The outcome of the first stage gave rise to the need to review related topics such as project success, procurement routes, project life cycle, and stakeholder collaboration as part of the first stage before moving on to the second stage. The subsequent stages of the study were based on the findings from the first stage. The second stage was to investigate current practice of stakeholder management in construction projects followed by the need to assess the effects of procurement routes and forms of contracts on stakeholder management in construction projects. The fourth stage of the study was to model the interrelationships among critical success factors for stakeholder management in construction projects and relate them to project success. The fifth stage was to develop a comprehensive framework for stakeholder management in construction projects based on the outcome of the four preceding stages and the sixth stage was to test the framework developed. The methods adopted to address the stages of the study include literature review (for stage one), survey using questionnaire for stages (two, three and four), process modelling was used for stage five and structured interview and questionnaire for stage six. The research process is shown in Figure 4.6.

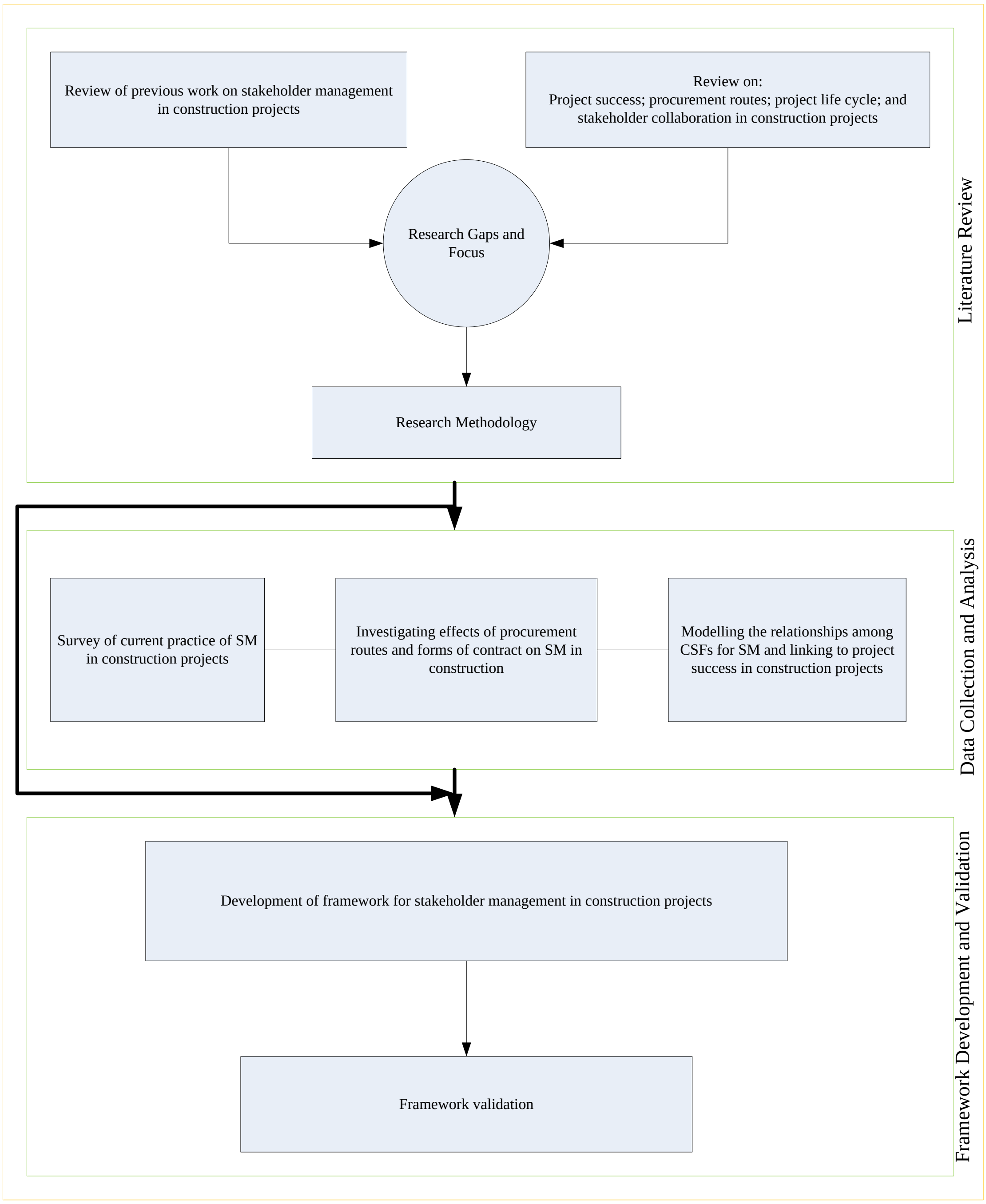

Figure 4.6 The research process

4.3.1 Literature Review

The research process commenced with literature review on stakeholder management in construction. Key among the outcome of the literature review include identification of critical success factors for stakeholder management in construction projects, need to carry out stakeholder management in construction project throughout the project life cycle, lack of clarity as to who should be responsible for stakeholder management in construction projects, need for collaboration among internal stakeholders, and need for a comprehensive framework for stakeholder management in construction projects. Based on these the research focus was set and a questionnaire was designed for data collection to address the succeeding objectives of the study.

4.3.2 Research Design

After identifying the research problem(s) and or research questions, the choice of a suitable research method or any possible combination of research strategies is very important before proceeding further with the research. There is not just one correct way to research design: it is up to the researchers to circumspectly decide which options they think work best for their research. Research design is all about making appropriate choices from the many available options to address research question(s) (Walker, 2010). Philosophical world views, research strategies, research methods and other necessary considerations all combine to make up the research design which could be based on quantitative qualitative or mixed method research approaches as shown on Table 4.5 presenting the distinct practices of the three approaches (Creswell (2009).

Table 4.5 Quantitative, Qualitative and Mixed methods approaches (Creswell, 2009)

Tend to or typically:	Qualitative Approaches	Quantitative approaches	Mixed methods approaches
• Use these philosophical assumptions	• Constructivist/advocacy/participatory knowledge claims	• Post-positivist knowledge claims	• Pragmatic knowledge claims
• Employ these strategies of inquiry	• Phenomenology, grounded theory, ethnography, case study and narrative	• Surveys and experiments	• Sequential, concurrent and transformative
• Employ these methods	• Open-ended questions, emerging approaches, text or image data	• Closed-ended questions, predetermined approaches, numeric data	• Both open- and close-ended questions, both emerging and predetermined approaches and both quantitative and qualitative data and analysis

Tend to or typically:	Qualitative Approaches	Quantitative approaches	Mixed methods approaches
• Use these practices of research as the researcher	• Positions him- or herself • Collects participant meanings • Focuses on a single concept or phenomenon • Brings personal values into the study • Studies the context or setting of participants • Validates the accuracy of findings • Makes interpretations of the data • Creates an agenda for change or reform • Collaborates with the participants	• Tests or verifies theories or explanations • Identifies variables to be studied • Relates variables in questions or hypotheses • Uses standards of validity and reliability • Observes and measures information numerically • Uses unbiased approaches • Employs statistical procedures	• Collects both qualitative and quantitative data • Develops a rationale for mixing • Integrates the data at different stages of inquiry • Presents visual pictures of the procedures in the study • Employs the practices of both qualitative and quantitative research

Based on the research design model (Figure 4.2) chosen to guide this research, the research design components found suitable and adopted for this study are shown in Figure 4.7.

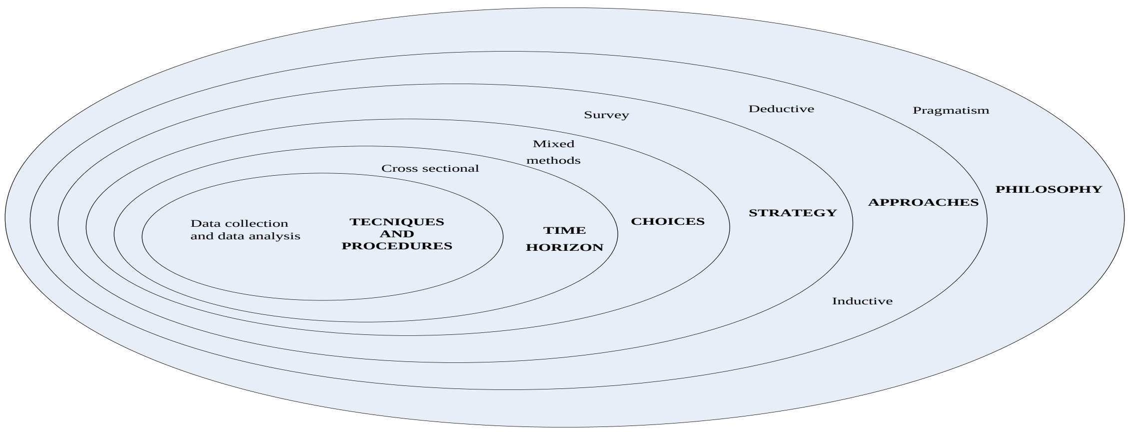

Figure 4.7 Research design for this study

Research philosophy: The research philosophy adopted for this study is pragmatism. A pragmatic approach which is based on actions, situations and consequences and allows the use of both quantitative and qualitative assumptions as well as a combination of both (mixed method) was adopted for this study (Creswell, 2009). The objectives of this study required the use of both qualitative and quantitative data/information both of which are explained by different knowledge claims as discussed in section 4.2.1 and shown on Table 4.2. Objectives 1 and 6 were based on qualitative data whereas objectives 2, 3 and 4 were based mainly on quantitative data.

Research Approach: Both qualitative and quantitative approaches are adopted to address different aspects of this study. Quantitative approaches were used to model the relationship between critical success factors for stakeholder management in construction projects and to assess the effects of procurement routes on stakeholder management process. Combinations of qualitative and quantitative approaches were used to investigate the current practice of stakeholder management in construction projects and to validate the framework developed for stakeholder management in construction projects.

Research Strategies: The main research strategy is survey research strategy. Survey strategy was chosen because it allows the collection of large amount of data within constrained time and resources yet ensuring credible data are obtained (Saunders *et al*., 2009). In the survey, the same questionnaire was used to collect mostly quantitative data and a bit of qualitative data to address objectives 2 to 4 (see section 1.3) and structured interviews was used to collect data for the purpose of validating the framework.

Research Choices: The qualitative and quantitative techniques were used in a complementary manner in order to address all aspects of the study which would have normally not been adequately addressed by either of the techniques if it was used alone in the study. This was very necessary in this study because, while some of the objectives can be addressed using qualitative techniques others can only be addressed through the use of qualitative techniques of data collection (information retrieval). Several reasons have been advanced for using mixed methods strategy in research, these include: triangulating data sources to obtain convergence between qualitative and quantitative methods, to integrate and or connect qualitative and quantitative data, to use the results from qualitative data and quantitative data side by side to complement or reinforce each other because one source may be insufficient, when there is need to generalise exploratory findings, when there is need to explain initial results (Creswell, 2009; Creswell and Clark, 2011). Literature review was used to address objective 1. Questionnaire survey was used to obtain quantitative and qualitative data to address objectives 2, 3 and 4. IDEF0 process (explained in Chapter 8) was used to address objective 5. Questionnaire/interviews were used to address objective 6.

Time Horizons: Time horizons form an important consideration in the study due to time limitations. The cross-sectional time horizon option guided the conduct of both the quantitative and qualitative aspects of the study. The objectives of the research as outlined in section 1.3 do not require a longitudinal study to be addressed since the study was not designed to observe any change over a period of time.

Data Collection method: The main data collection technique was questionnaire survey administered among experienced construction professionals practicing in the UK construction industry. A questionnaire can easily be completely quantitative, completely qualitative or a suitable combination of both quantitative and qualitative, because each question in a questionnaire seeks to obtain one type of data or the other (Walker, 2010). The questionnaire used in this study was designed predominantly to collect quantitative data with ample opportunity provided for the respondents to make comments in order to elicit any information that may have been missed by the questions and options provided. Structured interviews/questionnaires were used to collect qualitative and quantitative data to validate/evaluate the framework.

Questionnaire: The survey conducted to collect data for this study used a close ended questionnaire with an opportunity provided for respondents to make comments freely. A questionnaire survey (Appendix A) was designed under three sections covering the research objectives to elicit responses from construction professionals within the United Kingdom. The first section collected background information of the respondents; the second section collected data on the critical success factors for stakeholder management and the effect of procurement routes on stakeholder management process; and the third section collected data on the current practice of stakeholder management in construction projects. Professionals in architecture, construction management, quantity surveying, engineering, facility management, etc with at least five years of relevant professional experience were targeted to participate in the survey. The survey respondents were asked to respond to the questions based on their most recently completed project. The questionnaire also gathered background information of the respondents in order to ensure that they have the required background and years of professional experience to take part in this survey. A minimum of 5 years relevant professional experience was set for sampling the respondents to ensure they have participated in some projects up to completion so that they can have practical knowledge of stakeholder management issues.

For the purpose of sampling, a minimum of 50 responses was required to achieve the objectives of the current study (Iacobucci, 2010). Using an estimated response rate of 25% based on the average response rate obtainable in similar research in construction management, the sample population for the current study was determined as follows: $[(50 \times 100) \div 25] = 200$ (Saunders, *et al*. 2009). The survey link was sent to 200 professionals practicing within the United Kingdom. After two reminders (at one month's interval each) a total of 74 responses were received representing 37% of the total number of respondents to whom the link to the survey was emailed. Out of the 74 responses received, only 61 (30.5% of respondents contacted) were found suitable and accepted for analysis; 13 were rejected for having less than 5 years of professional experience in construction and/or for incomplete responses.

The following steps were taken in order to facilitate high response rate:

- Including a cover/invitation letter in which details about the research and researcher are provided encouraging participants to voluntarily complete the questionnaire with the assurances of anonymity and confidentiality in collating and handling their responses.
- The questionnaire was divided into three relevant groups. The questions were made closed very clear with all of them having options except the last question where respondents were required to comment freely.
- The observations from the pilot study carried out were taken into account before the questionnaire was sent out to respondents. Reminders were sent out twice to respondents.

Framework Development and validation/evaluation: The framework development was based on the outcome of the survey data analysis. The results of the data analysis were combined with important indications from literature review to form the components and structure of the framework. The life cycle based framework for stakeholder management in construction covers four stages including stakeholder management at inception, design, construction and operation stages. More details on the methodologies adopted for framework development and validation/evaluation are presented in chapters 8 and 9 respectively.

Data analyses: Regarding data analyses tools, different statistical techniques were used to analyse data collected aimed at addressing different objectives. Structural equation modelling (SEM) which was used to model the interrelationships among critical success factors for stakeholder management and other corresponding data analysis tools are discussed in section 4.4.

4.3.3 Validity and Reliability of Research Design

Validity is the extent to which a test measures what it set out to measure and reliability is the extent to which a test can consistently measure something. The need for validity applies to all stages of a research project including design, data collection and analysis. The literature on research methods refers to four main tests of validity including external validity, internal validity, construct validity and evidence-inference validity (or reliability) (Saunders *et al*., 2009; Creswell and Clark, 2011; Vogt *et al*., 2012). These tests are discussed below indicating the steps taken in this research to ascertain them.

External validity: External validity is concerned with the generalisability of the findings of the research and is the main criterion for deciding the quality of the populations and samples selected for the study (Saunders *et al*., 2009). In order to attain external validity in the current research, the survey respondents were ensured to be very relevantly experienced professionals practicing in the construction industry within the United Kingdom-the study site (Iacubucci, 2009). Furthermore, the purpose of the research was clearly stated in the invitation sent to respondents to participate in the survey. Additionally, a minimum threshold was set for the number of responses required for analysis.

Internal validity: Internal validity has to do with the extent to which the research design and data collected are able to adequately address the research question(s). The test of internal validity is applicable for explanatory and causal studies (Yin, 2003). Internal validity was ensured through the extensive review of relevant theories leading to a carefully drawn research design (presented in section 4.3.2). In designing the research, it was ensured that appropriate choices were made of data collection instruments and analysis techniques to adequately address the research objectives.

Construct validity: Construct validity is concerned with data coding which determines the extent to which the operationalisation of the constructs and concepts in the data collection instruments are true and appropriate for addressing the research question(s) (Saunders *et al*., 2009). Two steps were taken to ensure construct validity in the current research including pilot study of the questionnaire and validation of the results with selected industry practitioners. The pilot study was undertaken after ensuring that all the objectives of the research had questions aiming to address them. The aim of the pilot study was to ensure that the questionnaire was unambiguous, intelligible, easy to answer, as well as to ascertain the average time taken by respondents to complete the questionnaire (Saunders *et al*., 2009).

Evidence-inference validity: Evidence-inference validity borders on the appropriateness of the data analyses techniques used in the research and the extent to which they lead to reliable interpretations of results obtained (Creswell and Clark, 2011). To attain evidence-inference validity also known as reliability in the current research, the data collection analysis techniques were carefully selected. Very importantly, to address the objective of modelling the relationships between the CSFs for stakeholder management in construction, structural equation modelling was used because of its advantages over other multivariate data analysis tools as explained in section 4.4.

4.4 Data Analyses Techniques

Different data analyses techniques were employed to address the objectives of this study including mean rating, Kruskal-Wallis test, Mann-Witney test, correlation and structural equation modelling (SEM). These are explained in the following sub-sections:

4.4.1 Mean rating

Mean rating uses the numerical values assigned to factors or propositions to calculate their mean scores by all the respondents of the survey. This statistical technique was used to analyse respondents' rating in different questions included in the questionnaire. For example, mean rating was used to analyse respondents rating of the importance of critical success factors for stakeholder management and procurement routes related characteristics of stakeholder management process in construction (Pallant, 2007).

4.4.2 Kruskal-Wallis Test

The Kruskal-Wallis test is used to test for differences between the opinions of different (more than two) independent groups within the data set. It converts scores to ranks and the mean ranks for each group are compared (Pallant, 2007). The requirement for using Kruskal-Wallis test is that, there must be different people in each of the groups. This was used to explore differences across respondents with different years of professional experiences, professional field of practice, those employed by different types of clients and those using different forms of contracts within the data set.

4.4.3 Mann-Witney U Test

The Mann-Witney U test is useful for testing differences between two independent groups only on a continuous measure. It is similar to the Kruskal-Wallis test except that it cannot compare more than two independent groups (Pallant, 2007). It was used in this study as a complementing analysis to explore differences between pairs of independent groups where significant difference was found after using the Kruskal-Wallis test.

4.4.4 Correlation

Correlation analysis is used to examine the strength and sign of linear relationship between two variables. There are different options available in SPSS depending on the nature of data and level of measurement. The most commonly sued options include Pearson product-moment correlation coefficient and Spearman correlation coefficient. The Pearson product-moment correlation coefficient deals with intervals variables or a combination of interval and dichotomous variables. While the Spearman correlation coefficient deals with ordinal level or ranked data (Pallant, 2007). Since the data in this study involved continuous variable on a Likert scale, the Pearson product-moment correlation coefficient was used to examine the linear relationships between the procurement routes related characteristics of stakeholder management in construction projects.

4.4.5 Structural equation modelling (SEM)

4.4.5.1 Basic principles and Justification for using SEM

Different multivariate statistical methods are available for analysing relationships among variables (dependent and independent) in research, popular among these include: Regression analysis (simple and multiple regression analysis); Path analysis (PA); factor analysis (FA); and Structural equation modelling (SEM). Each of these is discussed in the following sub-sections.

Regression Analyses (RA): These are statistical tools used to address research problems concerned with either single measure dependent variables or more than one independent variable. The former is referred to as simple regression analysis (SRA) while the latter is referred to as multiple regression analysis (MRA). The scope of the current research however is not concerned with SRA. Therefore only MRA is of interest in this discussion. Multiple regression analysis is a statistical technique used to analyse the relationship between a single dependent variable and a set of independent variables. There is an underlying assumption in MRA that the sample population from which the data is collected and the resulting data are normally distributed. It also assumes that the dependent and independent variables are directly observable hence are easy to measure during data collection (Hair, *et al*., 1998). Although it is capable of simultaneously analysing the relationships between the dependent variable and each of the independent variables, the weakness of MRA is that it does not accommodate any linear relationships (or multicolinearity) among the independent variables of the model and does not account for measurement errors.

Path Analysis (PA): Path analysis involves the measurement of more than one dependent variable simultaneously, which makes it more advanced than MRA in which only one dependent variable is measured at a time. In path analysis, some variables can be dependent on other observed variables and at the same time they are independent on different other observed variables within the same model (Norman and Streiner, 2003). It however, does not measure the interrelations among latent variables (constructs/factors) and therefore, is not suitable for analysing research problems involving interrelationships.

Factor Analysis (Exploratory) (FA): There are two types of factor analysis: Principal component analysis (PCA) and common factor analysis (FA) both of which are used to explore the relationships among many interrelated variables in order to reduce or group them into smaller number of factor groupings (factors/constructs) and to explain the variables in terms of their common underlying dimensions (factors/constructs) (Hair, *et al*., 1998; Ozorhon *et al*., 2011). Furthermore, factor analysis is useful for determining how measured variables are explained through a smaller number of factors which are also referred to as latent variables or constructs. FA does not measure the relationships among the smaller groups (i.e. latent variables or constructs) which may be of interest to the researcher. The objective of factor analysis is to reduce the information originally contained in a number of variables into smaller groups without significant loss of information in an exploratory manner (Hair, *et al*., 1998). If a study requires a method that can in addition to what factor analysis does, simultaneously assess the validity and reliability of the relationships between the indicator (observed) and latent (unobserved) variables and test the interrelationships among latent (unobserved) variables of the model; FA will not be adequate.

Structural equation modelling (SEM): The use of structural equation modelling (SEM) in research has expanded steadily over the past two decades in a wide range of disciplines especially for researches in which most of the key concepts are not directly observable (Westland, 2012). It is a multivariate method of analysis used in examining interrelationships using operational data. It is capable of assessing the direct and indirect effects and relationships among the variables of a model. The underlying premise for SEM is that some very important variables to the researcher are not directly observable (latent variables) therefore they need to be observed or measured through other factors which can be measured operationally (Molenaar *et al*., 2000). Furthermore, SEM is a statistical technique that simultaneously combines a measurement model (confirmatory factor analysis) and structural model (regression or path analysis). The measurement model (confirmatory factor analysis (CFA)) is used to test hypothesised relationships between observed variables and their underlying latent variables (constructs or factors), that is how well the indicators measure the latent variables; and the structural model is used to test the interrelationships among the latent variables based on the researcher's knowledge of extant theory or empirical research in the subject area (Wong and Cheung, 2005; Byrne, 2010). Although it is not within the scope of the current paper, it should be noted that there are different software packages and approaches available for SEM users and details on these can be found in (Yuan *et al*., 2010; Byrne, 2010; Kline, 2010; Westland, 2012).

Before discussing the features and process of SEM further, it is worthwhile to present its comparative advantages over other multivariate analysis techniques (Hair *et al*., 1998; Byrne, 2010) which include the following:

1. It adopts a confirmatory rather than exploratory approach to data analysis and can still address aspects of the exploratory approach to data analysis. This is achieved by requiring that the pattern of intervariable relationships be hypothesised. Whereas most other multivariate methods are descriptive in their approach making it difficult for them to be used for theoretical hypotheses testing;

2. It provides explicit estimates of the error variance parameters especially of the independent variables which the older and traditional multivariate methods are not capable of doing;
3. It incorporates both observed and unobserved (latent) variables in data analysis but the other traditional methods are based only on observed variables; and
4. It has the unique features for modelling multivariate relationships and for estimating point as well as interval effects among variables in relationships simultaneously.

Given these advantages, SEM has become an increasingly popular methodology for non-experimental research and has been widely used by construction management researchers (Molenaar *et al*., 2000; Mohamed, 2002; Islam and Faniran, 2005; Chinda and Mohamed, 2008; Wong *et al*., 2008; Cho *et al*., 2009; Doloi, 2009; Doloi *et al*., 2011; Doloi *et al*., 2012a); to investigate different issues (see section 3.2 for more).

To examine the groupings of the critical success factors for stakeholder management in construction, confirmatory factor analysis (also known as the measurement component of SEM) can be used. Whereas, to investigate the interrelationships among the CSFs through their constructs; different forms of regression analysis can be used in a step by step fashion. However, the hypothesised models in the current study require the interrelationships to be explored simultaneously in a holistic manner so that errors of measurement can be adequately taken into account. To achieve this objective structural equation modelling (SEM) was considered most appropriate. SEM was chosen as the data analysis method among the other multivariate statistical analysis methods due to its ability for the simultaneous examination of relationships among a number of dependent (Latent) and independent (observed) variables (Hair *et al*., 1998). Another reason for choosing SEM was its ability to take into account the measurement errors inherent in subjective operational measurement and to define and explain the entire set of relationships in the hypothesised model (Byrne, 2010).

SEM like other multivariate statistical techniques involves the indicators (observed variables) and latent variables (constructs or factors) with the indicators being the variables through which the latent variables are measured. It should also be noted that there are two types of latent variables possible in a SEM model; exogenous and endogenous latent variables. The exogenous latent variables can also be referred to as independent variables. They give rise to fluctuations in the values of other latent variables and changes in them are not explained in the model because they are normally not included in the model specification. Endogenous latent variables are influenced by the exogenous latent variables either directly or indirectly. Changes in the values of endogenous latent variables are explained in the model since all latent variables that influence them are normally included in the model specification (Byrne, 2010).

The development of SEM usually goes through some stages (Hair *et al.*, 1998) which include:

1. Identify and define (operationally) the structural and measurement components (which include latent variables, measured variables and any other variables) based on theory. The measurement component of SEM deals with the relationships between the latent variables and their indicators whereas, the structural component deals with the relationships among the latent variables in the model;
2. Set up a hypothetical model (model specification) which sometimes may involve setting up more than one models (competing models) depending on the theoretical bases and aim of the research;
3. Assess the validity of the structural model using data collected based on the operationalised components (variables) of the model by evaluating model estimates and goodness of fit; and
4. Identify potential model changes and modify the model with theoretical justification.

It is vital during model specification, for researchers to ensure model identification. A model is said to be identified if a unique solution for the values of the structural parameters in the model can be found. This is an indication of whether or not the model parameters can be estimated to enable testing the model through empirical evaluation. There are three levels of identification possible for structural models specified in SEM: Under-identified, just-identified and over-identified model (Byrne, 2010). The level of identification is indicated by the "degrees of freedom" which is the result of subtracting the number of parameters to be estimated from the total data points. An under-identified model is that in which the number of parameters to be estimated is more than the number of data points (variances and covariances of the observed variables) in the model. This gives rise to negative degrees of freedom, indicating there is insufficient information for evaluation in the model. A just-identified model is that in which the number of parameters to be estimated equals the data points in the model. Therefore the degrees of freedom for just identified models is zero, hence there is no chance for rejection. An over-identified model is one in which the number of data points is in excess of the number parameters to be estimated in the model. This obviously gives rise to positive degrees of freedom which indicates the existence of a unique solution for the structural parameters in the specified model, allowing the model to be either accepted or rejected in the end (Byrne, 2010). Under-identified and just identified models are usually considered to be of no statistical importance due mainly to their inability to give rise to a unique set of solutions for the unknown parameters to enable the model to be empirically evaluated.

By going through these stages, SEM uses its structural and measurement component identified and defined during the first stage to determine and validate the appropriateness of the hypothetical model(s) and show the optimum causal relationships among the variables of the model. The appropriateness of SEM models referred to as the model fit can be tested using various model fit indices; to these we now turn in the next section.

4.4.5.2 Model fit indices in SEM

The results of structural equation modelling are required to be evaluated using model fit indices. Three main categories of fit indices are used to determine model fit in SEM. These are absolute fit indices, incremental fit indices and parsimony fit indices. These are discussed in the following sub-sections.

Absolute Fit Indices: These are used to determine how pre specified models fit the sample data on which the analysis is based and indicate which model has the best fit where candidate models are specified. Absolute fit indices indicate how well the hypothesised theory fits the data. This category of fit indices include chi-square (X^2), root mean square error of approximation (RMSEA), standardised root mean square error of approximation (SRMSEA), goodness-of-fit statistics (GFI), adjusted goodness-of-fit statistics (AGFI), root mean square residual (RMR), and standardised root mean square residual (SRMR) (Hooper *et al*. 2008).

The chi-square (X^2) measure for evaluating overall model fit is sensitive to sample size; it indicates the amount of discrepancy between the sample and fitted covariance matrices (Hu and Bentler, 1999). Low values of X^2 relative to degrees of freedom with an insignificant P-value ($P>0.05$) are considered acceptable. This is because it is a statistical significance test and it always almost rejects the model when large samples are used. Conversely, when small samples are used, the chi-square statistics may not distinguish or discriminate between good fitting and poor fitting models (Kenny and McCoach 2003). It should be noted that what constitute a large or small sample size is still debatable. In order to address its sensitivity to sample size, relative X^2 values are used, these are the ratios of X^2 to degrees of freedom (X2/df) in the model being assessed. Opinions differ on the acceptable values for these ratios; for instance, Tabachnik and Fidell (2007) recommend 2:1 and Kline (2005) recommend 3:1 whereas, Wheaton *et al*. (1977) recommend 5:1 as acceptable thresholds for the relative chi-square.

The goodness-of-fit (GFI) statistics is also affected by sample size. It ranges from 0 – 1 and increases with larger samples. The GFI has a downward bias when there are a large number of degrees of freedom in the model (which is a function of the model complexity) in comparison to sample size. Values greater than 0.95, are considered acceptable as higher values indicate better fit. This can be adjusted based on the number of parameters in the model to give rise to the adjusted goodness-of-fit index (AGFI) for which values can fall outside the 0 – 1 range (Hooper *et al*. 2008).

The root mean square error of approximation (RMSEA) is also sensitive to the number of estimated parameters in the model. It favours parsimony in that it will choose the model with the lesser number of parameters as the best fitting model. The lower limit is close to 0 while the upper limit is close to 0.07 and values less than 0.03 indicate excellent fit (Steiger 2007).

The root mean square residual (RMR) and standardised root mean square residual (SRMR) are affected by the scale of each indicator in the model such that varying or inconsistent levels of scale makes their interpretation difficult. Good models have small values of RMR and SRMR which is easier to interpret, is found to be lower in models with high number of parameters as well as in models based on large sample size (Kline, 2005). Values of RMR and SRMR less than 0.08 are considered acceptable and values closer to 0 represent excellent fits (Tabachnik and Fidell 2007).

Incremental Fit Indices: These are also known as comparative or relative fit indices. They compare the chi-square statistics to a baseline model based on the null hypothesis that all variables are uncorrelated. They include normal fit index (NFI), non-normed fit index (NNFI) and comparative fit index (CFI). The NFI is sensitive to sample size such that it underestimates fits for samples less than 200 (Kline 2005). The CFI which is the revised version of NFI takes sample size into account. The CFI performs well even when small sample sizes are used (Tabachnick and Fidell 2007). The range of values for these is also 0 – 1 and values greater than 0.95 are considered excellent and acceptable for all three of them except that for NNFI values can fall outside the range and it favours parsimony. Furthermore, the NFI assess model fit relative to a baseline model which assumes there is no covariance between the observed variables and has the tendency to overestimate fit when sample size is small (Hooper *et al*. 2008).

Parsimony Fit Indices: These have been developed to overcome the situation in which a less rigorous theoretical model produces better fit indices among candidate models. These include the parsimony goodness-of-fit index (PGFI), parsimonious normal fit index (PNFI), Akaike information criteria (AIC), consistent Akaike information criteria (CAIC). The PGFI and PNFI are based on the GFI and NFI respectively. Both of them adjust for degree of freedom and penalise for model complexity which results in lower parsimonious fit indices values than other goodness of fit indices. Given the numerous model fit indices in SEM, it is important for researchers to decide which appropriate fit indices should be reported for their models, as it is not realistic to include every fit index in the output (Hooper *et al*. 2008).

However, deciding which indices to report also depends on the options available to the researcher in the analysis software program (Byrne, 2010) which can be restrictive in some cases. The extant literature indicates that the most commonly and frequently reported model fit indices are the CFI, GFI, NFI, NNFI, RMR, SRMR, RMSEA and PNFI. It is not necessarily good practice to go by the popular fit indices therefore it was ensured that fit indices that satisfy the required level of statistical sophistication in assessing the models are reported in this study.

4.4.5.3 Sample size

Although larger samples sizes (from 100 to 400) are generally recommended for SEM analyses, there is no consensus on the acceptable thresholds among researchers that used SEM. Construction management researchers (for example; Doloi *et al*., 2012a; Doloi, 2009; Erikson and Pesamaa, 2007; Ozorhon *et al*., 2007; Islam and Faniran, 2005, Mohammed, 2002) have used smaller samples than those recommended, giving different reasons for doing so. Furthermore, if the model is not overly complex, its constructs are well defined and supported by theory, and the data is collected from reliable source; sample size of 50 can be enough for SEM analysis (Iacobucci, 2010). A questionnaire survey (Section 4.3.2) was used to obtain data to empirically test the conceptual model of the interrelations among CSFs for stakeholder management in construction.

The 61 responses in the current study having been collected from well experienced respondents with relevant professional backgrounds to whom the research objectives were clearly explained are considered reliable. Furthermore, the spread across construction professionals among the respondents, adds to the reliability of the data for investigating critical success factors for stakeholder management in construction. Table 4.6 presents the respondents' profiles in terms of their years of professional experience and professional field of practice with all of them, having relevant experience of at least 5 years and over 78% of them having 10 years and above experience. Moreover, all the targeted respondents are known to have worked on projects with multi parties and had to collaborate or engage with all or most of the parties. Given the inherent difficulty to collect questionnaire data in construction management research and coupled with the characteristics sought in the targeted respondents which limit the number of eligible respondents, 61 is a good sample size for this study.

Table 4.6 Respondents' profiles

	Years of Professional Experience					
Professional Field	**From 6 to 10 years**	**From 11 to 15 years**	**From 16 to 20 years**	**From 21 years and above**	**Total**	**%Total**
Architecture	5	4	1	2	12	19.67
Construction Management	1	6	3	8	18	29.51
Quantity Surveying	3	3	3	5	14	22.95
Engineering	3	3	1	3	10	16.39
Facility Management	1	3	1	2	7	11.48
Total	13	19	9	20	61	100
%Total	21.31	31.15	14.75	32.79	100	

4.5 Summary

This chapter has presented the general basic principles of research design discussing how the specific research design for this study was drawn. The chapter covers a comparison of four research design concepts and justified the research design adopted for this study discussing its components. Moreover, the data collection and analyses techniques have been discussed.

The next Chapter presents the first data analysis results aimed at addressing the second objective of the study.

5. CHAPTER FIVE: CURRENT PRACTICE OF STAKEHOLDER MANAGEMENT IN CONSTRUCTION PROJECTS

5.1 Introduction

The need to study the current practice of stakeholder management in construction projects was identified from the literature review as one of the objectives of the study. This chapter presents the analysis of survey results on the current practice of stakeholder management in construction projects. Data obtained from the questionnaire about stakeholder management decisions and responsibilities; change in stakeholder interests/disposition towards the project; internal stakeholder collaboration; stakeholder dynamics; techniques for stakeholder engagement/management; and general comments of respondents were analysed and presented. Finally, the results were discussed and conclusions drawn from these results are highlighted.

5.2 Stakeholder Management Decisions and responsibilities

This section presents the analysis results and findings on stakeholder management decisions, change of stakeholders' interests, internal stakeholder collaboration and stakeholder management responsibility. These are presented in the following sub-sections.

5.2.1 Stakeholder management decisions

In order to investigate the current practice of stakeholder management in the construction industry; survey respondents were asked to respond to the questions in section C of the questionnaire (see Appendix A) based on their experience on a recently completed project in which they were involved. Asked whether stakeholder management was carried out on the project; 23 representing 37.7% of the respondents said they carried out stakeholder management and 38 representing 62.3% said they did not carry out stakeholder management. Out of the 37% that said they carried out stakeholder management, 91% said no funding was provided on the projects for stakeholder management and 9% said funding was provided but did not say how much or what percentage of the project sum was committed for carrying out stakeholder management. Asked whether stakeholder management responsibility was assigned on the project, 30% said yes and 70% (of those who said they carried out stakeholder management) said no stakeholder management responsibility was assigned on the project.

From the results presented in this section, it can be concluded that stakeholder management is yet to be fully embraced by construction organisations as a deliberate strategy in the management of construction projects in the UK. The challenge for embracing stakeholder management can be said to be the inability of firm or client to set aside some funds to support stakeholder management process. Furthermore, the results revealed the need for firms to assign the responsibilities for stakeholder management to specific professionals in addition to deciding to undertake stakeholder management in construction projects.

5.2.2 Change of Stakeholders' Interests/Disposition towards Projects

The respondents were asked to indicate whether or not they noticed any changes in stakeholders' interests/disposition towards the project. The result indicates that 45 representing 73.8% of the respondents said they noticed some changes in stakeholder interests during the project whereas 16 representing 26.2% said they did not notice any change in stakeholder interests. The respondents were also asked to indicate from a list of causes identified from the literature of changes in stakeholder interests during the project. This question was intended to find out the most likely causes of change in stakeholder interests/disposition in projects. The frequency of selection of each of the causes was used for analysing this question. A quick look at the numbers will indicate that the total frequency is more than the number of respondents (61) in the survey; this is because respondents had the opportunity to choose as many causes as applicable to them. Their responses (see Figure 5.1) indicate that "acquisition of information previously not available to them" is the most common reason why stakeholders' interests changed followed by "gaining confidence and trust in the project"; "change in project mission"; "perceived non-involvement"; "loss of confidence in the project"; and "loss of confidence in the project team", in decreasing order of popularity. From the open option given to the respondents, other reasons for change in stakeholders' interests/disposition towards the project provided by the respondents include media influence and when stakeholders get to understand other stakeholder's interests on the project. Stakeholders getting to understand other stakeholders' interests on the project can be said to be the same as acquisition of information previously not available to them.

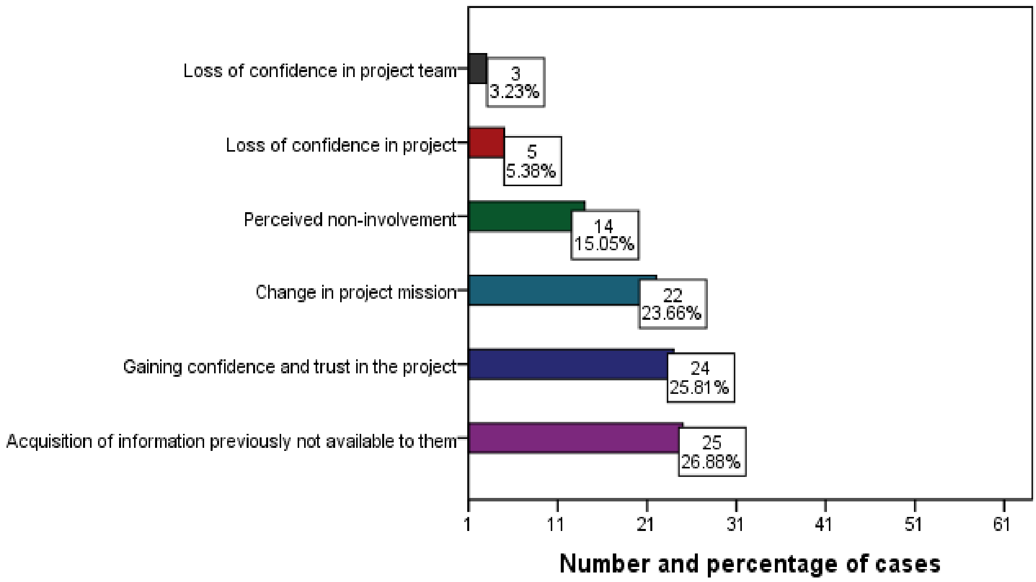

Figure 5.1 Reasons for change in stakeholders' interests

Similarly, the respondents were asked to indicate from a list of means identified from the literature through which they monitored or tracked changes in stakeholders' interests/disposition towards the project and their answers are as shown in Figure 5.2 with "feedback mechanisms" being the most popular followed by "early warning sings" and "checklist" with recorded frequencies of 32 (55.17%), 15 (25.86%) and 11 (18.97%) respectively. Furthermore, the option was given to the respondents in the questionnaire to indicate other means of tracking change in stakeholders' interests/disposition. Their answers indicate that the other means of tracking changes in stakeholders' interests/disposition towards the project is through reports during periodic project meetings which some of them referred to as "feedback at meetings", "feedback gained at stakeholder meetings" and "informally during meetings". Some of the respondents reported that they did not monitor any change in stakeholder interests/disposition towards the project at all but this is negligible as only two of the respondents shared this experience.

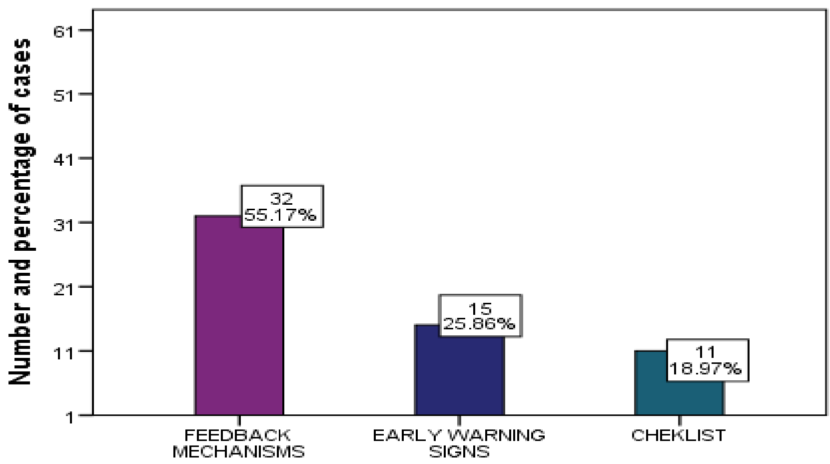

Figure 5.2 Means of tracking changes in stakeholders' interests

With respect to change in stakeholder interests/disposition towards the project (also known as stakeholder dynamism), the results (Figure 5.1) confirmed very strongly that stakeholder interests in construction project are indeed dynamic. This agrees with Mitchell *et al*. (1997). The results further indicate that the most important reason for which stakeholders' interests/disposition towards the project change is when they acquire information previously not available to them about the project. New information can cause stakeholders to change from being supportive to opposing stakeholders or otherwise depending on the effect of the new information they have just acquired. The next important reason for change in the interests/disposition of stakeholders towards the project is when the stakeholders gain confidence in the project and project management team. The effect of this reason is positive but it can be dangerous if the level of confidence is not safeguarded and it is lost during the project execution process. Another reason is when the project mission changes. Change in project mission outside the expectations and knowledge of some key stakeholders can cause them to oppose the project and obstruct/delay its progress. This points to the need for stakeholders to be involved in defining project mission at the early stage and in refining it at later stages when the need arise. The results also suggest that when stakeholders are not involved in project decision making even if they were involved in defining the project mission can cause their interest/disposition towards the project to change. The implication of these findings is that project management team should make sure all relevant stakeholders as much as possible are involved in defining the project mission and that both positive and negative impact of project objectives are clearly communicated to all stakeholders.

With respect to the means of monitoring and tracking the changes of stakeholders' interests/disposition towards the project, the results (Figure 5.2) revealed that the most popular and effective means of monitoring and tracking the changes in stakeholders' interests/disposition towards the project is through "feedback mechanism" followed by early "warning signs". This means it is necessary for project management team to put in place feedback mechanism and early warning signs when undertaking stakeholder management in construction projects. Furthermore, attention should be paid to any stakeholder issues that may come up during periodic project meetings. This would enable the tracking of any changes missed by the change tracking mechanisms put in place.

5.2.3 Stakeholder management collaboration

When asked whether there is a need for collaboration among internal stakeholders in carrying out stakeholder management in construction projects, an overwhelming acceptance was identified with 95.1% of the respondents agreeing to this. In order to further address the need to know who should be involved in the stakeholder collaboration at various stages of projects, a further question was asked. The respondents were asked to indicate in a matrix the internal stakeholders they think should be involved in stakeholder management collaboration at the various stages of construction projects based on their experience with their most recently completed projects. The result obtained from this is presented in Table 5.1. The result indicates the frequency of choice for each of the internal stakeholders who should be involved in internal stakeholder collaboration at the various stages in carrying out stakeholder management in construction projects. Table 5.1 indicates that the client (CL) has the highest frequency (59) of choice to be involved in internal stakeholder collaboration at the inception stage (IS) followed by design organisation (DO) and quantity surveyor (QS) with selection frequencies of 58 and 40 respectively. Main contractor has the least selection frequency of 9. At the design stage (DS), quantity surveyor (QS) has the highest frequency (53) of selection to be involved in internal stakeholder collaboration followed by design organisation (DO) and project management organisation (PMO) with 51 selection frequency each. The internal stakeholder with the least frequency of selection for involvement in internal stakeholder collaboration at the design stage was contract administrator (CA) with 25. For involvement in internal stakeholder collaboration at the construction stage (CS), project management organisation (PMO), quantity surveyor (QS), main contractor (MC) and the client (CL) each has selection frequency of 51 being the highest followed by contract administrator (CA) with 50, design organisation (DO) with 43 and lastly facility management organisation (FMO) with 35. For involvement in internal stakeholder collaboration at the operation stage (OS), the client (CL) has the highest selection frequency of 51 followed by facility management organisation (FMO) with 50. The other internal stakeholders have very low selection frequencies for involvement in internal stakeholder collaboration at the operation stage (OS) with quantity surveyor (QS) having the least selection frequency of 5.

Based on these results, internal stakeholders to be involved in collaboration for stakeholder management are indicated in Table 5.1 in bold revealing that only the client should be involved at all stages of the project with very high frequencies of selection at all the stages. Interestingly, the survey respondents are of the view that all internal stakeholders should be involved in collaboration for stakeholder management at the construction stage. The selections of internal stakeholders to involved in collaboration for stakeholder management was based on their frequency of selection presented in Appendix C1 being not less than 50% of the cases involved in the data.

