INFLUENCE OF CLIENT ORGANISATION ON ACHIEVING VALUE IN BUILDING DESIGNS

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BY

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DOCTOR OF PHILOSOPHY IN CONSTRUCTION MANAGEMENT

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Declaration

I declare that the work in this thesis entitled 'INFLUENCE OF CLIENT ORGANISATION ON ACHIEVING VALUE IN BUILDING DESIGNS' has been performed by me in the Department of Building. The information derived from the literature has been duly acknowledged in the text and a list of reference provided. No part of this thesis was previously presented for another degree or diploma at this or any other Institution.

Baba Adama Kolo		
Name of Student	Signature	Date

Certification

This thesis entitled 'INFLUENCE OF CLIENT ORGANISATION ON ACHIEVING VALUE IN BUILDING DESIGNS' by Baba Adama KOLO meets the regulations governing the award of the degree of Doctor of Philosophy of the Ahmadu Bello University, and is approved for its' contribution to knowledge and literary presentation.

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Dedication

To:

My Parents

Siblings & Family

&

All those who’d contributed in this journey

Acknowledgement

'Peace be upon you for what you patiently endured. And excellent is the final home'

'Every body perseveres in its state of rest, or of uniform motion in a right line, unless it is compelled to change that state by forces impress'd thereon' Issac Newton (1642 – 1727)

Been in a situation to be endured is an opportunity. Opportunities are in themselves rare and those that make them possible are indeed even rarer. In the course of this research I have overtly enjoyed these rarities – Newton's law was no doubt in action and did so most amazingly! And indeed was I endured by so many people! I'd like to acknowledge and appreciate the fantastic support, excellent guidance and friendly dispositions I received from the supervisory team chaired by Prof K. Bala who patiently and sustainably (I could be a handful actually!) provided the leadership, inspiration and thrust (sometimes indirectly – *'hmmm ... please tell him I'm still waiting for his submission* ...) that steered the work to its successful and logical completion (amazingly my Viva held the day he was elected DVC!). Prof I. K. Zubairu and Prof O. G. Okoli constantly ensuring that I was adequately 'protected' academically and intellectually engaging me throughout the process (*Are you sure you've conceptualised 'value in design' enough to investigate it? Can we get your work before 6:30pm today, your method seems too ambitious!!, Man Kolo I don't understand what you mean by ..... let's meet and discuss ok* ...). Prof A. D. Ibrahim and Associate Prof Y. M. Ibrahim made sure that the team got real 'value ~~for money~~ in supervision', exhibiting high logical sense of reasoning, vibrantly, knowledgeably and critically interrogating the philosophical and methodological instances, keenly spotting inherent ineptitudes, and even co-owing the work despite its deficiencies and near abstractness (... *this is our thinking ...; we don't expect that ....; well maybe we should consider ...; we are waiting o....!!!*). The team made sure and ensured that when it was time to move, I MOVED and when it's time to stop WE STOPPED no matter the resistance from me! Newton!!!

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Abstract

Client organisations are becoming more involved in their projects and the strategic decisions they make are known to have significant impact on project outcomes. Despite this, there is limited insight on the influences of client organisation on value delivery given the importance of the design stage. Not surprisingly therefore, the lack of such insight is also contributing to the high incidence of dissatisfaction amongst clients of the construction industry. Exploring relevant theories toward providing greater exploratory pluralism, this research investigates the influence of client organisation on achieving value for money *(V_fM)* in building designs. Evidences within the fields of organisational behaviour, small team literature, and supply management reveals that 'team functioning', a proxy for measuring the effectiveness of design outcomes can be influenced by client roles, contextual and compositional factors, all of which are reflective of the client organisation, and that these are mediated by the design process. Hence, these five constructs including the final outcome construct – value in design – formed the basis of developing the conceptual framework, its hypothecation and empirical investigation.

The research adopts multi-layered mixed methodology design strategies employing exploratory multi-case studies and survey designs. This is predicated on the nature of the research problem which navigates between objectivism (realism) and constructivism (relativism) ontological considerations and situated within the positivism epistemological paradigm. For the case studies, client organisations formed the unit of analysis while for the survey aspect building projects were the focal unit of analysis. Hence, data were elicited from members of supply management units in client organisations using interviews (Directors of units in charge of procurement) and focus group discussions (five to six members working in each unit) sourced from 10 universities (5 public and 5 private); and from members of design teams (each team consisting of 5 members) who participated in 45 building projects across the 10 Universities; all selected based on a non-probability sampling technique – purposive sampling. The constructs, were examined using descriptive and explanatory analytical tools, on one hand; and using content and comparative analyses on the other while influences were arrived at using regression modelling techniques.