Table 5.1 Preferences for involvement of internal stakeholders in stakeholder management at different stages of construction projects

Internal Stakeholders	Inception Stage	Design Stage	Construction Stage	Operation Stage
Designer Organisation	**96.7**	**85.0**	**71.7**	15.0
Project Management Organisation	**61.7**	**85.0**	**85.0**	30.0
Project Consultant	**73.3**	**78.3**	**71.7**	13.3
Project QS	**66.7**	**88.3**	**85.0**	8.3
Contract Administrator	28.3	41.7	**83.3**	28.3
Main Contractor	15.0	**66.7**	**85.0**	26.7
Facility Management Organisation	40.0	**76.7**	**58.3**	**83.3**
Client	**98.3**	**85.0**	**85.0**	**85.0**

Note: Values presented in this table are percentage total selection with respect to the total cases.

Furthermore, it was found necessary to check whether there are any biases by the respondents towards their professions in selecting who should be involved in internal stakeholder collaboration at the various stages of construction projects. To check this, Kruskal-Wallis Test was used the result of which revealed statistically insignificant difference among the professionals except for the involvement of Facility management organisation at the inception stage which reaches significance at $p = 0.01$ (see Appendix C2 for this result). A further look at the mean ranks of the groups of professionals revealed a lower selection of the involvement of facility management organisation at the inception stage by the facility managers themselves. However, the facility managers recorded a higher selection of involvement at the design through to operation stage.

Regarding whether or not there is need for collaboration among internal stakeholders in carrying out stakeholder management in construction projects, it can be concluded based on the results presented in this section that there is a strong need for internal stakeholders to collaborate in undertaking stakeholder management in construction projects. Since it is not possible for all stakeholders to be involved at all the stages, it was also investigated which of eight internal stakeholders should be involved in stakeholder collaboration at the various stages of construction projects. The findings presented in Table 5.1 show that: the design organisation, project management organisation, project consultant, quantity surveyor and the client should be involved at the inception stage; all the internal stakeholders except the contract administrator should be involved at the design stage; all the internal stakeholders should be involved at the construction stage; and only the facility management organisation and client should be involved in internal stakeholder collaboration at the operation stage. However, the involvement of internal stakeholders will depend on among other things, the procurement route being used for the project. For example if the traditional procurement route is being used, it will not be possible to involve the main contractor at the inception and design stages of the project. It is necessary to set out the process of transition from one stage to the other by clearly indicating the link between successive stages.

5.2.4 Stakeholder management leadership/coordination

The questionnaire survey contained another question on who should lead/coordinate stakeholder management process at the various stages of construction projects. The respondents were asked who should instead of who is currently leading because not all organisations have embraced stakeholder management in construction hence it was decided to ask their preferences based on their experience (Chinyio and Olomolaiye, 2010). The respondents were asked to indicate in a matrix form which internal stakeholders should be saddled with the responsibilities of leading stakeholder management at the various stages of construction projects. The frequencies of their responses are presented in Appendix C3. The result indicates the frequency of choice for each of the internal stakeholders who should be responsible for leading/coordinating stakeholder management at the various stages in construction projects. The results indicates that the client (CL) has the highest frequency of selection to lead/coordinate stakeholder management at the inception stage (IS) with 44, distantly followed by project management organisation (PMO) with 17. Main contractor (MC) and facility management organisation (FMO) both have no selection. For leading stakeholder management at the design stage (DS), the design organisation (DO) has the highest frequency of selection 38 followed by the project management organisation (PMO) with 20 and the client with 15. For leading stakeholder management at the construction stage (CS), the project management organisation (PMO) has the highest selection frequency of 48 distantly followed by the main contractor (MC) with 13. For leading stakeholder management at the operation stage (OS), the facility management organisation has the highest frequency of selection 39 followed by the client with 19.

From these results the suggested responsibilities for leading stakeholder management in construction projects are indicated in Table 5.2 in bold showing the internal stakeholders that have been selected down the columns as suitable for leading and coordinating stakeholder management process at the respective stages across the rows. The final decision was based on the internal stakeholders with the highest frequency of selection by the respondents to lead/coordinate stakeholder management at the various stages in construction projects.

Table 5.2 Preferences of who should lead stakeholder management at different stages of construction projects

Internal Stakeholders	Inception Stage	Design Stage	Construction Stage	Operation Stage
Designer Organisation	18.3	**63.3**	5.0	5.0
Project Management Organisation	28.3	33.3	**80.0**	18.3
Project Consultant	20.0	5.0	1.7	3.3
Project QS	6.7	1.7	3.3	3.3
Contract Administrator	3.3	6.7	15.0	6.7
Main Contractor	0.0	1.7	21.7	3.3
Facility Management Organisation	0.0	0.0	0.0	**65.0**
Client	**73.3**	25.0	20.0	31.7

Note: Values presented in this table are percentage total selection with respect to the total cases.

Furthermore, it was found necessary to check whether there are any biases by the respondents towards their professions in selecting who should lead the stakeholder management process at the various stages of construction projects. To check this, Kruskal-Wallis Test was used and the result revealed statistically insignificant difference among the professionals in selecting who should lead stakeholder management at the various stages of construction projects as none of them had a Sig P values less than 0.05 (see Appendix C4 for the results). This indicates a strong agreement in the opinions of respondents regarding who should lead the stakeholder management process in the various stages of construction projects.

The results presented in Table 5.2 show that: the responsibility of leading and coordinating stakeholder management at the inception stage rests with the client; the design organisation should lead/coordinate stakeholder management at the design stage; the project management organisation should lead/coordinate stakeholder management at the construction stage; and facility management organisation should be responsible for leading/coordinating stakeholder management at the operation stage. This means that the client organisation would appoint a suitable representative to lead/coordinate stakeholder management at the inception stage. In the case of an inexperienced individual client they would need to employ the services of a suitable internal stakeholder. Similarly, the design organisation would appoint a suitable member of staff to lead/coordinate stakeholder management at the design stage as would the project and facility management organisations at the construction and operation stages respectively. The results also suggest that the client and facility management organisation are the only internal stakeholders that can practically be available at the operation stage. Hence, it can also be concluded that the client and facility management organisation would need to relate with each other very closely for carrying out stakeholder management at the operation stage. It should be noted that the suggestion of stakeholder management leaders at the various stages based on these result (Table 5.2) is only a guide hence adequate care should be taken to ensure that a suitably qualified member of the internal stakeholders is assigned the role of leading/coordinating stakeholder management at the respective stages of construction projects. The stakeholder management leader should have a proven track record of carrying out the steps involved in the stakeholder management process at the respective stages in addition to having a full understanding of the entire process. Furthermore, the person should be given the authority and powers to make stakeholder management related decisions and allocate resources for same. It should be noted that previous research has suggested that the project manager or client should be responsible for leading stakeholder management process (Olander and Landing, 2008). But this will not apply in all project circumstances and stages depending on the procurement route and other characteristics of the project.

5.3 Techniques for Stakeholder Engagement/Management

The analysis presented in this section was aimed at assessing the level of awareness and effectiveness of various stakeholder engagement/management techniques by the respondents. Six stakeholder management/engagement techniques were identified from literature review and included in the questionnaire in which respondents were asked to indicate their awareness of and rate the effectiveness of these techniques in stakeholder engagement/management in construction projects. They were asked to rate on a five point-Likert scale and the mean ratings of the techniques by the respondents were used to analyse the levels of awareness and effectiveness of the techniques as shown in Table 5.5. The respondents were asked to rate the effectiveness of the techniques only if they are aware of them. Hence their ratings represent both level of awareness and level of effectiveness.

Table 5.5 indicates the respondents' ratings and awareness of stakeholder engagement techniques. The mean rating values reveal that "public hearing" with mean rating of 3.93 is the most effective technique for engaging construction project stakeholders. This was closely followed by "design charrette" with mean rating of 3.90. Conversely, "Contingent Valuation Method" with mean rating of 3.38 is the least effective technique for engaging construction project stakeholders.

Table 5.3 Rating of stakeholder engagement/management techniques

Stakeholder Engagement Techniques	Mean	Rank
Public Hearing	3.93	1
Design Charrette	3.90	2
Strategic Needs Analysis	3.85	3
Delphi Technique	3.79	4
Stakeholder Cycle	3.46	5
Contingent Valuation Method	3.38	6

The results of analyses of the respondents' awareness and rating of the effectiveness of stakeholder management techniques suggest that "public hearing" and "design charrette" are the most popular and effective stakeholder management/engagement techniques. "Strategic needs analysis" and "Delphi technique" are also considered effective. It can be concluded that the choice of which techniques to use would depend on the prevailing circumstances and knowledge of the techniques by the project team. It could also depend on their reason for engaging the stakeholders and the stage of project at which the stakeholders are engaged.

5.4 Qualitative Responses (general comments) on Ways to Improve Stakeholder Management in Construction Projects

In order to afford respondents the opportunity to fully express their views without restricting them to the questions included in the survey, respondents were asked to make free comments and suggestions of ways to improve the practice of stakeholder management in construction projects. The aim of this question was to enable the collection of any other information that may not have been captured in the questionnaire and to facilitate deeper and more holistic understanding of the issues. 22 respondents made comments and suggestions in response to this part of the survey. Their comments revealed the following points/opinions:

1. Stakeholder management is not deliberately carried out in projects until there are objections to planning permission; hence changes in stakeholders' interests are addressed as they arise.
2. Effective communication and collaborative environment are necessary ingredients for stakeholder management process to succeed in construction projects.
3. Avoid changes or keep them to the barest minimum as much as possible (engage everyone early enough on the project including facility managers and eventual insurers of the product.
4. Use appropriate procurement routes and contracts and ensure that project risks and responsibilities are properly allocated to the parties involved. For example a respondent wrote: "*Use Design and Build contract with terms passing risk to contractor awarded when the design is at circa 85% stage to ensure Client gets the building he wants and Client budget is protected by the contractor signing up to both design and construction risk, with Client keeping changes to an absolute minimum.*"
5. It is necessary to adopt a framework for stakeholder relationship at the outset of projects.

6. Media influence should be given adequate attention throughout the project life cycle.
7. Government policies could be made to encourage the practice of stakeholder management in construction project.

Some of the points highlighted above corroborate the findings from the quantitative data obtained from the closed questions included in the questionnaire. For example, point 1 agrees with the results presented in section 5.2.1 that 68% of the respondents said they did not carry out stakeholder management in their projects. Point 2 agrees with the results presented in section 5.2.2 where 95.1% of the respondents agreed that there is the need for internal stakeholders to collaborate in carrying out stakeholder management in construction projects. Furthermore, points 3 to 6 are in agreement with the critical success factors identified from literature and presented in chapter 2. Interestingly, point 7 which highlights the need for government policies to encourage stakeholder management in construction projects indicates the need for further research to investigate this area. However, this point can be said to have shed more light to the findings that stakeholder management is mostly an afterthought in construction projects. The qualitative data also confirms the need for assignment of responsibility and continuity of stakeholder management in construction projects. for example, a respondent wrote:

"*Involving stakeholders early enough is a good idea, however one should bear in mind that this can slow things down. Also considering the dynamic nature of construction projects (from inception to completion) this might be difficult, if not impossible in certain instances. A one size fits all approach to dealing with this is not always feasible. However the link of this to assigning tasks to these 'early involved stakeholder' is useful and could move things faster, but the issue still remains as to who will be really needed as the project progresses. The issue of involving stakeholders might take an oscillatory form*." An interesting finding from the qualitative response is suggestion of the need for a policy driven motivation for construction firms/organisations and client to make stakeholder management a part of their strategies and agenda. Another interesting finding from the qualitative data is the suggestion that risk allocation and stakeholder management responsibility are related. The researcher would suggest this for further research.

5.5 Chapter Summary

This chapter has presented the data analysis results of part of the survey that investigated the current practice of stakeholder management practice in construction projects in UK. The conclusions reached from the results discussed in the foregoing section of the chapter, are summarised as follows:

- Stakeholder management is yet to be fully embraced as a deliberate strategy in the management of construction projects in the UK.

- The main challenge for embracing stakeholder management can be said to be the inability of firm or client to set aside some funds to support stakeholder management process. Therefore, it is recommended that some financial provisions should be made in agreement between the client and key project team. Especially for stakeholder management related issues that may not be included in the project bill.

- There is need for firms to assign the responsibilities for leading stakeholder management to specific professionals in addition to deciding to undertake stakeholder management in construction projects. This should be done for each of the main stages of construction project as well as for the overall process of stakeholder management on the projects.

- There is a strong need for internal stakeholders to collaborate in undertaking stakeholder management in construction projects.

- Construction professionals perceive dynamics in stakeholder position as important and gaining new information is explanatory for that, but not loss of confidence in the project team.

- Public hearings and design charrettes are considered the most important stakeholder engagement instruments.

- There is need for a policy driven support for stakeholder management to be carried out in construction projects.

Finally, the involvement of internal stakeholders in stakeholder management collaboration and assignment of responsibilities for leading/coordinating stakeholder management process at the various stages will be greatly influenced by the procurement routes being used to execute the project. The next chapter presents the analysis of the effects of procurement routes and form of contracts on stakeholder management process.

6. CHAPTER SIX: EFFECTS OF PROCUREMENT ROUTES RELATED CHARACTERISTICS OF STAKEHOLDER MANAGEMENT AND CONTRACT FORMS ON STAKEHOLDER MANAGEMENT PROCESS IN CONSTRUCTION PROJECTS

6.1 Introduction

This chapter presents the effects of procurement routes alongside contract forms on stakeholder management in construction projects. The need to investigate the effects of procurement routes on stakeholder management process in construction projects was identified during the literature review stage and is one of the objectives of this study. Twelve procurement routes related characteristics of stakeholder management were identified from literature review as shown in chapter 3 and included in the questionnaire survey. Firstly, the extent to which procurement routes related characteristics of stakeholder management can influence stakeholder management process in projects is analysed and presented followed by relationships between client type and procurement routes related characteristics, relationships between contract forms and procurement route related characteristics and effects of forms of contracts on stakeholder management in construction projects.

6.2 Investigating the effects of procurement routes related characteristics on stakeholder management process

This section presents the results of the opinions of the respondents on the effects of procurement routes related characteristics of stakeholder management in construction projects. Survey respondents were asked to rate the effects of twelve procurement routes related characteristics of stakeholder management process on a five point Likert scale where 1 represent very negatively and 5 very positively. The data obtained from this question was analysed using the mean rating of each of the characteristics to identify the ones that influence stakeholder management positively or negatively the most. The analysis results for respondents' rating of the extent to which procurement routes related characteristics of stakeholder management can influence stakeholder management indicate a varying degree of agreement across the characteristics. Their mean ratings presented in Table 6.1 range from 2.74 to 4.39 indicating varying degrees of positive influence ratings for all the characteristics except PROCC5 (separation of design and construction roles) that has the lowest mean rating of 2.74 which is below the acceptable lower threshold of 3.5. Table 6.1 indicates that PROCC12 (Clear assignment of responsibilities) influences stakeholder management more positively than the other procurement routes related characteristics of stakeholder management process followed by PROCC8 (Cooperation among the internal stakeholders), PROCC6 (clear lines of control and communication), PROCC1 (Early involvement of contractor) and PROCC9 (External stakeholder identification/involvement) being the top five characteristics. PROCC5 (Separation of design and construction roles) is the only characteristics rated as affecting stakeholder management negatively. This result presented in Table 6.1 suggests the characteristics that should be sought in decreasing order of importance when selecting procurement routes that favour stakeholder management in construction projects.

Table 6.1 Mean rating and ranking of the effects of procurement routes related characteristics on stakeholder management

Code	Procurement Route Related Characteristics of SM	Mean	Rank
PROCC12	Clear assignment of responsibilities	4.39	1
PROCC8	Cooperation among the internal stakeholders	4.28	2
PROCC6	Clear lines of control and communication	4.20	3
PROCC1	Early involvement of contractor	4.11	4
PROCC9	External stakeholders identification/involvement	4.07	5
PROCC4	Integration of design and construction process	4.00	6
PROCC11	Opportunities to accommodate changes	3.97	7
PROCC7	Easy stakeholder identification	3.97	7
PROCC10	Opportunities for dispute avoidance/resolution	3.95	9
PROCC2	Contractor involvement in design	3.92	10
PROCC3	Single point of responsibility	3.66	11
PROCC5	Separation of design and construction roles	2.74	12

Notes: 1 = Very Negatively and 5 = Very Positively

Furthermore, it was found necessary to check whether the respondents' professional field of practice influenced their opinions. Kruskal-Wallis Test was used and the results revealed statistically insignificant influence of professional field of practice for all the procurement route related characteristics except for "cooperation among the internal stakeholders" for which there is a significant difference at P = 0.047 (the result is shown in Appendix C5). A further look at the mean ranks of the rating by different groups of professionals revealed that facility managers rated the effect of "cooperation among the internal stakeholders" highest and quantity surveyors rated it lowest with mean ranks of 38.00 and 22.54 respectively. This means that facility managers had the highest overall ranking corresponding to the highest scale 5. However, this is not a problem as the Sig p value is only slightly smaller than the threshold and Table 6.1 shows that cooperation among internal stakeholders is rated second with a mean rating of 4.28. Furthermore, facility managers are not the majority among the respondents and cannot have a domineering opinion over others.

6.3 Correlation analysis of procurement routes related characteristics of stakeholder management process

Correlation analysis was used to investigate the relationships between pairs of procurement route related characteristics and the results obtained are shown in (Appendix C6). The aim of this analysis was to investigate whether there are any statistically significant correlations between the procurement routes related characteristics of stakeholder management in construction projects. Preliminary analyses were carried out to make sure there are no violations of the assumptions of normality, linearity and homoscedasticity before performing the correlation analysis. The result revealed 24 statistically significant correlations out of 144 possible correlations as shown in Appendix C6. The statistically significant correlations are indicated in Table 6.2 with a double headed arrow. The double headed arrow shows that the procurement route related characteristics intersecting at the box in which the arrow is indicated can be supported by the same procurement routes. Interestingly, PROCC5 "separation of design and construction roles" which recorded the least mean rating of 2.74 indicating it influences stakeholder management negatively does not correlate with any other procurement route related characteristics of stakeholder management.

Table 6.2 Statistically significant correlation between procurement routes related characteristics of stakeholder management

	PROCC1	PROCC2	PROCC3	PROCC4	PROCC5	PROCC6	PROCC7	PROCC8	PROCC9	PROCC10	PROCC11	PROCC12
PROCC1		⤢		⤢								
PROCC2	⤢			⤢								
PROCC3						⤢						⤢
PROCC4	⤢	⤢										
PROCC5												
PROCC6			⤢				⤢	⤢	⤢	⤢	⤢	⤢
PROCC7						⤢		⤢	⤢	⤢		⤢
PROCC8						⤢	⤢		⤢	⤢		⤢
PROCC9						⤢	⤢	⤢		⤢	⤢	⤢
PROCC10						⤢	⤢	⤢	⤢		⤢	
PROCC11						⤢			⤢	⤢		⤢
PROCC12			⤢			⤢	⤢	⤢	⤢		⤢	

6.4 Investigating relationships between client type and procurement routes related characteristics of stakeholder management

Kruskal-Wallis Test was used to investigate if there exist any differences among the ratings of the procurement routes related characteristics of stakeholder management process by respondents working for different clients (public, private and both public and private). The result presented in Table 6.3 revealed that there is statistically insignificant difference across respondents working for different clients on the extent to which the procurement routes related characteristics can influence stakeholder management. The Sig. P values presented in Table 6.3 are all above the threshold of 0.05, hence there was no need to further look at their mean ranks in relation to the chi-square values. Figure 6.1 shows that fewer respondents were employed by “public and private” clients to the extent that they are not represented in two groups of years of professional experience (6 to 10 and 16 to 20). This however did not affect the rating of procurement routes related characteristics by respondents employed by “public and private” clients. This implies that the client type for which the respondents work did not affect their opinion on the procurement routes related characteristics of stakeholder management in construction projects.

Table 6.3 Kruskal Wallis Test of the rating of procurement route related characteristics of stakeholder management process by respondents working for different client types

Procurement routes related characteristics of stakeholder management process	Chi-Square	Asymp. Sig.
Early involvement of contractor	.378	.828
Contractor involvement in design	.614	.736
Single point of responsibility	.230	.892
Integration of design and construction process	1.787	.409
Separation of design and construction roles	1.797	.407
Clear lines of control and communication	.136	.934
Easy stakeholder identification	.264	.876
Cooperation among the internal stakeholders	2.390	.303
External stakeholders identification/involvement	.481	.786
Opportunities for dispute avoidance/resolution	1.223	.542
Opportunities to accommodate changes	1.576	.455
Clear assignment of responsibilities	.686	.709

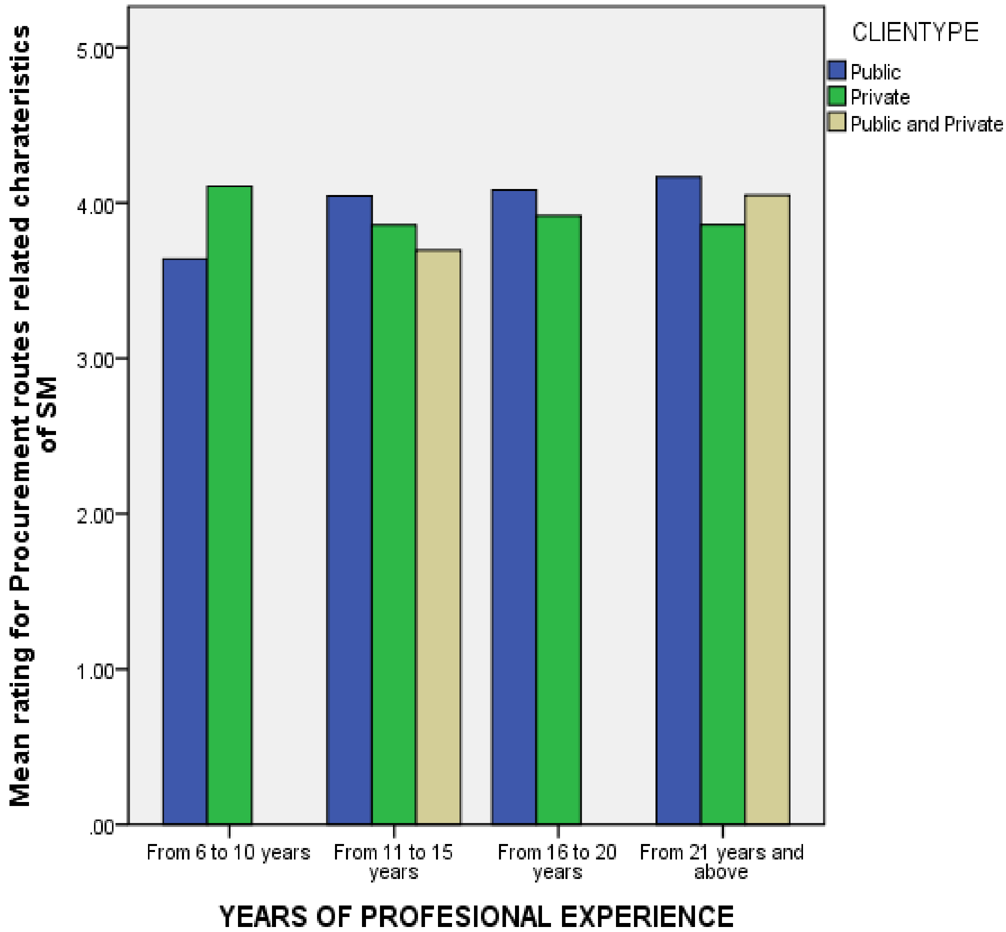

Figure 6.1 Mean rating of procurement routes related characteristics of stakeholder management by respondents of different client types and years of experience

6.5 Investigating relationships between years of experience and procurement routes related characteristics of stakeholder management

Kruskal-Wallis Test was carried out to investigate the relationships between years of professional experience and procurement routes related characteristics. The results presented in Table 6.4 revealed statistically insignificant difference in the rating of the procurement routes related characteristics by respondents with different years of professional experience. The exception here is (Table 6.4) only “single point of responsibility” which reaches significance at approximately 0.04 (which is very close to the threshold of 0.05). This was investigated further by obtaining the median scores presented in Table 6.5 for each group (years of professional experience) which revealed that respondents with years of experience from 6 to 10 years recorded a median rating of 3 compared to 4 recorded by all the respondents with older years of professional experience. This implies that the years of professional experience of the respondents did not significantly affect their opinion on the procurement routes related characteristics of stakeholder management process. However, the result suggests that respondents with more years of professional experience rated the procurement routes related characteristics of stakeholder management process more positively than those with less years of professional experience.

Table 6.4 Kruskal Wallis Test of the rating of procurement route related characteristics of stakeholder management process by respondents with different years of professional experience

Procurement routes related characteristics of stakeholder management process	Chi-Square	Asymp. Sig.
Early involvement of contractor	1.574	.665
Contractor involvement in design	2.318	.509
Single point of responsibility	8.434	.038
Integration of design and construction process	.582	.901
Separation of design and construction roles	2.019	.568
Clear lines of control and communication	.614	.893
Easy stakeholder identification	.820	.845
Cooperation among the internal stakeholders	2.041	.564
External stakeholders identification/involvement	.536	.911
Opportunities for dispute avoidance/resolution	6.258	.100
Opportunities to accommodate changes	1.451	.694
Clear assignment of responsibilities	.935	.817

Table 6.5 Median scores of procurement routes related characteristics of stakeholder management process by respondents with different years of professional experience

Procurement routes related characteristics of stakeholder management process	YEARS OF PROFESIONAL EXPERIENCE									
	From 6 to 10 years		From 11 to 15 years		From 16 to 20 years		From 21 years and above		Total	
	N	Median	N	Median	N	Median	N	Median	N	Median
Early involvement of contractor	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
Contractor involvement in design	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
Single point of responsibility	13	3.00	19	4.00	9	4.00	20	4.00	61	4.00
Integration of design and construction process	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
Separation of design and construction roles	13	3.00	19	3.00	9	2.00	20	2.00	61	2.00
Clear lines of control and communication	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
Easy stakeholder identification	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
Cooperation among the internal stakeholders	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
External stakeholders identification/involvement	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
Opportunities for dispute avoidance/resolution	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
Opportunities to accommodate changes	13	4.00	19	4.00	9	4.00	20	4.00	61	4.00
Clear assignment of responsibilities	13	5.00	19	4.00	9	4.00	20	5.00	61	4.00

N = Frequency of responses.

6.6 Assessing the effects of forms of contracts on stakeholder management process

6.6.1 Forms of contract used by respondents

Before assessing the effects of forms of contract on stakeholder management process, the respondents were asked to indicate the forms of contract they used for their most recently completed projects based on which they have been urged to complete the research survey. The results show that 86.9% of the respondents indicated using a specific form of contract (JCT, NEC or Bespoke) whereas, 13.1% indicated using other forms of contract. Among those who indicated using a specific form of contract; 52.46% used JCT, 27.87% used NEC and 6.56 used bespoke contracts as shown in Figure 6.2. Other forms of contract used by the respondents presented in Table 6.6 include one each of: design and construct, frameworks, ICE, JCT with some amendments, Negotiated/partnering, RTI, SBCC, and one said all of JCT, NEC and Bespoke. It can be observed that about four of these could be considered as JCT while the rest could be considered as some form of bespoke contracts which will not change the statistics in Figure 6.2 significantly.

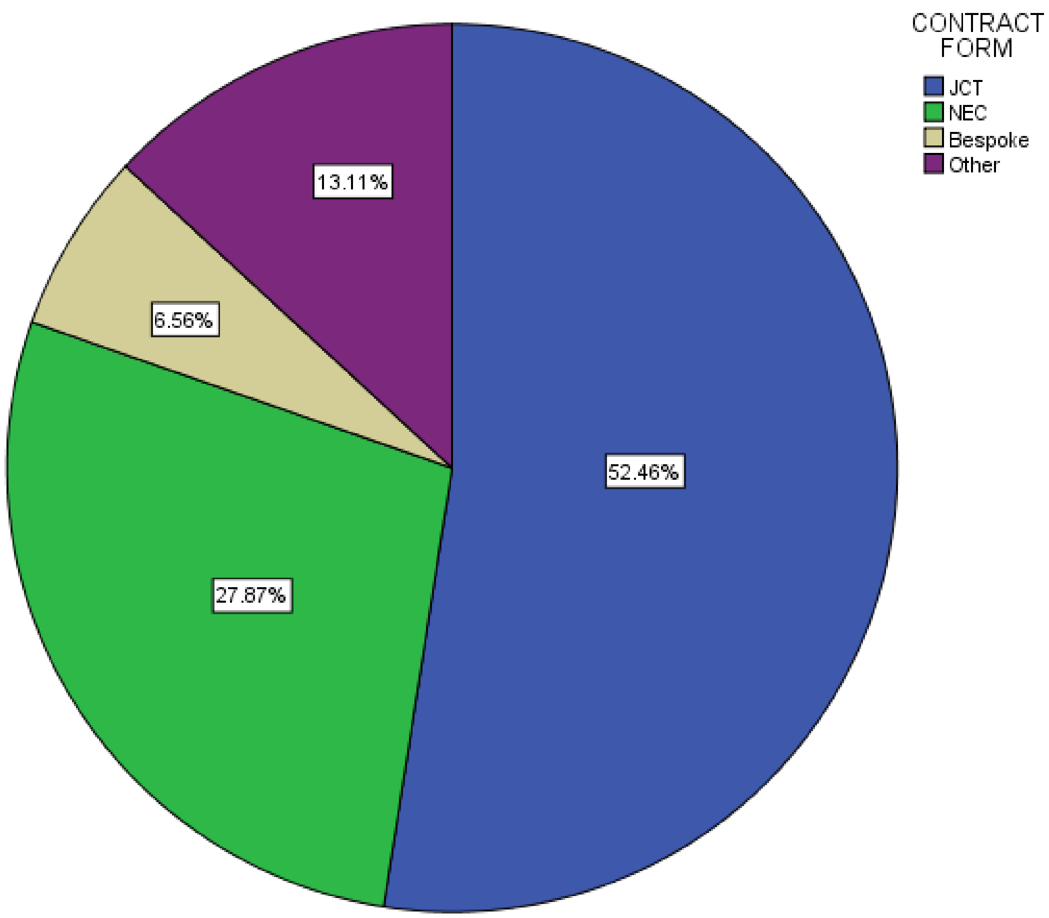

Figure 6.2 Forms of contracts used by respondents

Table 6.6 Other forms of contracts used by respondents

OTHER CONTRACT FORMS	Frequency	Percent
All the above	1	1.64
Design and construct	1	1.64
Frameworks	1	1.64
ICE	1	1.64
JCT with some amendments	1	1.64
negotiated/partnering	1	1.64
RT13	1	1.64
SBCC	1	1.64
Total	8	13.11

6.6.2 Effects of forms of contract on stakeholder management process in construction projects

The respondents were asked in a further question to rate the extent to which they think each of the three forms of contract included in the questionnaire might facilitate stakeholder management based on their experience with their most recently completed project. The result shown in Table 6.7 indicate that NEC form of contract facilitated (influenced) stakeholder management more positively with mean rating of 3.95 than JCT and Bespoke contracts with mean ratings 3.67 and 3.54 respectively. Further, their mean ratings all indicated positive influences with the lowest being 3.54 (Bespoke contract) which is just above the minimum threshold of acceptable rating 3.5. It can be interestingly observed that the respondent considered NEC form of contract to have facilitated stakeholder management more positively even though, a majority of them (52.46) said they used JCT in their most recently completed projects. This could have been so because of some industry based culture or policy which has a lot to do with their years of professional experience and type of clients they work for.

Table 6.7 Mean rating of the extent to which forms of contracts facilitated stakeholder management

Forms of Contracts	Mean rating	N	Std. Deviation
JCT	3.67	61	.625
NEC	3.95	61	.825
BESPOKE CONTRACT	3.54	61	.765

Notes: 1 = Very Negatively and 5 = Very Positively

6.6.3 Investigating client type difference in the extent to which forms of contract influence stakeholder management in construction projects

One-way between groups multivariate analysis was carried out to investigate client type differences in the extent to which forms of contract influence stakeholder management process in construction projects. It was necessary to perform preliminary tests to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicolinearity after which no serious violation was observed. A value of 0.058 was obtained for Box's M sig indicating that the data set did not violate the assumption of homogeneity. If Box's M sig value is greater than 0.001 then the assumption of homogeneity of variance – covariance matrices has not been violated (Tabachnich and Fidel, 2007; Pallant, 2007). Similarly, assumption of equality of variance for all the variables were not violated except for NEC which has a significance value of 0.014 which is less than the minimum threshold of 0.05 (Pallant, 2007). However, based on Tabachnich and Fidell's (2007) suggestion of setting a more conservative alpha level of either 0.025 or 0.01 rather than the conventional 0.05; this can also be said not to have violated equality of variance assumption for NEC (considered in the multivariate F-test).

Table 6.8 indicates that there is no statistically significant difference among respondents working for different clients on their rating of the influence of contract forms on stakeholder management process based on the following results: $F(6,110) = 1.23$, $P = 0.298$; Wilk's Lambda = 0.88; partial eta square = .063. There was no need to investigate each of the variables further since no statistically significant difference was found (as Wilk's Lamda is greater than 0.05) among respondents working for different clients and with different years of professional experience. Therefore it can be said that the respondents opinions of the influence of contract forms on stakeholder management was not influenced by the type of clients they worked for.

Table 6.8 Multivariate test statistics for the rating of the influence of contract forms on stakeholder management by respondents working for different clients

Effect		Value	F	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.857	110.211[b]	.000	.857
	Wilks' Lambda	.143	110.211[b]	.000	.857
	Hotelling's Trace	6.012	110.211[b]	.000	.857
	Roy's Largest Root	6.012	110.211[b]	.000	.857
Years of professional experience	Pillai's Trace	.111	2.283[b]	.089	.111
	Wilks' Lambda	.889	2.283[b]	.089	.111
	Hotelling's Trace	.125	2.283[b]	.089	.111
	Roy's Largest Root	.125	2.283[b]	.089	.111
Client type	Pillai's Trace	.124	1.233	.295	.062
	Wilks' Lambda	.878	1.228[b]	.298	.063
	Hotelling's Trace	.136	1.221	.301	.064
	Roy's Largest Root	.111	2.080[c]	.113	.100

An inspection of the mean ratings presented in Table 6.9 indicated that public client respondents rated JCT form of contract more positively (M = 3.81, SD = 0.750) than private client respondents (M = 3.63, SD = .554) and public/private client respondents (M = 3.50, SD = .535). NEC form of contract was rated more positively by private client respondents (M = 4.00, SD = .762) than public client respondents (M = 3.90, SD = 1.044) and public/private client respondents (M = 3.87, SD = 0.354). Further, bespoke contract was rated more positively by public/private client respondents (M = 4.13, SD = 0.835) than private client respondents (M = 3.47, SD = 0.567) and public client respondents (M = 3.43, SD = 0926). These insignificant differences can be said to be as a result of the difference in the number of respondents of different type of clients as respondents of “public and private” client with the smallest number of respondents recorded the lowest mean rating except for bespoke contract.

Table 6.9 Mean rating of the influence of contract forms by respondents employed by different client type

Contract form	Client type	Mean	Std. Deviation	Number of response
JCT	Public	3.81	.750	21
	Private	3.63	.554	32
	Public and Private	3.50	.535	8
	Total	3.67	.625	61
NEC	Public	3.90	1.044	21
	Private	4.00	.762	32
	Public and Private	3.87	.354	8
	Total	3.95	.825	61
BESPOKE CONTRACT	Public	3.43	.926	21
	Private	3.47	.567	32
	Public and Private	4.13	.835	8
	Total	3.54	.765	61

6.7 Investigating relationships between forms of contract and procurement routes related characteristics of stakeholder management

Kruskals-Wallis Test was employed to investigate the effect of forms of contract on procurement routes related characteristics of stakeholder management in construction projects. The result revealed there is no statistically significant difference in the rating of procurement routes related characteristics across respondents using different forms of contracts (JCT, NEC and Bespoke contracts) except for the rating of “clear lines of control and communication” for which there is statistically significant difference among respondents using different forms of contract at 0.012 presented in Table 6.10. Therefore, it was necessary to examine further, the mean ranks of the groups (respondents using different forms of contract) for "clear lines of responsibilities and communication" to see the extent of the difference. An inspection of the mean ranks for the groups presented in Table 6.11 indicates that respondents using bespoke contract reported the highest rating while those using NEC reported the lowest rating for "clear lines of controls and communications". This shows that respondents using bespoke contracts rated "clear lines of controls and communication" higher (more positively) than those using JCT and NEC. Furthermore, Mann-Whitney U test was carried out to examine the size of difference between the rating of "clear lines of controls and communications" by respondents using different forms of contract. The result revealed the following using Cohen's (1998) criteria that if $r = 0.1$ then the effect of the difference is small; if $r = 0.3$ then the effect of the difference is medium; and if $r = 0.5$ then the effect of the difference is large:

- A small insignificant difference between JCT and NEC ($U = 198.5$, $z = -1.690$, $p = 0.09$, $r = 0.24$).
- A large significant difference between NEC and bespoke ($U = 6.00$, $z = -2.684$, $p = 0.007$, $r = 0.58$).
- A medium significant difference between JCT and bespoke ($U = 24$, $z = -2.217$, $p = 0.027$, $r = .36$).

The results of the Mann-Whitney U test presented above is an indication of the effect of the difference between respondents using different forms of contract of "clear lines of controls and communication". It indicates that the difference between the opinion of those using JCT and NEC; and those using JCT and bespoke are medium and the difference between those using NEC and bespoke is large. The implication of this is that the use of bespoke contract is more likely to enable clear lines of controls and communication in the process of stakeholder management.

Furthermore, comparing the ratings of procurement routes related characteristics of stakeholder management by respondents using different forms of contract with different years of professional experience (Figure 6.3) revealed no significant difference in their pattern of ratings across the years of experience. These are indications of strong agreement in the opinions of the respondents on the influence of the procurement route related characteristic of stakeholder management.

Table 6.10 Kruskal Wallis Test of the rating of procurement routes related characteristics by respondents using different forms of contracts

Procurement route related characteristics	Chi-Square	Asymp. Sig.
Early involvement of contractor	1.203	.548
Contractor involvement in design	1.057	.590
Single point of responsibility	3.025	.220
Integration of design and construction process	5.112	.078
Separation of design and construction roles	3.077	.215
Clear lines of control and communication	8.908	.012
Easy stakeholder identification	.036	.982
Cooperation among the internal stakeholders	2.542	.281
External stakeholders identification/involvement	2.138	.343
Opportunities for dispute avoidance/resolution	3.133	.209
Opportunities to accommodate changes	4.353	.113
Clear assignment of responsibilities	3.430	.180

Table 6.11 Mean ranks of the rating of procurement routes related characteristics by respondents using different forms of contracts

Procurement route related characteristics	Contract Forms	Number of response	Mean Rank
Early involvement of contractor	JCT	32	25.81
	NEC	17	27.65
	Bespoke	4	33.75
	Total	53	
Contractor involvement in design	JCT	32	27.47
	NEC	17	24.79
	Bespoke	4	32.63
	Total	53	
Single point of responsibility	JCT	32	24.80
	NEC	17	28.71
	Bespoke	4	37.38
	Total	53	
Integration of design and construction process	JCT	32	27.61
	NEC	17	22.68
	Bespoke	4	40.50
	Total	53	
Separation of design and construction roles	JCT	32	29.16
	NEC	17	22.00
	Bespoke	4	31.00
	Total	53	
Clear lines of control and communication	JCT	32	28.05
	NEC	17	21.03
	Bespoke	4	44.00
	Total	53	
Easy stakeholder identification	JCT	32	27.30
	NEC	17	26.53
	Bespoke	4	26.63
	Total	53	
Cooperation among the internal stakeholders	JCT	32	25.41
	NEC	17	27.68
	Bespoke	4	36.88
	Total	53	
External stakeholders identification/involvement	JCT	32	27.98
	NEC	17	27.09
	Bespoke	4	18.75
	Total	53	
Opportunities for dispute avoidance/resolution	JCT	32	29.50
	NEC	17	22.24
	Bespoke	4	27.25
	Total	53	
Opportunities to accommodate changes	JCT	32	30.23
	NEC	17	21.91
	Bespoke	4	22.75
	Total	53	
Clear assignment of responsibilities	JCT	32	24.27
	NEC	17	30.41
	Bespoke	4	34.38
	Total	53	

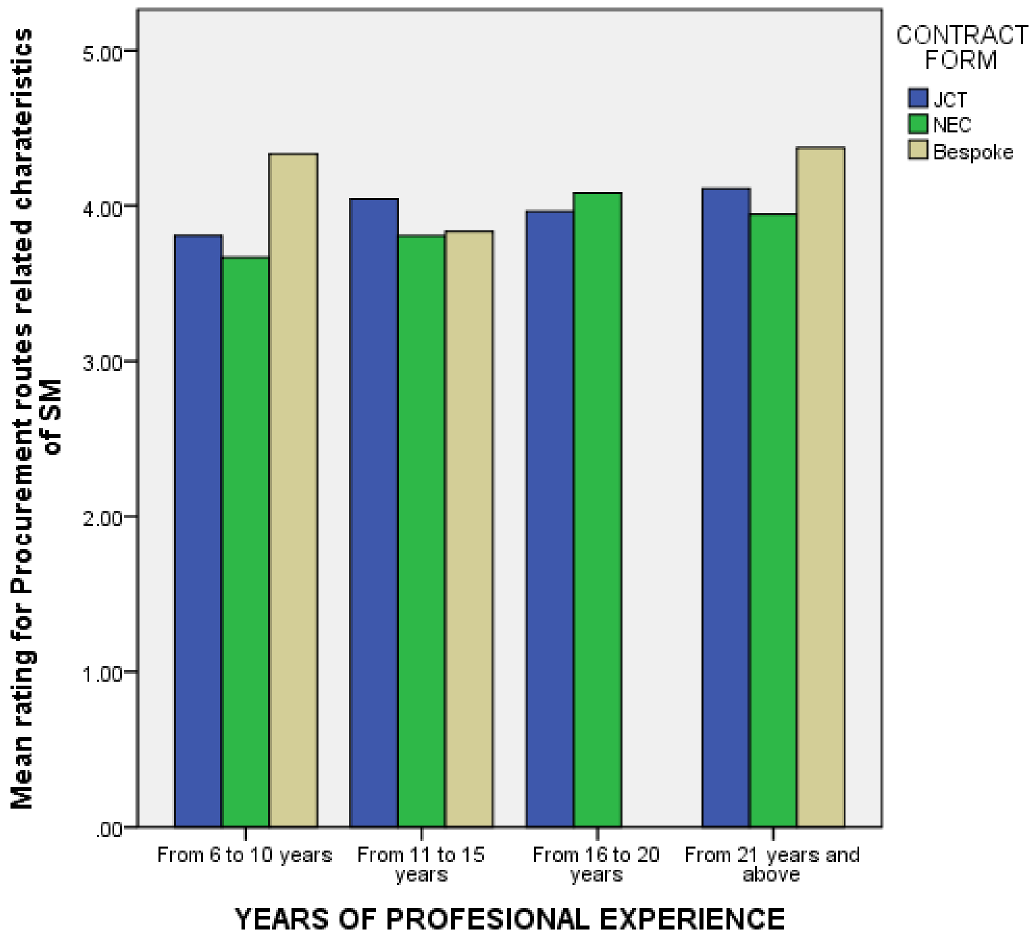

Figure 6.3 Mean ratings of procurement routes related characteristics of stakeholder management by respondents of different years of experience and forms of contract

6.8 Discussion of Results

The results of investigating the effects of procurement route related characteristics of stakeholder management in construction projects have been presented in the preceding sections. The results indicate that all the procurement route related characteristics of stakeholder management (Table 6.1) influence stakeholder management positively except "separation of design and construction roles" which was found to have negative influence on stakeholder management process. This connotes that if different organisations are responsible for the design and construction of the projects it will have a negative impact on stakeholder management. In such situations more, efforts and resources will need to be committed towards stakeholder management than if one organisation is responsible. Furthermore, the five most important characteristics to be sought when selecting a procurement route that favours stakeholder management in construction projects are Clear assignment of responsibilities; Cooperation among the internal stakeholders; Clear lines of control and communication; Early involvement of contractor; and External stakeholders' identification/involvement. The results presented in Table 6.1 indicate that all the procurement route related characteristics of stakeholder management should be given adequate attention except the separation of design and construction roles which is rated as having negative impact on stakeholder management.

Furthermore, the results also indicate that the JCT forms of contract is the most popular among the respondents followed by the NEC forms and then bespoke contracts for which there is a comparatively low rate of usage. But surprisingly, the results revealed that the NEC forms facilitate stakeholder management more positively than the others even though it was not the most popularly used.

The following implications can be inferred from the results of correlation analysis of the procurement route related characteristics presented in section 6.3:

1. Procurement routes that allow "early involvement of contractor" will enable "contractor involvement in design" and vice versa. This can be said to be applicable to 2-stage selective tendering, negotiated contracts, design and build, turnkey, develop and construct, management contracting and construction management procurement routes as presented in chapter 3.
2. Procurement route that allow "early involvement of contractor" will enable "integration of design and construction process" and vice versa. This can be said to be applicable to cost-reimbursable, design and build, turnkey, develop and construct, management contracting and construction management procurement routes as presented in chapter 3.
3. Procurement route that allow "integration of design and construction process" will enable "contractor involvement in design" and vice versa. This can be said to be applicable to design and build, turnkey, develop and construct, management contracting, construction management and design and manage procurement routes as presented in chapter 3.
4. Procurement routes that allow for "external stakeholder identification/involvement" will enable "easy stakeholder identification" and vice versa. This is applicable to PPP/PFI and management contracting as presented in chapter 3.
5. Procurement routes that allow "opportunities to accommodate changes" will enable "opportunities for dispute avoidance/resolutions" and vice versa. This is applicable to traditional method, management contracting, construction

management and design and manages as presented in chapter 3. However, previous research warns that the traditional procurement route and management contracting do not support contractor collaboration in the design process (Rwelamila, 2010) hence they should not be used if internal stakeholder collaboration is to be used. Furthermore, the design and manage option should be used with caution due to its lack of guarantee of financial outcome which can lead to claims and consequently conflicts between stakeholders.

The result presented in section 6.4 indicates that the type of client does not significantly influence the effects of procurement routes related characteristics of stakeholder management. Moreover, the result presented in section 6.5 revealed that years of experience has some influence on the effects of procurement route related characteristics of stakeholder management especially for single point of responsibility which was rated lower by respondents with years of experience from 6 to 10. This provides a strong evidence to conclude that the more experienced professional shave a more positive view of the procurement route related characteristics. Furthermore, the results presented in section 6.6 revealed that NEC is the most stakeholder management friendly for of contract followed by JCT and then bespoke contract although all of them have been found to have positive influence on stakeholder management. An interesting finding is that bespoke contract despite having been rated the least stakeholder management friendly contract form, is more likely to enable clear lines of controls and communication than NEC and JCT.

Finally, there is strong evidence to conclude that choosing the appropriate procurement route will enable the process of stakeholder management in construction projects provided the responsible persons are well experience and knowledgeable enough and the adopted contract form is followed.

6.9 Summary and Conclusions

This chapter has presented the results of data analyses carried out in order to investigate the effects of procurement routes and forms of contract on stakeholder management in construction projects. The summary of findings and conclusions from these analyses are presented in this section.

Based on the findings presented in section 6.2 and the result of literature review presented in chapter 3, a summary of the procurement routes related characteristics of stakeholder management that should be sought in decreasing order of importance when selecting procurement routes that favour stakeholder management in construction projects is presented in Table 6.1 in which Clear assignment of responsibilities; Cooperation among the internal stakeholders; and Clear lines of control and communication are the three topmost characteristics to be sought. Conversely, separation of design and construction roles is to be avoided as much as possible.

Other important findings are summarised as follows:

- The type of client for the project will not affect stakeholder management process provided the appropriate procurement route is selected and the form of contract is followed.
- The more experienced the professionals responsible for stakeholder management are, the more effective it will be in terms of making appropriate stakeholder management decisions in construction projects.
- All forms of contract influence stakeholder management positively but the NEC form of contract have the highest positive effect on stakeholder management process in construction projects.
- Among the procurement routes related characteristics of stakeholder management, only “clear lines of controls and communication” is affected by the form of contracts used. This suggests the need for the form of contract to support the allocation of responsibilities and communication flow among the stakeholders involved.
- The top three procurement routes that mostly favour stakeholder management in construction projects are Management Contracting, PPP/PFI and Design and Build.

Lastly, procurement route and contract condition will serve as control in the process of the life cycle based framework for stakeholder management in construction projects to be presented in Chapter 8. The choice of procurement route for a project depends on the project characteristics and issues at stake such as contractor collaboration in design, internal stakeholder collaboration throughout the project, cost control, price guarantee and quality level desired. Even if the appropriate procurement route that favours stakeholder management is selected, it would be necessary for the project management team to have full understanding of the critical success factors for stakeholder management in construction projects. The next chapter presents the analyses of the interrelationships among the critical success factors for stakeholder management in construction projects.

7. CHAPTER SEVEN: MODELLING THE INTERRELATIONSHIPS AMONG THE CRITICAL SUCCESS FACTORS (CSFs) FOR STAKEHOLDER MANAGEMENT IN CONSTRUCTION PROJECTS

7.1 Introduction

The literature review findings on stakeholder management in construction projects revealed that the interrelationships among the critical success factors for stakeholder management in construction projects are yet to be understood. The critical success factors have been identified during the literature review and presented in chapter 2. This chapter addresses the evaluation of the conceptual measurement and structural models of the critical success factors for stakeholder management developed in chapter 3. Structural equation modelling (SEM), which was explained in detail in Chapter 4, was used to analyse the collected data to reveal these relationships. The Chapter first presents the evaluation of the measurement model of the critical success factors before presenting the evaluation of the structural model after which the discussion of results and conclusions are presented.

7.2 Measurement Model of Critical Success Factors for Stakeholder Management in Construction

In order to empirically investigate the interrelationships among the CSFs, it was necessary to develop a conceptual measurement model, portrayed in Figure 7.1 first presented in chapter 3 based on the extant literature. The conceptual measurement model presented in Chapter 3, is a representation of the theoretical interrelationships among the CSFs for stakeholder management in construction and their latent variables (constructs) drawn from the extant literature. This section first presents the analysis result of the measurement model also known as confirmatory factors analysis (CFA) including preliminary analysis. Preliminary (consistency) analyses including mean ratings of the CSFs, un-rotated principal component factor analysis and standardised Cronbach's alpha coefficient were performed using IBM SPSS 20. Finally, structural equation modelling with IBM AMOS 20 software was used to test the hypothesised measurement model of the interrelations among the CSFs and their latent variables.

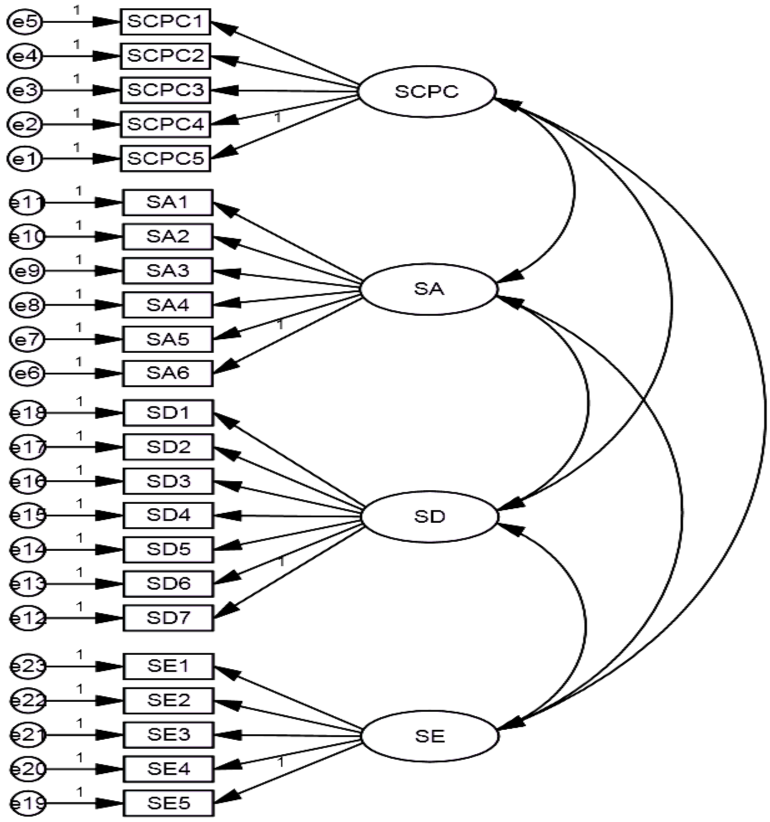

Figure 7.1 Conceptual Measurement Model of CSFs for Stakeholder Management in Construction

7.2.1 Preliminary analysis for consistency checks

It was necessary to carry out some consistency tests to make sure that there are no issues of consistency associated with the data set as explained in section 7.2. The mean ratings of the CSFs were obtained to check for acceptance of the CSFs by the respondents; un-rotated principal component factor analysis was performed to check for commonality within the data set; and standardised Cronbach's alpha coefficient was used to check for reliability of measurement within the data set. The results are presented as follows:

Acceptance if critical success factors for stakeholder management in construction projects:

The result of mean rating presented in Table 7.1 reveals high level of agreement that the CSFs are important for stakeholder management in construction projects. The factor with the highest rating by all respondents is "involving relevant project stakeholders at the inception stage and whenever necessary to refine project mission" (SE1) with mean rating of 4.43 and the factor with the lowest rating is "ensuring the use of flexible project organisation" (SCPC4) with mean rating of 3.85.

Table 7.1 Mean rating and ranking of Critical Success Factors for Stakeholder Management

Code	Critical Success factors for Stakeholder Management	Mean[a]	Rank
SE1	Involving relevant project stakeholders at the inception stage and whenever necessary to refine project mission	4.43	1
SCPC5	Identifying and understanding stakeholders' areas of interests in the project	4.33	2
SE4	Communicating with stakeholders properly and frequently	4.33	2
SD6	Managing how project decisions affect stakeholders	4.30	4
SD1	Resolving conflicts among stakeholders effectively	4.28	5
SE3	Keeping and promoting positive relationships among stakeholders	4.21	6
SCPC3	Carefully identifying and listing the project stakeholders from the on set	4.18	7
SCPC1	Clearly formulating the project mission	4.15	8
SCPC2	Ensuring the use of a favourable procurement route	4.13	9
SA6	Identifying and analysing possible conflicts and coalitions among stakeholders	4.11	10
SD7	Predicting stakeholders' likely reactions for implementing project decisions	4.07	11
SE2	Formulating appropriate strategies to manage/engage different stakeholders	4.07	11
SA5	Predicting stakeholders' potential influence on the project	4.03	13
SD3	Managing the change of stakeholders' influence	4.03	13
SA1	Determining and assessing the attributes (Power, Urgency, Legitimacy and proximity) of stakeholders in/to the project	4.03	15
SE5	Considering corporate social responsibilities (paying attention to Economic, legal, environmental, and ethical issues)	4.03	15
SA2	Appropriately classifying stakeholders according to their attributes	4.03	15
SD4	Managing the change of relationship among stakeholders	4.02	18
SD2	Managing the change of stakeholders' interests	4.00	19
SA3	Predicting and mapping stakeholders' behaviours (Supportive, Opposition, Neutral, etc)	3.95	20
SA4	Predicting stakeholders' potential influence on each other	3.93	21
SD5	Managing change of stakeholders' attributes	3.92	22
SCPC4	Ensuring the use of flexible project organisation	3.85	23

Notes: [a]: 1= Strongly Disagree and 5= Strongly Agree.

Commonality (common variance) check within the data set:

Un-rotated principal component factor analysis was used to check for commonality within the data set. If the results of un-rotated principal component factor analysis reveal the existence of only one factor, then it suggests that commonality is an issue meaning the factors in the data set are likely to fall into the same group (Schriesheim, 1979). The result of un-rotated principal component analysis shows items loading on more than one component which indicates the existence of more than one factor. In all six factors were extracted accounting for 65.48% of the total variance in the data set (Appendices C7a and C7b). These suggest that commonality is not an issue within the data.

Reliability of measurement test results:

Cronbach's alpha coefficient was used to test the reliability of measured variables within the data set. Alpha values should be at least 0.70 with values closer to 1.0, indicating better reliability (Nunnally and Bernstein, 1994; Hair *et al*., 2008). Standardised Cronbach's alpha coefficient of 0.907 was obtained for the measured variables indicating high reliability. Having confirmed the acceptance of all the CSFs, absence of commonality and reliability, the measurement model was then tested.

7.2.2 Evaluation of Measurement Model of Critical Success Factors for Stakeholder Management in Construction Projects

IBM SPSS AMOS 20 software was used to empirically test the hypothetical measurement model of critical success factors (CSFs) for stakeholder management in construction. To achieve this, the measurement model component of structural equation modelling (SEM) was used to investigate the appropriateness and strength of the relationships between the observed and latent variables as well as to measure if there are any, correlations/co-variances among the four latent variables.

Using confirmatory factor analysis (CFA) also known as "measurement model", the assessment of fit between the data collected and the theoretically conceptual model (portrayed in Figure 7.1) of the relationships between observed and latent variables was done. The latent variables in the hypothetical model include: stakeholder characteristics and project characteristics (SCPC); stakeholder analysis (SA); stakeholder dynamics (SD); and stakeholder engagement/empowerment (SE); and their indicators (measured variables) are the CSFs presented in chapter 2.

SEM uses goodness-of-fit (GOF) indices shown in Table 7.2 from the output obtained in AMOS in order to assess how well the hypothesised model fits the data set. The GOF indices shown in Table 7.2 include the root mean square residual (RMR), comparative fit index (CFI), incremental fit index (IFI), Tucker-Lewis index (TLI), goodness of fit index (GFI), ratio of minimum discrepancy to the degrees of freedom (CMIN/DF) and root mean square error of approximation (Anderson and Gerbing, 1984; Kline, 2004; Iacobucci, 2010). The RMR computes the residual differences between the data set and model prediction and take the square root of the result. It ranges from 0 – 1 with smaller values indicating better fit. The CFI compares the fit of a baseline model to the data with the fit of the hypothesised model to the same data. It also ranges from 0 – 1 but with larger values indicating better fit. IFI is the ratio of the difference between the discrepancy and degrees of freedom of the hypothesised model and that of the baseline model. It also ranges from 0 – 1 with larger values showing better fit. The TLI compares the discrepancy and degrees of freedom for the hypothesised model with those of the baseline model. It also ranges from 0 – 1 with larger values indicating better fit. The GFI is a test if the maximum likelihood estimate of the hypothesised model fit to the data set. It also ranges from 0 – 1 and higher values indicate better fit. The CMIN/DF adjusts the chi-square by computing the ration of the minimum discrepancy to degrees of freedom. It ranges from 1- 2 with vales closer to 1 indicating closer fit.

Measurement model modification:

After analysing the hypothesised measurement model, the path coefficients as well as the GOF revealed the need to refine/modify the measurement model. Three main considerations are used to modify models in SEM (Kline, 2005): looking for and eliminating paths with very low factor loadings; removing variables indicated by the modification indices as having multi-co-linearity; and removing observed variables with very high values in the standardised residual correlation matrix. Additionally, model refinement/modification should lead to the selection of a fitting model which satisfies not only the GOF measures but also falls within and satisfies the theoretical expectation (Molenaar, *et al*., 2000; Byrne, 2010). After going through the refinement/modification steps, seven observed variables were dropped from the hypothesised measurement model for showing signs of multi-co-linearity and having high standardised residual correlations above 0.4: three from SCPC (SCPC1, SCPC4, and SCPC5); three from SD (SD1, SD6, and SD7) and one from SE (SE4). Furthermore, three observed variables (SA1, SA2, and SE1) have been relocated to another construct and all the correlations among the latent variables were retained (Table 7.3). For details about the full meanings of observed variables refer to Table 7.1. The resultant best fitting measurement model is portrayed in Figure 7.2 as further refinement/modification failed to improve the model fit. The GOF indices for both the conceptual measurement model and the fitting measurement model are presented in Table 7.2.

Table 7.2 Result of GOF measures for both Conceptual and best fitting measurement models of the CSFs for stakeholder management in construction

Goodness-of-fit (GOF) measures	Recommended level of GOF measures	Conceptual measurement model	Best fitting measurement model
CMIN/DF	1 (very good) – 2 (threshold)	1.41	1.18
Root mean sq. Error of approx. (RMSEA)	>0.05 (Very good) – 0.1 (threshold)	0.08	0.05
Root mean sq. Residual (RMR)	0 – 1 (Smaller values = better fit)	0.44	0.35
Goodness-of-fit index (GFI)	0 (no fit) – 1 (perfect fit)	0.72	0.82
Comparative-fit index (CFI)	0 (no fit) – 1 (perfect fit)	0.83	0.95
Incremental-fit index (IFI)	0 (no fit) – 1 (perfect fit)	0.84	0.95
Tucker-Lewis index (TLI)	0 (no fit) – 1 (perfect fit)	0.80	0.94

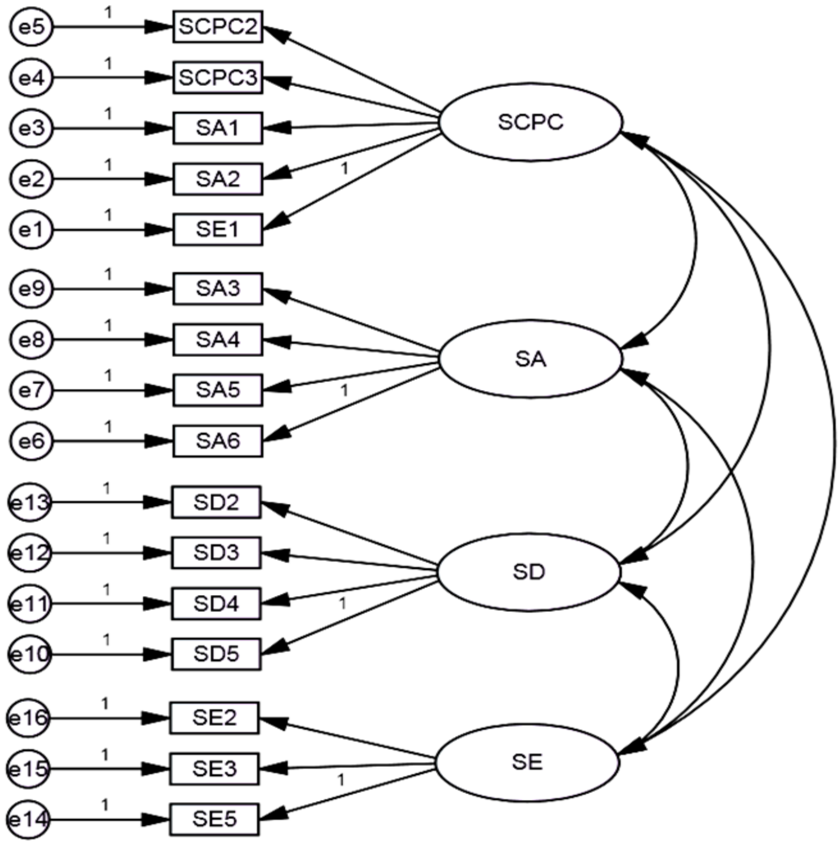

Figure 7.2 The Best Fit Measurement Model of CSFs for SM in Construction

Path coefficient of observed variables' loading on latent variables:

The strength with which the observed variables measure the latent variables in the best fit measurement model, is indicated by their standardised path coefficients (also known as factor loading) which are shown in Table 7.3. The path coefficients of the influence of the observed variables on the latent variables ranged from 0.54 to 0.89 (Table 7.3), indicating that the retained observed variables significantly measure the latent variables. Moreover, all the path coefficients are positive and statistically significant at level P < 0.05, therefore, they are supported. Values of factor loading equal to or greater than 0.40 with significant P value <0.05 indicate strong measurement with values closer to 1 indicating stronger measurement (Li *et al*., 2005; Akson and Hadikusumo, 2008). This suggests that the latent variables are valid groupings of the CSFs for stakeholder management in construction projects.

Table 7.3 Standardised path coefficients of observed variables' loading on latent variables

Latent variables and their indicators[a]	Standardised path coefficients
Stakeholder Characteristics and Project Characteristics (SCPC)[b]	
SCPC2	+0.54
SCPC3	+0.59
SA1	+0.55
SA2	+0.57
SE1	+0.65
Stakeholder Analysis (SA)[b]	
SA3	+0.68
SA4	+0.75
SA5	+0.70
SA6	+0.64
Stakeholder Dynamics (SD)[b]	
SD2	+0.78
SD3	+0.89
SD4	+0.75
SD6	+0.76
Stakeholder Engagement/Empowerment (SE)[b]	
SE2	+0.69
SE3	+0.72
SE5	+0.68

Note: The path coefficients are all statistically significant at level $P < 0.05$;
[a]: refer to Table 7.1 for full meanings of the indicators; [b]: Latent variables

Correlation and covariance coefficient of the best fitting measurement model:

The strengths of the correlations and covariant relationships among the latent variables are shown in Table 7.4 indicating that the latent variables strongly affect one another positively with the smallest value of correlation being 0.579 (between SD and SE) which is still above the minimum threshold of 0.5. Furthermore, all the correlations are statistically significant at level $P < 0.05$ and the covariance estimates are all below the maximum threshold of 0.3. The standard errors (S.E.) do not present with any outliers (i.e. any extremely large or small values) same as the critical ratios (C.R.). Therefore, all the hypothesised correlations among the latent variables are supported and the specific interrelationships among them can be investigated in a structural component of SEM. Furthermore, the strong correlation estimates presented in Table 7.4 point to the existence of some interrelationships direct or indirect among the constructs of CSFs for stakeholder management in construction (SCPC, SA, SD and SE).

Table 7.4 Standardised correlation and covariance coefficients of the best fitting measurement model of CSFs for stakeholder management in construction

Covariance links			Correlation Estimate	Covariance Estimate	S.E.	C.R.	Sig(P)
SCPC	<-->	SA	+0.773	0.147	0.049	2.980	0.003
SCPC	<-->	SD	+0.696	0.187	0.061	3.069	0.002
SCPC	<-->	SE	+0.768	0.135	0.046	2.963	0.003
SA	<-->	SD	+0.782	0.212	0.064	3.319	***
SA	<-->	SE	+0.730	0.130	0.044	2.963	0.003
SD	<-->	SE	+0.579	0.145	0.051	2.835	0.005

Interestingly, the CSFs excluded from the measurement model have been strongly accepted by the respondents based on their mean ratings presented in Table 7.1. Therefore, they have been compared with and realigned into other factors that have been retained in the final measurement model. The reason is to avoid losing too much of the CSFs and care was taken to ensure that the final CSFs constituting the measured variables (indicators) in the best fitting model are still consistent with the extant theoretical postulations. This led to the merging of CSFs presented in Table 7.5 based on which the final measurement and structural models were analysed.

Table 7.5 Realigned critical success factors for stakeholder management in construction projects

	Critical Success Factors for Stakeholder Management	
Code[a]	**Old name**	**New name**
SE1 + SCPC1	Involving relevant project stakeholders at the inception stage and whenever necessary to refine project mission	Involving relevant project stakeholders at the inception stage and whenever necessary to formulate and refine project mission
SE3	Keeping and promoting positive relationships among stakeholders	None
SCPC3 + SCPC5	Carefully identifying and listing the project stakeholders from the on set	Carefully identifying and listing the project stakeholders and their areas of interests from the on set
SCPC2 + SCPC4	Ensuring the use of a favourable procurement route	Ensuring the use of a favourable procurement route and flexible project organisation
SA6 + SD1	Identifying and analysing possible conflicts and coalitions among stakeholders	Identifying, analysing and resolving possible conflicts and coalitions among stakeholders
SE2 + SE4	Formulating appropriate strategies to manage/engage different stakeholders	Formulating appropriate communication strategies to manage/engage different stakeholders
SA5	Predicting stakeholders' potential influence on the project	None
SD3	Managing the change of stakeholders' influence	None
SA1	Determining and assessing the attributes (Power, Urgency, Legitimacy and proximity) of stakeholders in/to the project	None
SE5	Considering corporate social responsibilities (paying attention to Economic, legal, environmental, and ethical issues)	None
SA2	Appropriately classifying stakeholders according to their attributes	None
SD4 + SD6	Managing the change of relationship among stakeholders	Managing the change of relationship among stakeholders and how project decisions affect them
SD2	Managing the change of stakeholders' interests	None
SA3 + SD7	Predicting and mapping stakeholders' behaviours (Supportive, Opposition, Neutral, etc)	Predicting and mapping stakeholders' behaviours (Supportive, Opposition, Neutral, etc) and reactions for implementing project decisions
SA4	Predicting stakeholders' potential influence on each other	None
SD5	Managing change of stakeholders' attributes	None

Note: [a:] affected CSFs are presented in bold in the first column

7.3 Evaluation of the Structural Model of Critical Success Factors for Stakeholder Management in Construction Projects and Hypothesis Testing

Based on the outcome of an extensive literature review on stakeholder management in construction projects presented in chapter 2 and project success presented in chapter 3, it was hypothesised that adequately obtaining information on stakeholder characteristics and project characteristics (SCPC); carrying out informed stakeholder analysis (SA); understanding stakeholder dynamics (SD); and effective stakeholder engagement/empowerment (SE) affect the impact of stakeholder management on construction projects success. These have been discussed in Chapter three. In line with these, the following specific hypotheses have been stated (portrayed in Figure 7.3) to further investigate the relationships among the critical success factors for stakeholder management in construction:

Hypothesis 1: Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) influences the impact of stakeholder management on construction project success (PS).

Hypothesis 2: Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) enables stakeholder analysis (SA).

Hypothesis 3: Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) enables the understanding of stakeholder dynamism (SD).

Hypothesis 4: Stakeholder analysis (SA) influences the overall impact of stakeholder management on construction project success (PS).

Hypothesis 5: Stakeholder analysis (SA) enables effective stakeholder engagement/empowerment (SE).

Hypothesis 6: Understanding stakeholder dynamism (SD) influences the overall impact of stakeholder management on construction project success (PS).

Hypothesis 7: Stakeholder analysis (SA) enables the understanding of stakeholder dynamism (SD).

Hypothesis 8: Understanding stakeholder dynamism (SD) enables effective stakeholder engagement/empowerment (SE).

Hypothesis 9: Effective stakeholder engagement/empowerment (SE) influences the impact of stakeholder management on construction project success (PS).

Hypothesis 10: Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) enables effective stakeholder engagement/empowerment (SE).

The evaluation of the final structural model of critical success factors for stakeholder management was based on the merged CSFs (indicators) shown in Table 7.6. The codes retained for the indicators are shown in brackets in the second column of Table 7.6.

Table 7.6 Final indicators of the constructs of the structural model of CSFs for stakeholder management in construction projects

Constructs	Indicators and codes used
Stakeholder characteristics and project characteristics (**SCPC**)	• Ensuring the use of a favourable procurement route and flexible project organisation (**SCPC2**); • Carefully identifying and listing the project stakeholders and their areas of interests from the on set (**SCPC3**); • Determining and assessing the attributes (Power, Urgency, Legitimacy and proximity) of stakeholders in/to the project (**SA1**); • Appropriately classifying stakeholders according to their attributes (**SA2**); • Involving relevant project stakeholders at the inception stage and whenever necessary to formulate and refine project mission (**SE1**).
Stakeholder analysis (**SA**)	• Predicting and mapping stakeholders' behaviours (Supportive, Opposition, Neutral, etc) and reactions for implementing project decisions (**SA3**) • Predicting stakeholders' potential influence on each other (**SA4**); • Predicting stakeholders' potential influence on the project (**SA5**); • Identifying, analysing and resolving possible conflicts and coalitions among stakeholders (**SA6**).
Stakeholder dynamics (**SD**)	• Managing the change of stakeholders' interests (**SD2**); • Managing the change of stakeholders' influence (**SD3**); • Managing the change of relationship among stakeholders and how project decisions affect them (**SD4**); • Managing change of stakeholders' attributes (**SD5**).
Stakeholder engagement/empowerment (**SE**)	• Formulating appropriate communication strategies to manage/engage different stakeholders (**SE2**); • Keeping and promoting positive relationships among the stakeholders (**SE3**); • Considering corporate social responsibilities (paying attention to economic, legal, environmental and ethical issues) (**SE5**).
Project Success (**PS**)	• Completion of project on time (**PS1**); • Completion on budget (**PS2**); • Completion to specified standards/qualities (**PS3**); • Completion to the satisfaction of a majority of the project stakeholders (**PS4**).

Figure 7.4 presents the final structural equation model of CSFs for stakeholder management in construction projects with standardised path coefficients on the structural paths of the hypothesised relationships shown in Figure 7.3. The standardised path coefficients were tested using critical ratios, standard errors and their level of statistical significance to ascertain whether the hypotheses are supported by the data set or not (see Table 7.7). As presented in Table 7.7, the standard errors (S.E.) do not present with any extremely high or low values except for that of H4. The critical ratios (C.R.) for H1, H3, H4 and H6 are extremely low and a further look at the results

presented in Table 7.7 reveal that only four hypothesised relationships are supported at the statistical significance level of $P<0.05$. The relationship path between stakeholder characteristics and project characteristics (SCPC) and stakeholder dynamism (SD) with insignificant P value of 0.322 and low path coefficient of 0.255 does not support Hypothesis 3. Similarly the paths between stakeholder analysis (SA) and project success (PS) with insignificant P value of 0.721 and a negative low path coefficient of -0.125; stakeholder dynamism (SD) and project success (PS) with insignificant P value of 0.902 and a low path coefficient of 0.041; stakeholder characteristics and project characteristics (SCPC) and project success (PS) with insignificant P value 0.968 and low path coefficient of 0.012 failed to support Hypotheses 4, 6, 1 respectively. Conversely, the relationship path between stakeholder characteristics and project characteristics (SCPC) and stakeholder analysis (SA) with P value of 0.002 and path coefficient of 0.772 strongly sup-ports Hypothesis 2. Other hypotheses supported by the results presented in Table 7.7 include Hypotheses 7, 8 and 9. They are supported by the paths between stakeholder analysis (SA) and stakeholder dynamism (SD) with significant P value of 0.025 and acceptable path coefficient of 0.608; stakeholder dynamism (SD) and stakeholder engagement/empowerment (SE) with very significant P value and acceptable path coefficient of 0.634; and stakeholder engagement/empowerment (SE) and project (PS) with significant P value of 0.008 and acceptable path coefficient of 0.695; respectively. Table 7.8 presents the GOF measures for the conceptual and best fitting structural models of critical success factors for stakeholder management in construction. Figure 7.4 indicates improvement in the strengths of the supported hypothesis after deleting the hypotheses not supported as shown in Table 7.7.

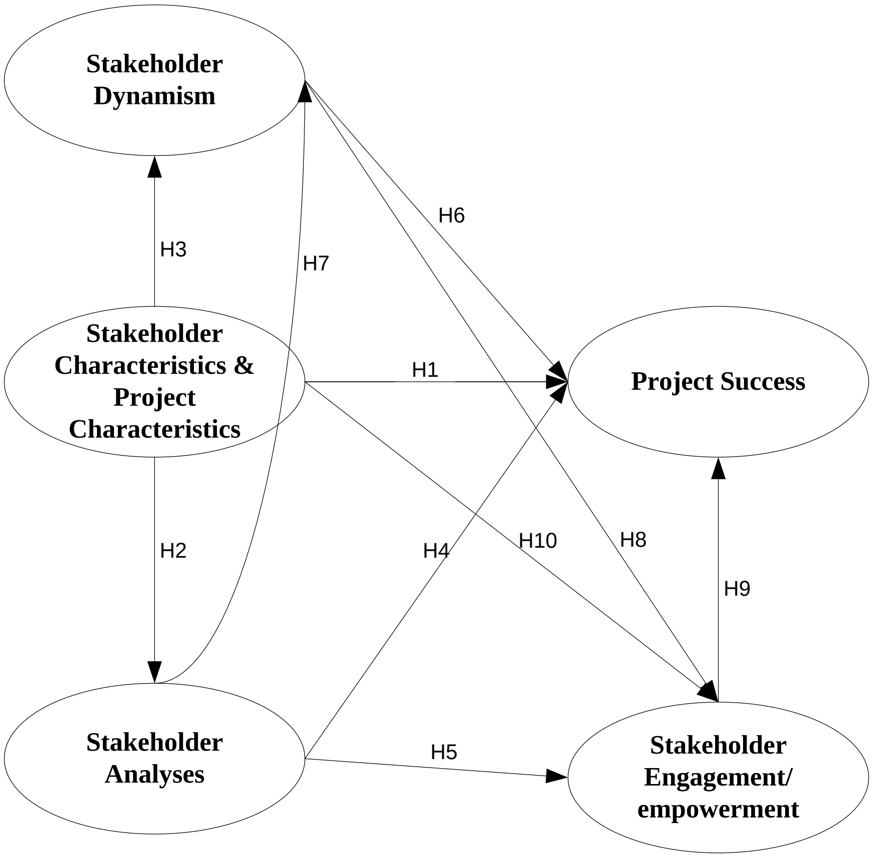

Figure 7.3 Hypothesised structural model of critical success factors for stakeholder management in construction projects

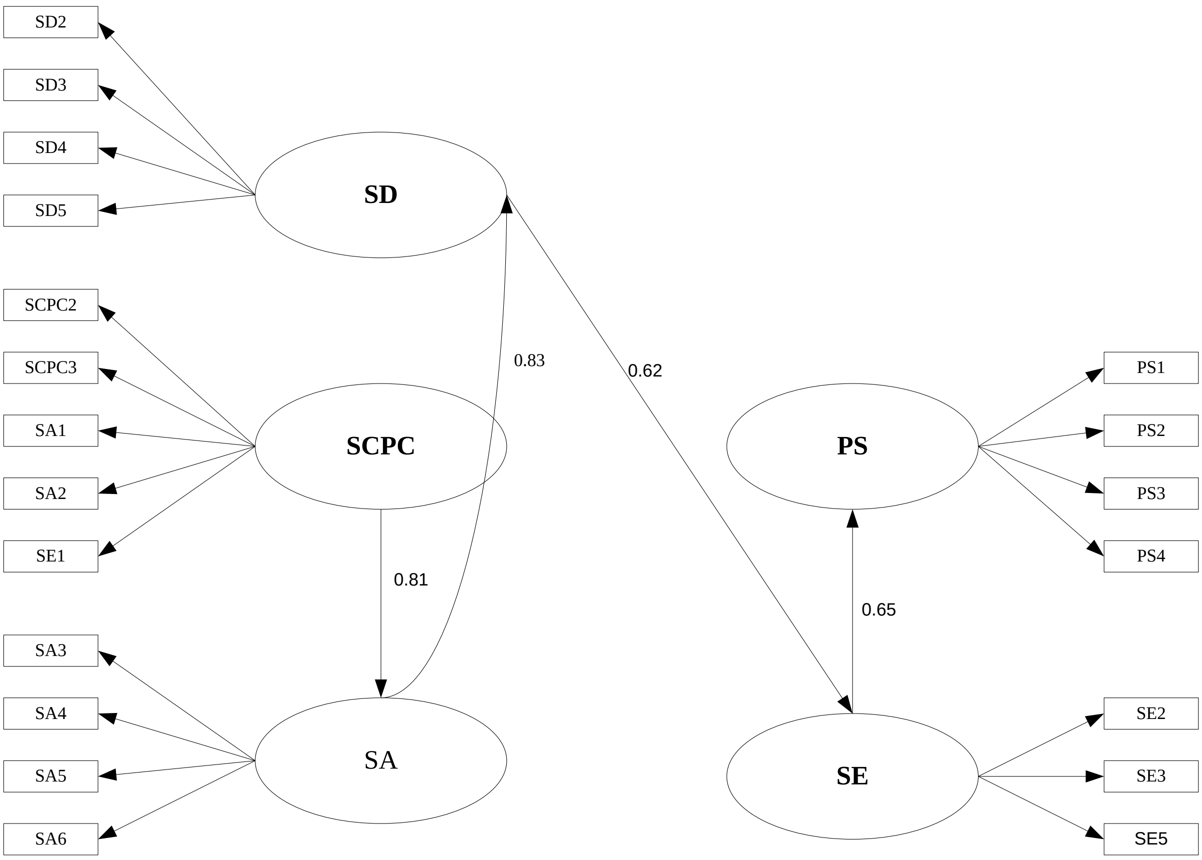

Figure 7.4 Final structural model of critical success factors for stakeholder management in construction projects

Table 7.7 Standardised path coefficients of the conceptual structural model of the interrelations among CSFs for stakeholder management in construction

Hypothesised relationships			Path coefficient	S.E.	C.R.	Sig(P)	Interpretation
H1:PS	<---	SCPC	+0.012	0.389	0.040	0.968	Not supported
H2:SA	<---	SCPC	+0.772	0.244	3.165	0.002	Supported
H3:SD	<---	SCPC	+0.255	0.372	0.991	0.322	Not supported
H4:PS	<---	SA	-0.125	0.435	0.357	0.721	Not supported
H5:SE	<---	SA	+0.393	0.332	1.069	0.285	Not supported
H6:PS	<---	SD	+0.041	0.283	0.123	0.902	Not supported
H7:SD	<---	SA	+0.608	0.391	2.249	0.025	Supported
H8:SE	<---	SD	+0.634	0.117	3.507	***	Supported

Hypothesised relationships			Path coefficient	S.E.	C.R.	Sig(P)	Interpretation
H9:PS	<---	SE	+0.695	0.346	2.667	0.008	Supported
H10:SE	<---	SCPC	+0.528	0.324	1.503	0.133	Not supported

The goodness of fit indices for conceptual and best fitting structural models are presented in Table 7.8. The GOF indices indicate some improvements over the conceptual structural model after deleting the hypothesised relationships not supported by the data set.

Table 7.8 Result of GOF measures for both Conceptual and best fitting structural models

Goodness-of-fit (GOF) measures	Recommended level of GOF measures	Conceptual structural model	Best fitting structural model
CMIN/DF	1 (very good) – 2 (threshold)	1.27	1.24
Root mean sq. Error of approx. (RMSEA)	>0.05 (Very good) – 0.1 (threshold)	0.07	0.06
Root mean sq. Residual (RMR)	0 – 1 (Smaller values = better fit)	0.05	0.04
Goodness-of-fit index (GFI)	0 (no fit) – 1 (perfect fit)	0.77	0.82
Comparative-fit index (CFI)	0 (no fit) – 1 (perfect fit)	0.90	0.92
Incremental-fit index (IFI)	0 (no fit) – 1 (perfect fit)	0.91	0.92
Tucker-Lewis index (TLI)	0 (no fit) – 1 (perfect fit)	0.89	0.90

7.4 Discussion of Results and Conclusions

This chapter investigated the interrelationships among the CSFs for stakeholder management in construction projects based on four latent variables drawn from previous research. The results indicate acceptance of the CSFs for stakeholder management in construction by the survey respondents as well as the existence of statistically significant relationships between the measured (CSFs) and latent variables and among the latent variables (SCPC, SA, SD and SE).

The findings based on the measurement model indicate that SE1 “Involving relevant project stakeholders at the inception stage and whenever necessary to refine project mission” is the most accepted CSF by the respondents with mean rating of 4.43 followed by SCPC5 “Identifying and understanding stakeholders’ areas of interests in the project”, SE4 “Communicating with stakeholders properly and frequently”, SD6 “Managing how project decisions affect stakeholders” and SD1 “Resolving conflicts among stakeholders effectively” with mean ratings 4.33, 4.33, 4.30 and 4.28 respectively. SCPC4 “Ensuring the use of flexible project organisation” has the least mean rating 3.85 which is still way above the acceptable rating for a five-point Likert scale being 3.5. This connotes that the survey respondents considered all the 23 CSFs as vital for the success of stakeholder management in construction which is partly in line with the findings of Yang *et al*., (2009) except for the additional CSFs. Furthermore, Yang *et al*. (2009) found that SE5 (Considering corporate social responsibilities (paying attention to Economic, legal, environmental, and ethical issues)) was the most important CSF and could not be grouped under any of the constructs and identified it as the precondition factor of stakeholder management in construction projects. However, the findings in the current study grouped SE5 under stakeholder engagement (SE) with a factor loading of 0.68.

Additionally, the most important CSF in the current study is SE1 (Involving relevant project stakeholders at the inception stage and whenever necessary to refine project mission) which was initially hypothesised to be under the construct stakeholder engagement/empowerment (SE) but the result of the measurement model analysis moved it to the construct stakeholder characteristics and project characteristics (SCPC). As reported in the preceding section, the results of the “measurement model” reduced 7 CSFs from the best fitting measurement model including SCPC1, SCPC4, SCPC5, SD1, SD6, SD7 and SE4 which were merged with other retained CSFs during model modification (see Tables 7.5 and 7.6: for the mergers and their final meanings/retained codes respectively).

Another important revelation of the measurement model is that, the strong correlation estimates presented in Table 7.4 point to the existence of some interrelationships direct or indirect among the constructs of CSFs for stakeholder management in construction (SCPC, SA, SD and SE).

The final structural model suggests that only one of the CSFs for stakeholder management constructs, stakeholder engagement/empowerment has a direct positive impact on project success. The results indicate that the other three constructs (SCPC, SA and SD) cannot directly influence project success (PS) but they influence project success indirectly by their collective interactions through stakeholder engagement/empowerment (SE) as follows:

- Stakeholder characteristics and project characteristics (SCPC) influence stakeholder analysis (SA) with a very high path coefficient of 0.81 and a significant P value of 0.026.
- Stakeholder analysis (SA) in turn influences the understanding of stakeholder dynamism (SD) with an equally high path coefficient of 0.83 and a significant P value of 0.002.
- The understanding of stakeholder dynamism (SD) will enable stakeholder engagement/empowerment (SE) with an acceptable path coefficient of 0.62 and a very significant p value.
- Stakeholder engagement/empowerment (SE) influences project success (PS) with an acceptable path coefficient of 0.65 and a very significant P value.

The finding that stakeholder analysis (SA) cannot directly impact/influence project success (PS) is a shift from the view within the construction based stakeholder management literature that stakeholder analysis can lead to project success (Jepsen and Eskerod, 2009; Olander and Landin, 2005). Moreover, non-support for H3 (Obtaining adequate information on stakeholder characteristics and project characteristics (SCPC) enables the understanding of stakeholder dynamism (SD)) can be considered counter intuitive. However, stakeholder engagement/empowerment (SE) being the only construct found to directly influence project success (PS) depends on the understanding of stakeholder dynamism (SD) which also depends very strongly on the results of stakeholder analysis (SA). The finding that understanding stakeholder dynamism (SD) depends on the results of stakeholder analysis (SA) is in agreement with the position of Aaltonen *et al*. (2008). Interestingly, although the relationship between SCPC and SD was not supported (see Table 7.7), the path coefficients between them indicates that a little understanding of stakeholder dynamism can be gained based only on the information collected on project characteristics and stakeholder characteristics.

Furthermore, the findings suggest that obtaining information on project characteristics and stakeholder characteristics is a major precondition step in the process of stakeholder management. This finding is in line with the opinion canvassed by a faction of the extant literature (Mitchell *et al*., 1997; Chinyio and Akintoye, 2008) and disagrees with the position of Yang *et al*. (2009) that the precondition factor for stakeholder management in construction projects is "considering corporate social responsibilities" which by the findings of the current study is an indicator of stakeholder engagement/empowerment (SE).

Conclusion: The objective of this chapter was to understand the interrelations among the critical success factors for stakeholder management in construction through their relationships with the latent variables as well as the causal interrelations among the latent variables; and to examine the fit between extant theoretical standing and the survey data collected for the current study. Based on the goodness-of-fit indices shown in Table 7.2, it can be concluded with high level of confidence that the measurement model portrayed in Figure 7.2 fits the sample data fairly well and therefore is accepted. This implies that all stakeholder management decisions made in the four distinct processes shown in the latent variables (obtaining information on project characteristics and stakeholder characteristics; undertaking stakeholder analysis; understanding stakeholder dynamism; and stakeholder engagement/empowerment) affect each other directly or indirectly.

The results of the structural model portrayed in Figure 7.4 support the following:

- The ability of the project management team to clearly obtain adequate information on stakeholder characteristics and project characteristics will influence and aid their ability to carry out stakeholder analysis.
- Understanding stakeholder dynamism depends on the results of stakeholder analysis to inform decision on how to effectively engage/empower stakeholders during construction projects.
- Effective stakeholder engagement/empowerment will facilitate project success.

Further implication is that being able to carry out effective stakeholder management in construction is contingent upon understanding of the interrelationships among the CSFs with obtaining information about project characteristics and stakeholder characteristics (SCPC) being the precondition factor (construct). Failure to adequately and holistically address the critical success factors for stakeholder management in construction projects will prevent stakeholder management efforts from achieving the desired results-project success. The findings presented in this chapter provide a logical guide for carrying out stakeholder management in construction projects and are used in developing the framework presented in the next Chapter (8).

8. CHAPTER EIGHT: DEVELOPMENT OF LIFE CYCLE BASED FRAMEWORK FOR STAKEHOLDER MANAGEMENT IN CONSTRUCTION PROJECTS

8.1 Introduction

Literature review findings on stakeholder management in construction projects revealed that project failure is linked to lack of or inadequate stakeholder management process. The review also identified the need for stakeholder management to be carried out throughout the life cycle of construction projects but the current frameworks fail to address this need. It has been shown that there is need for a framework for stakeholder management in construction that provides a comprehensive and coherent guide for carrying out stakeholder management in construction and thereby increases the propensity for achieving project success in construction. This chapter presents the development of the framework for stakeholder management in construction resulting from this study aimed at addressing this need. The chapter starts by giving an overview of the life cycle based framework for stakeholder management followed by framework development approach, features of the framework, IDEF0 process models of framework for stakeholder management and then chapter summary.

8.2 Overview of the Life Cycle Based Framework for Stakeholder Management in Construction

8.2.1 Background to framework development

The framework for stakeholder management in construction was developed by using the analysis results presented in Chapters 5, 6 and 7 in combination with theoretical findings from literature review presented in Chapters 2 and 3. These findings constitute the components of the framework developed. The framework was developed using process modelling in line with the PMI's (2004) definition of project stakeholder management as "the systematic identification, analysis and planning of actions to communicate with and influence stakeholders".

Investigation of current practice of stakeholder management in construction presented in chapter 5 revealed the following:

- There is need to assign specific responsibilities for stakeholder management in construction projects as currently no specific responsibility is assigned for stakeholder management in construction projects.
- Construction companies/organisations should make stakeholder management a part of their organisational agenda/policy/strategy.
- When reasons for change in stakeholder interests/disposition were investigated, it was found that all relevant stakeholders should be involved as much as possible in defining project mission in order to avoid the impact of change.
- Both negative and positive impacts of project objectives should be communicated to the stakeholders in order to secure their trust.
- There is need to put in place feedback mechanisms and early warning signs to track change in stakeholder interests/disposition throughout the project.
- The results further confirmed the need for internal stakeholder collaboration in carrying out stakeholder management and identified the internal stakeholders that should be involved in such collaboration at the various stages of the project.
- The results also identified the internal stakeholders that should lead/coordinate stakeholder management at various stages in construction projects.
- The results also identified the most effective/popular techniques for stakeholder engagement.