Major findings from the research indicates that client organisations are underdeveloped to undertake strategic supply management but are most capable for operational supply management; and that they operate reasonably with specific strategies at the corporate and operational level but not popular with functional level strategies. While they possess adequate competencies and skills, there is room for improvement. Managing relationship comes with its specific challenges given that the client organisations first do not seem to focus on the main issue of a relationship – the process – but rather tend to manage the 'agreement' and second, they believe that only the performance of the design partner should be measured. These findings do have significant impact on the effective strategic management of the supply chain. In terms of their value systems, the study found that definitive value determination process exist in client organisations but in most cases they are informal, and that though there exist opportunities for value dialogues during design process, value judgements are still heavily reliant on the famous iron triangle in construction – cost, time and quality. This reveals the ineffectiveness of the value system of client organisations and its inherent inflexibility toward positively influencing value delivery.

Notwithstanding the aforementioned challenges, while client roles in the industry are rated as *extremely important*, the level of their performance by client organisations is out of sync with the level of importance attached to them – their performance is *moderate*. Of the three client organisation parameters (COPs), client roles (design, leadership, procurement) have significant influences of -14.6%, -21.3.0%, 22.0% respectively on conflict resolution; organisational context (evaluation) has significant influence of 41.7% on communication and

34.8% on conflict resolution; while team composition (personality and general roles) also have significant influences of -15.5% and 20.7% respectively on communication and 0% and 30.3% respectively on the conflict resolution. None of the COPs have significant influence on collaboration. Finally, it was established that under mediation, client roles and organisational contexts do not have significant influence on team functioning; while team composition (personality and general roles) have significant influences of -18.1% and 63.1% respectively on team functioning. And that of the three known mediators of teamwork, communication and collaboration have significant mediation influences of -11.5% and 11.8% respectively between the COPs and team functioning while collaboration is not a significant mediator between them.

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Chapter 1 – Introduction

1.1 Background to the Study

Clients of the construction industry are evolving from the dormant participants that they were up to the mid 20th century to a much more involved and active participants which the 21st century is witnessing. The surge toward active engagement in their projects is credited to some industry reports that required client organisations to provide the necessary leadership needed for improving the performance of the construction industry given its failure to adequately satisfy its clients (Latham, 1994; Egan, 1998; Strategic Forum for Construction, 2002; Wolstenholme, 2009). Indeed, client organisations, particularly those in the public sectors, are rising to the challenges and positioning themselves towards providing this leadership mainly by emphasising and re-engineering their organisation around the concept of value (for money) (V_fM) in developed and developing economies (FGN, 2007, Ibrahim et al., 2007; OGC, 2007a; Commission of Architects for the Built Environment, 2010; Construction Clients' Group, 2013; Ogunsemi, 2015).

Though the V_fM concept debuted in the construction industry more than 50 years ago, it was not until the end of the 20th century did it receive prominence as one of the most important success criteria for judging the performance of construction projects. And at the start of the 21st century emphasis on success in construction in terms of satisfaction, shifted to having such judgements made on a set of value systems – client value system, multi value system (consisting of designers, contractors and suppliers) and user value system (Standing, 2001; Male, Kelly, Gronqist & Graham, 2007; Thomson et al., 2013). Recent investigations on clients satisfaction in the construction industry corroborates this viewpoint in that there are empirical evidences that meeting or exceeding the requirements of the client value system is the *raison d'etre* for

satisfaction in the construction industry (Thomson & Austin, 2006; Kelly, 2007; Vargo, Maglio, & Akaka, 2008; Thyssen, 2011; Mills, 2013). Hence, current thinking on satisfaction as a measure of project success within the construction industry is predicated upon achieving or exceeding the requirements of the client value system.

Considerations in client value system in construction revolves around the integrated value process framework proposed by Payne and Holt (2001), establishing value as a broad based concept, going beyond the traditional views in terms of transaction, economic utility, exchange and trade-off, to one that is multi-parametered and judged differently by various stakeholders. The Payne and Holt (2001) value process framework has two main aspects. The first aspect is the value process, at the core of the framework, comprising of value determination, value creation, value delivery and value assessment. This is surrounded by key stakeholder groups i.e. the second aspect, comprising of employees, external stakeholder and customers. Contemporary research within value in construction have revolved around the Payne and Holt's framework as a means of improving upon value delivery to clients particularly focusing on: 1) understanding the value process in terms of determining and creating value, in isolation of the stakeholder's imfluences (Kelly, 2007; Male et al., 2007; Thyssen, 2011) on the one hand; and 2) those that look at the value process relative to its interaction with stakeholders' influence (Thomson, Austin, Mills, & Devine-Wright, 2003; Mills, Austin, & Thomson, 2006; Thomson & Austin, 2006; Mills, 2013) on the other hand, with particular reference to value dialogues during the design process.

Building upon the works of Thomson and Austin (2006); Kelly and Male (2006) and Kelly (2007), Mills (2013) makes a significant contribution towards the implementation of an integrated 'process – stakeholder' system based on the Payne

and Holt (2001) value process framework towards managing value in construction by investigating values (the aspect that determines stakeholder's value judgement both at individual and group level) and value (the aspect that relates with value definition and creation based on stakeholders' values). Mills (2013) study clearly demonstrates the relationship between values and value toward understanding and defining value for determining the client value system, and found the relationship to be quite significant. This is an improvement upon the works of Kelly and Male (2002, 2004, 2006) and Kelly (2007) which developed metrics for determining client value system based on making explicit the variables of cost time and quality using value management techniques; and apraising theoretically, the influence of stakeholders in defining the client value system.

However, pushing the frontier beyond that of understanding values and defining value, which are the main functions in establishing and determining the client value system, and extending it to the aspect of value delivery (representing the delivery and assessment aspects of the Payne and Holt value process framework) will require greater considerations beyond relating stakeholders' values to value, the main thesis of Mills (2013) work, to include that of engaging with and managing the design process. This is the process responsible for the delivery of value, first within designs which are then implemented and further assessed, monitored and controlled during the construction phase of building projects as suggested by the VALiD™® Framework developed by Thomson and Austin (2006), restructured and revalidated by Mills (2013) under the assessing value proposition category.

1.2 Statement of the Research Problem

Clients are increasingly becoming more and very influentially involved in their projects (Pettit, 2000; Cheng, 2008; Mills, 2013), but despite this they are the least considered at the point of value delivery, only featuring more at the creation and definition stage i.e. understanding their values towards defining their value systems (Thomson & Austin, 2006; Thomson, Austin, Mills, & Devine-Wright, 2013). Value delivery in construction requires a team-based multi-disciplinary approach anchored by the design process toward fulfilling the requirement of the client value system (Male et al., 2002; Lawson, 2005; Emmitt, 2007; Walker, 2007; CABE, 2010). Successes of the outcome of the design process have been linked to organisational performance in terms of aligning design outcomes to organisational strategies .

Generic evidences abound that organisational performances (in terms of outcomes) are the direct significant consequence of organisational behaviours, the former in this research been "value in (building) designs", and the latter conceptualised as "team functioning". Organisational behaviours are known to be influenced by *the individuals* that make up the organisation, *groups/teams* within the organisations and lastly by *the organisation* itself (Robbins & Judge, 2013; Francesco & Gold, 2005; Mullins, 2010) conceptualised as 'client organisation parameters'. However, despite the existence of the consequential relationships between 'organisation parameters and organisational behaviour' on the one hand and 'organisational behaviour and organisational performance' on the other, researches within construction management have consistently linked organisation parameters directly to performances totally neglecting the influence of the mediating variables – organisational behaviours within their inherent processes (Shehu & Akintoye, 2009; Garbharran, Govender, & Msani, 2012; Ubani, Nwachukwu, & Nwokonkwo, 2010; Toor & Ogunlana, 2009).

Given that within the field of organisational behaviour organisations impacts on organisational performance (outcomes) through some process mediation, applied to construction management, construction client organisations will have some influences on design outcome mediated by the design process and these influences are not known. When knowledge of such influences is used as *'feed forwards'* during the design process there certainly would be some improvement on the achievement of value in design. Such feed forwards are uncommon in construction researches due to non existence of knowledge on the nature and magnitude of these influences. Hence, the lack of a mechanism that models value in design based on the relationships and influences of client's organisation (in terms of their roles, contextual and composition factors), on organisational behaviours and performance; and the absence of the aforementioned feed forwards, creates a significant knowledge gap in both theory and practice. This research contributes toward bridging this gap.