Investigation- of the effects of procurement routes and forms of contract on stakeholder management process in construction projects presented in chapter 6 revealed the following:

- The procurement routes that favour procurement routes related characteristics of stakeholder management in the project are adopted.
- It should be ensured that the project contract supports clear allocation of responsibilities and communication flow among the key/internal stakeholders of the project.

Investigation- of the interrelationships among the critical success factors for stakeholder management in construction presented in chapter 7 identified the important lines of influence/relationships among the groups of CSFs indicating areas that should be given closer attention to achieve project success.

From the literature review, the stages of construction projects were mapped out. These include inception, design, construction and operation stages which were used to design the questionnaires with respect to life cycle related questions.

The framework for stakeholder management in construction is developed to address the need for a comprehensive guide for carrying out stakeholder management in construction projects. It is intended that the framework should be used by construction professionals and other relevant stakeholders working at different stages of construction projects. Specifically, the client, designers, construction managers, contractors, quantity surveyors, facility managers and some end users are potential users of the framework.

8.2.2 Framework development approach-IDEF0

The IDEF0 technique has been chosen to model the framework for stakeholder management in construction because it allows different levels of details through the process and sub process to be presented very clearly in parent and child diagrams. Moreover, it enables consensus decision making which is vital to the stakeholder management process. Furthermore, its simplified graphical presentation would enable the construction professionals and other relevant stakeholders to easily understand and follow the stages for successful stakeholder management in construction projects.

8.2.2.1 IDEF Techniques

The Integrated Definition for Function Modelling is a family of methods that support a paradigm that is able to address the modelling needs of an enterprise and its business areas. It is abbreviated as IDEF (representing Integrated DEFinition). IDEF originated when the US Air Force, in response to the identified need for improving manufacturing operations, developed the Integrated Computer-Aided Manufacturing (ICAM) in the mid-1970s (IDEF, 2003). The IDEF family has different techniques developed to suit different purposes and applications. The most important techniques of the IDEF family include IDEF0, IDEF1, IDEF1X, IDEF2, IDEF3, IDEF4 and IDEF5. Their respective applications are summarised in Table 8.1.

Table 8.1 IDEF Techniques and their Purposes (Aguilar-Saven, 2004)

Name of technique	Model developed	Purpose
IDEF0	Function model	Represents functions, activities or processes in a structured way (also called "what do I do" model)
IDEF1	Information model	Represents the structure and semantics of information
IDEF1X	Semantic data model	An extended version of IDEF1 that captures logical data base of an organisation/system
IDEF2	Dynamics/Simulation model	Represents time varying behaviour of resources in an organisation/system
IDEF3	Behavioural model	Captures different views of how things work in an organisation/system
IDEF4	Object-oriented design model	Supports the design to implement C language applications
IDEF5	Ontology model	Assists in creating, modifying and maintaining ontology

IDEF0 is the most suitable for application in the stakeholder management framework because it enables the functions, activities and processes of stakeholder management in construction projects to be represented in a structured way. The next sub-section explains the IDEF0 technique.

8.2.2.2 IDEF0 Technique

The IDEF0 technique is a method designed to model the decisions, actions and activities of an organisation or system. It is based on a graphical language known as Structural Analysis and Design Technique (SADT) (IDEF0, 2003). IDEF0 helps to promote good communication among users. It also enhances expert involvement and consensus decision making through simplified graphical devices (Figure 8.1). Furthermore, IDEF0 enables the identification of what functions should be performed, what is/are needed to perform the functions and what the current system does right and wrong.

The main features of an IDEF0 diagram are boxes and arrows (Figure 8.1). An IDEF0 diagram shows the function (activity) as a box and the interfaces to or from the function as arrows entering or leaving the box. Depending on their positions, the arrows represent Inputs, Controls, Outputs and Mechanisms (ICOMs) or call outs which are explained in Table 8.2.

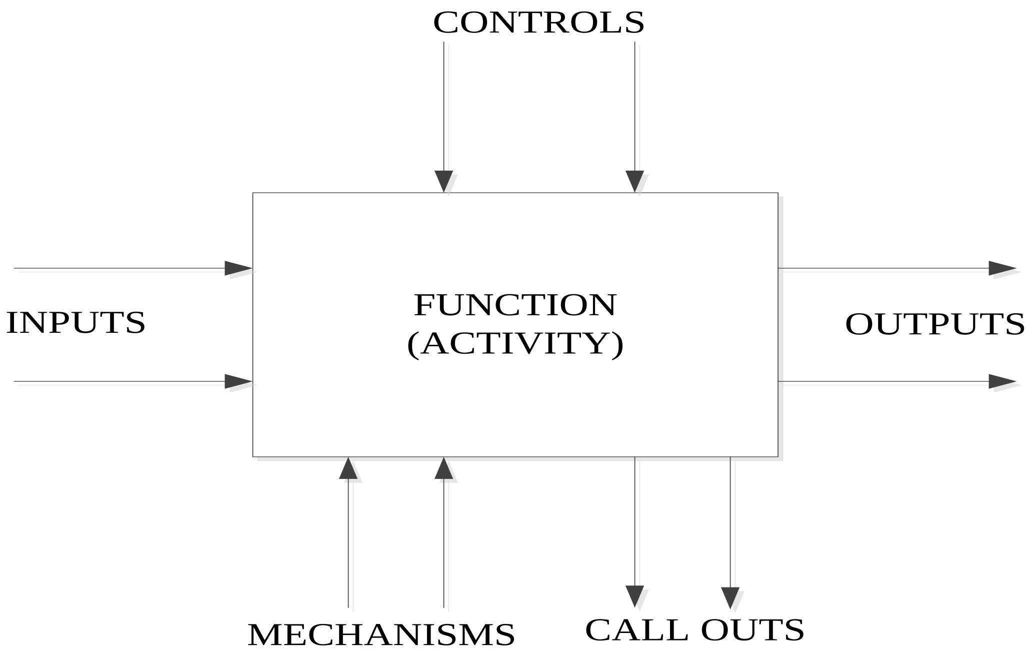

Figure 8.1 IDEF0 Box and Arrow Graphics (adapted from IDEF0, 2003)

Table 8.2 Table 8.2 IDEF0 Interfaces and their Meanings

Interface	**Meaning/Explanation**
Inputs	These are the data or objects that are transformed by the function into outputs
Controls	These define the conditions/restrictions required to produce the right outputs
Outputs	These are the results, data or objects produced by the function
Mechanisms	These are the means (resources) required to perform the function
Call outs	These are extra interfaces which enable the sharing of vital details between models or within a model

Furthermore, IDEF0 models are made up of several diagrams with each describing in more details a box from a more general diagram as the models are read in a top-down fashion. The process of describing a diagram/box in more details is known as decomposing a function. The more general diagram is known as the parent and the more detailed diagram is known as the child with particular reference to a given parent diagram. Each diagram is identified by a diagram node number shown at the lower left corner of the frame, whereas each activity is identified (numbered) at the lower right corner of the box. The top level diagram referred to as the context and numbered A-0 diagram, summarises the overall function of the system represented by a single box. Following the context diagram, is the A0 diagram, which represents the first decomposition of the system. All subsequent diagrams are identified using their respective numbers following their parent diagrams' numbers as shown in Figure 8.2.

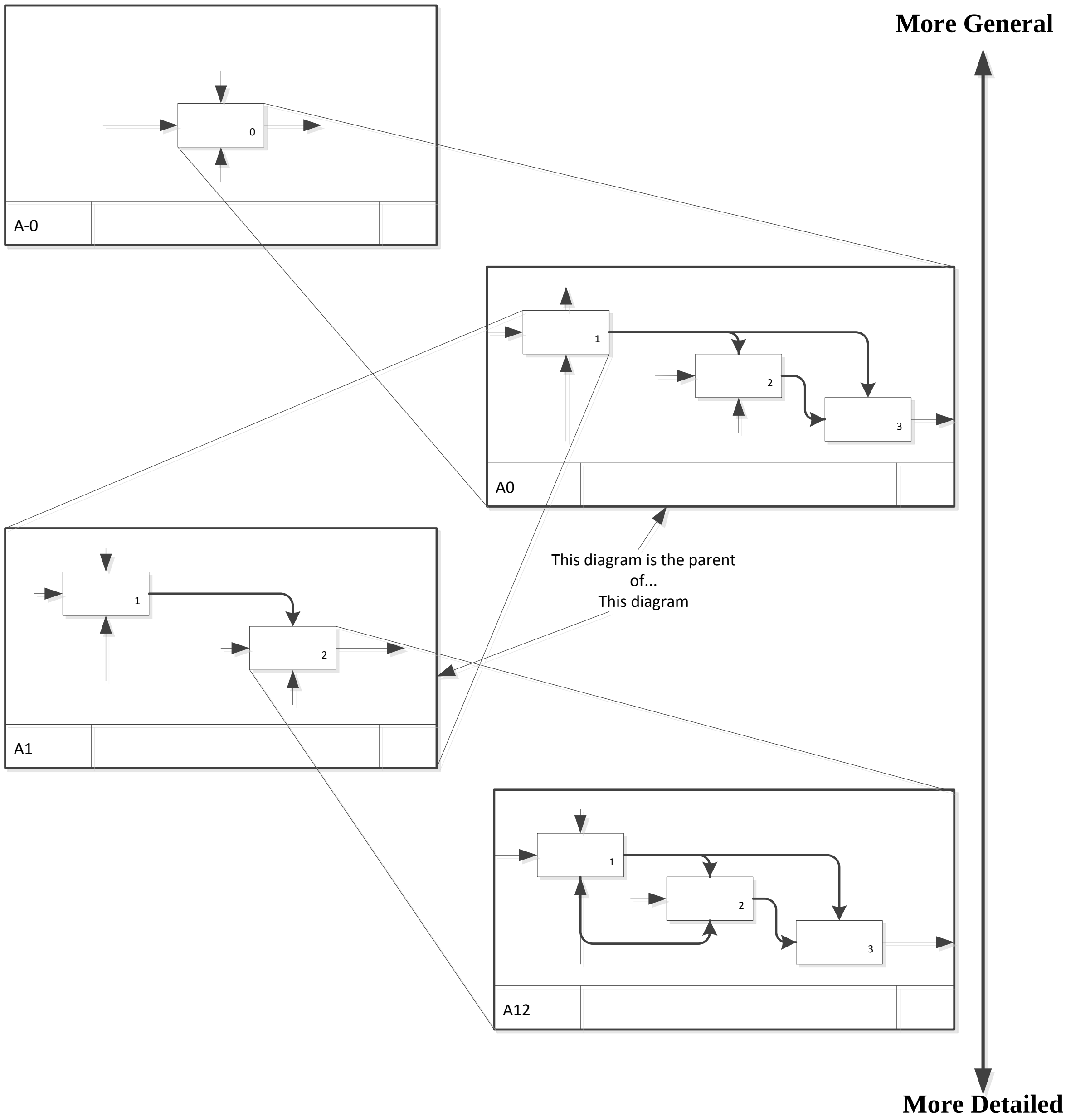

Figure 8.2 Decomposition of IDEF0 Diagram

8.3 Features of the Framework

8.3.1 Conceptual framework

The life cycle based framework for stakeholder management in construction is based on the idea that stakeholder management needs to be carried out throughout the project life cycle as justified in Chapter 2. Furthermore, responsibilities for leading and coordinating the stakeholder management process needs to be assigned to the internal stakeholders across the project life cycle. Moreover, the assignment of these responsibilities will depend among other things on the procurement route being used for the project. There is also need for the internal stakeholders to collaborate among themselves in carrying out stakeholder management over the project life cycle. This will enable the smooth transition of responsibilities and continuity from one stage to the other.

The construction project life cycle stages have been grouped into four main stages: Inception, design, construction and operation stages based on the literature review on construction project life cycle presented in Chapter 3. The framework for stakeholder management in construction developed a process map for each of these four stages to enable project management team make project specific as well as stage specific stakeholder management decisions throughout the project life cycle. Figure 8.3 presents these stages: stakeholder management at inception stage (SMIS); stakeholder management at design stage (SMDS); stakeholder management at construction stage (SMCS); and stakeholder management at operation stage (SMOS) which feeds into future projects at the end. The framework for stakeholder management at all the stages involve five main steps as justified in Chapter 7 including: Identify stakeholder characteristics and project characteristics (Identify SCPC); Carry out stakeholder analyses (Carry out SA); map stakeholder dynamism (Map SD); and Plan and Implement stakeholder engagement/empowerment strategies (Plan and Implement SES).

The framework for SMIS focusses on ensuring that adequate information are obtained on both project and stakeholders to enable clear capture and definition of project as well as stakeholder management mission. At the design stage the framework (SMDS) focusses on ensuring that the project design process is well coordinated, as smooth as possible and considers stakeholder needs and expectations in the project adequately. The framework for SMCS focusses on ensuring that project implementation and execution methods are fair to all, project implementation is protected from any external disturbances, differences are proactively avoided or addressed and stakeholders' support is secured and maintained. At the operation stage, the framework (SMOS) focusses on ensuring that the end product performs as expected, all stakeholders are satisfied/happy and lessons are captured and documented for future reference.

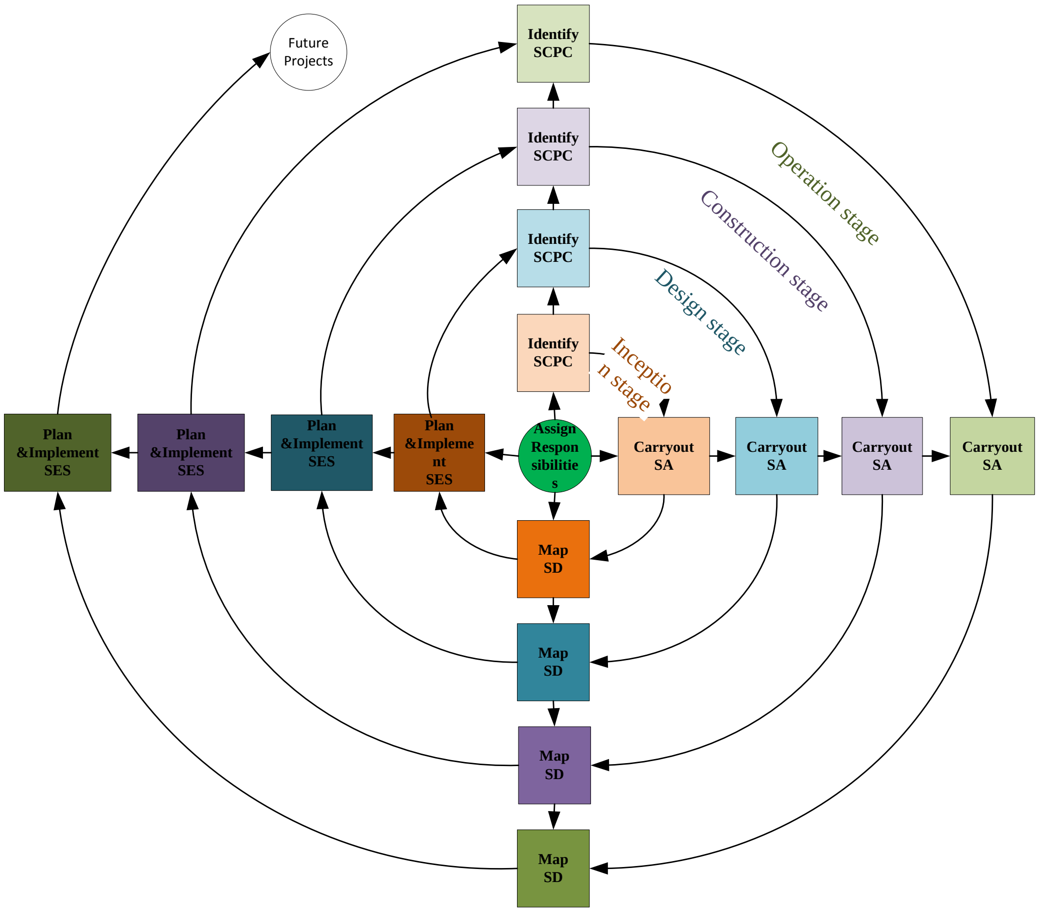

Figure 8.3 Conceptual life cycle based framework for stakeholder management in construction projects

The conceptual framework for stakeholder management in construction is modelled using the IDEF0 process modelling approach. Actors in the framework indicated as mechanisms in the IDEF0 model are based on findings from literature review presented in chapter 2 and analyses results presented in chapter 5. The responsibility for leading and coordinating the stakeholder management process at the respective stages is assigned to one of the internal stakeholders. This depends on among other things, the procurement route, contract clauses and stage of the project. Members of the stakeholder management team (SMT) are drawn from the internal stakeholders and any other relevant/key stakeholders of the project. It should be noted that the actors in the framework for stakeholder management in construction are not a replacement for the entire project management team.

8.3.2 Actors in the framework

8.3.2.1 Project Director (PD)

The project director is the top level manager who leads the execution of construction projects. The role is responsible for coordinating all the activities of the project and communicating with all parties throughout the stakeholder management process on the project. In project where the role of project Director does not exist, the topmost manager will play this role.

8.3.2.2 Stakeholder management leader (SML)

A suitable leader is appointed to superintend over the entire stakeholder management process. Additionally, specific responsibilities are assigned to members of the internal stakeholders for leading/coordinating stakeholder management at various stages of the project. The stakeholder management leaders at the various stages, report to the overall stakeholder management leader. The respective stage stakeholder management leaders liaise with each other throughout the project.

8.3.2.3 Stakeholder management team (SMT)

The stakeholder management team is made up of the stakeholder management leaders, client representative, and any other key stakeholders as may be found necessary. Members of the stakeholder management team should ideally cover all relevant interests and concerns on the project that are capable of presenting their interests and giving adequate feedbacks. They are responsible for taking and ratifying stakeholder management decisions and actions throughout the project.

8.3.2.4 Regulatory authorities

As it may become necessary, representatives of regulatory authorities should be invited to play a role on stakeholder management decisions. Their roles will include shedding light on grey relevant regulations concerning stakeholder management and advising against any bad practices. These may be on the impact of construction activities and rights of external stakeholders. The representatives may include Environmental Health Officers, community councils, key councillors, MPs, local authorities etc. the regulatory authorities to be involved will depend on the type, client-ship and location of the project.

8.3.3 Framework for stakeholder management in construction – idef0 process modelling overview

The framework for stakeholder management in construction covers four stages as explained in the previous section. The A-0 IDEF0 process model of the overall framework (SM/A-0) is presented in Figure 8.4 and the A0 (SM/A0) level showing the four stages is presented in Figure 8.5. The four stages are the sub-process of the SM/A0 process. The A0 level processes of the four stages are called "stakeholder management at inception stage (SMIS)", "stakeholder management at design stage (SMDS)", "stakeholder management at construction stage (SMCS)" and "stakeholder management at operation stage (SMOS)" respectively.

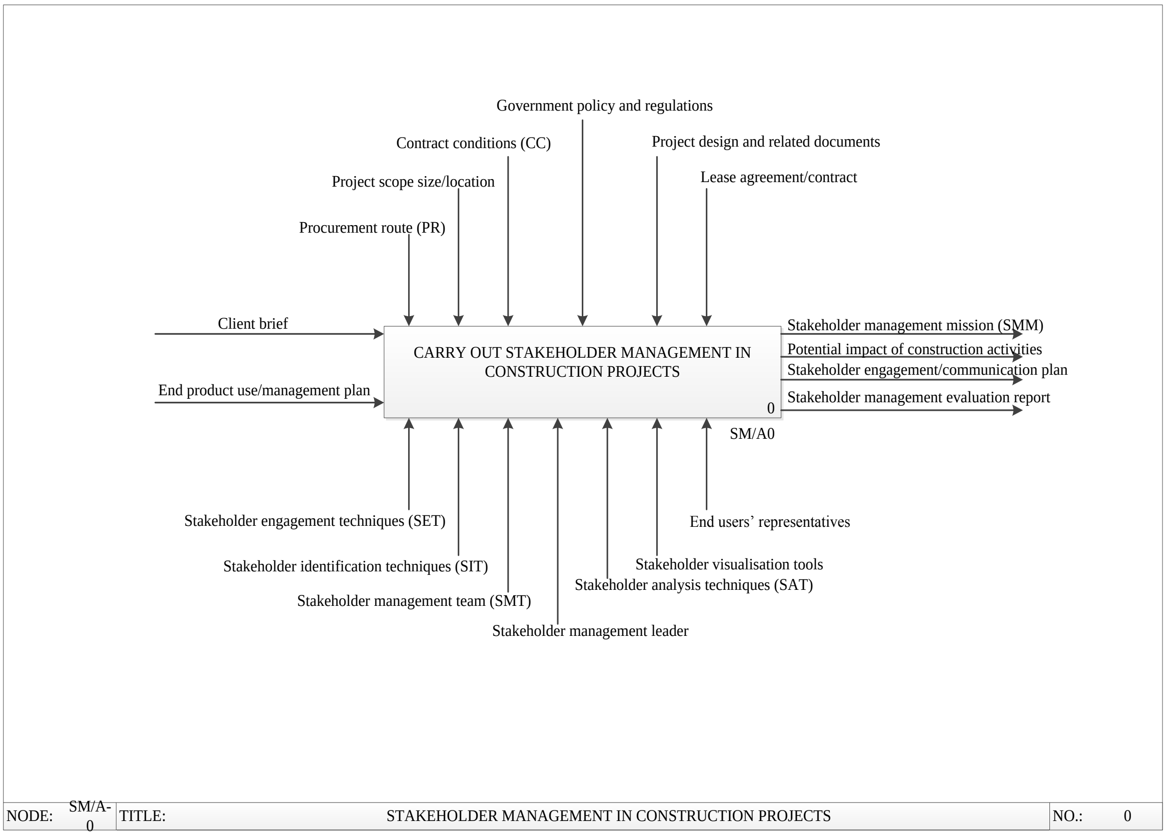

Figure 8.4 Overall stakeholder management in construction projects Model SM/A-0 Process

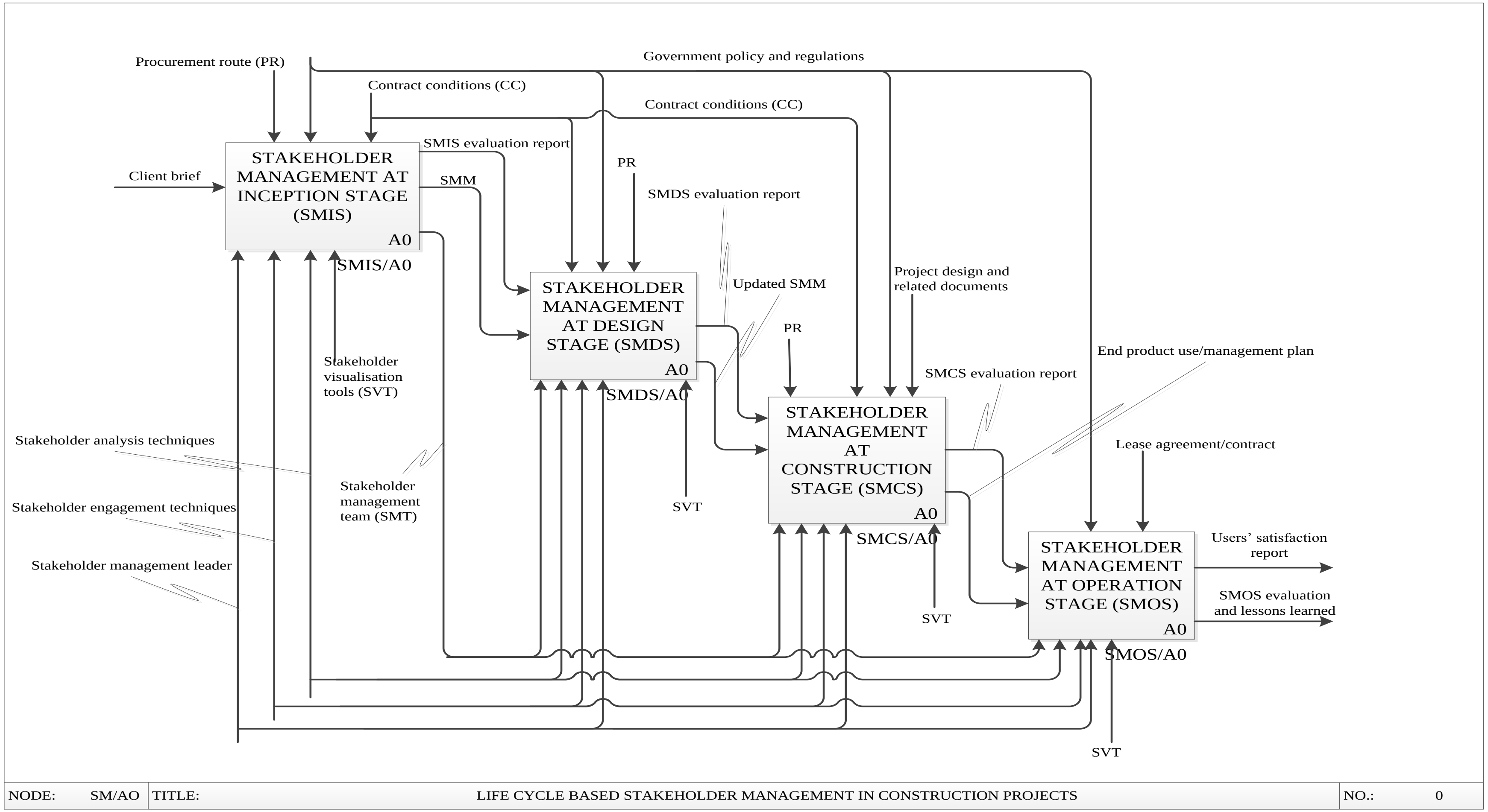

Figure 8.5 Life cycle based framework for stakeholder management in construction projects – SM/A0 Process

Furthermore, as explained in the previous section, the framework for stakeholder management at the four stages involve five key steps which are considered as the main sub-processes of the A0diagrams for SMIS, SMDS, SMCS and SMOS when developing the IDEF0 models. The A0 diagrams for SMIS, SMDS, SMCS, and SMOS are shown in Figures 8.6 – 8.9.

The five main sub-processes are further decomposed into some child diagrams. The stakeholder management decisions and actions determined through the literature review and questionnaire survey results were used in developing the sub-processes. These processes are presented in a node index in Table 8.3 showing all nodes in the respective IDEF0 process diagrams in an outline order.

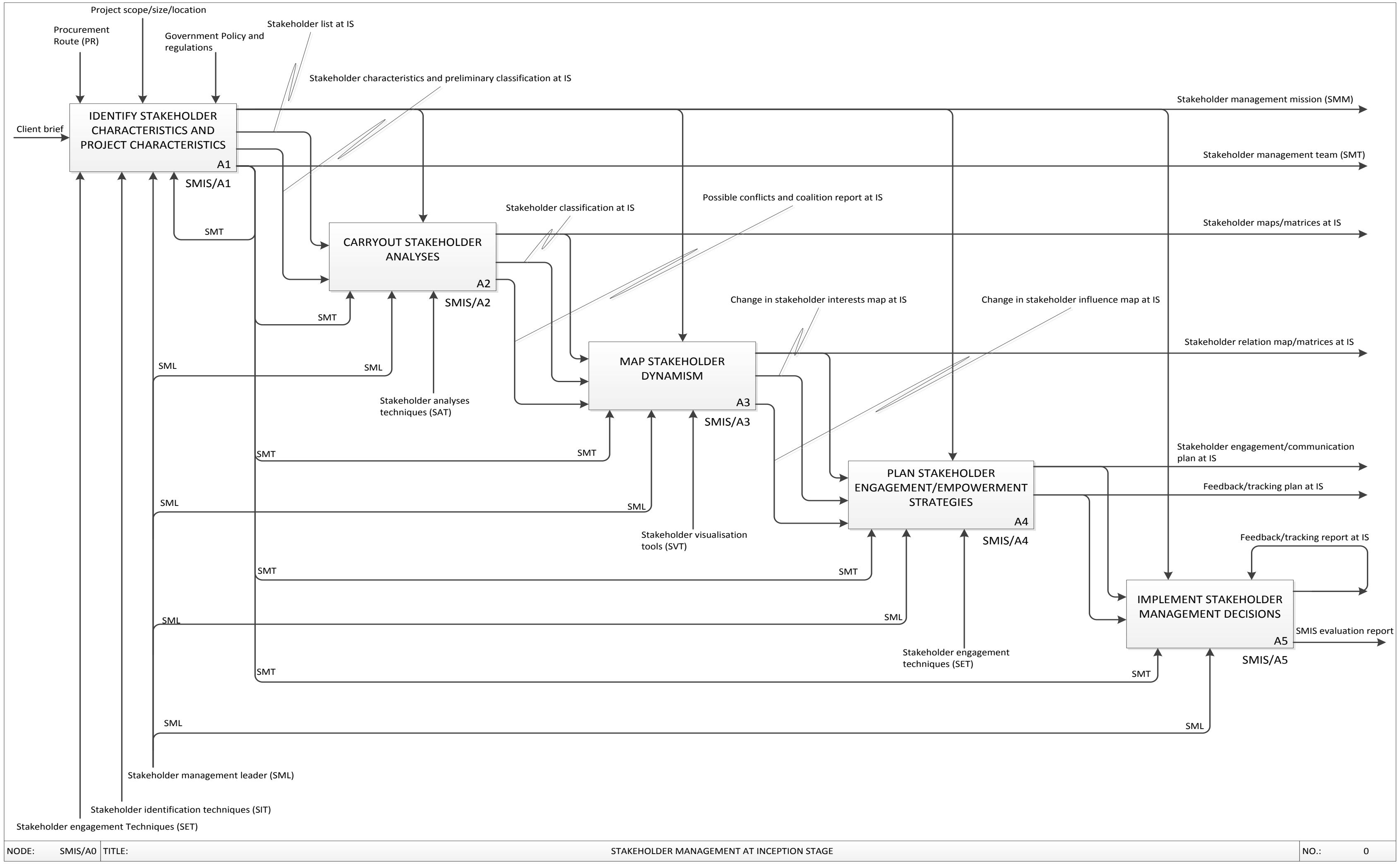

Figure 8.6 SMIS Model – A0 Process

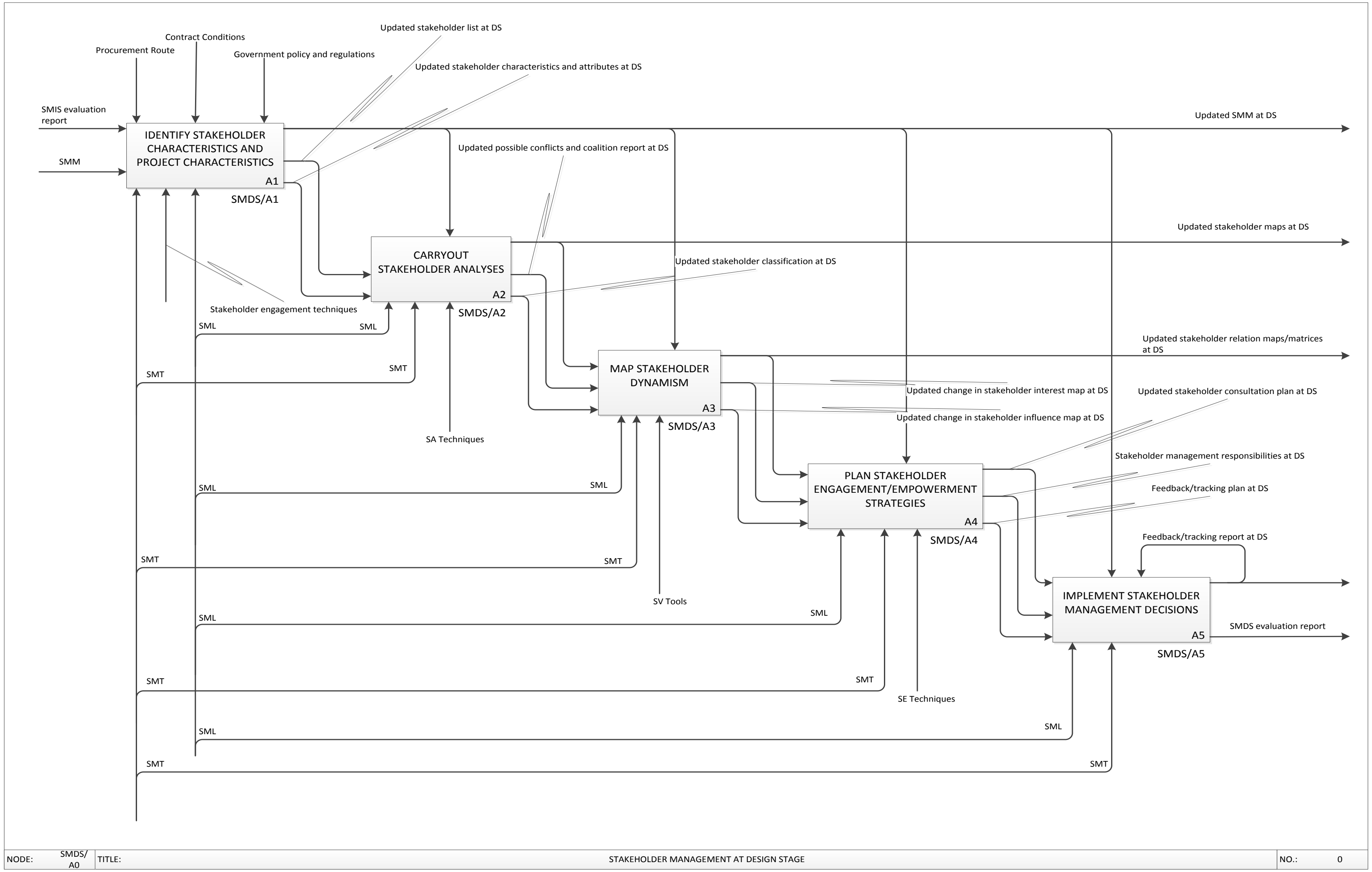

Figure 8.7 SMDS – A0 Process

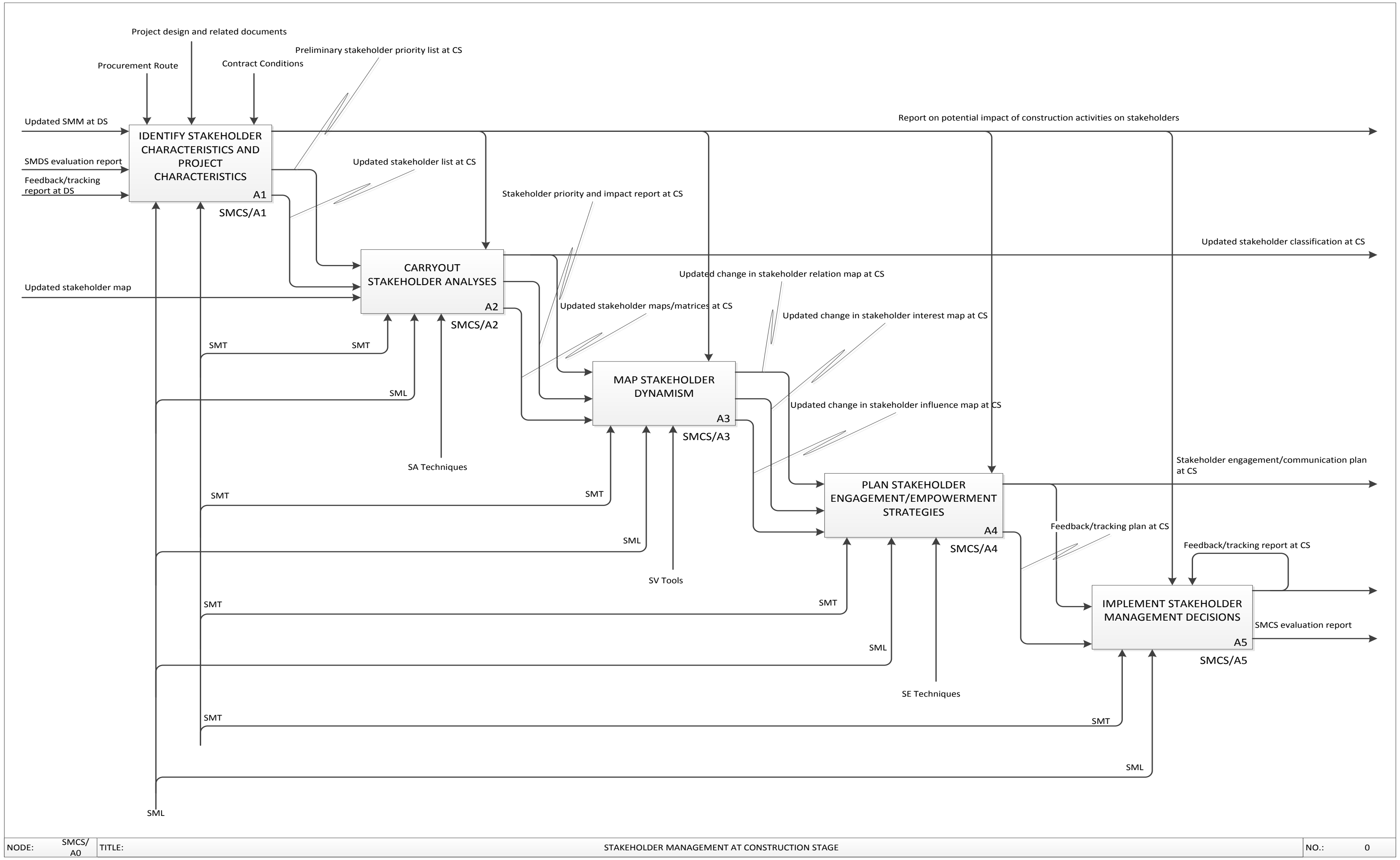

Figure 8.8 SMCS – A0 Process

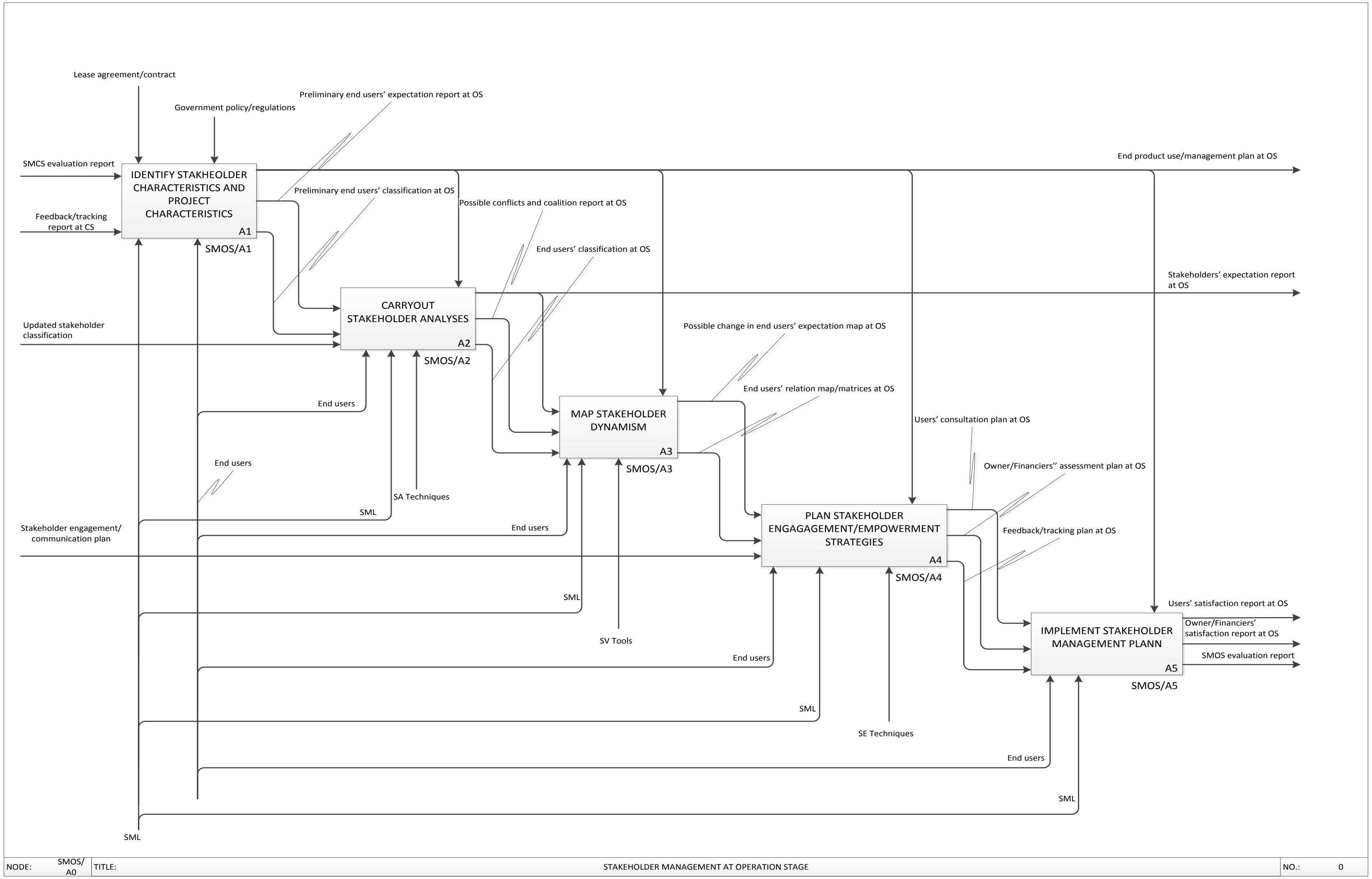

Figure 8.9 SMOS – A0 Process

Table 8.3 Node Index for SMIS Process Model

Diagram Reference	Description and Activities Included	
SMIS/A0	**Stakeholder Management at Inception Stage**	
SMIS/A1	Identify Stakeholder Characteristics and Project Characteristics	
	A11	Define stakeholder management mission
	A12	Identify stakeholder, their characteristics and preliminary classification
	A13	Constitute stakeholder management team
SMIS/A2	Carryout Stakeholder Analyses	
	A21	Classify stakeholders
	A22	Draw up stakeholder maps/matrices
	A23	Identify possible conflicts and coalition among stakeholders
SMIS/A3	Map Stakeholder Dynamism	
	A31	Draw stakeholder relation map/matrices
	A32	Draw change in stakeholder interests map
	A33	Draw change in stakeholder influence map
SMIS/A4	Plan Stakeholder Engagement/Empowerment Strategies	
	A41	Draw up stakeholder engagement and communication plan
	A42	Plan how to track changes and get feedback at IS
SMIS/A5	Implement Stakeholder Management Decisions	
	A51	Do change tracking and feedback report at IS
	A52	Evaluate SMIS
SMDS/A0	**Stakeholder Management at Design Stage**	
SMDS/A1	Identify Stakeholder Characteristics and Project Characteristics	
	A11	Update stakeholder management mission
	A12	Update stakeholder list
	A13	Update stakeholder interests, characteristics and profile
SMDS/A2	Carryout Stakeholder Analyses	
	A21	Update stakeholder classification
	A22	Update stakeholder map/matrices
	A23	Update possible conflicts and coalition report
SMDS/A3	Map Stakeholder Dynamism	
	A31	Update stakeholder relation maps/matrices
	A32	Update change in stakeholder interests maps/matrices
	A33	Update change in stakeholder influence maps/matrices
SMDS/A4	Plan Stakeholder Engagement/Empowerment Strategies	
	A41	Draw up stakeholder consultation plan at DS
	A42	Specify responsibilities for SMT members at DS
	A43	Plan how to track changes and get feedback at DS
SMDS/A5	Implement Stakeholder Management Decisions	
	A51	Do change tracking and feedback report at DS
	A52	Evaluate SMDS
SMCS/A0	**Stakeholder Management at Construction Stage**	
SMCS/A1	Identify Stakeholder Characteristics and Project Characteristics	
	A11	Identify potential impact of construction activities on stakeholders at CS
	A12	Update stakeholder list and profile at CS

Diagram Reference	Description and Activities Included	
	A13	Draw up preliminary stakeholder priority list at CS
SMCS/A2	Carryout Stakeholder Analyses	
	A21	Update stakeholder classification at CS
	A22	Finalise stakeholder priority at CS
	A23	Update stakeholder maps/matrices at CS
SMCS/A3	Map Stakeholder Dynamism	
	A31	Update change in stakeholder relation maps/matrices at CS
	A32	Update change in stakeholder interests maps/matrices at CS
	A33	Update change in stakeholder influence maps/matrices at CS
SMCS/A4	Plan Stakeholder Engagement/Empowerment Strategies	
	A41	Plan stakeholder engagement/communication strategies at CS
	A42	Plan how to track changes and get feedback at CS
SMCS/A5	Implement Stakeholder Management Decisions	
	A51	Do change tracking and feedback report at CS
	A52	Evaluate SMCS
SMOS/A0	**Stakeholder Management at Operation Stage**	
SMOS/A1	Identify Stakeholder Characteristics and Project Characteristics	
	A11	Draw up end product use/management plan
	A12	Do preliminary end user classification
	A13	Identify preliminary end users’ expectations
SMOS/A2	Carryout Stakeholder Analyses	
	A21	Finalise end users’ expectation
	A22	Finalise end users’ classification
	A23	Identify possible conflicts and coalition at OS
SMOS/A3	Map Stakeholder Dynamism	
	A31	Map possible change in end users’ expectation
	A32	Draw up end users’ relation map/matrices
SMOS/A4	Plan Stakeholder Engagement/Empowerment Strategies	
	A41	Draw up end users’ consultation plan
	A42	Plan owner/financiers’ satisfaction assessment
	A43	Plan how to track changes and get feedback at OS
SMOS/A5	Implement Stakeholder Management Decisions	
	A51	Do users’ satisfaction report
	A52	Do owner/financiers’ satisfaction report
	A53	Prepare SMOS evaluation report

8.4 IDEF0 Model of SMIS

This section explains the processes of SMIS model for which the IDEFO diagrams were shown in the previous section in Figure 8.4 for A-0 and Figure 8.6 for A0 level processes. Its node index was presented in Table 8.3.