1.3 Research Aim and Objectives

1.3.1 Aim

The research aims at *determining the influence of client organisation on achieving value for money in building designs through team functioning, mediated by the design process*. This is with the view to further understanding of client's involvement in building projects in particular and the construction industry in general.

1.3.1 Objectives

The specific objectives explored pursuant to the research aim are to:

i. Explore the $V_f M$ concept and the associated factors affecting its achievement for construction clients during early design stages;

ii. Establish frameworks for explaining the relationships amongst the determinants of V_fM in building designs;

iii. Appraise client organisation practices in terms of supply management and their value systems in procuring building designs;

iv. Appraise the determinants of V_fM in building designs in terms of client organisation parameters, design process and team behaviours;

v. Determine the effect of the determinants of V_fM in building designs i.e. client organisation parameters, design process and team behaviours on achieving value in building designs;

vi. Examine the implications of the influences on achieving V_fM in building design based on client organisation parameters.

1.4 Justification of the Study

Client value system has attracted so much interest in recent times within construction management, due to the importance it command towards driving value for money in terms of customer's satisfaction. The development of frameworks for managing client value systems via value determination, value dialoguing, judgement and value assessment (Kelly and Male, 2006; Thomson and Austin, 2006; OGC, 2007) provides basis for studying client organisations and their interactions with the construction industry. However, studies on interactions in the industry have concentrated on construction practitioners and their performances within teams (Xie, 2002; Chow, Then & Skitmore, 2005; Liu & Fellows, 2008; Bresnen, 2010; Fellows & Liu, 2012). This is in spite of the impact client organisations have on the industry's performance in terms of their involvement, strategic decisions, etc (Bell, 1994; Pettit, 2000; Cheng, 2008, Mills, 2013). Continuing with the tradition of investigating teams, this research explored the influences client organisations exert on teams towards value delivery in

design. This adds to Mills work which investigated client organisation in terms of values and value towards value delivery leaving out the capabilities of these organisations at successful delivery.

Another reason for undertaking the study is geared towards supply management which has in many ways been accepted as the panacea for improving the performance of the construction industry (Strategic Forum for Construction, 2002; Pryke, 2009; Wolstenholme, 2009; BIS, 2013). The call on client organisation to provide the leadership necessary for improving performance hinges mainly on the extent to which they can manage their supply chains (Rimmer, 2009) but recent researches on supply management have neglected the client organisation. This may seem a misnomer given the following on supply chain management: "*SCM involves intensive management activities from a central position within the construction coalition or networks either by the client organisation, or .... the client's agent. The time consuming and demanding activities comprising effective supply chain management in construction .... requires capacity and knowledge .... certain commitment from client organisation"* (Prkye, 2009).

1.5 Scope of Research

Specifically, the research focus is primarily targeted at achieving V_fM within building designs based on the influence of the tripartite issues acting on and surrounding a project – client organisation, design process and design team functioning. Considerations will only be on those issues that are actionable during early design stages (EDS). Issues before and after the EDS are outside the research scope. Reason for excluding these issues, especially those after EDS, is the need to consider factors that impacts the greatest on design outcomes. This thinking is in line with the *theories*

of 'performance influence' and *'change cost'*[1] (Faniran et al., 2000; Flanagan and Jewel, 2005; Kolo, 2009).

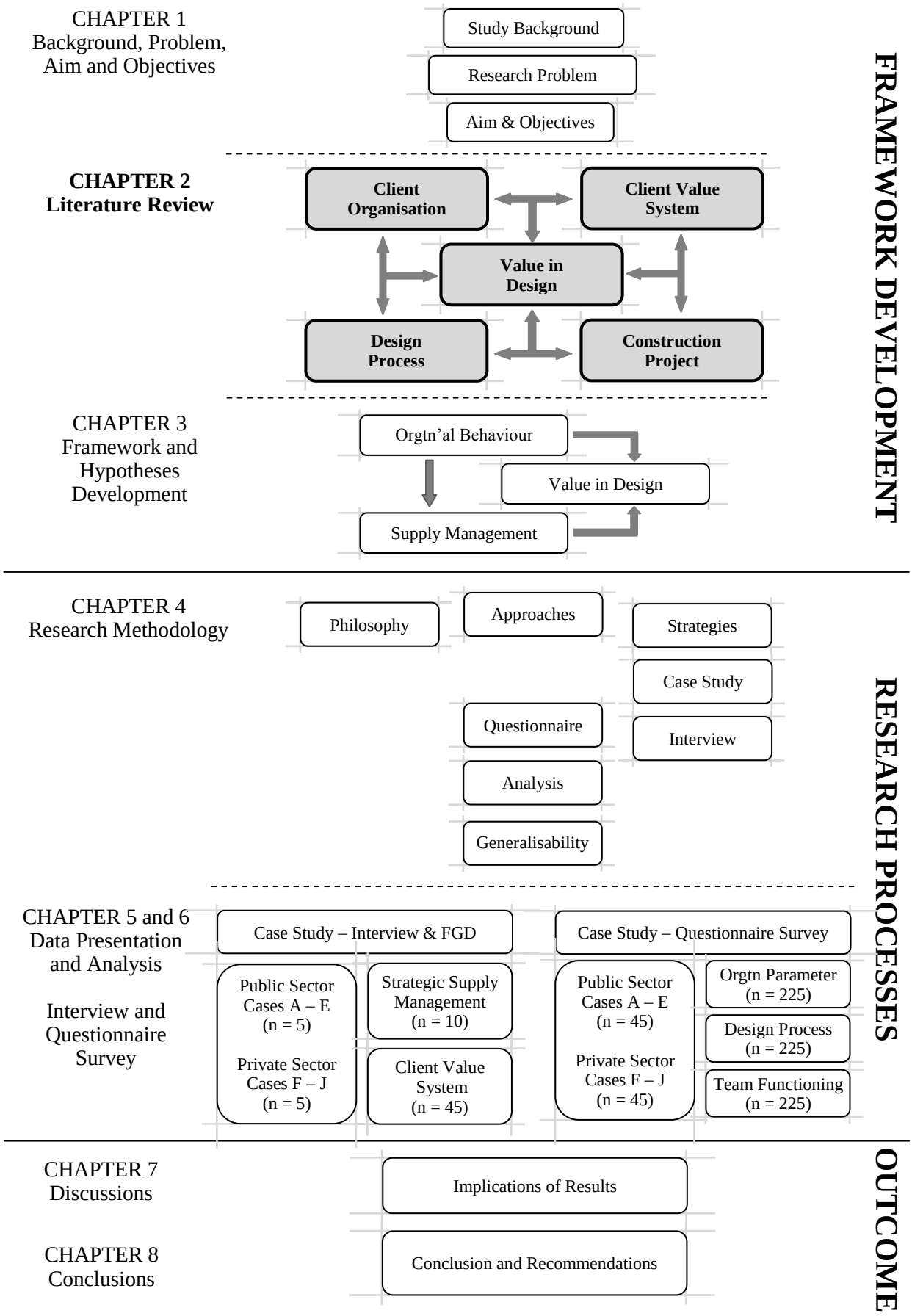
Value system within the construction industry can be distinctively studied under four main areas – *client*, *designer*, *construction* and *users* (Standing, 1999; Kelly et al., 2002). While recognising the advantage of a holistic consideration of these aspects, this research focuses only on (interaction and/or interrelationship of) client and designers value systems, giving more emphasis to the former. Though, Construction and User Value Systems (CUVS) are outside the scope of the research, their contribution to the design process cannot be overemphasised. Two reasons are advanced for not considering the CUVS. Firstly, at the EDS which is the focus of this study, users' involvement at this stage may not a value adding activity since users' requirements (presumably via their involvement and participation) would have been adequately captured in an earlier stage e.g. at briefing stage. This is equally true for construction, in that where matters of build-ability and constructability are of the essence, they are partially resolved at the briefing and/or detailed design stages (i.e. outside the conceptual stage). Secondly, from a contextual viewpoint, value within this stage is reflective of actions and influences of these participants on achieving V_fM at the point of construction and occupation, which again is outside the scope of this research.