8.4.1 Identify stakeholder characteristics and project characteristics - SMIS/A1

This is the first sub-process of SMIS and initiates the stakeholder management process. It is aimed at identifying stakeholder characteristics and project characteristics at the inception stage of the project. It consists of three sub-processes the IDEF0 diagram of which is presented in Figure 8.10. The three sub-processes are explained in the following sub-sections.

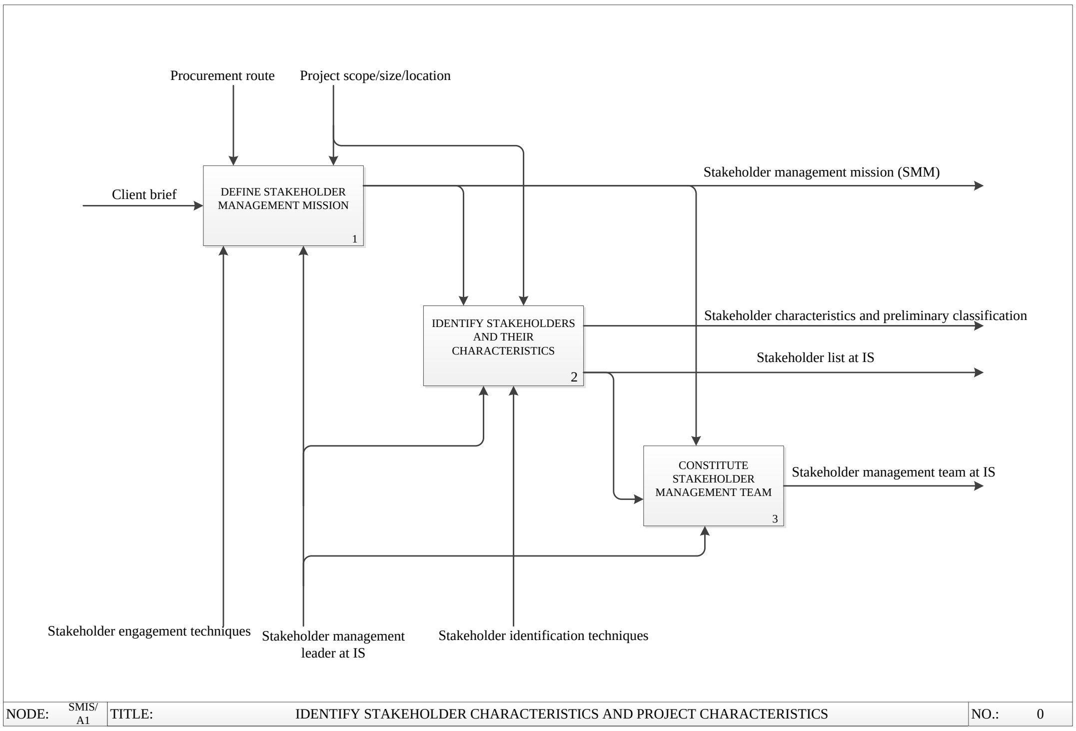

Figure 8.10 Identify stakeholder characteristics and project characteristics - SMIS/A1

8.4.1.1 Define stakeholder management mission

This process is coordinated by the stakeholder management leader (as discussed in Section 8.3.2.2) who is also a member of the stakeholder management team. During this process the need for and aim of stakeholder management in the project is agreed and established. This is guided by the procurement route chosen for the project, the contract clauses of the project, project location, project size and scope. The client brief provide specific project information that determine very strongly what constitute the stakeholder management mission at the inception stage as explained in section 8.3. To carry out this process, stakeholder engagement techniques (SET) are used to communicate with and elicit key stakeholders' inputs on the project. The output from this process is stakeholder management mission (SMM) which serves as control in SMIS/A2, SMIS/A3, SMIS/A4 and SMIS/A5 as shown in Figure 8.6.

8.4.1.2 Identify project stakeholders and their characteristics

At this step, the entire stakeholders apart from the internal stakeholders who are directly involved and are part of the project/stakeholder management team, of the project are identified by the responsible members of the stakeholder management team using stakeholder engagement techniques. The output from this sub-process is stakeholder list.

8.4.1.3 Constitute stakeholder management team

The stakeholder management team is constituted depending on the procurement route chosen for the project and contract clauses and conditions. Specific responsibilities are assigned to members of the stakeholder management team one of whom takes the role of coordinating the entire process of stakeholder management (stakeholder management leader-SML) at the inception stage. This would ideally comprise of the internal stakeholders of the project such as the project manager, contractor, designers, consultants, project quantity surveyors, contract administrators and client or client's representative and as it becomes necessary any other vital stakeholders.

8.4.1.4 Identify stakeholder characteristics and prepare preliminary classification

After identifying the stakeholders, their interests, concerns, and attributes with respect to the project are identified. Based on these characteristics a preliminary classification of the stakeholders is done. Therefore, the output from this sub-process is stakeholder characteristics and preliminary classification.

8.4.2 Carryout stakeholder analyses – SMIS/A2

This is the second sub-process of stakeholder management at inception stage aimed at carrying out stakeholder analyses. Here, the stakeholders' characteristics are analysed in order to enable stakeholder categorisation and inform further stakeholder management steps. It consists of three sub-processes namely draw up stakeholder maps/matrices, finalise stakeholder classification and draw up possible conflicts and coalition report (Figure 8.11). These are explained in the following sub-sections.

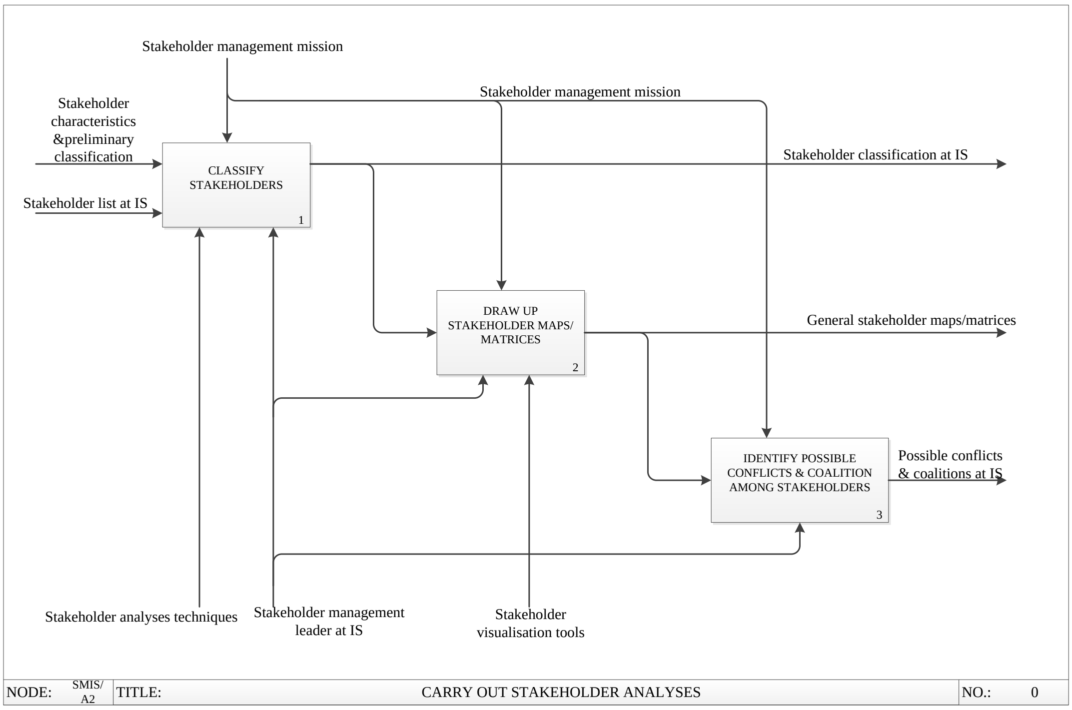

Figure 8.11 Carryout stakeholder analyses – SMIS/A2

8.4.2.1 Classify stakeholders

The responsible member of the stakeholder management team uses the preliminary stakeholder classification and general stakeholder maps/matrices to finalise stakeholder classification. Therefore the main output from this sub-process is stakeholder classification.

8.4.2.2 Draw up stakeholder maps/matrices

Based on the stakeholder characteristics and preliminary classification identified in SMIS/A1, their, level of power, position and influence in the project are determined and plotted into general maps or matrices. Stakeholder analyses techniques such as power and predictability index, position index, interest/influence index are used to achieve this and the output is general stakeholder map/matrices.

8.4.2.3 Identify possible conflicts and coalition among stakeholders

Using the stakeholder maps/matrices, possible conflicts and coalition among the project stakeholders are predicted and documented. This is necessary to enable proactive decisions on any surprises that the project may face due to stakeholders having conflicting interests or forming coalitions to exert their interests as the project progresses. This helps in the visualisation of stakeholder relationships in the project.

8.4.3 Map stakeholder dynamism – SMIS/A3

This is the third sub-process of SMIS which is aimed at visualising stakeholder dynamism. This consists of three sub-processes including map stakeholder relationships, map change in stakeholder interests and map change in stakeholder influence in the project (Figure 8.12). These are explained in the following sub-sections.

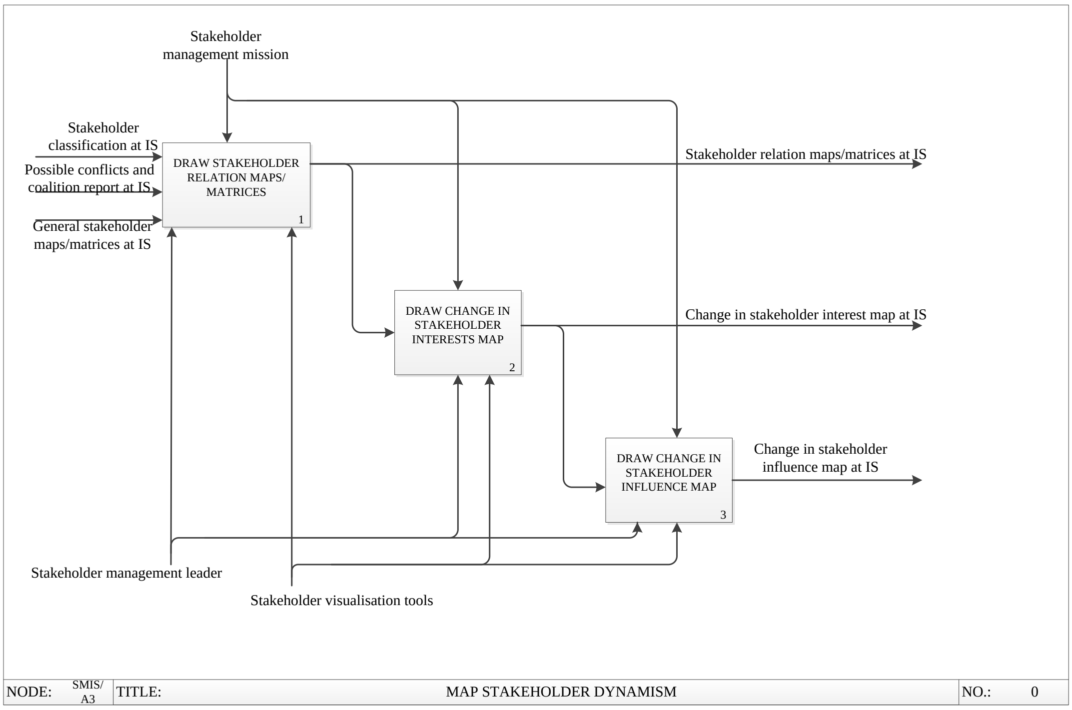

Figure 8.12 Map stakeholders' dynamism – SMIS/A3

8.4.3.1 Draw up stakeholder relationships maps/matrices at IS

In this sub-process, the relationships between different stakeholders as classified earlier are mapped to create visual information of the relationships. Stakeholder classification, general stakeholder maps/matrices and possible conflicts and coalition map are used to execute this sub-process. Stakeholder visualisation tools are used as mechanism to execute this process. The output from this sub-process is stakeholder relation map/matrices.

8.4.3.2 Draw up change in stakeholder interests maps at IS

In order to create visual image of the likely changes in stakeholder interests during the inception stage, a change in stakeholder interests' map is created using mainly the possible conflicts and coalition report. Stakeholder visualisation tools are used as mechanism to execute this process. The output from this sub-process is the change in stakeholder interests' map.

8.4.3.3 Draw up change in stakeholder influence map at IS

Similarly, in order to create a visual image of the likely changes of stakeholder influence during the inception stage, a change in stakeholder influence map is created using a combination of the general stakeholder maps/matrices and possible conflicts and coalition report. Stakeholder visualisation tools are used as mechanism to execute this process. The output from this process is the change in stakeholder influence map.

8.4.4 Plan stakeholder engagement/empowerment strategies – SMIS/A4

This is the fourth sub-process of SMIS which is aimed at planning the appropriate stakeholder engagement/empowerment strategies to be used in the project. It consists of two sub-processes including plan stakeholder engagement/communication and plan change tracking/feedback mechanisms (Figure 8.13). These are explained in the following sub-sections.

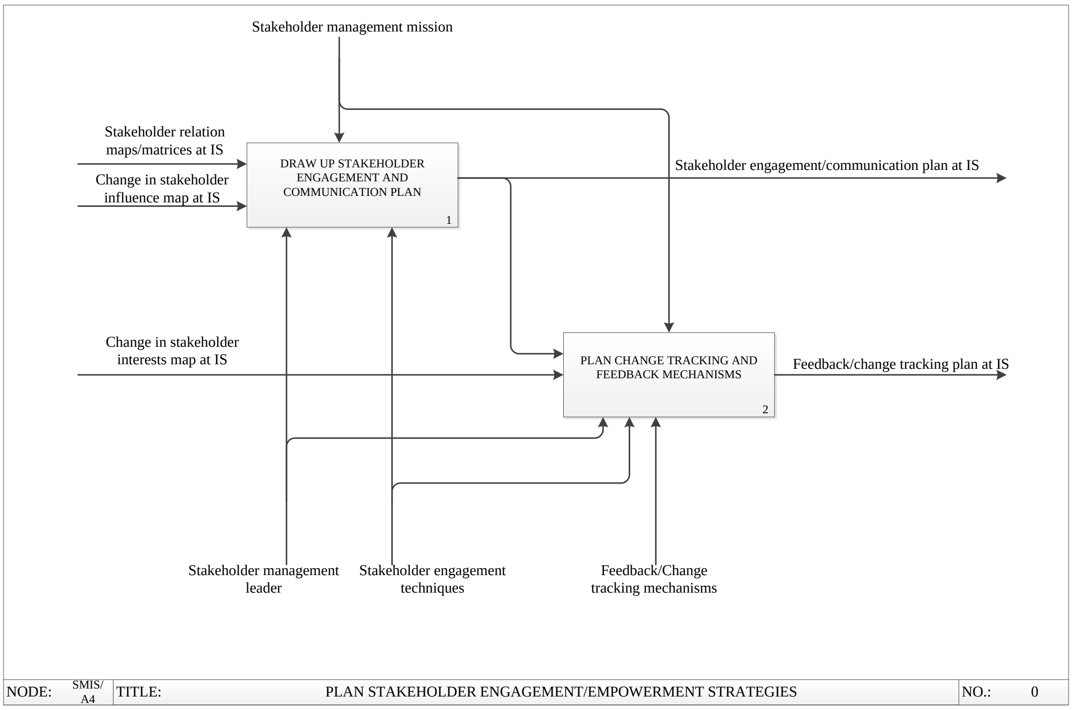

Figure 8.13 Plan stakeholder engagement/empowerment strategies – SMIS/A4

8.4.4.1 Draw up stakeholder engagement/communication plan at IS

This sub-process is aims to decide stakeholder engagement and communication strategies that are appropriate for the different stakeholders of the projects. As one strategy appropriate for one stakeholder, may not be appropriate for other stakeholders. Executing this sub-process depend on the content of stakeholder relation map/matrices, change in stakeholder interests map and change in stakeholder influence map which are indicated as inputs of SMIS/A4 in Figure 8.6. Therefore, the output from this process is the stakeholder engagement/communication plan. Although it is not always possible to please all stakeholders, it is necessary to plan to address stakeholders' concerns as much as possible.

8.4.4.2 Plan change tracking and feedback mechanisms at IS

In order to be able to track changes and get feedback, this sub-process aims to plan change tracking and feedback mechanisms. The inputs for this sub-process include stakeholder relation map/matrices, change in stakeholder interests' map and change in stakeholder influence map. Stakeholder engagement techniques are used in addition to stakeholder management team and leader as mechanisms. The output from this sub-process is feedback and change tracking plan. This sub-process is very necessary since stakeholders' interests and influence on the project are not constant.

8.4.5 Implement stakeholder management plan – SMIS/A5

This sub-process aims to implement the stakeholder management decisions taken at the inception stage and check the performance of stakeholder management. It consists of two sub-processes including feedback and change tracking report and SMIS evaluation report (Figure 8.14). These are explained in the following sub-sections.

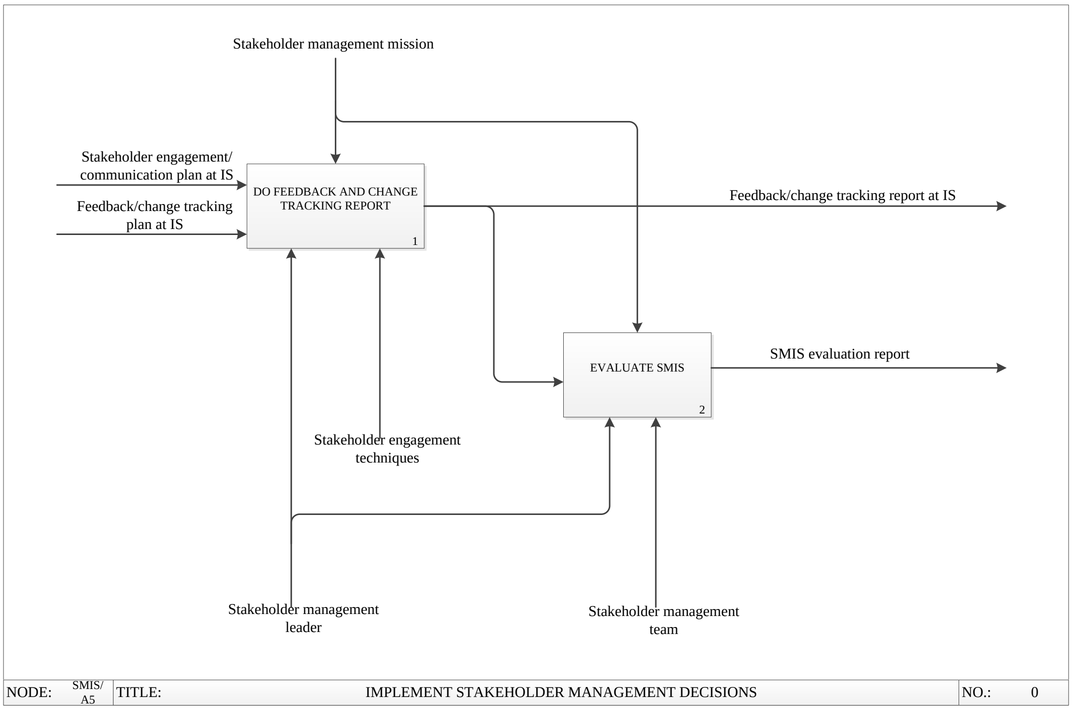

Figure 8.14 Implement stakeholder management plan – SMIS/A5

8.4.5.1 Do feedback and change tracking report

In this sub-process, the stakeholder management decisions are implemented. The stakeholder engagement/communication plan and feedback/change tracking plan are the inputs. The outputs are feedback and change tracking reports and SMIS evaluation report. The feedback and change tracking reports also serve as additional control for SMIS/A5 in the event of any undesired outcome in the report.

8.4.5.2 Prepare SMIS evaluation report

This sub-process aims at producing an entire evaluation report for stakeholder management at inception stage. The report compiles an account of what went well and what did not go well in SMIS and captures vital lessons for the next stage (SMDS). In doing so the entire actions taken in respect of stakeholder management at the inception stage of the project are evaluated.

8.5 IDEF0 Model of SMDS

This section explains the processes of SMDS model for which the IDEFO diagrams were shown in in Figure 8.5 for A0 and Figure 8.7 for A0 level sub-processes. Its node index was presented in Table 8.3.

8.5.1 Identify stakeholder characteristics and project characteristics - SMDS/A1

This is the first stage of SMDS aimed at updating stakeholder characteristics, stakeholder list and stakeholder management mission. Therefore the sub-processes are to update stakeholder list at DS, update stakeholder characteristics at DS and update stakeholder management mission at DS. The IDEF0 diagram for SMDS/A1 is presented in Figure 8.15. The three sub-processes of SMDS/A1 are explained in the following sub-sections.

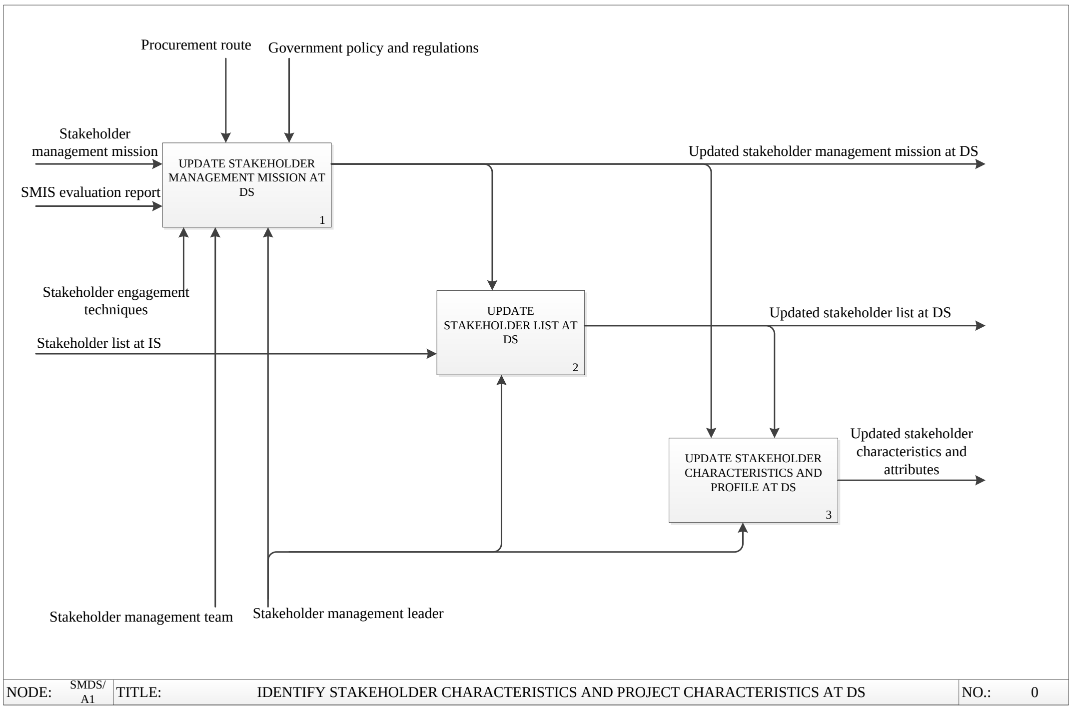

Figure 8.15 Identify stakeholder characteristics and project characteristics - SMDS/A1

8.5.1.1 Update stakeholder management mission at DS

In this sub-process the stakeholder management mission is updated in line with the project scope and client needs to ensure a smooth design process for the project. In addition to the procurement route and contract conditions, government policies and regulations relevant to design of construction projects acts as control in this sub-process. The inputs in this process are SMIS evaluation report and stakeholder management mission while the output is stakeholder management mission at DS.

8.5.1.2 Update stakeholder list at DS

As stakeholder come and go during the project life cycle, it is crucial to make sure that stakeholder list is updated and all are consulted while the project is designed. The output from this sub-process is updated stakeholder list at DS.

8.5.1.3 Update stakeholder characteristics and profile at DS

Similarly, in line with the dynamism of stakeholders, the stakeholder characteristics are updated in this sub-process. The output from this sub-process is updated stakeholder characteristics.

8.5.2 Carryout stakeholder analyses – SMDS/A2

This is the second process in SMDS which aims to analyse the project stakeholders based on their updated information. It consists of three sub-processes including updated stakeholder maps at DS, updated possible conflicts and coalition report and updated stakeholder classification. The sub-processes are shown in the IDEF0 diagram for SMDS/A2 (Figure 8.16) and discussed in the following sub-sections.

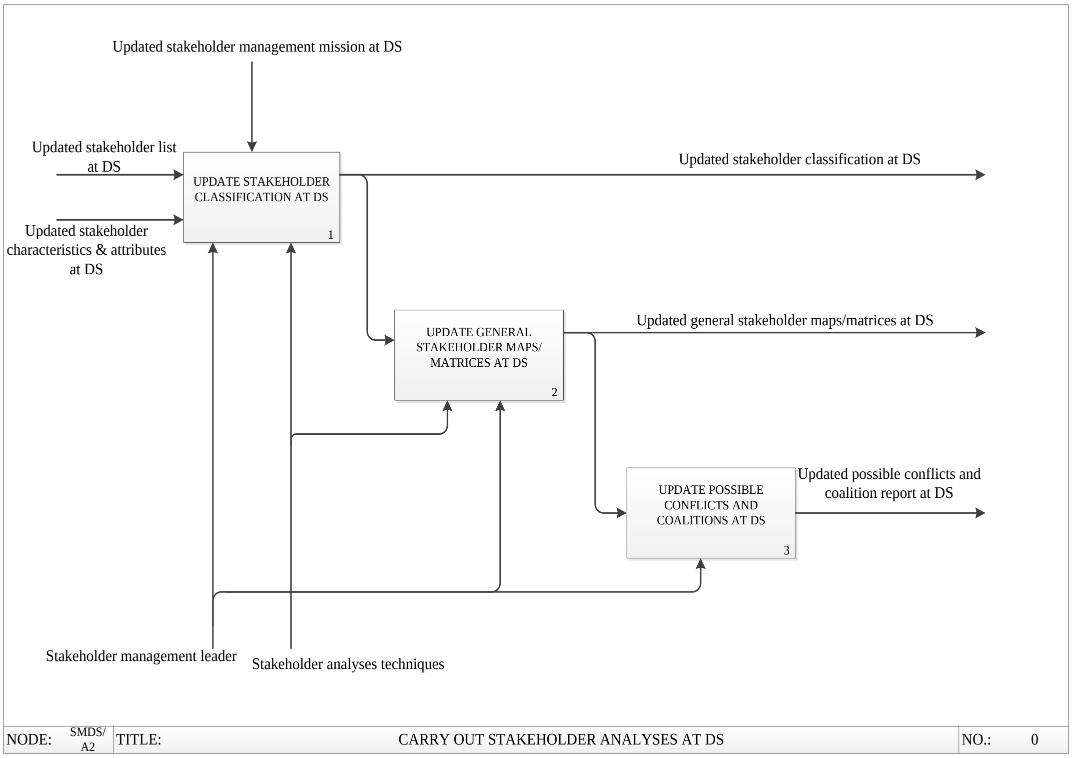

Figure 8.16 Carryout stakeholder analyses – SMDS/A2

8.5.2.1 Update stakeholder classification at DS

This sub-process processes the updated stakeholder list and stakeholder characteristics at the DS as inputs. The out from this sub-process is updated stakeholder classification at the DS.

8.5.2.2 Update general stakeholder maps/matrices at DS

This sub-process aims to update general stakeholder maps to reflect the objective of stakeholder management at the design stage of construction projects. The inputs for this sub-process are updated stakeholder list at DS and updated stakeholder characteristics at DS. The output from this sub-process is updated stakeholder maps showing their current relative powers, interests, predictability etc.

8.5.2.3 Update possible conflicts and coalition report at DS

In this sub-process, the analyses uses the updated stakeholder management mission, stakeholder list and stakeholder characteristics as inputs. The output from this sub-process is updated possible conflicts and coalition report at the Ds.

8.5.3 Map stakeholder dynamism – SMDS/A3

The third process of SMDS basically maps likely changes in stakeholders' interests/disposition in the project as the project progresses in the DS. The process consists of three sub-processes including drawing up stakeholder relation map/matrices, change in stakeholder interests map and change in stakeholder influence at the DS. The IDEF0 diagram for SMDS/A3 is shown in Figure 8.17 and its sub-processes are explained in the following sub-sections.

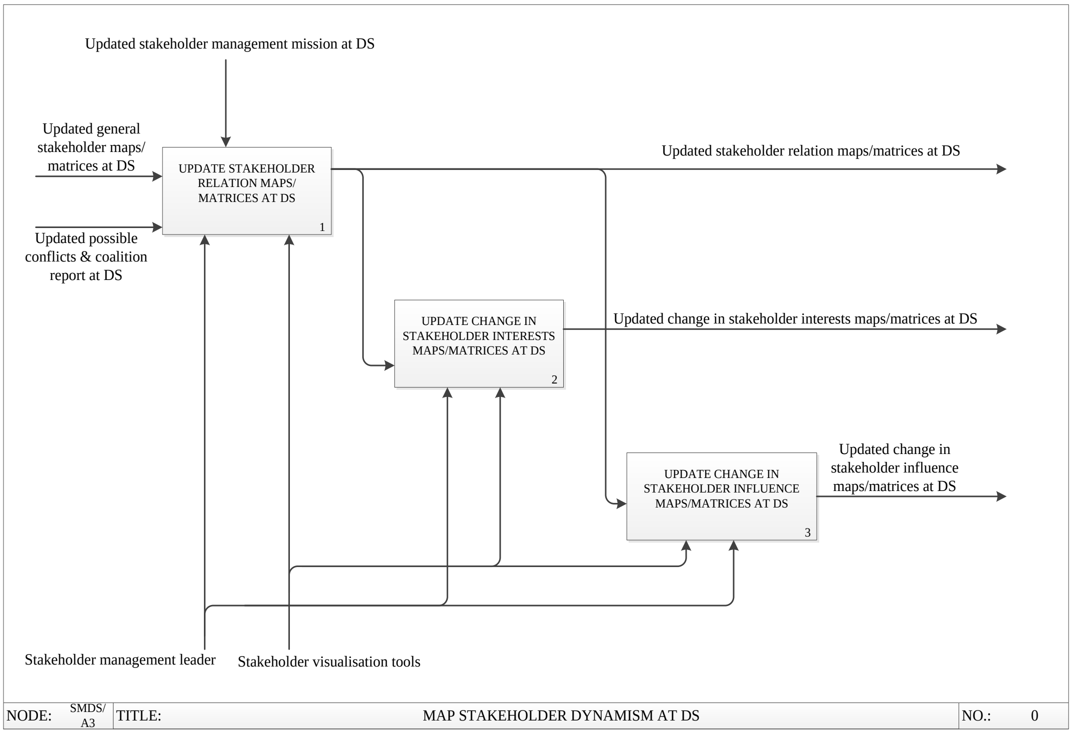

Figure 8.17 Map stakeholders' dynamism – SMDS/A3

8.5.3.1 Update stakeholder relationships maps/matrices at DS

This sub-process aims to create a visual image of the relationships among different stakeholders involved at the design stage of the project. The general stakeholder maps/matrices and possible conflicts and coalition report from SMDS/A2 are the inputs for this sub-process. The output is stakeholder relation map/matrices at the DS.

8.5.3.2 Update change in stakeholder interests maps/matrices at DS

In this sub-process, the likely changes in stakeholder interests are mapped. The inputs here are the stakeholder classification and possible conflicts and coalition report from SMDS/A2. The output from this sub-process is change in stakeholder interests' map at the DS.

8.5.3.3 Update change in stakeholder influence maps/matrices at DS

The aim of this sub-process is to map the likely changes in the influence of stakeholders on each other and on the project. The inputs for this sub-process are stakeholder general maps, stakeholder classification and possible conflicts and coalition report from SMDS/A2. The output from this sub-process is change in stakeholder influence maps/matrices at the DS.

8.5.4 Plan stakeholder engagement/empowerment strategies – SMDS/A4

The aim of this process is to decide and plan appropriate engagement and communication strategies for the different stakeholders of the project. The process consists of three sub-processes namely plan stakeholder consultation, assign responsibilities and plan feedback and change tracking mechanisms. The IDEF0 diagram for this process is shown in Figure 8.18 and the three sub-processes are explained in the following sub-sections.

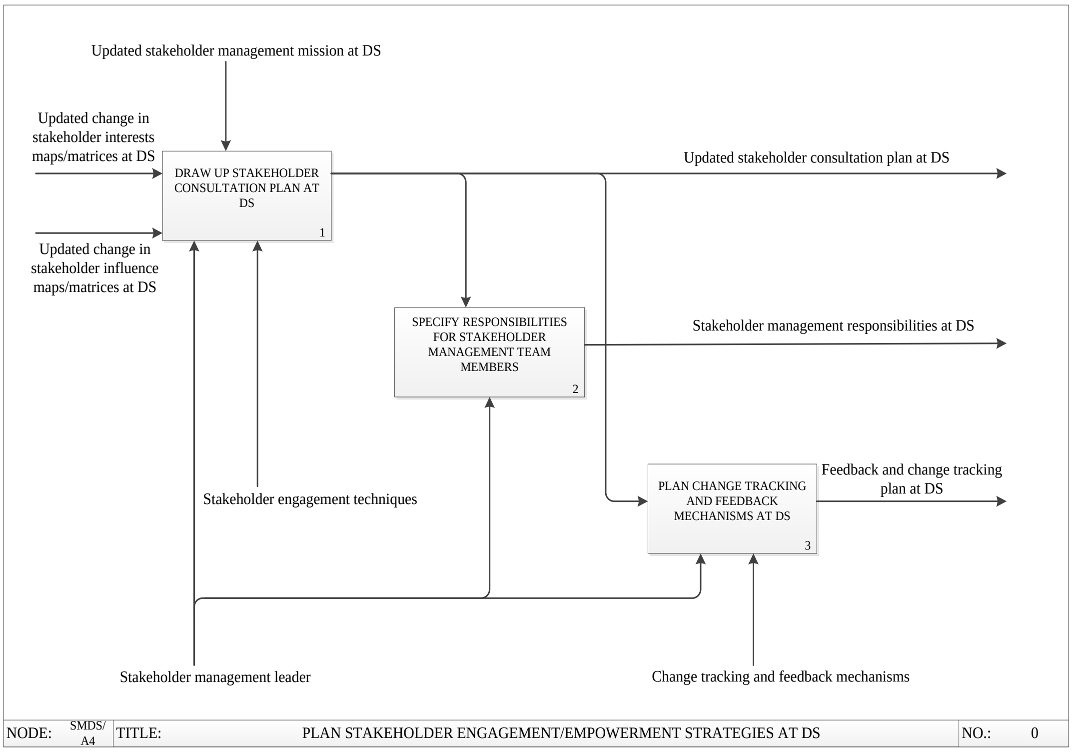

Figure 8.18 Plan stakeholder engagement/empowerment strategies – SMDS/A4

8.5.4.1 Plan stakeholder consultation at DS

This sub-process aims to appropriate stakeholder consultation strategies for the different stakeholders of the project. The inputs for this sub-process include change in stakeholder interests' map and change in stakeholder influence map. Stakeholder engagement techniques are used as additional mechanisms as shown in Figure 8.7. The output from this process is stakeholder consultation plan at DS.

8.5.4.2 Assign engagement responsibilities at DS

The aim of this sub-process is to assign responsibilities to the members of the stakeholder management team for engaging and consulting different stakeholders at the DS. The main input for this sub-process is the stakeholder relation map from SMDS/A3.

8.5.4.3 Plan change tracking and feedback mechanisms at DS

The aim of this sub-process is to plan change tracking and feedback mechanisms at the DS. The inputs for this sub-process include stakeholder relation map/matrices, change in stakeholder interests' map and change in stakeholder influence map from SMDS/A3. Stakeholder engagement techniques are used in addition to stakeholder management team and leader as mechanisms. The output from this sub-process is feedback and change tracking plan at DS.

8.5.5 Implement stakeholder management plan – SMDS/A5

The aim of this process is to implement the stakeholder management decisions taken at the design stage and check the performance of stakeholder management. It consists of two sub-processes including feedback and change tracking report and SMDS evaluation report (Figure 8.19). These are explained in the following sub-sections.

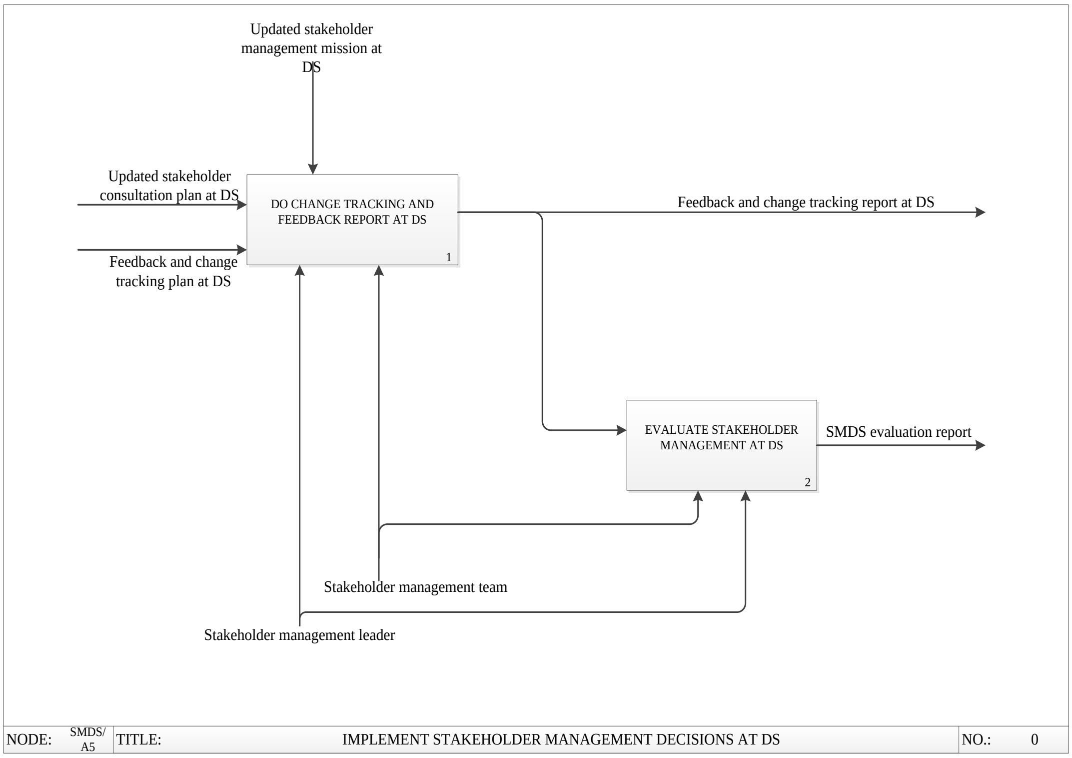

Figure 8.19 Implement stakeholder management plan – SMDS/A5

8.5.5.1 Prepare change tracking and feedback report for DS

The aim of this sub-process is to implement and evaluate the stakeholder management decisions at the DS. The stakeholder consultation plan and feedback/change tracking plan are the inputs. The outputs are feedback and change tracking reports and SMDS evaluation report which serves as inputs for SMCS/A1. The feedback and change tracking reports also serve as additional control for SMDS/A5.

8.5.5.2 Prepare SMDS evaluation report

The aim of this sub-process is to prepare an entire evaluation report for stakeholder management at inception stage. The report compiles an account of what went well and what did not go well in SMIS and captures vital lessons for the next stage (SMCS).

8.6 IDEF0 Model of SMCS

This section explains the processes of SMCS model for which the IDEFO diagrams were shown in in Figure 8.5 for A0 processes and Figure 8.8 for A0 level sub-processes. Its node index was presented in Table 8.3. The five main processes are explained in the following sub-sections.

8.6.1 Identify stakeholder characteristics and project characteristics - SMCS/A1

This is the first stage of SMCS aimed at updating stakeholder list, drawing up stakeholder priority list, and writing a report on potential impact of construction activities on stakeholders. Therefore the sub-processes are updated stakeholder list at CS, stakeholder priority list and report on potential impact of construction activities on stakeholders. The IDEF0 diagram for SMCS/A1 is presented in Figure 8.20. The three sub-processes of SMCS/A1 are explained in the following sub-sections.

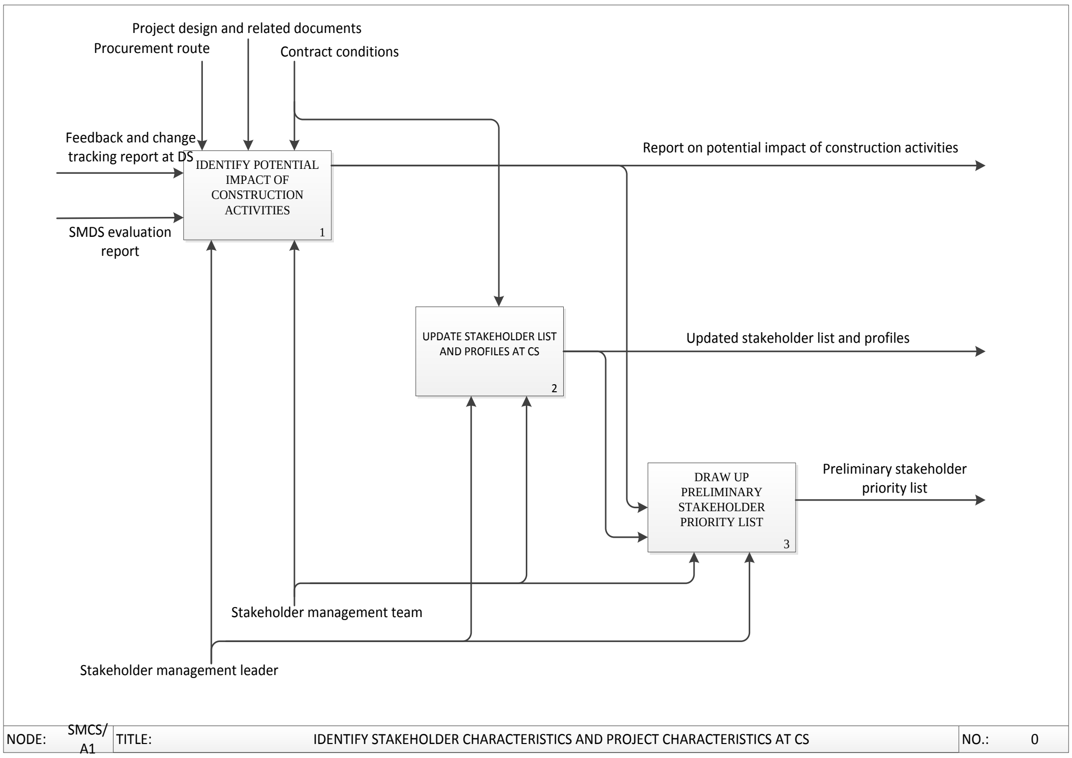

Figure 8.20 Identify stakeholder characteristics and project characteristics - SMCS/A1

8.6.1.1 Prepare report on potential impact of construction activities on stakeholders

The aim of this sub-process is to make sure that the potential impacts of proposed construction methods (activities) on the stakeholders are adequately reported. The inputs for this sub-process are updated stakeholder management mission from DS, SMDS evaluation report and feedback/change tracking report from DS. In addition to the procurement route and contract conditions, this sub-process is controlled by project design and production documents. The output from this sub-process is report on potential impacts of construction activities on stakeholders.

8.6.1.2 Update stakeholder list and profiles at CS

In this sub-process, the stakeholder list is updated to include all stakeholders who were not there at the inception and design stages of the project. The additional control for this sub-process is project design and related documents. The output from this sub-process is updated stakeholder list at CS.

8.6.1.3 Prepare preliminary stakeholder priority list at CS

The aim of this sub-process is to prepare a preliminary priority report on stakeholders. If a preliminary priority report can be prepared, it will be easier for the stakeholders to be prioritised during stakeholder analyses. The output from this sub-process is preliminary stakeholder priority list.

8.6.2 Carryout stakeholder analyses – SMCS/A2

This is the second process in SMCS which aims to analyse the project stakeholders based on their updated information. It consists of three sub-processes including updated general stakeholder maps/matrices at CS, updated stakeholder classification at CS and stakeholder priority and impact report. The sub-processes are shown in the IDEF0 diagram for SMCS/A2 (Figure 8.21) and explained in the following sub-sections.

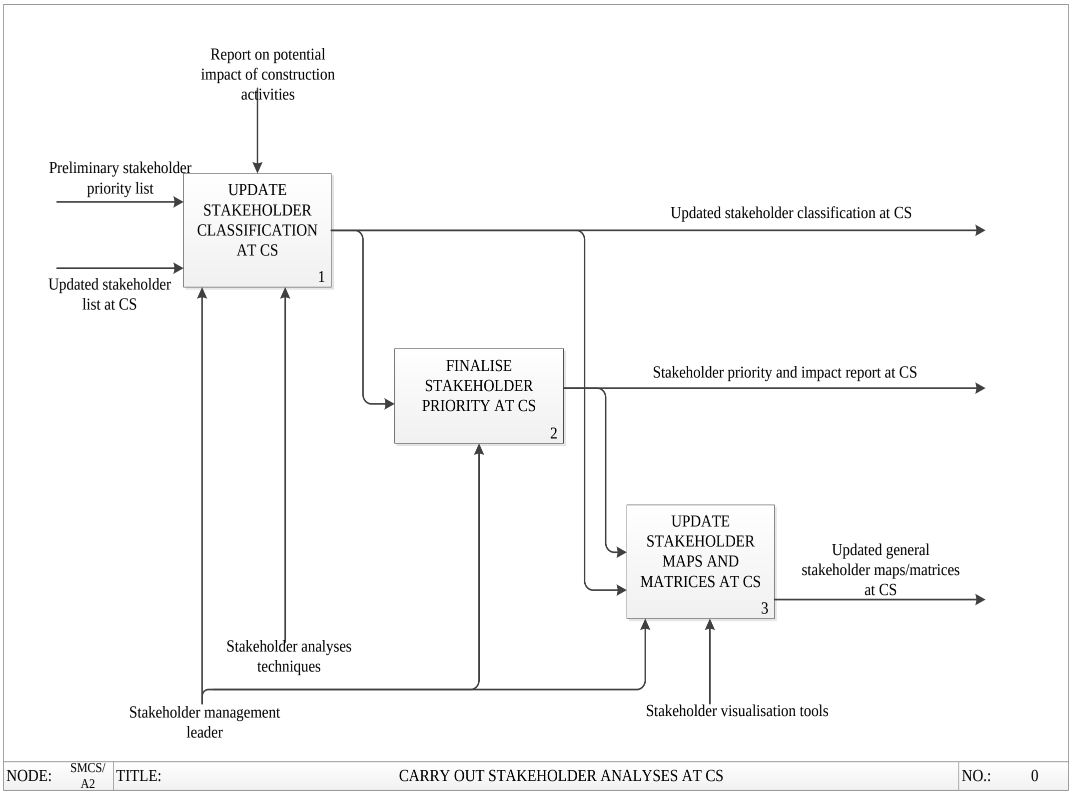

Figure 8.21 Carryout stakeholder analyses – SMCS/A2

8.6.2.1 Update stakeholder classification at CS

The aim of this sub-process is to make sure that and updated stakeholder classification reflecting all the stakeholders at the construction stage is made. The inputs for this sub-process are updated stakeholder list at CS and preliminary stakeholder priority list from SMCS/A1. The output from this sub-process is updated stakeholder classification at CS.

8.6.2.2 Prepare stakeholder priority and impact report at CS

This sub-process aims to finalise stakeholder priority at the CS. The inputs for this sub-process are report on potential impacts of construction activities on stakeholders and preliminary stakeholder priority list from SMCS/A1. The output from this sub-process is stakeholder priority and impact report.

8.6.2.3 Prepare updated stakeholder maps/matrices at CS

This sub-process aims to prepare an update of general stakeholder maps/matrices showing their levels of power, predictability, interest and influence at the CS. The inputs for this sub-process include preliminary stakeholder priority list, report on potential impact of construction activities on stakeholders and updated stakeholder list from SMCS/A1. The output from this sub-process is general stakeholder maps/matrices at CS.

8.6.3 Map stakeholder dynamism – SMCS/A3

The third process of SMCS basically aims to map likely changes in stakeholders' interests/disposition in the project as the project progresses in the CS. The process consists of three sub-processes including drawing up change in stakeholder relation map/matrices, change in stakeholder interests map and change in stakeholder influence at the CS. The IDEF0 diagram for SMCS/A3 is shown in Figure 8.22 and its sub-processes are explained in the following sub-sections.

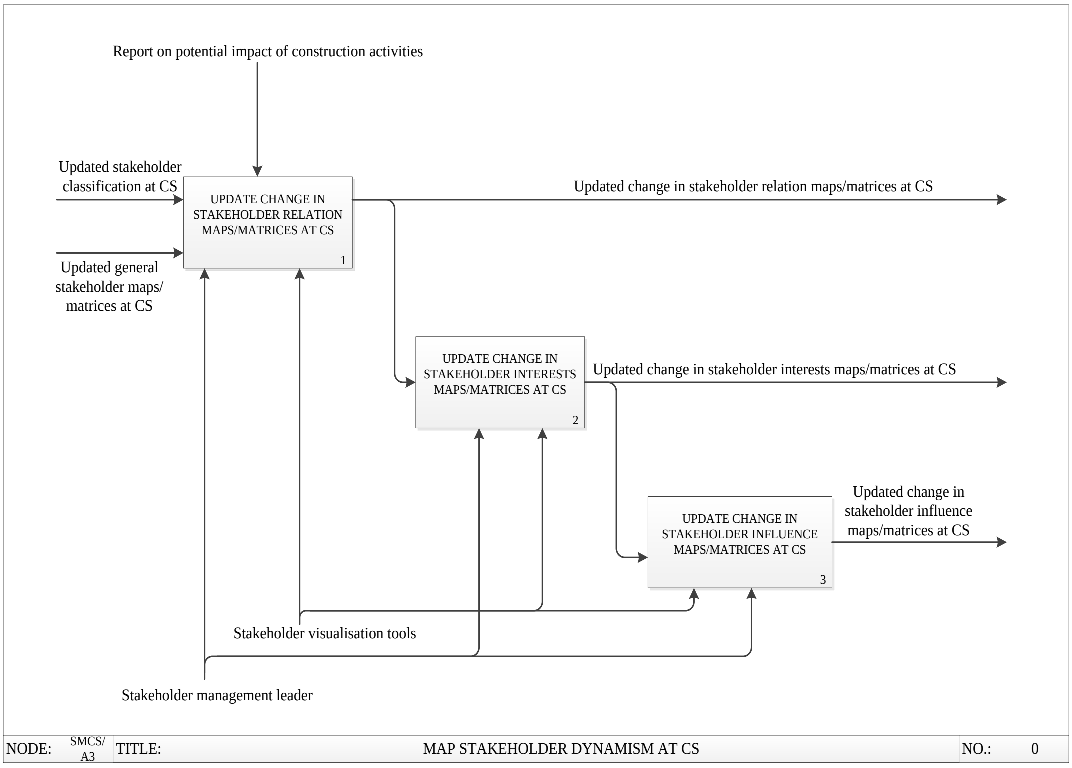

Figure 8.22 Map stakeholders' dynamism – SMCS/A3

8.6.3.1 Update change in stakeholder relation map at CS

This sub-process aims to create a visual image of likely changes in the relationships among different stakeholders involved at the construction stage of the project. The general stakeholder maps/matrices and stakeholder priority and impact report from SMCS/A2 are the inputs for this sub-process. The output is change in stakeholder relation map/matrices at the CS.

8.6.3.2 Update change in stakeholder interests' map at CS

This sub-process aims to map the likely changes in stakeholder interests. The inputs here are the general stakeholder maps/matrices, updated stakeholder classification and stakeholder priority and impact report from SMCS/A2. The output from this sub-process is change in stakeholder interests' map at the CS.

8.6.3.3 Update change in stakeholder influence map at CS

The aim of this sub-process is to map the likely changes in the influence that stakeholders would have on each other and on the project at the construction stage. The inputs for this sub-process are the general stakeholder maps/matrices and stakeholder priority and impact report from SMCS/A2. The output from this sub-process is change in stakeholder influence maps/matrices at the CS.

8.6.4 Plan stakeholder engagement/empowerment strategies – SMCS/A4

In this process appropriate engagement and communication strategies for the different stakeholders of the project at the CS are decided. The process consists of two sub-processes namely plan stakeholder engagement/communication strategies and plan feedback and change tracking mechanisms at the CS. The IDEF0 diagram for this process (SMCS/A4) is shown in Figure 8.23 and the two sub-processes are explained in the following sub-sections.

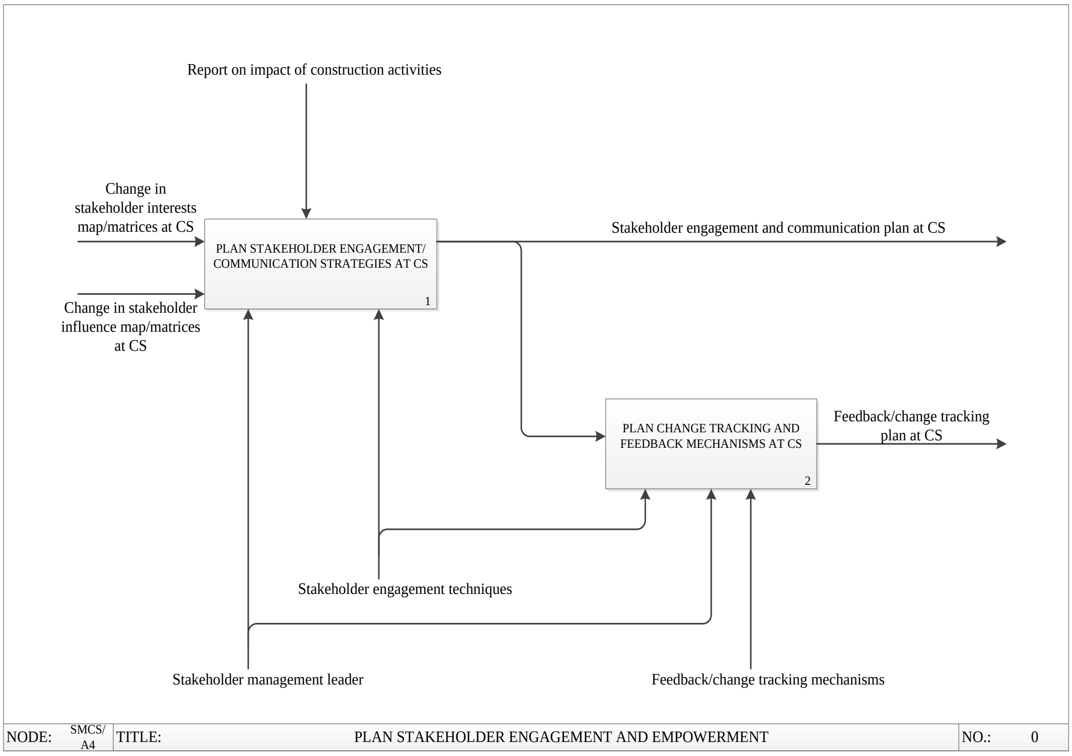

Figure 8.23 Plan stakeholder engagement/empowerment strategies – SMCS/A4

8.6.4.1 Plan stakeholder engagement/communication strategies at CS

This sub-process aims to decide stakeholder engagement and communication strategies that are appropriate for the different stakeholders of the projects at the CS. The inputs for this sub-process include change in stakeholder relation map/matrices, change in stakeholder interests' map and change in stakeholder influence map from SMCS/A3. Therefore, the output from this process is the stakeholder engagement/communication plan at the CS.

8.6.4.2 Plan change tracking and feedback mechanisms at CS

This sub-process aims to plan change tracking and feedback mechanisms at the construction stage of the project. The inputs for this sub-process include change in stakeholder relation map/matrices, change in stakeholder interests' map and change in stakeholder influence map from SMCS/A3. Stakeholder engagement techniques are used in addition to stakeholder management team and leader as mechanisms. The output from this sub-process is feedback and change tracking plan for CS.

8.6.5 Implement stakeholder management decisions – SMCS/A5

The aim of this process is to implement the stakeholder management decisions taken at the construction stage and check the performance of stakeholder management. It consists of two sub-processes including feedback and change tracking report and SMCS evaluation report shown in Figure 8.24. The two sub-processes are explained in the following sub-sections.

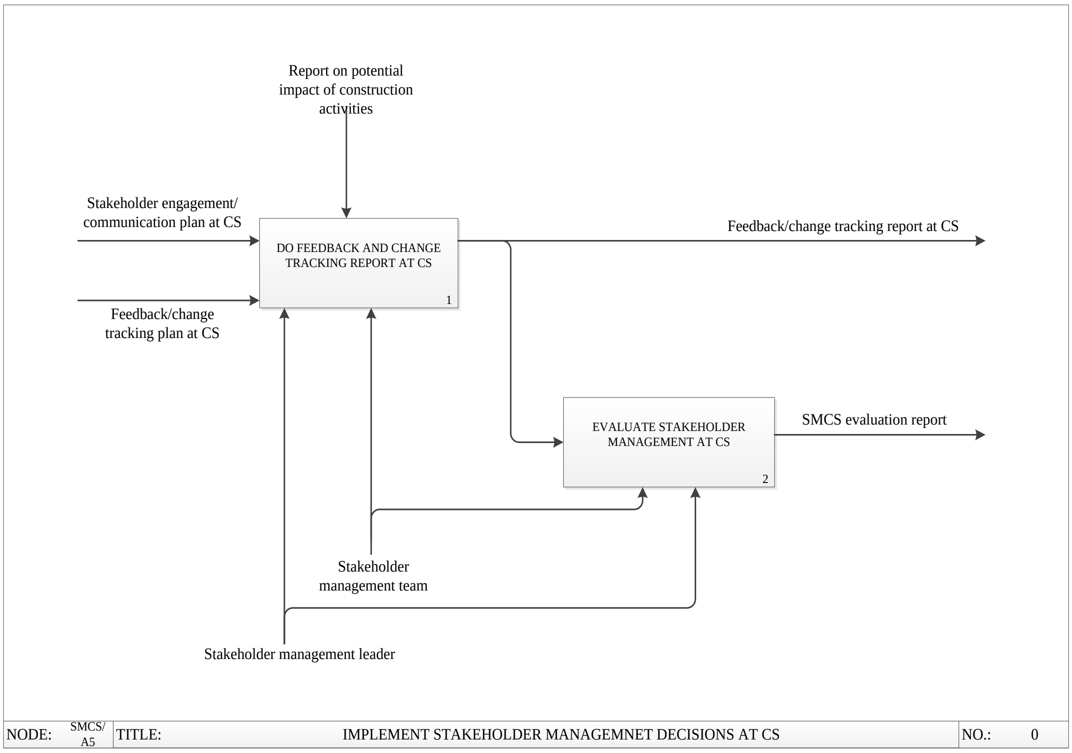

Figure 8.24 Implement stakeholder management decisions – SMCS/A5

8.6.5.1 Prepare feedback and change tracking report for CS

This sub-process aims to implement and evaluate the stakeholder management decisions at the CS. The stakeholder engagement/communication plan and feedback/change tracking plan are the inputs. The output here is feedback and change tracking report at the CS. The feedback and change tracking reports also serve as additional control for SMCS/A5.

8.6.5.2 Prepare SMDS evaluation report at CS

The aim of this sub-process is to prepare an evaluation report for stakeholder management at the construction stage. The report compiles an account of what went well and what did not go well in SMCS and captures vital lessons for the next stage (SMOS).

8.7 IDEF0 Model of SMOS

This section explains the processes of SMOS model. The IDEFO diagrams for SMOS are shown in in Figure 8.5 for A0 level and Figure 8.9 for the A0 level sub-processes. Its node index was presented in Table 8.3. The five main processes are explained in the following sub-sections.

8.7.1 Identify stakeholder characteristics and project characteristics at – SMOS/A1

This is the first stage of SMOS aimed at obtaining relevant information about the stakeholders and end product. It consists of three sub-processes including Preparing end product use/management plan, preliminary end users' expectation report and preliminary end users' classification. The IDEF0 diagram for SMOS/A1 is presented in Figure 8.25 and the three sub-processes are explained in the following sub-sections.

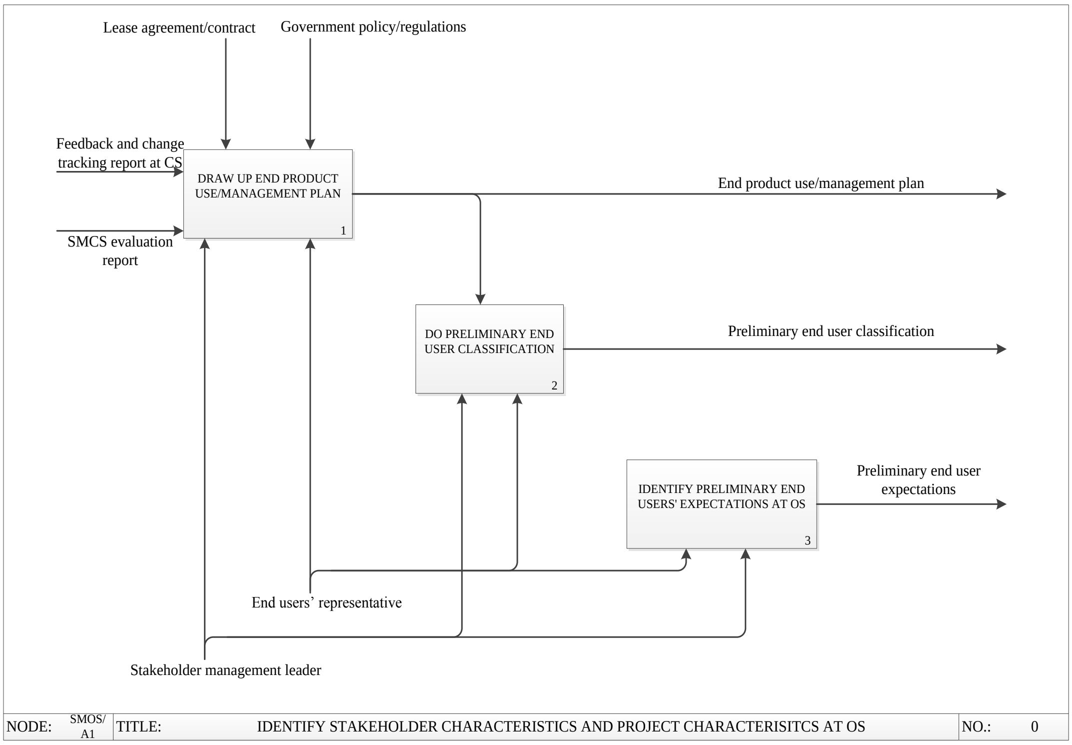

Figure 8.25 Identify stakeholder characteristics and project characteristics at – SMOS/A1

8.7.1.1 Prepare end product use/management plan

The aim of this sub-process is to prepare user manual (guide) and end product (Facility) management plan at the operation stage. The inputs for this sub-process are SMCS evaluation report and feedback/tracking report from CS. The controls are lease agreement/contract and government policy/regulations. The output from this sub-process is end product use/management plan.

8.7.1.2 Prepare preliminary end users' classification

The aim of this process is to identify the end users and prepare their preliminary classification. The output from this sub-process is therefore preliminary end users' classification. It helps the facility management team to know the end users of the project in more depth.

8.7.1.3 Prepare preliminary end users' expectation report

This sub-process aims to prepare preliminary end users' expectations from the product or facility. The input for this sub-process is feedback/change tracking report from CS. The output from this sub-process is preliminary end users' expectation report.

8.7.2 Carryout stakeholder analyses – SMOS/A2

This second process in SMOS aims to analyse the project stakeholders based on their updated information. It consists of three sub-processes including finalised stakeholder (end users) expectation report at OS, finalised stakeholder (end users) classification at OS and possible conflicts and coalition report at OS. The sub-processes are shown in the IDEF0 diagram for SMOS/A2 (Figure 8.26) and explained in the following sub-sections.

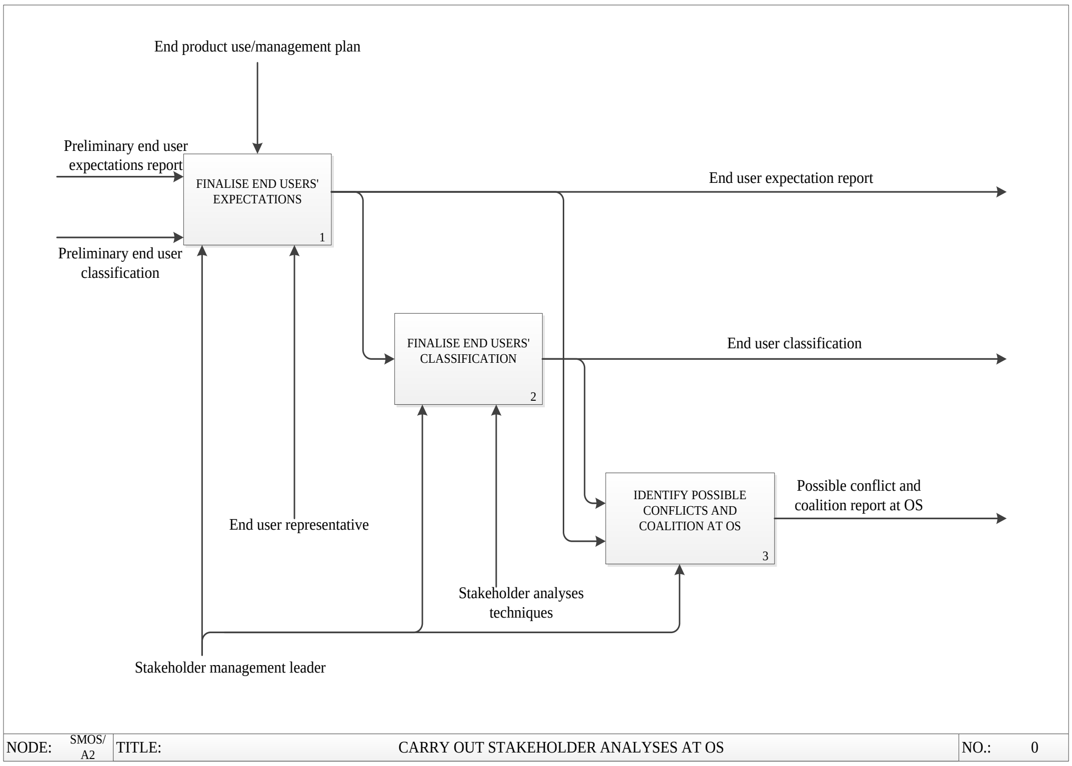

Figure 8.26 Carryout stakeholder analyses – SMOS/A2

8.7.2.1 Prepare final end-users'/stakeholders' expectation report at OS

The aim of this sub-process is to prepare a report detailing the expectation of stakeholders (owners/financiers and end users) from the facility created at the OS. The inputs of this sub-process are end product use/management plan, preliminary end users' classification and preliminary stakeholder expectation report from SMOS/A1. The output from this sub-process is stakeholder expectation report.

8.7.2.2 Finalise end users' classification at OS

The aim of this sub-process is to finalise the end users' classification at the OS. The inputs of this sub-process are preliminary end users' classification and expectation report from SMOS/A1. The output from this sub-process is end users' classification at OS.

8.7.2.3 Prepare possible conflicts and coalition report at OS

The aim of this sub-process is to prepare a report on the possible conflicts and coalition among the stakeholders involved at the OS of the project when the end product or facility created is being put to use. The inputs for this sub-process are preliminary end users' expectation report and end product use/management plan from SMOS/A1. The output from this sub-process is possible conflicts and coalition report at OS.

8.7.3 Map stakeholder dynamism – SMOS/A3

This process of SMOS basically aims to map likely changes in stakeholders' interests and expectation from the end product (or facility created) as it is being put to use at the OS. The process consists of two sub-processes including drawing up change in stakeholder expectation map/matrices and change in stakeholder relation map/matrices. The IDEF0 diagram for SMOS/A3 is shown in Figure 8.27 and its sub-processes are explained in the following sub-sections.

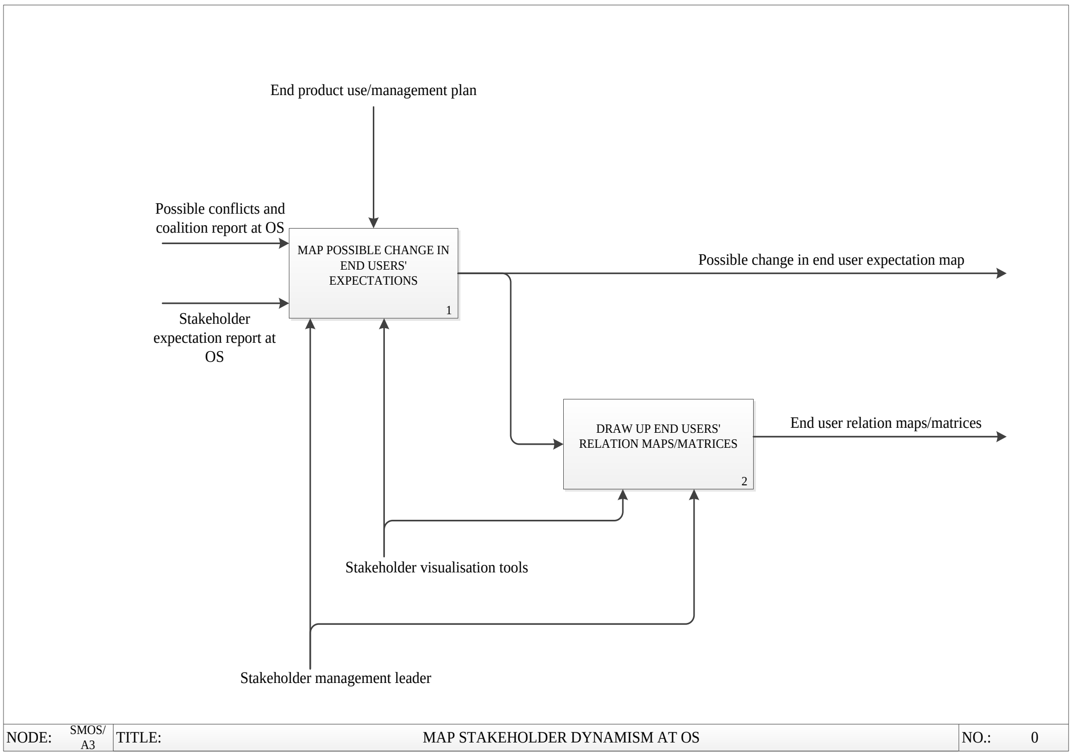

Figure 8.27 Map stakeholders' dynamism – SMOS/A3

8.7.3.1 Map possible change in stakeholder expectation at OS

The aim of this sub-process is to map possible changes in the end users' and owners expectation from the project as its end product is being put to use during the operation stage. The inputs for this sub-process are stakeholder expectation report and possible conflicts and coalition report from SMOS/A2. The output from this sub-process is change in stakeholders' expectation maps/matrices at OS.

8.7.3.2 Draw up change in stakeholder relation map/matrices at OS

This sub-process aims to map the possible changes in the relationships among the stakeholders involved at the OS. The inputs for this sub-process are possible conflicts and coalitions report and stakeholder expectation report from SMOS/A2. The output from this sub-process is change in stakeholders' relation maps/matrices at OS.

8.7.4 Plan stakeholder engagement/empowerment strategies – SMOS/A4

In this process appropriate engagement and communication strategies for the different stakeholders of the project at the OS are decided. The process consists of three sub-processes namely plan stakeholders' consultation/communication strategies, plan stakeholder assessment strategies and plan feedback and change tracking mechanisms at the OS. The IDEF0 diagram for this process (SMOS/A4) is shown in Figure 8.28 and the three sub-processes are explained in the following sub-sections.

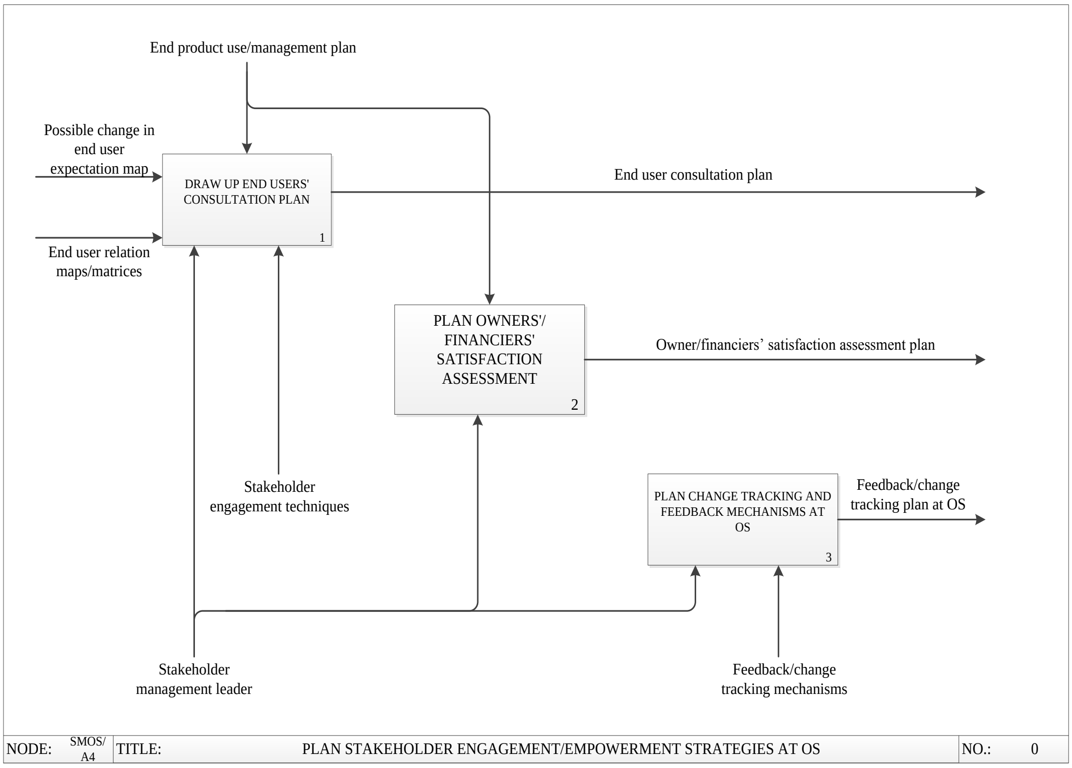

Figure 8.28 Plan stakeholder engagement/empowerment strategies – SMOS/A4

8.7.4.1 Plan end-users'/stakeholders' consultation/communication strategies at OS

This sub-process is aimed at deciding stakeholder engagement and communication strategies that are appropriate for the different stakeholders (including end users and financiers) of the projects at the OS. The inputs for this sub-process include change in stakeholder relation map/matrices and change in stakeholder expectation maps/matrices from SMOS/A3. Therefore, the output from this process is the stakeholder consultation/communication plan at the OS.

8.7.4.2 Plan stakeholder assessment strategies at OS

The aim of this sub-process is to plan the strategies through which different stakeholders of the project involved at the operation stages will be assessed to ascertain their level of satisfaction with the facility created. The inputs for this sub-process are change in stakeholder expectation maps/matrices and change in stakeholder relation maps/matrices from SMOS/A3. The mechanisms of this process include End users, stakeholder management leader and stakeholder engagement techniques. The output from this process is stakeholder assessment strategies at OS.

8.7.4.3 Plan change tracking and feedback mechanisms at OS

This sub-process is aimed at planning change tracking and feedback mechanisms at the operation stage of the project. The inputs for this sub-process include change in stakeholder expectation map/matrices and change in stakeholder relation map and/matrices from SMOS/A3. Stakeholder engagement techniques including feedback and change tracking mechanisms are used in addition to stakeholder management team, leader and end users as mechanisms. The output from this sub-process is feedback and change tracking plan for OS.

8.7.5 Implement stakeholder management decisions - SMOS/A5

The aim of this process is to implement the stakeholder management decisions taken at the operation stage and check the performance and satisfaction of stakeholder with the created facility. It consists of three sub-processes including users' satisfaction report, owner/financiers' satisfaction report and SMOS evaluation report shown in Figure 8.29. The two sub-processes are explained in the following sub-sections.

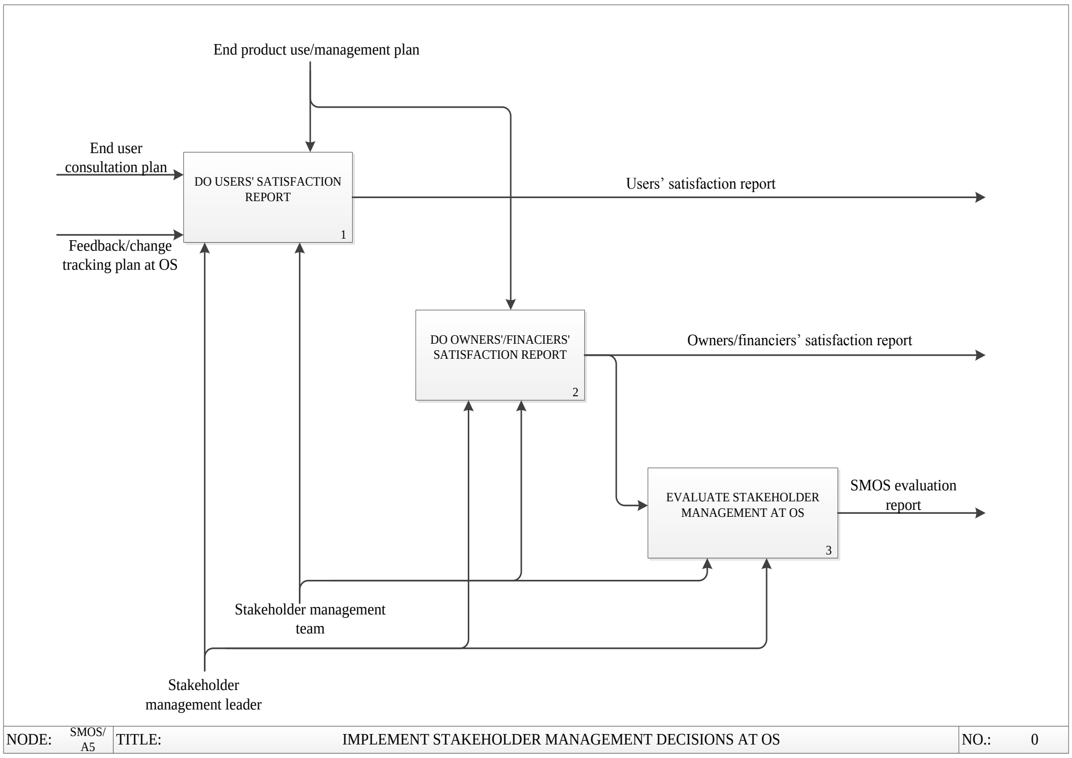

Figure 8.29 Implement stakeholder management decisions - SMOS/A5

8.7.5.1 Do users' satisfaction report at OS

This sub-process aims to assess users' satisfaction with the facility created as results of the project during the operation stage of the project. The inputs for this sub-process are stakeholder consultation and communication plan and feedback/change tracking plan from SMOS/A4. It has stakeholder engagement techniques as additional mechanism. The output from this sub-process is users' satisfaction report.

8.7.5.2 Do owners/financiers' satisfaction report at OS

The aim of this sub-process is to assess the level of satisfaction of the owners or financiers of the project with the facility created at the operation stage. The inputs for this sub-process are owners'/financiers' assessment plan and feedback/change tracking plan from SMOS/A4. The output from this sub-process is owners'/financiers' satisfaction report at OS.

8.7.5.3 Prepare SMOS evaluation report

The aim of this sub-process which is the last is to prepare an evaluation report for stakeholder management at the operation stage. The report compiles an account of what went well and what did not go well in SMOS and captures vital lessons throughout the project's lifecycle for future projects.

8.8 Chapter Summary

This chapter has presented the life cycle based framework for stakeholder management in construction projects developed using IDEF0 process modelling, in order to increase the propensity for achieving success in construction projects. The life cycle based framework consists of four interdependent parts representing framework for stakeholder management at Inception (SMIS), Design (SMDS), Construction (SMCS) and Operation (SMOS) stages of construction projects. These four interdependent and continuous parts of the framework are aimed at providing a comprehensive, simple and easy to use guide for stakeholder management throughout the life cycle of construction projects.

This chapter has explained all processes and their main sub-processes covered in SMIS, SMDS, SMCS and SMOS using IDEF0 diagrams developed for the processes and their main sub-process. However, the life cycle based framework for stakeholder management in construction projects cannot be complete unless it is validated/evaluated. Therefore, it was decided to validate/evaluate the framework with practicing construction industry professionals. The results of the framework validation/evaluation are presented in the next chapter.

9. CHAPTER NINE: VALIDATION/EVALUATION OF THE FRAMEWORK FOR STAKEHOLDER MANAGEMENT IN CONSTRUCTION PROJECTS

9.1 Introduction

This chapter presents the validation/evaluation of the life cycle based framework for stakeholder management in construction projects (this would be referred to subsequently as ‘the framework’) presented in chapter 8. It begins with an explanation of the aim and objectives of validating/evaluating the framework. The aim and objectives are based on the intended purposes of the framework which include ensuring smooth running of projects to successful completion. This is followed by an explanation of the methodology adopted for the validation/evaluation process including qualitative and quantitative approaches in face to face interviews with the validators. Next is presentation of the analyses of the quantitative and qualitative data collected during the framework validation/evaluation process. Following this, the suggested improvements, barriers to the use of the framework and further development of the framework are presented. The results obtained are then discussed and the chapter summary is presented.

9.2 Aim and Objectives of Framework Validation/Evaluation

The framework validation/evaluation was carried out with the aim of determining the appropriateness and applicability of the life cycle based framework for stakeholder management in construction projects by industry practitioners. The specific validation/evaluation objectives include:

1. To assess the applicability and overall effectiveness of the life cycle based framework for stakeholder management in construction projects.
2. To assess the extent to which the framework is able to avoid/reduce conflicts among project stakeholders.
3. To assess the extent to which the framework is able to enable continuity of stakeholder management process in construction projects.
4. To assess the extent to which the framework is able to inform stakeholder management decisions in construction projects.

5. To assess the extent to which the framework is able to facilitate project success in construction.
6. To obtain suggestions from the potential end users (construction industry practitioners) of the framework on the benefits of the framework, barriers to its use and how to further improve it.

9.3 Methodology Adopted for Framework Validation/Evaluation

Frameworks/models are developed to address specific problems but they cannot be used with confidence to solve such problems unless they are validated or evaluated. Framework validation and evaluation are complementary terms that are being used interchangeably by researchers and framework/model developers. Validation or evaluation is carried out not to discover new knowledge but to ensure that a framework or model is able to serve its intended purpose(s). In other words, framework/model validation is aimed at substantiating the framework/model to ensure that it possesses a satisfactory range of accuracy and acceptability consistent with its intended purpose (Schlesinger *et al*., 1979). Therefore, it is important to adopt appropriate methodology in validating a framework/model but there is no known formal guide for choosing the methodology to use in validating a framework/model as each framework development (modelling) tool has its peculiar challenges. Moreover, each framework or model developed has its peculiar intended purpose(s) in line with which the validation should be carried out. If the purpose of the framework/model is to answer a variety of questions, then its validity should be determined with respect to these questions (Sargent, 2005). Therefore, the researcher has to figure out the best method to adopt in validating their framework/model.

There are four basic approaches for deciding whether a framework/model is valid or not (Sargent, 2005):

1. To make a subjective decision based on the results of the various validity tests carried out during the framework development process: This means that only the researcher(s) will be involved in the validation process. It is hardly possible for the framework/model validated using this approach to be considered valid and credible unless the researcher(s) is (are) the end users themselves.
2. To involve the end users of the framework together with the researcher(s) in determining the validity of the framework: In this approach, the focus of who

determines the validity of the framework moves from the researcher(s) to the potential end users of the framework. When this approach is used, the framework also gains credibility if found valid. Credibility means the end users have the confidence to accept and use the framework. Although the researcher(s) may have conducted some validation of the data used in developing the framework/model, it is always better to involve the potential end users of developed framework/model in the validation of the framework/model itself (Martis, 2006).

3. To use a third party separate from the researcher(s) and potential end users to determine the validity of the framework: This approach is referred to as independent validation. It can either run concurrently with the framework development or after the framework has been developed. The credibility of the framework when this approach is used depends on the level of knowledge and integrity of the third party used in validating the framework.
4. To use a scoring model: In this approach, scores (or weights) are used to assess various aspects of the framework developed with respect to the intended purpose of the framework. The framework is considered valid if the overall scores in the aspects of the framework assessed are above the minimum acceptable scores. The minimum acceptable scores depend on the scale of scores used (this for example is 3.5 for a five-point Likert scale). The credibility of the framework is high if its scores very high in all the aspects of the framework assessed.

After careful consideration of these four approaches, it was decided to use a combination of approaches 2 and 4 to validate the framework. In order to gather feedback from the potential end users of the framework on its intended purpose and to identify how it can be further improved to achieve its intended purpose. Sargent, (2005) recommends the use of, a combination of approaches in the validation stage in order to achieve the best result and return not only a valid framework but a credible one as well.

The life cycle based framework for stakeholder management in construction projects was developed using the results obtained from industry survey carried out within the United Kingdom. Therefore it was decided to contact the same industry practitioners who took part in the survey to validate the framework developed as they will eventually be the end users of the framework. The survey respondents were chosen from the field of construction management, architecture, quantity surveying, facility management and engineering including designers and consultants some of whom work for clients. This was done to ensure coverage of the main professional fields involved in construction projects as much as possible. It should be noted that during the industry survey, the target minimum experience was 5 years and this was maintained for the framework validation. This was to ensure that validators of the framework had sufficient experience and knowledge of industry practice such that they would have been involved in two or more construction projects dealing with different stakeholders thereby making the validation results reliable and acceptable. Furthermore, practitioners that have decision making and operational roles ranging from site operation to directorship in their organisations were targeted. The framework validators included practitioners working in both private and public sectors of the construction industry. A total of 19 validation interview sessions were conducted. Details on the professionals involved in the validation process are presented in Table 9.1. It should be noted that the validators' names and other personal information are not included in Table 9.1 in order to keep the validators anonymous in line with ethical requirements and assurances given to the validators before they agreed to take part in the validation. Table 9.1 shows that the minimum years of experience of the validators is 8 and the maximum years of experience is 46. Additionally, the average experience for all the validators is 21.11years.

Table 9.1 Background information of the validators

Validators' No	Company type	Job title	Speciality	Experience (Years)
1	Contractors	Site operations agent	Civil Engineer	14
2	Architecture/Design	Associate	Architect (Healthcare)	12
3	Public sector	Principal Construction Adviser	Architect	24
4	Management and Consultancy	Senior Project Manager	Property development	10
5	Design and Consultancy	Managing director	Project management	20
6	Public sector	Chief Surveyor	Property adviser	38
7	Developers	Director	Property finance	12
8	Developers	Project Manager	Project management	39
9	Engineering enterprise	Senior Commercial Manager	Contractual matters	46
10	Design and Consultancy	Senior Building Services Engineer	Mechanical engineering	8
11	Engineering enterprise	Senior Quantity Surveyor	Construction/Civil/water	10
12	Contractors	Managing Surveyor	Commercial management	15
13	Property management and Consultancy	Park Manager	Property management	30
14	Contractors	Interface Manager	Civil Engineer	20
15	Design and Consultancy	Director	Structural Engineer	25
16	Contractors	Construction Director	Design & Build projects	35
17	Contractors	Quantity Surveyor	Quantity Surveyor	11
18	Contractors	Contracts Manager	Civil Engineer	22
19	Owner and Operator of Infrastructure	Community liaison Manager	Community Engagement	10

The validation was carried out using an interview approach in face to face meetings. Each validation session was designed to last 45 minutes. However, some of the sessions lasted longer depending on the level and amount of discussion with the validators which varied from one validator to the other. The validation interviews consisted of four main parts presented in Figure 9.1. These include:

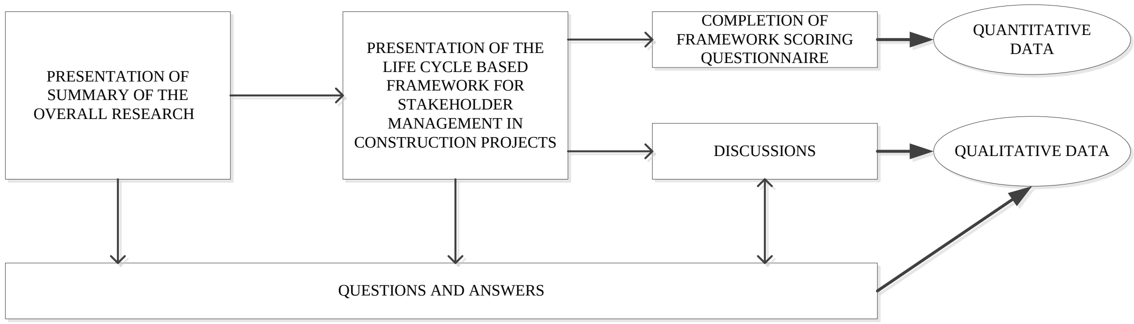

Figure 9.1 Framework Validation Process

1. A summary of the overall research that led to the development of the framework was presented to the validators. This involved presenting the aim and objectives of the research, methodology adopted and preliminary findings in 10 minutes.
2. The life cycle based framework for stakeholder management in construction projects was presented. This involved explaining the conceptual framework (Figure 8.3) and the four stages of the framework developed using IDEF0 (Figures 8.8, 8.9, 8.10 and 8.11) in 15 minutes.
3. A 15 minutes time was allowed for discussions (questions and answers) although the validators were allowed the opportunity to interrupt and ask questions during the presentations. 17 discussion sessions were recorded whereas notes were taken in two sessions as the validators declined to be recorded.
4. An evaluation (scoring) questionnaire was completed by the validators at the end of the discussions. Most of the validators completed the questionnaire in 5 minutes.

A power point presentation was prepared for each validation session to give the validators an overview of the overall research before introducing the framework being validated. During the sessions, three sets of documents were handed out to the validators including:

1. Print outs of power point slides of the presentation. This was because there was no opportunity to project the presentation at most of the interview venues.
2. A set of IDEF0 diagrams to help them follow through the four stages of the life cycle based framework for stakeholder management in construction projects.
3. The framework validation questionnaire (Appendix B) which they completed and returned at the end of the sessions. The validation questionnaire comprised of three sections. The first section collected data on the background information of the validators including their names, company name and address, job title/position, experience of practice in the construction industry in years, speciality and email or contact number. The second section consisted of 11 close ended questions aimed at assessing (using a five-point scale) the overall effectiveness of the framework. The third section consisted of four open ended questions requesting the validators to comment on the main benefits of the framework, barriers to its use, suggestions to further improve the framework and any other comments they wished to add verbally. This part was recorded for all the validators in order to avoid missing any points made by the validators. But two of the respondents declined to be recorded hence notes were taken during their responses.