Placing *value* within the context of this research, its meaning in the domain of theories of economics, characterised by demand and supply, scarcity and exchange concept etc is outside the research scope. *Value* as used in this work means that as defined within

[1] The *theory of 'performance influence'* stipulate that as building project progresses from the inception stage to completion, chances of influencing the performance of the product (i.e. the finished building that satisfies the user's requirement) diminishes at an increasing rate until it reaches zero at execution stage. The *theory of change cost* propounds that as the project progresses from conception to execution, the cost to change the character of the building increases at an increasing rate

the confines of *'value for money in construction'* based on value determination through organisational values i.e. client value systems. The research is further delimited to projects undertaken by regularly procuring clients i.e. clients who are in the business of commissioning projects for use on a constant basis and are thus knowledgeable. This is opposed to those clients who undertake projects occasionally. Also, clients who procure building for commercial purposes do not fall within the scope of this research. Lastly, client organisations are described as complex systems whose behaviour can be conceptualised and operationalised at three levels – general behaviour, evolutionary behaviour and connective behaviour (Lucas, 2005). This research conceptualises the client organisation at both the general behaviour and connective behaviour levels of complex systems which focuses at studying the system's organisation and relations between its parts respectively. The aspect of system's learning and development i.e. evolutionary behaviour is not considered in this research. The reason for this is the impracticality of collecting the required data for investigating learning and development of an organisation during the course of the study.

Chapter 2 – Literature Review



2.1 Introduction

This chapter outlines the outcome of review of literature related to V_fM within construction management and allied fields toward achieving the first objective of the research i.e. exploring the V_fM concept and associated factors affecting its achievement for construction clients during early design stages. Its begins with a generic consideration of value for money, briefly detailing its emergence in the construction industry as borrowed from the manufacturing industry; and then specifically exploring its various definitions, bringing out the peculiarity of each and how they fit within the current research considerations; providing justifications for considering V_fM in building projects; exploring the various schools of thought on its measurement; and bringing out a new perspective to its dimensions – ability and capacity to deliver value by the client organisation.

Continuing the review, four main aspects were identified as having significant influence on value delivery from a client organisation perspective shown in Figure 2.1. These aspects, each forming separate sections within this chapter comprises of: 1) having an understanding of clients in construction which provides the opportunity to define client organisation and explore their various responsibilities within building projects, how their requirements are satisfied, the theories guiding their existence and then having an understanding of how complex they are; 2) an exploration of the theories behind client value systems and the existing frameworks for its determination; 3) gaining an understanding of how clients determine and measure the success of their project via project performance evaluation using critical success factors and success criteria; and then finally the review 4) considered the theories surrounding building designs and their associated design processes, and explaining how they are managed.