9.4 Results of Framework Validation/Evaluation

Two sets of data were collected during the framework validation exercise including quantitative and qualitative data. Using a triangulation of quantitative and qualitative methods was helpful in the validation process. The quantitative data collection enabled researcher bias to be avoided and the qualitative data collection enabled the gathering of more detailed information. This led to a more in-depth understanding of the quantitative data. This section presents results obtained during the statistical analysis of the quantitative data and the thematic analysis of the qualitative data.

9.4.1 Quantitative Results

This sub-section presents the analysis of the responses of the framework validators to the closed questions. The validators were asked to score the framework in relation to the aim of the framework development (Table 9.2) on a five-point Likert scale where 1 represents ‘Poor’, 2 represents ‘Fair’, 3 represents ‘Satisfactory’, 4 represents ‘Good’ and 5 represents ‘Excellent’. The results from these closed questions are presented in Tables 9.2 and 9.3. Table 9.2 presents a statistical summary of the validators’ scores on the key aspects of the intended purpose of the framework and Table 9.3 presents the percentage scores for the key aspects of the framework based on the scoring scale.

Table 9.2 Validation responses on scoring of key aspects of the framework

No	Validation questions	Minimum Score	Maximum Score	Mean Score	Skewness	Kurtosis
1	How useful would you rate the overall framework for stakeholder management in construction?	4	5	4.47	.115	-2.235
2	How easy would it be to follow the IDEF0 process in the framework (clarity of the framework)?	2	5	3.63	-.921	.719
3	To what extent can following the framework help in carrying out stakeholder management in construction?	3	5	4.16	.385	1.113
4	How effectively can the framework facilitate the overall success of construction projects?	3	5	4.05	-.026	.024
5	How effectively does the framework focus on stakeholder management issues relevant to construction projects?	2	5	3.89	-.498	.302
6	How well does the framework establish links between the stages of construction projects?	2	5	4.05	-.717	.367
7	How would you rate the applicability of the framework in construction projects?	3	5	4.05	-.074	-.766
8	How would you rate the logical structure of the framework?	3	5	4.16	.385	1.113
9	How would you rate the comprehensiveness of the framework?	3	5	4.21	-.173	-.311
10	How useful would you consider the framework in decision making?	3	5	4.21	-.173	-.311
11	How useful would you consider the framework in reducing conflicts among internal stakeholders?	3	5	4.05	-.074	-.766

Table 9.3 Percentage scores of the key aspects of the framework based on the scale points

No	Validation questions	1 Poor	2 Fair	3 Satisfactory	4 Good	5 Excellent
1	How useful would you rate the overall framework for stakeholder management in construction?	-	-	-	52.6%	47.4%
2	How easy would it be to follow the IDEF0 process in the framework (clarity of the framework)?	-	10.4%	21.1%	63.2%	5.3%
3	To what extent can following the framework help in carrying out stakeholder management in construction?	-	-	5.3%	73.6%	21.1%
4	How effectively can the framework facilitate the overall success of construction projects?	-	-	15.7%	63.2%	21.1%
5	How effectively does the framework focus on stakeholder management issues relevant to construction projects?	-	5.3%	21.1%	52.6%	21.1
6	How well does the framework establish links between the stages of construction projects?	-	5.3%	15.7%	47.4%	31.7%
7	How would you rate the applicability of the framework in construction projects?	-	-	21.1%	52.6%	26.3%
8	How would you rate the logical structure of the framework?	-	-	5.3%	73.6%	21.1%
9	How would you rate the comprehensiveness of the framework?	-	-	10.4%	57.9%	31.7%
10	How useful would you consider the framework in decision making?	-	-	10.4%	57.9%	31.7%
11	How useful would you consider the framework in reducing conflicts among internal stakeholders?	-	-	21.2%	52.6%	26.3%

An investigation of the results from the closed questions reveals an overall positive response by the validators on the framework. Table 9.2 shows that none of the 11 questions was scored 1 (poor) by the validators and all of them had a score of 5 (excellent). This can be seen from the 4th and 5th columns of Table 9.2 which present the minimum and maximum scores respectively for each of the 11 closed questions included in the framework validation questionnaire. The mean scores for all the 11 questions ranged from 3.63 to 4.47, all of them above the acceptable score of 3.5 for a five-point Likert scale.

Furthermore, the Skewness and Kurtosis values shown in Table 9.2 indicate the distribution of scores for the 11 closed questions (Pallant, 2007). Positive Skewness values indicate that scores are clustered around the low values of the scale whereas; negative Skewness values indicate scores are clustered around the high values of the scale. Positive Kurtosis values indicate that scores are clustered around the middle of the scale. A combined look at the Skewness and Kurtosis values shows clustering of scores from the middle to high values of the scale. This explains the high mean scores recorded by all 11 questions. In order to see more clearly the pattern of scores, the percentage scores for the 5 points of the scale were calculated (Table 9.3). The percentage scores indicate that the validators rated the questions mostly from 3 to 5. A further look at the individual validators' scores reveals that no validator continuously indicated low scores for the questions. But two validators scored the question "how easy it would be to use the framework" low being the only question with up to two scores of "2" (fair).

The highest mean score of 4.47 out of 5 was recorded by the question on the overall usefulness of the framework. Conversely, the lowest mean score of 3.63 out of 5 was recorded by the question on how easy it would be to follow the IDEF0 process in the framework. Although this is above the acceptable score, it is comparatively the lowest score recorded in the framework validation. This is not a surprising result as not all the validators have used IDEF0 process before although most of them are familiar with/aware of it.

9.4.2 Qualitative Results

This sub-section presents qualitative results of the framework validators' responses. The qualitative results are presented under three main themes including 'main benefits of the framework', 'barriers to the use of the framework' and 'recommended improvements on the framework'.

9.4.2.1 Main benefits of the framework

The validators were asked what they considered the main benefits of the framework. All validators agreed that the framework provided a logical step by step process for carrying out stakeholder management in construction projects. Moreover, they agreed that the life cycle approach to detailing the framework is a great advantage that would enable continuity of the stakeholder management process in construction projects. Other things the validators liked about the framework include allocation of responsibility and constitution of stakeholder management team for all the stages of the framework; consideration of stakeholder dynamism which would in the words of one of the validators "prevent any unknowns from developing as the project reaches fruition"; early and continuous involvement of all relevant stakeholders will help minimise delays and changes which are very expensive in construction projects; and the provision for documenting lessons learned for onward consideration in future stages and projects. From the results of recorded discussions and notes taken during the validation presented in this section, it can be seen that the main benefit of the life cycle based framework for stakeholder management in construction projects is that it provides a logical step by step process to follow in carrying out stakeholder management in construction projects which was lacking. Moreover, the provision for early and continuous engagement of stakeholders through the project life cycle stands out as the most liked feature of the framework.

9.4.2.2 Barriers to the use of the framework

The validators identified the following barriers to the implementation of the life cycle based framework for stakeholder management in construction projects:

1. End users of the framework may not see the immediate benefits of using the framework;
2. There is the likelihood that the end users of the framework might be afraid that it would lead to additional role to be created, paper work and would be time consuming;
3. Users may hesitate thinking that it would lead to additional cost to implement the framework and nobody may want to shoulder the extra cost. However, one validator is of the view that implementing the framework would not actually

lead to any extra cost since it is controlled by the procurement route and contract conditions. Similarly, another validator said stakeholder management measures such as notification of pedestrian diversions, temporary bridges and public travel protection are actually part of the project sum. Another validator said they commit one percent of their profit for stakeholder engagement;

4. The process of implementing the framework may be considered rigid and maybe difficult to keep to it; and
5. Political pressure on the side of public sector may prevent the implementation of the framework.

The barriers identified to the implementation of the framework centred on responsibility, cost and time related concerns. This is not surprising as it is common practice when executing construction projects to try as much as possible to minimise time and cost. However, spending time to carryout stakeholder management would deliver some positive benefits that far outweigh the time and money spent. These include enabling the smooth running of the project, reduction of delays and changes, reduction of disputes and claims all of which are very expensive to manage. Furthermore, professionals/organisations who use such framework and are able to deliver to clients' and other stakeholders' satisfaction, would increase their long term competitive advantages. Some of the validators noted that organisations are likely to see it as change which is always resisted. It was also noted that some organisations may view some external stakeholders as peripheral and may not have the patience to take time and engage with them.

9.4.2.3 Recommended improvements for the framework

The validators made suggestions towards improving the framework, these include:

1. The framework needs to be made as flexible as possible in order to allow for different project circumstances to be accommodated;
2. The look of the framework should be simplified to make it more user friendly for example by the use of colours (as is the case in the spiral conceptual presentation of the framework shown in Figure 8.3) and other possible means of distinction;
3. Advanced funding of the whole package should be made clear. It should be stated who would be responsible between the client and the contractor, for the funding of any extra cost as a result of the framework implementation; and

4. Appending a result of using examples of past projects to say how things would have gone had this framework been put to use.

The validators have made recommendations for further improvement of the framework to make its implementation easier. These recommendations centred on the outlook and flexibility of the framework. The need for flexibility is already taken care of by the provision for collaboration among the internal stakeholders that serve as either the stakeholder management leaders at the various stages or as members of the stakeholder management team. The framework has also been made to enable the consideration of project specific circumstances through the control from the procurement routes and contract conditions. The recommendation that the framework should be supported with examples from real projects would be recommended by the researcher for further research. Some validators recommended that the framework should be simplified. However, it was observed from the quantitative data that only two of the validators rated the question "how easy it would be to follow the IDEF0 process in the framework" 2 (fair). It was further observed from the qualitative data that these same validators were among the few who said they were not familiar with the IDEF0 technique and further noted that it would be necessary for some kind of training to be provided. Moreover, these validators scored the other questions higher than 2.

9.5 Chapter Summary

This chapter has presented the validation of the life cycle based framework for stakeholder management in construction projects. The validation was carried out using a combination of quantitative and qualitative data collected in interview sessions with 19 well experienced practicing professionals in the construction industry. Findings from the validation indicate that the framework is valid and credible hence, it is able to serve its intended purpose of guiding stakeholder management in construction projects although there are some recommendations for further improvement on the framework. The next chapter concludes the study and makes recommendation for further research.

10.CHAPTER TEN: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

10.1 Introduction

The research presented in this thesis focussed on developing a comprehensive life cycle based framework for stakeholder management in construction projects. This chapter summarises the overall research undertaken in pursuing this aim and evaluates it against the specific research objectives set out. The conclusions reached are then presented and the limitations of the research are discussed. The chapter concludes with a section on recommendations for further research.

10.2 Summary of the Overall Research

The overall aim of this study was to explore the formulation of a comprehensive framework for stakeholder management in construction projects which integrates and links the different stages of the project life cycle. This aim was pursued by addressing the following specific research objectives:

1. To review previous work on stakeholder management in construction projects in particular.
2. To investigate the current practice of stakeholder management within the construction industry.
3. To assess the effect of procurement routes and contract forms on stakeholder management process.
4. To model the relationship among the critical success factors for stakeholder management in construction projects.
5. To develop a comprehensive framework for stakeholder management in construction projects.
6. To validate/evaluate the framework.

The specific tasks accomplished in the current study are summarised based on the research objectives as follows:

Objective 1: To review previous work on stakeholder management in construction projects.

The literature review on stakeholder management in construction projects presented in Chapter 2 revealed that project failure in construction is directly linked to lack of or inadequate stakeholder management during the project execution. Current frameworks for stakeholder management were reviewed. The need for a comprehensive framework for stakeholder management in construction projects was identified as current frameworks were found to be unable to meet this need. The review also identified the need for internal stakeholders to collaborate in carrying out stakeholder management and for responsibility to be assigned for leading/coordinating the process of stakeholder management at the various stages of construction projects. The review further revealed that the involvement of stakeholders in collaboration and assignment of responsibility for leading/coordinating the process can be influenced by the procurement route and contract forms being used for executing the project. The review also identified the need to understand why stakeholder interests change in the course of the project and how such changes could be tracked. The critical success factors for stakeholder management in construction projects were reviewed leading to the identification of 23 critical success factors. Furthermore, the need for a deeper understanding of the interrelationships among these critical success factors and how they can be used to achieve project success were identified. Tools and techniques for stakeholder engagement were reviewed and 6 stakeholder engagement/management techniques were identified with the need to understand which, among them are the most effective tools for engaging stakeholders in construction projects.

As necessitated by the first literature review, another review was carried out on project life cycle, project success, the relationship between procurement routes and stakeholder management as well as stakeholder collaboration. This review was presented in Chapter 3. Construction project life cycle stages were reviewed and four key stages including inception, design, construction and operation stages were identified. The current understanding of project success in construction was reviewed and four key performance indicators were identified including timely completion, completion on budget, completion to specified quality standards and completion to stakeholder satisfaction. It was found that stakeholder management in construction projects will be effective/successful if internal stakeholders collaborate in the process throughout the project's life cycle. Construction procurement routes were discussed under three main groups including the traditional, integrated, and management based procurement routes. The review reveals that no procurement route fully supports the process of stakeholder management in construction projects. At the end, conceptual measurement and structural models were specified to enable the investigation of the interrelationships among the critical success factors for stakeholder management in construction projects and how they lead to project success. The conceptual models had the 23 critical success factors presented in Chapter 2 and four project success indicators presented in Chapter 3; as indicators of the constructs which include stakeholder characteristics and project characteristics (SCPC), stakeholder analysis (SA), stakeholder dynamism (SD), stakeholder engagement/empowerment (SE) and project success (PS).

The literature review concluded that there is currently no framework for stakeholder management in construction that covers the life cycle of projects. As such, filling this gap was chosen as the main focus of this research. The specific objectives of the research were based on a combination of the gaps from the literature review carried out.

Objective 2: To investigate the current practice of stakeholder management within the construction industry.

An industry survey was carried out to investigate the current practice of stakeholder management in the UK construction industry. The survey results, presented in Chapter 5, revealed that stakeholder management has yet to be fully embraced among the construction organisations. The need for internal stakeholders to be involved in stakeholder collaboration throughout the project life cycle was supported with empirical evidence and suggestions were made regarding who should be involved in the collaboration at the various stages of construction projects. Preferences for assignment of responsibility for stakeholder management at the various stages of construction projects were identified. Furthermore, the most effective technique for engaging stakeholders in construction projects was identified to be public hearing. The most common reason why stakeholder interests change in the course of the project was identified to be when stakeholders acquire new information previously not available to them about the project and the means for tracking stakeholder dynamism include feedback mechanisms, early warning signs and checklist in decreasing order of popularity.

Objective 3: To assess the effect of procurement routes and contract forms on stakeholder management process.

Chapter 6 presented the results from part of the survey that investigated the effects of procurement routes and contract forms on stakeholder management process. 12 procurement routes related characteristics of the stakeholder management process were rated using a five-point Likert scale. The results revealed that Clear assignment of responsibilities; Cooperation among the internal stakeholders; and Clear lines of control and communication are the three topmost characteristics to be sought because they influence stakeholder management in construction more positively than others. Conversely, separation of design and construction roles is to be avoided as much as possible because it was found to have negative influence on stakeholder management. The results also revealed that, the more experienced the professionals responsible for stakeholder management are, the more effective the propriety of making stakeholder management decisions in construction projects. All forms of contract influence stakeholder management positively but the NEC form of contract have the highest positive effect on stakeholder management process in construction projects.

Objective 4: To model the relationship among the critical success factors for stakeholder management in construction projects.

This objective was set to understand the interrelations among the critical success factors for stakeholder management in construction through their relationships with the latent variables as well as the causal interrelations among the latent variables; and to examine the fit between extant theoretical standing and the survey data collected for the current study. This analysis was based on the conceptual models presented in Chapter 3. The indicators were the 23 CSFs and project success indicators; and the latent variables or constructs in the model include project characteristics and stakeholder characteristics (SCPC), stakeholder analysis (SA), stakeholder dynamism (SD), stakeholder engagement/empowerment (SE) and project success (PS). The results reveal that the measurement model portrayed in Figure 7.2 fits the sample data fairly well and therefore is accepted. This implies that all stakeholder management decisions made in the four distinct processes shown in the latent variables (obtaining information on project characteristics and stakeholder characteristics; undertaking stakeholder analysis; understanding stakeholder dynamism; and stakeholder engagement/empowerment) affect each other directly or indirectly. The findings from the structural model indicate that stakeholder analysis (SA) cannot directly impact/influence project success (PS). However, stakeholder engagement/empowerment (SE) being the only construct found to directly influence project success (PS) depends on the understanding of stakeholder dynamism (SD) which also depends very strongly on the results of stakeholder analysis (SA). Interestingly, although the relationship between SCPC and SD was not supported, the path coefficients between them indicates that a little understanding of stakeholder dynamism can be gained based only on the information collected on project characteristics and stakeholder characteristics.

Objective 5: To develop a comprehensive framework for stakeholder management in construction projects.

The literature review revealed the need for a comprehensive framework that spans the entire project life cycle to guide the process of stakeholder management in construction projects. The life cycle based framework for stakeholder management in construction projects has been developed using IDEF0 to address this need. The findings from the preceding objectives informed the formulation of this framework. The framework consists of four stages: stakeholder management at inception stage (SMIS), stakeholder management at design stage (SMDS), stakeholder management at construction stage (SMCS) and stakeholder management at operation stage (SMOS). Each of these four stages was further decomposed into sub-processes according to the stakeholder management process based on the relationships among the CSFs presented in Chapter 7. The steps follow the sequence of identifying project characteristics and stakeholder characteristics, carrying out stakeholder analysis, mapping stakeholder dynamism, planning and implementing stakeholder management/engagement strategies. The overall framework provides a comprehensive guide for carrying out stakeholder management in construction projects.

Objective 6: To validate/evaluate the framework.

The life cycle based framework for stakeholder management in construction process was validated in a survey with practicing construction industry professionals. Chapter 9 of this thesis has presented the validation process and discussion of the evaluation results. The validation was carried out using a combination of quantitative and qualitative data collected in interview sessions with 19 well-experienced practicing professionals in the construction industry. Findings from the validation indicated that the framework is valid and credible hence, it is able to serve its intended purpose of guiding stakeholder management in construction projects although there are some recommendations for further improvement of the framework.

10.3 Conclusions and Recommendations for Practice

The research presented in this thesis focussed on improving stakeholder management in construction projects by developing a comprehensive framework that spans the entire life cycle of construction projects to guide stakeholder management process in construction projects. The conclusions drawn from the overall research process are presented as follows:

- Stakeholder management is yet to be fully embraced as a deliberate strategy in the management of construction projects in the UK.
- There is a strong need for internal stakeholders to collaborate in undertaking stakeholder management in construction projects.
- Construction professionals perceive dynamics in stakeholder position as important and gaining new information is explanatory for that, but not loss of confidence in the project team. It is necessary for all stakeholders to be adequately briefed about the project including telling them both the positive and negative aspects of the project.
- There is need to put in place feedback mechanisms and early warning signs to track change in stakeholder interests/disposition throughout the project.
- Public hearings and design charrettes are considered the most important stakeholder engagement instruments.
- The main challenge for embracing stakeholder management can be said to be the inability of firm or client to agree and or set aside some funds to support stakeholder management process. Therefore, it is recommended that some financial provisions should be made in agreement between the client and key project team. Especially for stakeholder management related issues that are not included in the project bill.
- There is need for firms to assign the responsibilities for leading stakeholder management to specific professionals in addition to deciding to undertake stakeholder management in construction projects as currently, no specific responsibility is assigned for stakeholder management in construction projects. This should be done for each of the main stages of a construction project as well as for the overall process of stakeholder management on projects. The

procurement routes and contract forms being used should guide this. There is need for a policy driven support for stakeholder management to be carried out in construction projects. The government and relevant regulatory authorities as stakeholders should ensure this is done.

- The choice of procurement route for a project depends on the project characteristics and issues at stake such as contractor collaboration in design, internal stakeholder collaboration throughout the project, cost control, price guarantee and quality level desired. Even if the appropriate procurement route that favours stakeholder management is selected, it would be necessary for the project management team to have full understanding of the critical success factors for stakeholder management in construction projects. Some of the critical success factors can be skipped in some projects depending on their peculiarities.

- Four hypotheses have been supported by the data set including: H2 (SCPC → SA), H7 (SA →SD), H8 (SD →SE) and H9 (SE →PS). And the final structural model is made of 20 indicators including 16 critical success factors for stakeholder management and 4 project success indicators.

- Obtaining information about project characteristics and stakeholder characteristics (SCPC) has been identified as being the precondition factor (construct) for carrying out effective stakeholder management in construction. Failure to adequately and holistically address the critical success factors for stakeholder management in construction projects will prevent stakeholder management efforts from achieving the desired results-project success.

- The life cycle based framework for stakeholder management in construction projects provides a smooth methodology to guide the process of stakeholder management in construction projects. The framework has been evaluated and found to be credible and acceptable to the construction industry.

10.4 Limitations of the Research

This study like others has its limitations. A real project would have provided better feedbacks than the validation and the framework could have been further improved. But due to time limitations as PhD studies are time bound, the framework could not be implemented practically in a real construction project. The generalisation of the findings in this study is limited to the UK construction industry. Moreover, the results of similar study in different countries may differ depending on government policies and regulation, procurement routes, contract conditions, culture and economic climate.

10.5 Recommendations for Further Research

During the study presented in this thesis, some areas for further studies were identified. These are listed as follows:

- The life cycle based framework for stakeholder management developed in this study is generic for construction projects. Further research could be carried out to develop similar life cycle based framework for specific construction projects such as transport, housing, retail, hospitals, etc. to serve as further motivation for embracing stakeholder management in construction projects.

- Further studies using action research should be carried out to implement the life cycle based framework for stakeholder management in real life construction projects so that the framework can be further improved and simplified based on the findings from the action research. Action research will enable the identification of real life strengths and weaknesses of the framework.

- Anecdotal evidence from the current study suggests there is a link between stakeholder management and risk management in construction projects. Establishing and understanding this link could improve both stakeholder and risk management in construction projects. Further research should be carried out to establish this link and further enhance the propensity for achieving projects success in construction.

- The results of the research reveal the need for policy to support stakeholder management in construction projects. Further research should be undertaken to investigate relevant government policies and regulations to identify how they can be tailored towards supporting stakeholder management in construction projects

References

Aaltonen, K., and Kujala, J. (2010). A project lifecycle perspective on stakeholder influence strategies in global projects. *Scandinavian Journal of Management*, 26(4), 381-397.

Aaltonen, K., Jaakko, K. and Tuomas, O. (2008). Stakeholder salience in global project, *International Journal of Project Management*, 26, 509-516.

Aaltonen, K., Sivonen, R. (2009). Response strategies to stakeholder pressures in global projects. *International Journal of Project Management*, 27 (2), 131–141.

Aguilar-Saven, R. S. (2004). Business process modelling: Review and framework. *International Journal of production economics*, 90(2), 129-149.

Aibinu, A. A. and Al-Lawati, A. M. (2010). Using PLS-SEM technique to model construction organisations' willingness to participate in e-bidding. *Automation in Construction*, 19, 714-724.

Akintoye, A. (1994), Design and build: a survey of construction contractors' views, *Construction Management and Economics*, 12 (2), 155-63.

Akintoye, A., Hardcastle, C., Beck, M., Chinyio, E., and Asenova, D. (2003). Achieving best value in private finance initiative project procurement, *Construction Management and Economics*, 21(5), 461 – 470.

Akintyoye A. and Main J., (2007). Collaborative relationships in construction: the UK contractors' perception, collaborative relationships in construction, engineering. *Construction and Architectural Management*, 14 (6), 597-617.

Aksorn, T. and Hadikusumo, B. H. W. (2008). Critical success factors influencing safety program performance in Thai construction projects, *Safety Science* 46: 709–727. Doi:10.1016/j.ssci.2007.06.006

Anderson, J. C. and Gerbing, D. W. (1991). Predicting the performance of measures in a confirmatory factor analysis with a pretest assessment of their substantive validities. *Journal of Applied Psychology*, 76(5), 732−740.

Anderson, J. C. and Gerbing, D.W. (1984). The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. *Psychometrika*, 49, 155−173.

Ankrah, N.A., Proverbs, D. and Debrah, Y. (2009). Factors influencing the culture of a construction project organisation: an empirical investigation. *Engineering Construction and Architectural Management* 16 (1), 26–47.

Anumba, C. J., and Evbuomwan, N. F. O. (1997). Concurrent engineering in design-build projects, *Construction Management and Economics*, 15: 3, 271 – 281.

Atkin, B. and Skitmore, M. (2008) Editorial: Stakeholder management in construction, *Construction Management and Economics*, 26: 6, 549 – 552.

Atkinson, A.A., Waterhouse, J.H. and Wells, R.B. (1997). A stakeholder approach to strategic performance measurement. *Sloan Management Review; Cambridge*, 38 (3), 25-37.

Awakul, P. and Ogunlana, S.O. (2002), The effect of attitudinal differences on interface conflicts on large construction projects: The case of Pak Mun Dam Project, *Environmental Impact Assessment Review*, 20, 311-35.

Bagozzi, R. P. (2010). Structural equation models are modelling tools with many ambiguities: comments acknowledging the need for caution and humility in their use. *Journal of Consumer Psychology* 20, 208-214.

Baiden, B. K., Price, A. D. F. and Dainty, A. R. J. (2005). The extent of team integration within construction projects. *International Journal of Project Management*, 24(1), 13-23. DOI: 10.1016/j.ijproman.2005.05.001.

Barrett, P. (2007). Structural Equation modelling: adjudging model fit, *Personality and Individual Differences,* 42, 815-824.

Best, R. and Valence, G.D. (2002), *Design and Construction Building in Value*, Butterworth Heinemann, Oxford.

Black, K., (1995). Causes of project failure: a survey of professional engineers. *PM Network*, November; 21-24.

Blaikie, N. (2007). *Approaches to social enquiry: Advancing knowledge*. Polity.

Bordass, W. and Leaman, A. (2005) Making feedback and postoccupancy evaluation routine. 1: A portfolio of feedback techniques. *Building Research & Information*, 33(4), 347–352.

Bourne, L. (2005) Project relationship management and the stakeholder circle, Doctoral thesis, *Graduate School of Business, Melbourne*, RMIT University.

Bourne, L. and Walker, D.H.T. (2005). Visualising and mapping stakeholder influence. *Management Decision*, 43(5), 649–60.

Bourne, L., Walker, D. (2006). Using a visualizing tool to study stakeholder influence – two Australian examples. *The Project Management Journal*, 37 (1), 5–21.

Bryde, D. J. and Brown, D. (2005). The influence of project performance measurement system on the success of a contract for maintaining motor ways and trunk roads, *Project Management Journal*, 35(4), 57 – 65.

Bryde, D. J. and Robinson, L. (2005). Client versus contractor perspectives on project success criteria, *International Journal of Project management*, 23, 622 – 629.

Byrne, B. M. (2010). *Structural Equation Modelling with AMOS: Basic Concepts, Applications and Programming,* (2nd ed.), Routledge, Taylor and Francis Group, New York.

Chan, A., Chan, D. and Ho, K. (2003). An empirical study of the benefits of construction partnering in Hong Kong. *Construction Management and Economics* 21 (5), 523–533.

Chan, A.P.C., Scott, D. and Chan, A.P.L., (2004). Factors affecting the success of a construction project, *Journal of Construction Engineering and Management,* 153.

Chan, D., Kumaraswamy, M. (1997). A comparative study of causes of time overruns in Hong Kong construction projects. *International Journal of Project Management* 15 (1), 55–63.

Chan, P. P. C. and Chan, A. P. L. (2004). Key performance indicators for measuring construction success, Benchmarking: *An International Journal*, 11(2), 203 – 221. Doi 10.1108/14635770410532624.

Chartered Institute of Building (2008). Code of practice for project management for construction and development. LibreDigital.

Cheeks, J. R. (2003). Multistep disputes resolution in design and construction industry. *Journal of Professional Issues in Engineering Education and Practice,* ASCE, 129(2), 84-91.

Cheung, S. O., Lam, T. I., Leung, M. Y. and Wan, Y. W. (2001). An analytical hierarchy process based procurement selection method. *Construction Management & Economics*, 19(4), 427-437.

Chinda, T. and Mohamed, S. (2008). Structural equation model of construction safety culture, *Engineering, Construction and Architectural Management,* 15 (2), 114-131.

Chinyio, E. (2010). Case studies. *In: Chinyio, E. and Olomolaiye, P. (Eds.) Construction Stakeholder Management*, John Wiley & Sons Ltd, United Kingdom, 350 – 376.

Chinyio, E. A. and Akintoye, A. (2008). Practical approaches for engaging stakeholders: findings from the UK, *Construction Management and Economics*, 26: 6, 591-599.

Chinyio, E. and Olomolaiye, P. (2010). Introducing stakeholder management. *In Chinyio, E. and Olomolaiye, P. (Eds.) (2010). Construction Stakeholder Management*, John Wiley & Sons Ltd, United Kingdom, 1 – 12.

Chinyio, E. and Olomolaiye, P. (Eds.). (2010). Construction stakeholder management. *Blackwell Publishing limited*, UK.

Cho, K., Hong, T. and Hyun, C. (2009). Effect of project characteristics on project performance based on structural equation model. *Expert Systems with Applications*, 36, 10461-10470.

Cilliers, P. (2005). Knowing complex systems, in K.A. Richardson (ed.), *Managing Organizational Complexity: Philosophy, Theory, and Application*, 7-19.

Cleland, D. I. (1995), Leadership and the project management body of knowledge, *International Journal of Project Management*, 13(2), 82-8.

Cleland, D. I. (2002) *Project Management: Strategic Design and Implementation*, 4th edn, McGraw-Hill, London.

Cleland, D. I., (1999). *Project Management Strategic Design and Implementation*. McGraw-Hill, New York.

Cookie-Davies, T., (2002). The real success factors on projects, *International Journal of Project Management* 20 (3), 185–190. Cox, D. (2001). Private finance initiate-an introduction to the structure and concepts of PFI, *In the Proceedings of 2001 of International Conference on Construction, Hong Kong*, pp. 501-12.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed approaches*. Sage publications, Thousand Oaks, CA.

Creswell, J. W. (2007). *Qualitative inquiry and research method: Choosing among five approaches*. Sage Publications, Thousand Oaks, CA.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications, Incorporated.

Creswell, J. W. and Plano Clark, V. L. (2011). *Designing and Conducting Mixed Methods Research*, Sage publications. Thousand Oaks, CA.

Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. Sage publications, Thousand Oaks, CA.

Crotty, M. (2003). *The foundations of social research; meaning and perspective in the research process*. SAGE Publications, Los Angeles, London, New Delhi and Singapore.

Doloi, H, Iyer, K. C. and Sawhney, A. (2011). Structural equation model for assessing impacts of contractor's performance on project success, *International Journal of Project Management*, 29, 687-695.

Doloi, H. (2009). Relational partnerships: the importance of communication, trust and confidence and joint risk management in achieving project success. *Construction Management and Economics*, 27(11), 1099-1109.

Doloi, H., Sawhney, A. and Iyer, K. C. (2012a). Structural equation model for investigating factors affecting delay in Indian construction projects. *Construction Management and Economics*, DOI:10.1080/01446193.2012.717705, 1-16.

Doloi, H., Sawhney, A., Iyer, K.C. and Rentala, S. (2012b) Analysing factors affecting delays in Indian construction projects. *International Journal of Project Management*, 30, 479–89.

Dorsey, R.W. (2004). *Project Delivery Systems for Building Construction*, 2nd ed., Associated General Contractors of America, San Diego, CA.

Egan, J., (1998). Rethinking construction: report of the construction task force on the scope for improving the quality and efficiency of UK construction, *Department of the Environment, Transport and the Region*, London.

Erdogan, B., Anumba, C. J., Bouchlaghem, D., and Nielsen, Y. (2008). Collaboration Environments for Construction: Implementation Case Studies. *ASCE Journal of Management in Engineering,* 24(4), 234-244.

Eriksson, P. E. and Laan, A. (2007). Procurement effects on trust and control in client–contractor relationships. *Engineering, Construction and Architectural Management* 14 (4), 387–399.

Eriksson, P. E. and Pesamaa, O. (2007). Modelling procurement effects on cooperation. *Construction Management and Economics*, 25, 893–901.

Eriksson, P. E. and Westerberg M. (2011). Effects of cooperative procurement procedures on construction project performance: a conceptual framework. *International Journal of Project Management*; 29: 197–208.

Faniran, O. O., Love, P. E. D. and Smith, J. (2000). Effective front-end project management–a key element in achieving project success in developing countries. In Proceedings of the Construction Development Conference, *Construction Industry Institute*, Bostwana, June 2-16.

Fellows, R. and Liu, A. (2003). *Research methods for construction*, 2nd Ed., Blackwell Science, Oxford, U.K.

Fewings, P. (2005). *Construction Project management, An Integrated Approach*, Taylor and Francis, London.

Flick, U. (2006). *An Introduction to Qualitative Research*. SAGE Publications, London.

Fonta, W. M., Ichoku, H. E., Ogujiuba, K. K. and Chukwu, J. O. (2007). Using contingent valuation approach for improved solid waste management facilities: Evidence from Enugu State, Nigeria, *Journal of African Economics*, 17 (2), 277 – 304.

Freeman, R. A. (1984). *Strategic Management: a stakeholder approach*, pitman press, Boston.

Freeman, R. E., Harrison, J. S. and Wicks, A. C. (2007). Managing for stakeholders: Survival, reputation, and success. *Yale University Press*.

Glenigan, (2011). KPI findings. www.glenigan.com/media/kpi_zone.aspx. accessed 16/10/2011.

Graham, J.R. (2001). Benefiting from public private partnerships in Honk Hong, *In the Proceedings of 2001 International Conference on Construction in Hong Kong*, pp. 513-23.

Gray, B. (1985). Conditions facilitating interorganizational collaboration. *Human Relations*, 38(10):911–936.

Gray, D. E. (2009). *Doing Research in the Real World*. 2nd Edition, SAGE Publications, Los Angeles, London, New Delhi, Singapore and Washington DC.

Grix, J. (2004). *The Foundations of Research*. Palgrave Macmillan, New York.

Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (2008). *Multivariate Data Analysis,* (7th ed.). Prentice Hall Publisher, Upper Saddle River, New Jersey.

Harris, F. (2010). *A historical overview of stakeholder management*. Wiley-Blackwell, Oxford, UK.

Hooper, D., Coughlan, J. and Mullen, M. (2008). Structural equation modelling: guidelines for determining model fit. *Electronic Journal of Business Research Methods*, 6 (1) 53-60.

Hu, LI-tze, and Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1−55.

Iacobucci, D. (2009). Everything you always wanted to know about SEM (structural equations modeling) but were afraid to ask. *Journal of Consumer Psychology*, 19, 673−680.

Iacobucci, D. (2010). Structural equations modelling: Fit indices, sample size, and advanced topics. *Journal of Consumer Psychology*, 20, 90-98.

Ibrahim, R. and Nissen, M., (2003). Emerging Technology to Model Dynamic Knowledge Creation and Flow among Construction Industry Stakeholders during the Critical Feasibility-Entitlements Phase. *Proceedings of the American Society of*

Civil Engineers (ASCE) 4th Joint Symposium on IT in Civil Engineering. ASCE, Nashville, TN, pp. 1–14. Nov. 15-16.

IDEF (2003). Family of Methods web page: http://www.idef.com. Last accessed 20th April, 2014.

Isik, Z., Arditi, D., Dikmen, I. and Birgonul, M.T. (2009). Impact of corporate strengths/weaknesses on project management competencies, *International Journal of Project Management* 27, 629–637.

Islam, M. D. M. and Faniran, O. O. (2005). Structural equation model of project planning effectiveness, *Construction Management and Economics*, 23, 215–23.

Jackson, D. L. (2003). Revisiting sample size and number of parameter estimates: Some support for the N:q hypothesis. *Structural Equation Modeling*, 10(1), 128−141.

Jamal, B. T. and Getz, D. (1995). Collaboration theory and community tourism planning. Annals of Tourism Research, 22(1), 186-204.

Jepsen, A. L. and Eskerod, P. (2009). Stakeholder analysis in projects: challenges in using current guidelines in the real world, *International Journal of Project Management* 27, 335 – 345.

Jergeas, G.E., Williamson, E., Skulmoski, G.J. and Thomas, J.L., (2000). Stakeholder management on construction projects. *AACE International Transactions* 12, 1–5.

Jugdev, K. and Muller, R. (2005). A retrospective look at our evolving understanding of project success, *Project management Journal*, 36: 4, 19-31.

Juliano, W. J. (1995) External Communication as an Integral Part of Project Planning, *PM Network* 18–20.

Kagioglou, M., Cooper, R., Aouad, G. and Sexton, M. (2000). Rethinking construction: the generic design and construction process protocol. *Engineering construction and architectural management*, 7(2), 141-153.

Kagioglou, M., Cooper, R., Aouad, G. and Sexton, M. (2000). Rethinking construction: the generic design and construction process protocol. *Engineering construction and architectural management*, 7(2), 141-153.

Karlsen, J. T. (2002). Project stakeholder management, *Engineering Management Journal*, 14: 4, 19-24.

Karlsen, J. T., Graee, K. and Massaoud, M. J. (2008). The role of trust in project-stakeholder relationships: a study of a construction project. *International Journal of Project Organisation and Management*, 1(1), 105-118.

Kenny, D. A. and McCoach, B. D. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural Equation Modeling*, 10(3), 333−351.

Kline, R. B. (2005). *Principles and Practice of Structural Equation Modelling*: Methodology in the Social Sciences. Guilford Press, New York.

Kline, R. B. (2010). *Principles and Practice of Structural Equation Modelling*. (3rd ed.), the Guilford Press, New York

Korde, T., Li, M. and Russell, A. D. (2005). State-of-the-art review of construction performance models and factors. In *Broadening Perspectives: Construction Research Congress*, April.

Kujala, J. (2010). Corporate responsibility perceptions in change: Finnish managers' views on stakeholder issues from 1994 to 2004. *Business Ethics: A European Review*, 19 (1), 14–34.

Lee, S. K. and Yu, J. H. (2012). Success model of project management information system in construction. *Automation in Construction*, 25, 82-93.

Leung, M. and Olomolaiye, P. (2010). Risk and construction stakeholder management. *In: Chinyio, E. and Olomolaiye, P. (Eds.) Construction Stakeholder Management*, John Wiley & Sons Ltd, United Kingdom, 75 – 98.

Li, B.; Akintoye, A.; Edwards, P. J. and Hardcastle, C. (2005). Critical success factors for PPP/PFI projects in the UK construction industry, *Construction Management and Economics* 23: 459–471.

Li, T. H. Y., Ng, T. S. and Skitmore, M. (2012). Conflict or consensus: An investigation of stakeholder concerns during the participation process of major infrastructure and construction projects in Hong Kong, *Habitat International*, 36, 333 – 342.

Li, Y., Lu, Y. and Peng, Y. (2011). Hierarchical structuring success factors of project stakeholder management in construction organizations, *African Journal of Business Managemnet* 5(22), 9705 – 9713. http:/www.academicjournals.rog/AJBM.

Lim, C. S. and Mohamed, M. Z., (1999). Criteria of project success: an exploratory re-examination, *International Journal of Project Management* 17 (4), 243–248.

Long, N. D., Ogunlana, S., Quang, T. and Lam, K. C. (2004). Large construction projects in developing countries: a case study from Vietnam, *International Journal of Project management,* 22: 553-561.

Love, P. E. D., Skitmore, N. and Earl, G. (1998). Selecting a suitable procurement method for a building project, *Construction Management and Economics* 16, 221-233.

Low, S.P. and Chuan, Q.T. (2006). Environmental factors and work performance of project managers, *International Journal of Project Management* 21 (1), 24–37.

Manowang, E. and Ogunlana, S. (2010). Strategies and tactics for managing construction stakeholders. *In: Chinyio, E. and Olomolaiye, P. (Eds.) Construction Stakeholder Management*, John Wiley & Sons Ltd, United Kingdom, Pg 121 – 137.

Martis, M. S. (2006). Validation of simulation based models: a theoretical outlook. *The Electronic Journal of Business Research Methods,* 4(1), 39-46.

Masterman, J. W. E. (2002). Introduction to Building Procurement Systems, 2nd ed., *Spon Press*, London.

Mathur, V. N., Price, A. D. F. and Austin, S. (2008). Conceptualizing stakeholder engagement in the context of sustainability and its assessment, *Construction Management and Economics*, 26: 6, 601-609.

McDermott, P. and Khalfan, M. M. A. (2006), “Achieving supply chain integration within construction industry”, *The Australian Journal of Construction Economics and Building*, 6 (2), pp. 44-54.

Miller, J. B. (2002). *Case Studies in Infrastructure Delivery*, Kluwer Academic, London.

Mitchel, R. K., Agle, B. R. and Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts, *Academy management review*, vol 22 no 4.

Mohamed, S. (2002). Safety Climate in Construction Site Environments. *Journal of Construction Engineering and Management*, ASCE, 128(5), pp. 375-384.

Mohsini, R. A. (1993). Knowledge-based design of project-procurement process, *Journal of Computing in Civil Engineering*, Vol. 7 No. 1, pp. 107-22.

Molenaar, K., Washington, S. and Diekmann, J. (2000). Structural equation model of construction contract dispute potential. *J. Constr. Eng. Manage.*, 126 (4), 268–277.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained methodological implications of combining qualitative and quantitative methods. *Journal of mixed methods research*, 1(1), 48-76.

Morris, P.W.G. (1994). *The Management of Projects: A New Model*, Thomas Telford, London.

Nash, S., Chinyio, E., Gameson, R. and Suresh, S. (2010). The dynamism of stakeholders' power in construction projects. *In: Egbu, C. (Ed) procs 26th Annual ARCOM conference*, 6 – 8 September, Leeds, UK, Association of Researchers in Construction Management, 471 – 480.

Neuman, W.L. (2006) Social *Research Methods: Qualitative and Quantitative Approaches*. Boston: Pearson.

Newcombe, R. (1996). Empowering the project team, *International Journal of Project Management*, 14(2), 75–80.

Newcombe, R. (2003). From client to project stakeholders: a stakeholder mapping approach, *Construction Management and Economics*, 21: 8, 841-848.

Ng, T., Rose, T., Mak, M. and Chen, S.E. (2002). Problematic issues associated with project partnering – the contractor perspective. *International Journal of Project Management* 20 (6), 437–449.

Norman, G. R., and Streiner, D.L (2003). PDQ Statistics (3rd ed.). *B C Decker Inc*.

Nunnally, J. C. and Bernstein, I. H. (1994) *Psychometric Theory*, McGraw-Hill, New York.

OGC (2008), Review of government construction procurement strategies, The Final Report of the Public Sector Construction Clients' Forum, *Office of Government Commerce*, Shanghai.

Ojiako, U., Johnson, E. and Greenwood, D. (2008). A qualitative re-construction of project management criteria, *Industrial Management and Data Systems*, 108: 3, 405-417.

Oke, A. E. Ogunsami, D. R. and Ogunlana, S. O. (2012). Establishing a common ground for the use of structural equation modelling for construction related research studies, *Australasian Journal of Construction Economics and Building,* 12 (3) 89-94.

Olander, S. (2006) External stakeholder management, Unpublished PhD thesis, Lund University.

Olander, S. (2007). Stakeholder impact analysis in construction project management, *Construction Management and Economics*, 25: 3, 277-287.

Olander, S. and Landin, A. (2005). Evaluation of Stakeholder influence in the implementation of construction projects, *International Journal of Project Management*, 23, 321-328.

Olander, S. and Landin, A. (2008). A comparative studies of factors affecting the external stakeholder management process, *Construction Management and Economics*, 26(6), 553. doi:10.1080/01446190701821810.

Orndoff, C. J. W. (2005). Promising new tool for stakeholder interaction. *Journal of Architectural Engineering*, 11(4), 139–46.

Oyegoke, A. S. (2001). UK and US Construction management contracting procedures and practices: a comparative study, *Journal of Engineering Construction and Architectural Management*, Vol. 8, Nos. 5/6, 403-417.

Oyegoke, A. S., Dickinson, M., Khalfan, M. M., McDermott, P. and Rowlinson, S. (2009). Construction project procurement routes: an in-depth critique. *International Journal of Managing Projects in Business*, 2(3), 338-354.

Ozorhon, B., Arditi, D., Dikmen, I. and Birgonul, M. T. (2007). Structural equation modelling applications in construction management. *International journal of project management*, 25, 799-806.

Ozorhon, B., Arditi, D., Dikmen, I. and Birgonul, M.T. (2011). Toward a Multidimensional Performance Measure for International Joint Ventures in Construction, *J. Constr. Eng. Manage*. 137(6):403-411.

Ozorhon, B., Dikmen, I. and Birgonul, M. T. (2009). Effects of host country and project conditions in international construction joint ventures. *In* (Abott, C., Aouad, G., Kagioglou, M. and Pathmeswaran; eds.): *International Research Symposium, the Lowry, Salford Quays, greater Manchester, UK, 27th-28th January*, 175-188.

Pajunen, K. (2006), Stakeholder influences in organisational survival, *Journal of Management Studies*, 43(6), 1261-88.

Pallant, J., (2007). Survival manual: A step by step guide to data analysis using SPSS for windows, 3rd Edition, *Open University press*, McGraw-Hill, Uk.

Patton, M. Q. (1990). Qualitative evaluation and research methods . *SAGE Publications, inc*, Thausand Oaks, CA.

Pesamaa, O., Erikson, P. E. and Hair, J. F. (2009). Validating a model of cooperative procurement in the construction industry. *International Journal of Project Management*, 27, 552-559.

PMI (2004) *A Guide to the Project Management Body of Knowledge*, 3rd edn, Project Management Institute, Sylva, NC.

Portney, K. (2005). Civic engagement and sustainable cities in the United States. *Public Administration Review*, 65(5), 579-591.

Portney, P. R. (1994). The contingent valuation debate: why economists should care. *The Journal of Economic Perspectives*, 3-17.

Rahman, M. M. and Kumaraswamy, M. M. (2005). Relational Selection for Collaborative Working Arrangements. *Journal of Construction Engineering and Management.*, 131(10), 1087–1098.

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J. and Stringer, L. C. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of environmental management*, 90(5), 1933-1949.

RIBA (2005). Code of professional conducts for Architect. *Royal Institute of British Architect*.

RIBA, (2007). The RIBA Outline Plan of Work, *Royal Institute of British Architects*.

RICS (2004). Contracts in Use – A Survey of Building Contracts in Use During 2004, *Royal Institution of Chartered Surveyors*, Coventry.

RICS (2013). Rules of conduct for members. *Royal Institute of Chartered Surveyors*.

Rockart, J.F., (1979). Chief executives define their own data needs. *Harvard Business review*; 57(2): 81–93.

Rossman, G. B. and Wilson, B. L. (1985). Numbers and Words Combining Quantitative and Qualitative Methods in a Single Large-Scale Evaluation Study. *Evaluation review*, 9(5), 627-643.

Rowe, G., and Frewer, L. J. (2005). "A typology of public engagement mechanisms." *Sci. Tech. Hum. Values*, 30(2), 251–290.

Rwelamila, P. D. (2010). Impact of procurement on stakeholder management. *In: Chinyio, E. and Olomolaiye, P. (Eds.) Construction Stakeholder Management*, John Wiley & Sons Ltd, United Kingdom, 193 – 215.

Sargent, R. G. (2005, December). Verification and validation of simulation models. *In Proceedings of the 37th conference on Winter simulation* (pp. 130-143). Winter Simulation Conference.

Saunders, M., Lewis P. and Thornhill, A. (2009). *Research Methods for Business Students*. Financial Times Prentice Hall Inc., London.

Schlesinger, *et al*. (1979). Terminology for model credibility. *Simulation* 32 (3): 103-104.

Schriesheim, C.A. (1979). The similarity of individual directed and group directed leader behavior descriptions. *Academy of Management Journal*, 22, 345–55.

Scottish sustainable communities initiative (SSCI), (2008). Charrette series report, http://www.scotland.gov.uk/Resource/Doc/260590/0105938.pdf. Last accessed 15th March 2013.

Smith, J. and Love, P.E.D. (2004). Stakeholder management during project inception: strategic needs analysis. *Journal of Architectural Engineering*, 10(1), 22–33.

Smith, J., Love, P. E. D. and Wyatt, R. G. (2001). To build or not to build? Assessing the strategic needs of construction industry clients and their stakeholders. *Structural Survey*, 19(2), 121–32.

Smyth, H. (2008). The credibility gap in stakeholder management: ethics and evidence of relationship management. *Construction Management and Economics*, 26(6), 633-643.

Steiger, J. H. (2007). Understanding the limitations of global fit assessment in structural equation modelling. *Personality and Individual Differences*, 42 (5), 893-898.

Sutton, S. E. and Kemp, S. P. (2006). Integrating social science and design inquiry through interdisciplinary design charrettes: an approach to participatory community problem solving. *American Journal of Community Psychology*, 38(1-2), 125-139.

Tabachnick, B. G. and Fidell, L. S. (2007). *Using multivariate statistics* 5th ed. New York: Allyn and Bacon.

Takim, R. (2009). The Management of Stakeholders' Needs and Expectations in the Development of Construction Projects in Malaysia, *Modern Applied Science*, vol. 3 No. 5 pp 167-175, www.ccsenet.org/journal.html, available 17/11/2010.

Takim, R. and Akintoye, A., (2002). Performance indicators for successful construction project performance. *In: Greenwood, D. (Ed.), 18th Annual ARCOM Conference*, 2-4 September, University of Northumbria Association of Researchers in Construction Management, 2, 545-555.

Tashakkori, A. and Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Sage publications, Thousand Oaks, CA.

Thomson, D. S., Austin, S. A., Devine-Wright, H. and Mills, G. R. (2003). Managing value and quality in design. *Building Research & Information*, 31(5), 334-345.

Toor, S.R. and Ogunlana, S.O., (2008). Critical COMs of success in large-scale construction projects: evidence from Thailand construction industry, *International Journal of Project Management* 26 (4), 420–430.

Toor, S.R. and Ogunlana, S.O., (2010). Beyond the 'iron triangle': Stakeholder perception of key performance indicators (KPIs) for large-scale public sector development projects *International Journal of Project Management* 28, 228–236.

Tzortzopoulos, P., Cooper, R., Chan, P. and Kagioglou, M. (2006). Clients' activities at the design front-end. *Design Studies*, 27(6), 657-683.

Vinten, G. (2000). The stakeholder manager. *Management Decision*, 38(6), 377-383.

Vogt, W. P., Gardner, D. C. and Haeffele, L. M. (2012). *When to use what research design*. Guilford Press, NY.

Walker, D. H. T. and Hampson, K. D. (2003). *Procurement Strategies: A Relationship Based Approach*, Blackwell, Oxford.

Walker, D. H. T., Bourne, L. M. and Rowlinson, S. (2008). Stakeholder and the supply chain, In: Walker, D.H.T, Rowlinson, S. (Eds.), Procurement Systems: A Cross-industry Project Management Perspective. *Taylor & Francis*, UK, 70–100.

Walker, I. (2010). *Research Methods and statistics*. Palgrave Macmillan.

Ward, S. and Chapman, C. (2008). Stakeholders and uncertainty management in projects, *Construction Management and Economics*, 26: 6, 563-577.

Wateridge, J. (1998). How can IS/IT projects be measured for success. *International Journal of Project Management,* 16 (1), 59-63.

Westland, J. C. (2012). Modern Path Analysis & Structural Equation Models. *CreateSpace Independent Publishing Platform*.

Wheaton, B., Muthen, B., Alwin, D. F. and Summers, G. (1977). Assessing reliability and stability in panel models. *Sociological Methodology*, 8 (1), 84-136.

Wilkinson, P. (2005). *Construction collaboration technologies: the extranet evolution*. Taylor & Francis, US.

Winch, G. M., (2010). *Managing Construction projects: an information processing approach*, 2nd Edition, Wiley-Blackwell, West Sussex, UK.

Wong, P.S.P. and Cheung, S. (2005). Structural equation model of trust and partnering success. *ASCE Journal of Management in Engineering*, 21(2), 70–80.

Wong, W.K., Cheung, S.O., Yiu, T.W. and Pang, H.Y. (2008). A framework for trust in construction contracting, *International Journal of Project Management* 26, 821–829.

Yang, J., Shen, G. Q., Ho, M., Drew, D. S. and Chan, A. P. (2009). Exploring critical success factors for stakeholder management in construction projects. *Journal of civil engineering and management*, 15(4), 337-348.

Yang, J., Shen, G. Q., Ho, M., Drew, D. S. and Xue, X. (2011). Stakeholder management in construction: An empirical study to address research gaps in previous studies. *International Journal of Project Management*, 29(7), 900-910.

Yang, L. R., Chen, J. H. and Wang, H. W. (2012). Assessing impacts of information technology on project success through knowledge management practice. *Automation in Construction*, 22, 182–191.

Yang, R. J. and Shen, G. Q. P. (2014). Framework for stakeholder management in construction projects, *Journal of Management in Engineering*, DOI: 10.1061/(ASCE)ME.1943-5479.0000285.

Yang, R. J., Wang, Y. and Jin, X-H. (2014). Stakeholders' attributes, behaviours, and decision-making strategies in construction projects: Importance and correlation in practice. *Project Management Journal*, 45 (3), 74 – 90.

Yin, R. (2003). K.(2003). *Case study research: Design and methods*. Sage publications, Inc, 5, 11.

Young, T. L. (2006). *Successful Project Management*, Second Edition. Kogan Page, UK.

Yu, T.W., Shen, Q.P., Kelly, J. and Hunter, K. (2007). An empirical study of the variables affecting construction project briefing/architectural programming, *International Journal of Project Management*, 25(2), 198-212.

Yuan, K., Wu, R. and Bentler, P. M. (2010). Ridge structural equation modelling with correlation matrices for ordinal and continuous data, *British Journal of Mathematical and Statistical Psychology*, 64, 107-133.

Appendices

Appendix A: Questionnaire survey instrument.

INVESTIGATING CURRENT PRACTICE AND CRITICAL SUCCESS FACTORS FOR STAKEHOLDER MANAGEMENT IN CONSTRUCTION PROJECTS

This survey is being carried out as part of my PhD research aimed at developing a comprehensive framework for carrying out stakeholder management in construction projects. The survey is aimed at investigating current practice and critical success factors for stakeholder management.

Your time in filling this questionnaire will be appreciated. Please click next to continue and complete the survey and remember to click submit at the end.

There are 26 questions in this survey

SECTION A (1 OF 3): BACKGROUND INFORMATION

1. Please indicate your years of professional experience in construction.

Please choose **only one** of the following:

○From 1 to 5

○From 6 to 10

○From 11 to 15

○From 16 to 20

○From 21 and above

2. Please indicate your profession (field of work)

Please choose **all** that apply:

☐Architecture

☐Construction management

☐Quantity surveying

☐Engineering

☐Facility management

☐Other:

3. Please indicate your Job title.

Please choose **only one** of the following:

○Project director

○Project manager/ Construction manger

○Contract administrator

○Assistant manager

○Site manager

○Project engineer

○Designer/consultant

○Other

4. Please indicate your highest academic qualification

Please choose **only one** of the following:

○ND/NC

○HND/HNC

○B.Sc/B.Eng/B.Tech

○M.Sc/M.Eng/M.Tech/P.Dip

○PhD/D.Eng

○Other

5. Please indicate your professional body (ies) membership. Choose more than one if applicable.

Please choose **all** that apply:

☐RIBA

☐CIOB

☐RICS

☐RICE

☐RISE

☐CIBSE

☐Other:

SECTION B (2 OF 3): INVESTIGATING CSFS FOR STAKEHOLDER MANAGEMENT (SM) IN CONSTRUCTION PROJECTS.

6. Please indicate your level of agreement with the following statements about stakeholder management: on "stakeholder characteristics and project characteristics related actions"

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

Please choose the appropriate response for each item:

	1	2	3	4	5
Clearly formulating the project mission will enable effective stakeholder management	○	○	○	○	○
Ensuring the use of a favourable procurement method will enable effective stakeholder management	○	○	○	○	○
Carefully identifying and listing the project stakeholders will enable effective stakeholder management	○	○	○	○	○
Ensuring flexible project organisation will enable effective stakeholder management	○	○	○	○	○
Identifying and understanding stakeholders' areas of interests in the project will enable effective stakeholder management	○	○	○	○	○

7. Please indicate your level of agreement with the following statements about stakeholder management: on "stakeholder analysis related actions"

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

Please choose the appropriate response for each item:

	1	2	3	4	5
Determining and assessing the power (capacity to influence the actions of other stakeholders); urgency (degree to which	○	○	○	○	○

	1	2	3	4	5
stakeholders' claims requires immediate attention); legitimacy (perceived validity of claims); and proximity (level of association or closeness with the project) of stakeholders will enable effective stakeholder management					
Appropriately classifying stakeholders according to their attributes/characteristics (Power, legitimacy, urgency, proximity, level of interest, etc) will enable effective stakeholder management	○	○	○	○	○
Predicting and mapping stakeholders' behaviours (supportive, opposition, neutral, etc) will enable effective stakeholder management	○	○	○	○	○
Predicting stakeholders' potential influence on each other will enable effective stakeholder management	○	○	○	○	○
Predicting stakeholders' potential influence on the project will enable effective stakeholder management	○	○	○	○	○
Identifying and analysing possible conflicts and coalitions among stakeholders will enable effective stakeholder management	○	○	○	○	○

8. Please indicate your level of agreement with the following statements about stakeholder management: on "stakeholder dynamics related actions"

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

Please choose the appropriate response for each item:

	1	2	3	4	5
Resolving conflicts among stakeholders effectively will enable effective stakeholder management	○	○	○	○	○
Managing the change of stakeholders' interests will enable effective stakeholder management	○	○	○	○	○
Managing the change of stakeholders' influence will enable effective stakeholder management	○	○	○	○	○
Managing the change of relationship among stakeholders will enable effective stakeholder management	○	○	○	○	○
Managing change of stakeholders' attributes will enable effective	○	○	○	○	○

	1	2	3	4	5
stakeholder management					
Managing how project decisions affect stakeholders will enable effective stakeholder management	○	○	○	○	○
Predicting stakeholders' likely reactions for implementing project decisions will enable effective stakeholder management	○	○	○	○	○

9. Please indicate your level of agreement with the following statements about stakeholder management: on "stakeholder engagement/empowerment related actions"

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

Please choose the appropriate response for each item:

	1	2	3	4	5
Involving relevant stakeholders at the inception stage and whenever necessary, to redefine (refine) project mission will enable effective stakeholder management	○	○	○	○	○
Formulating appropriate strategies to manage/engage different stakeholders will enable effective stakeholder management	○	○	○	○	○
Keeping and promoting positive relationships among the stakeholders will enable effective stakeholder management	○	○	○	○	○
Communicating with stakeholders properly and frequently (instituting feedback mechanisms) will enable effective stakeholder management	○	○	○	○	○
Considering corporate social responsibilities (paying attention to economic, legal, environmental and ethical issues) will enable effective stakeholder management	○	○	○	○	○

10. Please indicate your level of agreement with the following statements about stakeholder management: "Relating stakeholder management to project success measures"

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

Please choose the appropriate response for each item:

	1	2	3	4	5
Effective stakeholder management can lead to timely completion	○	○	○	○	○

	1	2	3	4	5
of projects					
Effective stakeholder management can lead to cost savings on projects	○	○	○	○	○
Effective stakeholder management can lead to acceptable quality standard	○	○	○	○	○
Effective stakeholder management can lead to completion of projects to stakeholder satisfaction	○	○	○	○	○

11. Please, indicate in your opinion the extent to which the following procurement route related characteristics can influence stakeholder management:

1 = Very Negatively; 2 = Negatively 3 = Neutral; 4 = Positively 5 = Very Positively.

Please choose the appropriate response for each item:

	1	2	3	4	5
Early involvement of contractor	○	○	○	○	○
Contractor involvement in design	○	○	○	○	○
Single point of responsibility	○	○	○	○	○
Integration of design and construction process	○	○	○	○	○
Separation of design and construction roles	○	○	○	○	○
Clear line of control and communication	○	○	○	○	○
Easy stakeholder identification	○	○	○	○	○
Cooperation among the internal stakeholders	○	○	○	○	○
External stakeholders identification/involvement	○	○	○	○	○
Opportunities for dispute avoidance/resolution	○	○	○	○	○
Opportunities to accommodate changes	○	○	○	○	○
Clear assignment of responsibilities	○	○	○	○	○

Section C (3 of 3): Current practice of stakeholder management in construction.

Please answer the questions in this section based on your experience with a recently completed project.

12. Type of client for the project

Please choose **only one** of the following:

- ○Public
- ○Private
- ○Public and private

13. What forms of contract did you use for the project?

Please choose **only one** of the following:

- ○Standard form JCT
- ○NEC
- ○Bespoke contracts
- ○Other

14. How would you rate the extent to which the form of contracts facilitated stakeholder management on this project?

1 = Very Negatively; 2 = Negatively 3 = Neutral; 4 = Positively 5 = Very Positively

Please choose the appropriate response for each item:

	1	2	3	4	5
Standard form JCT	○	○	○	○	○
NEC	○	○	○	○	○
Bespoke contracts	○	○	○	○	○

15. Did you have stakeholder management on the project? Yes or No, if No, please go to question 19.

Please choose **only one** of the following:

- ○Yes

○No

16. Were there any funds allocated for stakeholder management? Yes or No, if Yes, please answer the next question.

Please choose **only one** of the following:

○Yes

○No

17. If answer to 16 is Yes, please indicate as a percentage of project cost to take care of responsible personnel and associated cost in the box provided. For example, if answer is 5%, enter 05 in the box.

Please write your answer here:

----

18. Was anyone specifically assigned the overall responsibility of stakeholder management on the project?

Please choose **only one** of the following:

○Yes

○No

19. Was/were there any noticeable change(s) in the interest/disposition of stakeholders towards the project as the project progressed? Yes or No, if No, please, go to Question 22. (For example, supportive stakeholders changing to opposing ones).

Please choose **only one** of the following:

○Yes

○No

20. In your opinion what made stakeholders' interest/dispositions towards the project to change as the project progressed? Please indicate as many as applicable among the following:

Please choose **all** that apply:

☐Change in project mission

☐Perceived non involvement

☐Loss of confidence and trust in the project team

☐Loss of confidence and trust in the project

☐Gaining confidence and trust in the project

☐Acquisition of information previously not available to them

☐Other:

21. How did you monitor and track the changes in stakeholders’ interest/disposition towards the project? Indicate if more than one are applicable.

Please choose **all** that apply:

☐By feedback mechanisms

☐By early warning signs

☐By check list

☐Other:

22. Do you agree that there should be collaboration among internal stakeholders at all the stages in carrying out stakeholder management? Yes ( ) No ( ). If Yes please indicate by ticking those you think should be involved at the respective stages in questions 23.

Please choose **only one** of the following:

○Yes

○No

23. Please indicate by ticking all who you think should be involved in collaboration at the various stages in carrying out stakeholder management. (Note:* Project consultant is anybody other than the Designer, project manager, project QS and Contract administrator employed by the client to perform a specific role on the project).

	Inception stage	Design stage	Construction stage	Operation stage
Designer organisation	☐	☐	☐	☐
Project management organisation	☐	☐	☐	☐

	Inception stage	Design stage	Construction stage	Operation stage
Project consultant*	☐	☐	☐	☐
Project QS	☐	☐	☐	☐
Contract Administrator	☐	☐	☐	☐
Main Contractor	☐	☐	☐	☐
Facility management organisation	☐	☐	☐	☐
Client	☐	☐	☐	☐

24. In your opinion who should lead stakeholder management at the various stages of a project? Please indicate by ticking as many as you think applicable. (Note:* Project consultant is anybody other than the Designer, project manager, project QS and Contract administrator employed by the client to perform a specific role on the project).

	Inception stage	Design stage	Construction stage	Operation stage
Designer organisation	☐	☐	☐	☐
Project management organisation	☐	☐	☐	☐
Project consultant*	☐	☐	☐	☐
Project QS	☐	☐	☐	☐
Contract Admisitrator	☐	☐	☐	☐
Main Contractor	☐	☐	☐	☐
Facility management organisation	☐	☐	☐	☐
Client	☐	☐	☐	☐

25. Please rate the extent to which you agree that these techniques would be effective in stakeholder engagement/management if you are aware of them:

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree and 5 = Strongly Agree, NA = No Answer

Please choose the appropriate response for each item:

	1	2	3	4	5
Design charrette	○	○	○	○	○
Delphi technique	○	○	○	○	○
Strategic needs analysis	○	○	○	○	○
Contingent valuation method	○	○	○	○	○
Stakeholder cycle	○	○	○	○	○
Public hearing	○	○	○	○	○

26. Please give any suggestions on how to improve stakeholder management in construction projects in the space below:

Please write your answer here: --

Thank you for your kind help in completing this survey. Your time is sincerely appreciated.

Appendix B: Framework validation instrument.

Framework for stakeholder management in construction

Validation/evaluation questionnaire

Part 1: Background information

Name (Optional):	
Company name and address (Optional):	
Job title/position:	
Experience in construction (in years):	
Speciality if any:	
Email/contact number (Optional):	

Part 2: Framework evaluation questions

Please answer the following questions by circling the appropriate number (1 = Poor and 5 = Excellent)

1. How useful would you rate the overall framework for stakeholder management in construction? **1 2 3 4 5**
2. How easy would it be to follow the IDEF0 process in the framework (clarity of the framework)? **1 2 3 4 5**
3. To what extent can following the framework help in carrying out stakeholder management in construction? **1 2 3 4 5**
4. How effectively can the framework facilitate the overall success of construction projects? **1 2 3 4 5**
5. How effectively does the framework focus on stakeholder management issues relevant to construction projects? **1 2 3 4 5**
6. How well does the framework establish links between the stages of construction projects? **1 2 3 4 5**
7. How would you rate the applicability of the framework in construction projects? **1 2 3 4 5**
8. How would you rate the logical structure of the framework? **1 2 3 4 5**
9. How would you rate the comprehensiveness of the framework? **1 2 3 4 5**
10. How useful would you consider the framework in decision making? **1 2 3 4 5**
11. How useful would you consider the framework in reducing conflicts among internal stakeholders? **1 2 3 4 5**

Part 3: General comments (to be recorded during question and answer discussions)

1. What do you consider the main benefits of the framework for stakeholder management in construction or what do you particularly like about the framework? ...
2. What improvements would you suggest for the framework? ...
3. What do you think are the likely obstacles to the use of the framework for stakeholder management in construction projects? ...
4. Please make any other comments….

Thanks a lot for your valuable help.

Jurbe Joseph Molwus.

Appendix C: Tables of Statistical Results.

Appendix C1: Stakeholder involvement in collaboration at various stages of construction projects

Involvement in collaboration for stakeholder management at different stages[a]		Number of Selections	Percent of Cases
Inception stage (IS)	DOinIS	58	96.7%
	PMOinIS	37	61.7%
	PCinIS	44	73.3%
	QSinIS	40	66.7%
	CAinIS	17	28.3%
	MCinIS	9	15.0%
	FMOinIS	24	40.0%
	CLinIS	59	98.3%
Design stage (DS)	DOinDS	51	85.0%
	PMOinDS	51	85.0%
	PCinDS	47	78.3%
	QSinDS	53	88.3%
	CAinDS	25	41.7%
	MCinDS	40	66.7%
	FMOinDS	46	76.7%
	CLinDS	51	85.0%
Construction stage (CS)	DOinCS	43	71.7%
	PMOinCS	51	85.0%
	PCinCS	43	71.7%
	QSinCS	51	85.0%
	CAinCS	50	83.3%
	MCinCS	51	85.0%
	FMOinCS	35	58.3%
	CLinCS	51	85.0%
Operation stage (OS)	DOinOS	9	15.0%
	PMOinOS	18	30.0%
	PCinOS	8	13.3%
	QSinOS	5	8.3%
	CAinOS	11	18.3%
	MCinOS	16	26.7%
	FMOinOS	50	83.3%
	CLinOS	51	85.0%
Total		1195	1991.7%

a. Dichotomy group tabulated at value 1. DO = design organisation; PMO = project management organisation; PC = project consultant; QS = quantity surveyor; CA = contract administrator; MC = main contractor; FMO = facility management organisation; and CL = client.

Appendix C2: Kruskal-Wallis test on the influence of respondents' professions in selecting who should be involved in stakeholder collaboration at the various stages of construction projects.

Internal stakeholders	Professional field of practice	N	Mean Rank	Asymp. Sig.
DOinIS	Architecture	11	29.50	1.00
	Construction management	18	29.50	
	Quantity surveying	13	29.50	
	Engineering	10	29.50	
	Facility management	6	29.50	
	Total	58		
DOinDS	Architecture	12	27.00	0.311
	Construction management	14	27.00	
	Quantity surveying	11	27.00	
	Engineering	9	24.11	
	Facility management	6	27.00	
	Total	52		
DOinCS	Architecture	12	23.00	0.259
	Construction management	12	23.00	
	Quantity surveying	9	23.00	
	Engineering	7	19.86	
	Facility management	4	23.00	
	Total	44		
DOinOS	Architecture	5	8.60	0.795
	Construction management	2	6.50	
	Quantity surveying	1	10.00	
	Engineering	4	6.50	
	Facility management	2	6.50	
	Total	14		
PMOinIS	Architecture	9	18.83	0.552
	Construction management	11	21.00	
	Quantity surveying	7	18.21	
	Engineering	8	21.00	
	Facility management	4	21.00	
	Total	39		
PMOinDS	Architecture	11	26.00	1.000
	Construction management	16	26.00	
	Quantity surveying	10	26.00	
	Engineering	8	26.00	
	Facility management	6	26.00	
	Total	51		
PMOinCS	Architecture	12	26.00	1.000
	Construction management	14	26.00	
	Quantity surveying	11	26.00	
	Engineering	8	26.00	
	Facility management	6	26.00	
	Total	51		
PMOinOS	Architecture	7	11.21	0.949
	Construction management	7	12.86	
	Quantity surveying	1	14.50	
	Engineering	4	11.63	
	Facility management	4	11.63	
	Total	23		

Internal stakeholders	Professional field of practice	N	Mean Rank	Asymp. Sig.
PCinIS	Architecture	8	22.50	1.000
	Construction management	13	22.50	
	Quantity surveying	10	22.50	
	Engineering	8	22.50	
	Facility management	5	22.50	
	Total	44		
PCinDS	Architecture	10	24.00	1.000
	Construction management	15	24.00	
	Quantity surveying	10	24.00	
	Engineering	5	24.00	
	Facility management	7	24.00	
	Total	47		
PCinCS	Architecture	10	22.00	1.000
	Construction management	13	22.00	
	Quantity surveying	9	22.00	
	Engineering	5	22.00	
	Facility management	6	22.00	
	Total	43		
PCinOS	Architecture	3	4.50	1.000
	Construction management	1	4.50	
	Engineering	2	4.50	
	Facility management	2	4.50	
	Total	8		
QSinIS	Architecture	7	18.57	0.302
	Construction management	12	21.50	
	Quantity surveying	10	21.50	
	Engineering	6	21.50	
	Facility management	6	21.50	
	Total	41		
QSinDS	Architecture	12	27.00	1.000
	Construction management	16	27.00	
	Quantity surveying	10	27.00	
	Engineering	8	27.00	
	Facility management	7	27.00	
	Total	53		
QSinCS	Architecture	12	26.00	1.000
	Construction management	15	26.00	
	Quantity surveying	10	26.00	
	Engineering	8	26.00	
	Facility management	6	26.00	
	Total	51		
QSinOS	Architecture	1	4.00	0.572
	Construction management	2	2.50	
	Engineering	1	4.00	
	Facility management	2	4.00	
	Total	6		
CAinIS	Architecture	5	12.00	0.232
	Construction management	5	10.00	
	Quantity surveying	4	7.00	
	Engineering	4	12.00	
	Facility management	2	12.00	
	Total	20		
CAinDS	Architecture	7	15.00	0.648
	Construction management	8	13.31	
	Quantity surveying	5	12.30	
	Engineering	4	15.00	
	Facility management	3	15.00	
	Total	27		

Internal stakeholders	Professional field of practice	N	Mean Rank	Asymp. Sig.
CAinCS	Architecture	12	25.50	1.000
	Construction management	15	25.50	
	Quantity surveying	10	25.50	
	Engineering	7	25.50	
	Facility management	6	25.50	
	Total	50		
CAinOS	Architecture	3	7.00	0.558
	Construction management	3	5.00	
	Quantity surveying	3	7.00	
	Engineering	2	7.00	
	Facility management	1	7.00	
	Total	12		
MCinIS	Architecture	2	6.00	0.261
	Construction management	3	6.00	
	Quantity surveying	2	3.50	
	Engineering	3	6.00	
	Total	10		
MCinDS	Architecture	11	22.50	0.526
	Construction management	13	20.88	
	Quantity surveying	6	22.50	
	Engineering	6	22.50	
	Facility management	6	19.00	
	Total	42		
MCinCS	Architecture	12	27.00	0.651
	Construction management	15	25.27	
	Quantity surveying	11	27.00	
	Engineering	8	27.00	
	Facility management	6	27.00	
	Total	52		
MCinOS	Architecture	5	9.50	0.517
	Construction management	4	7.38	
	Quantity surveying	3	9.50	
	Engineering	4	9.50	
	Facility management	1	9.50	
	Total	17		
FMOinIS	Architecture	8	14.50	0.010
	Construction management	8	14.50	
	Quantity surveying	7	12.64	
	Engineering	2	14.50	
	Facility management	1	1.50	
	Total	26		
FMOinDS	Architecture	11	24.50	0.300
	Construction management	14	24.50	
	Quantity surveying	8	21.56	
	Engineering	8	24.50	
	Facility management	6	24.50	
	Total	47		
FMOinCS	Architecture	7	19.00	0.478
	Construction management	11	19.00	
	Quantity surveying	8	16.75	
	Engineering	5	19.00	
	Facility management	5	19.00	
	Total	36		

Internal stakeholders	Professional field of practice	N	Mean Rank	Asymp. Sig.
FMOinOS	Architecture	12	26.50	0.457
	Construction management	14	26.50	
	Quantity surveying	11	24.18	
	Engineering	8	26.50	
	Facility management	6	26.50	
	Total	51		
CLinIS	Architecture	12	31.00	0.109
	Construction management	18	31.00	
	Quantity surveying	13	31.00	
	Engineering	10	31.00	
	Facility management	7	26.71	
	Total	60		
CLinDS	Architecture	12	26.00	1.000
	Construction management	14	26.00	
	Quantity surveying	11	26.00	
	Engineering	8	26.00	
	Facility management	6	26.00	
	Total	51		
CLinCS	Architecture	12	27.00	0.105
	Construction management	14	27.00	
	Quantity surveying	11	27.00	
	Engineering	9	27.00	
	Facility management	6	22.67	
	Total	52		
CLinOS	Architecture	12	26.00	1.000
	Construction management	14	26.00	
	Quantity surveying	11	26.00	
	Engineering	8	26.00	
	Facility management	6	26.00	
	Total	51		

Appendix C3: Responsibilities for leading stakeholder management at various stages in construction projects

Responsibility for leading stakeholder management at different stages[a]		Number of Selections	Percent of Cases
Inception stage (IS)	DOleadIS	11	18.3%
	PMOleadIS	17	28.3%
	PCleadIS	12	20.0%
	QSleadIS	4	6.7%
	CAleadIS	2	3.3%
	MCleadIS	0	0.0%
	FMOleadIS	0	0.0%
	CLleadIS	44	73.3%
Design stage (DS)	DOleadDS	38	63.3%
	PMOleadDS	20	33.3%
	PCleadDS	3	5.0%
	QSleadDS	1	1.7%
	CAleadDS	4	6.7%
	MCleadDS	1	1.7%
	FMOleadDS	0	0.0%
	CLleadDS	15	25.0%
Construction stage (CS)	DOleadCS	3	5.0%
	PMOleadCS	48	80.0%
	PCleadCS	1	1.7%
	QSleadCS	2	3.3%
	CAleadCS	9	15.0%
	MCleadCS	13	21.7%
	FMOleadCS	0	0.0%
	CLleadCS	12	20.0%
Operation stage (OS)	DOleadOS	3	5.0%
	PMOleadOS	11	18.3%
	PCleadOS	2	3.3%
	QSleadOS	2	3.3%
	CAleadOS	4	6.7%
	MCleadOS	2	3.3%
	FMOleadOS	39	65.0%
	CLleadOS	19	31.7%
Total		342	570.0%

a. Dichotomy group tabulated at value 1. DO = design organisation; PMO = project management organisation; PC = project consultant; QS = quantity surveyor; CA = contract administrator; MC = main contractor; FMO = facility management organisation; and CL = client.

Appendix C4: Kruskal-Wallis test on the influence of respondents' professions in selecting who should lead/coordinate stakeholder management at the various stages of construction projects.

Internal stakeholders	Professional field of practice	N	Mean Rank	Asymp. Sig.
DOleadIS	Architecture	2	12.00	0.566
	Construction management	8	9.88	
	Quantity surveying	2	7.75	
	Engineering	2	7.75	
	Facility management	3	6.33	
	Total	17		
DOleadDS	Architecture	8	20.50	0.068
	Construction management	14	20.50	
	Quantity surveying	8	20.50	
	Engineering	5	20.50	
	Facility management	4	15.63	
	Total	39		
DOleadCS	Architecture	2	3.00	0.317
	Quantity surveying	2	2.00	
	Total	4		
DOleadOS	Architecture	1	2.00	1.000
	Construction management	1	2.00	
	Quantity surveying	1	2.00	
	Total	3		
PMOleadIS	Architecture	5	9.00	1.000
	Construction management	6	9.00	
	Quantity surveying	1	9.00	
	Engineering	2	9.00	
	Facility management	3	9.00	
	Total	17		
PMOleadDS	Architecture	7	11.50	0.525
	Construction management	4	11.50	
	Quantity surveying	5	9.40	
	Engineering	1	11.50	
	Facility management	4	11.50	
	Total	21		
PMOleadCS	Architecture	12	24.50	1.000
	Construction management	17	24.50	
	Quantity surveying	8	24.50	
	Engineering	5	24.50	
	Facility management	6	24.50	
	Total	48		
PMOleadOS	Architecture	2	6.00	1.000
	Construction management	5	6.00	
	Quantity surveying	2	6.00	
	Engineering	1	6.00	
	Facility management	1	6.00	
	Total	11		
PCleadIS	Architecture	2	8.50	0.689
	Construction management	4	6.75	
	Quantity surveying	3	6.17	
	Engineering	3	8.50	
	Facility management	2	8.50	
	Total	14		
PCleadDS	Quantity surveying	2	2.00	1.000
	Engineering	1	2.00	
	Total	3		

Internal stakeholders	Professional field of practice	N	Mean Rank	Asymp. Sig.
PCleadCS	Architecture	1	2.00	0.317
	Quantity surveying	1	1.00	
	Total	2		
PCleadOS	Architecture	1	1.50	1.000
	Construction management	1	1.50	
	Total	2		
QSleadIS	Construction management	1	2.50	1.000
	Quantity surveying	1	2.50	
	Engineering	2	2.50	
	Total	4		
QSleadCS	Architecture	1	1.50	1.000
	Construction management	1	1.50	
	Total	2		
QSleadOS	Architecture	1	1.50	1.000
	Construction management	1	1.50	
	Total	2		
CAleadIS	Engineering	2	1.50	-
	Total	2[a]		
CAleadDS	Quantity surveying	2	2.50	1.000
	Engineering	1	2.50	
	Facility management	1	2.50	
	Total	4		
CAleadCS	Architecture	1	5.00	1.000
	Construction management	1	5.00	
	Quantity surveying	4	5.00	
	Engineering	1	5.00	
	Facility management	2	5.00	
	Total	9		
CAleadOS	Construction management	2	2.50	1.000
	Quantity surveying	1	2.50	
	Engineering	1	2.50	
	Total	4		
MCleadCS	Architecture	2	7.00	1.000
	Construction management	5	7.00	
	Quantity surveying	3	7.00	
	Engineering	3	7.00	
	Total	13		
MCleadOS	Architecture	1	1.50	1.000
	Construction management	1	1.50	
	Total	2		
FMOleadIS	Architecture	1	2.00	1.000
	Construction management	1	2.00	
	Quantity surveying	1	2.00	
	Total	3		
FMOleadOS	Architecture	9	20.00	1.000
	Construction management	12	20.00	
	Quantity surveying	9	20.00	
	Engineering	4	20.00	
	Facility management	5	20.00	
	Total	39		
CLleadIS	Architecture	7	23.50	0.246
	Construction management	16	23.50	
	Quantity surveying	11	23.50	
	Engineering	7	20.29	
	Facility management	4	23.50	
	Total	45		

Internal stakeholders	Professional field of practice	N	Mean Rank	Asymp. Sig.
CLleadDS	Architecture	4	9.00	0.072
	Construction management	8	9.00	
	Quantity surveying	2	5.00	
	Engineering	2	9.00	
	Total	16		
CLleadCS	Architecture	2	6.50	1.000
	Construction management	6	6.50	
	Quantity surveying	2	6.50	
	Engineering	2	6.50	
	Total	12		
CLleadOS	Architecture	4	10.00	1.000
	Construction management	6	10.00	
	Quantity surveying	3	10.00	
	Engineering	4	10.00	
	Facility management	2	10.00	
	Total	19		
a. There is only one non-empty group. Kruskal-Wallis Test cannot be performed.				

Appendix C5: Kruskal-Wallis test on the influence of respondents' profession on their rating of the procurement route related characteristics of stakeholder management in construction projects

Procurement route related characteristics	Professional field of practice	N	Mean Rank	Asymp. Sig.
Early involvement of contractor	Architecture	12	26.38	0.491
	Construction management	18	30.33	
	Quantity surveying	14	34.57	
	Engineering	10	27.90	
	Facility management	7	37.93	
	Total	61		
Contractor involvement in design	Architecture	12	23.46	0.294
	Construction management	18	30.86	
	Quantity surveying	14	37.79	
	Engineering	10	30.00	
	Facility management	7	32.14	
	Total	61		
Single point of responsibility	Architecture	12	33.08	0.591
	Construction management	18	29.44	
	Quantity surveying	14	32.36	
	Engineering	10	35.20	
	Facility management	7	22.71	
	Total	61		
Integration of design and construction process	Architecture	12	29.00	0.982
	Construction management	18	32.00	
	Quantity surveying	14	30.25	
	Engineering	10	32.90	
	Facility management	7	30.64	
	Total	61		
Seperation of design and construction roles	Architecture	12	30.96	0.215
	Construction management	18	35.44	
	Quantity surveying	14	34.57	
	Engineering	10	25.00	
	Facility management	7	21.07	
	Total	61		
Clear lines of control and communication	Architecture	12	31.58	0.413
	Construction management	18	31.06	
	Quantity surveying	14	33.96	
	Engineering	10	33.70	
	Facility management	7	20.07	
	Total	61		
Easy stakeholder identification	Architecture	12	39.42	0.107
	Construction management	18	34.28	
	Quantity surveying	14	26.75	
	Engineering	10	27.30	
	Facility management	7	21.93	
	Total	61		
Cooperation among the internal stakeholders	Architecture	12	31.33	0.047
	Construction management	18	37.56	
	Quantity surveying	14	22.54	
	Engineering	10	25.75	
	Facility management	7	38.00	
	Total	61		
External stakeholders identification/involvement	Architecture	12	39.96	0.153
	Construction management	18	30.36	
	Quantity surveying	14	28.71	

Procurement route related characteristics	Professional field of practice	N	Mean Rank	Asymp. Sig.
	Engineering	10	26.35	
	Facility management	7	28.50	
	Total	61		
Opportunities for dispute avoidance/resolution	Architecture	12	33.88	0.368
	Construction management	18	31.89	
	Quantity surveying	14	34.82	
	Engineering	10	27.10	
	Facility management	7	21.71	
	Total	61		
Opportunities to accomodate changes	Architecture	12	31.50	0.409
	Construction management	18	32.81	
	Quantity surveying	14	34.36	
	Engineering	10	22.10	
	Facility management	7	31.50	
	Total	61		
Clear assignment of responsibilities	Architecture	12	23.00	0.096
	Construction management	18	28.56	
	Quantity surveying	14	34.18	
	Engineering	10	40.90	
	Facility management	7	30.50	
	Total	61		

Appendix C6: Correlation of procurement route related characteristics of stakeholder management

		PROCC1	PROCC2	PROCC3	PROCC4	PROCC5	PROCC6	PROCC7	PROCC8	PROCC9	PROCC10	PROCC11	PROCC12
PROCC1	Pearson Correlation	1	.730**	.012	.502**	-.103	.117	-.026	.250	.227	.012	.107	.076
	Sig. (2-tailed)		.000	.930	.000	.428	.368	.845	.052	.079	.929	.410	.558
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC2	Pearson Correlation	.730**	1	.128	.509**	-.071	.139	-.062	.073	.012	-.066	.110	.175
	Sig. (2-tailed)	.000		.325	.000	.587	.285	.635	.574	.929	.615	.398	.177
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC3	Pearson Correlation	.012	.128	1	.176	.010	.279*	.207	.116	.048	.085	.065	.268*
	Sig. (2-tailed)	.930	.325		.176	.937	.030	.110	.372	.714	.513	.617	.037
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC4	Pearson Correlation	.502**	.509**	.176	1	-.155	.231	.208	.158	.146	.151	.089	.061
	Sig. (2-tailed)	.000	.000	.176		.234	.074	.108	.223	.261	.245	.495	.642
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC5	Pearson Correlation	-.103	-.071	.010	-.155	1	-.118	.136	-.121	-.029	-.096	-.013	-.069
	Sig. (2-tailed)	.428	.587	.937	.234		.367	.294	.354	.823	.461	.920	.597
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC6	Pearson Correlation	.117	.139	.279*	.231	-.118	1	.305*	.266*	.289*	.417**	.273*	.442**
	Sig. (2-tailed)	.368	.285	.030	.074	.367		.017	.039	.024	.001	.033	.000
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC7	Pearson Correlation	-.026	-.062	.207	.208	.136	.305*	1	.377**	.622**	.371**	.165	.301*
	Sig. (2-tailed)	.845	.635	.110	.108	.294	.017		.003	.000	.003	.204	.019
	N	61	61	61	61	61	61	61	61	61	61	61	61

Appendix C6 Continued

		PROCC1	PROCC2	PROCC3	PROCC4	PROCC5	PROCC6	PROCC7	PROCC8	PROCC9	PROCC10	PROCC11	PROCC12
PROCC8	Pearson Correlation	.250	.073	.116	.158	-.121	.266*	.377**	1	.434**	.285*	.234	.413**
	Sig. (2-tailed)	.052	.574	.372	.223	.354	.039	.003		.000	.026	.070	.001
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC9	Pearson Correlation	.227	.012	.048	.146	-.029	.289*	.622**	.434**	1	.385**	.335**	.313*
	Sig. (2-tailed)	.079	.929	.714	.261	.823	.024	.000	.000		.002	.008	.014
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC10	Pearson Correlation	.012	-.066	.085	.151	-.096	.417**	.371**	.285*	.385**	1	.507**	.355**
	Sig. (2-tailed)	.929	.615	.513	.245	.461	.001	.003	.026	.002		.000	.005
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC11	Pearson Correlation	.107	.110	.065	.089	-.013	.273*	.165	.234	.335**	.507**	1	.301*
	Sig. (2-tailed)	.410	.398	.617	.495	.920	.033	.204	.070	.008	.000		.019
	N	61	61	61	61	61	61	61	61	61	61	61	61
PROCC12	Pearson Correlation	.076	.175	.268*	.061	-.069	.442**	.301*	.413**	.313*	.355**	.301*	1
	Sig. (2-tailed)	.558	.177	.037	.642	.597	.000	.019	.001	.014	.005	.019	
	N	61	61	61	61	61	61	61	61	61	61	61	61

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix C7a: Un-rotated principal component analysis of critical success factors for stakeholder management in construction projects.

Component Matrix[a]

Factor	Component					
	1	2	3	4	5	6
SCPC1	.351	.593	-.219	.525	-.307	.279
SCPC2	.385	-.032	-.459	.682	.457	.315
SCPC3	.488	.145	.684	-.082	.064	-.211
SCPC4	.131	-.454	.584	-.347	.368	.407
SCPC5	.536	.177	.552	.258	-.080	-.138
SA1	.427	-.097	-.267	.267	.417	-.510
SA2	.512	-.227	.174	.498	.233	-.160
SA3	.625	-.357	.223	-.060	.096	.094
SA4	.677	-.219	.158	.205	-.011	.201
SA5	.645	-.121	.356	.271	-.217	-.060
SA6	.671	.088	-.136	.279	.017	.341
SD1	.479	.613	.265	-.219	-.086	.208
SD2	.742	-.045	-.138	-.027	-.338	.092
SD3	.756	-.246	-.316	-.096	-.348	.010
SD4	.689	-.460	-.118	-.167	-.053	-.107
SD5	.636	-.549	-.069	-.224	-.166	-.051
SD6	.724	.008	-.144	-.322	.175	-.221
SD7	.619	.136	-.136	-.375	-.028	-.227
SE1	.609	.181	-.154	.151	-.180	-.174
SE2	.638	.288	.164	-.580	.193	.014
SE3	.638	.417	.006	-.182	.295	.147
SE4	.510	.550	-.172	-.122	-.003	-.065
SE5	.662	.217	-.037	-.075	.092	.131

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

Appendix C7b: Total variance of principal component analysis of the critical success factors for stakeholder management in construction projects.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.996	34.764	34.764	7.996	34.764	34.764
2	1.960	8.520	43.284	1.960	8.520	43.284
3	1.442	6.269	49.553	1.442	6.269	49.553
4	1.359	5.908	55.461	1.359	5.908	55.461
5	1.204	5.234	60.694	1.204	5.234	60.694
6	1.100	4.783	65.478	1.100	4.783	65.478
7	.998	4.339	69.817			
8	.926	4.027	73.844			
9	.782	3.398	77.242			
10	.773	3.362	80.604			
11	.670	2.912	83.516			
12	.607	2.641	86.157			
13	.507	2.204	88.361			
14	.497	2.161	90.521			
15	.402	1.748	92.270			
16	.376	1.634	93.904			
17	.352	1.529	95.433			
18	.294	1.279	96.712			
19	.225	.976	97.688			
20	.172	.748	98.436			
21	.138	.602	99.037			
22	.112	.487	99.524			
23	.109	.476	100.000			

Extraction Method: Principal Component Analysis.

List of publications

1. **Molwus, J J**, Erdogan, B and Ogunlana, S O (2014). A study of the current practice of stakeholder management in construction projects In: Raiden, A B and Aboagye-Nimo, E (Eds) *Procs 30th Annual ARCOM Conference*, 1-3 September 2014, Portsmouth, UK, Association of Researchers in Construction Management, pp 945-954.

2. **Molwus, J.J**, Erdogan, B., Ogunlana, S. O. (2013). **Sample Size and Model Fit Indices for Structural Equation Modelling (SEM): the Case of Construction Management Research**. In: Lennerts, K., Shen, G. Q. P. and Bai Y. *Proceedings of International Conference on Construction and Real Estate Management (ICREM)*, 10-11 October, Karlsruhe, Germany, pp 338 – 347.

3. **Molwus, J.J**, Erdogan, B., Ogunlana, S. O. (2013). **'Critical Success Factors for Stakeholder Management and Project Success in Construction Projects'**. In: *Proceedings of the 11th International Postgraduate Research Conference (IPGRC)*, 8-10 April, Manchester, UK, pp 758-767.