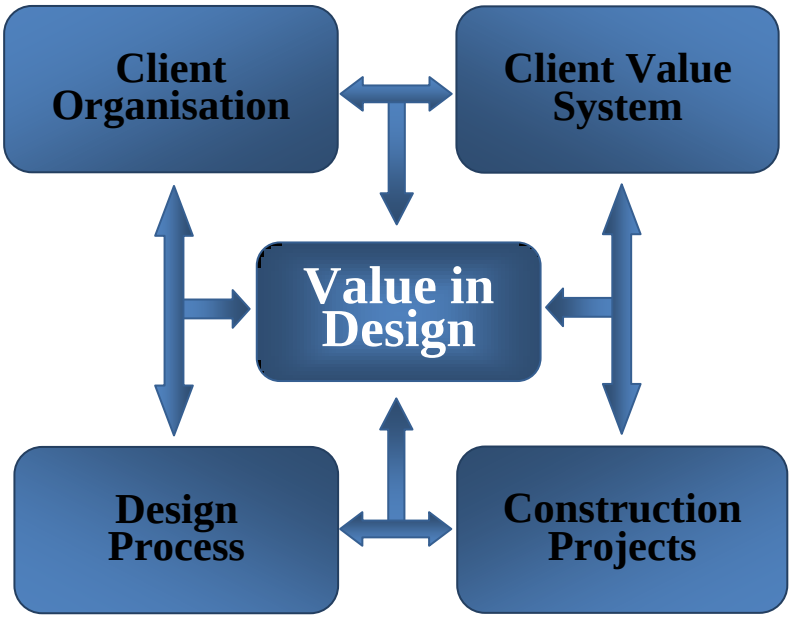


Figure 2.1 – Mapping Client Organisation's Determinants of Value in Design

2.2 Value for Money in Construction

2.2.1 General Consideration

Recent attempts at improving the performance of the construction industry towards increase clients' satisfaction, is the adoption of the '*New Product Development*' NPD approach/methodology (Cooper, et al., 2005). This approach views *'customers' satisfaction'* as the production of goods and/or services that demonstrates V_fM to the customer. Furthermore, the maxim *'the customer is king'* has propelled industries dealing with the production of customer-focused services and/or products, to concentrate on the concept of *value for money* as a means of achieving the ultimate purpose of doing business – creating and growing stakeholders' wealth through customer retention by improving on customers' satisfaction (Kolo & Ibrahim, 2010).

The re-emergence of the V_fM concept in construction in the mid-20th century created a 'wild-goose-chase' situation. The lack of a philosophical and theoretical framework guiding its adoption in construction may have been responsible for this. UK based

literature of the early 1990s – the era in which V_fM concept was popularised therein captured this lack of operational framework (Kelly, Male, & Graham, 2004; Shichao, Qiping, & Kelly, 2008). Common with these literature were the differing understanding and interpretation of the term 'value for money' thereby attracting several meanings. For instance, Bell (1994) captured the following as British Airport Authority Plc's V_fM philosophy: *'To provide the growing number of airport users with continually improving levels of services in efficient, user friendly airports while ensuring a healthy return on its shareholder's investment'*.

Green (1996) acknowledges this lack of common definition of the V_fM concept within the construction industry thus:

> *'Whilst all clients claim to want value for money, very few are able to define what it means. Many commentators seem to confuse the issue of value for money with simple cost efficiency. However, it is important to recognise that a cost-efficient building does not necessarily provide value for money. Irrespective of how cost efficient a building is, if it fails to satisfy the client's requirements then it cannot be seen to provide value for money'*.

Hitherto, V_fM considerations have been centred on the supply side of the construction industry neglecting as it were the fundamental purpose of its products – delivering success construction projects to its clients. The non-consideration of client organisation's perspective to V_fM has led to the continued dissatisfaction of clients within the industry (Kelly, Male, & Graham, 2004). As a means of addressing the ailing performance of the construction industry relative to the V_fM concept, considerations of the concept began to focus more on meeting the requirements of the demand side and from their perspectives rather than from those of the supply side. This changing pattern in consideration is demonstrated in definitions that came after this realisation. Some of these definitions are outlined below.

Definition of Value for Money

Morton & Jaggar (1995) emphasised that *value for money* can be achieved when there is an understanding of *'how design decisions and construction process may produce or fail to produce buildings which meet the requirements of users effectively and efficiently'*. Office of Government Commerce (OGC) (2003) defines V_fM as *'the optimum combination of whole life cost (WLC) and quality to meet user's requirement'*. Leung and Liu (2003) view the concept as a representation of *"the best value indicative of the client's requirements being translated into project goals"*[2]. This definition is predicated on the transition of *value specificity* to *goal specificity* through values conflict resolutions towards achieving project outcomes.

The transitional consideration of value advocates the concept of 'personal' values (from a psychological perspective as a conception of the desirable that influences the selection from available modes, means and ends of action, (see Kluckhohn, 1959 cited in Leung and Liu, 2003) as against 'product' value (the relationship between ability of an object to satisfy and the cost of providing the object). This distinction, particularly the latter part upon which this research is founded, is particularly helpful in the management of the *'value chain'*.

NAO (2005) describes value for money thus: '*it is essential therefore that departments and other public sector organisations achieve value for money through efficient construction processes that deliver buildings to time, cost and quality, that are cost effective to run over their whole operational life, and lead to better quality service and sustainable community*' (p.3). United Nations Economic Commission for Europe (UNECE) (2007) advanced that V_fM, though within the context of *Public Private Partnerships*, is *'a concept associated with the economy, effectiveness and efficiency*

[2] Value is seen as an assigned objective(s) of a project which represents the client's requirements or any criteria decided or chosen by the client based on previous projects while project goals are considered as a participative decision of the project team (Leung & Liu, 2003).

of a service, product or process'. The Treasury policy document (HMT, 2008) like that of the NOA (2005) introduces the dynamism of the concept by recognising the 'perpetual process' that exists throughout a product/process existence as captured in their definition thus: *'securing the best mix of quality and effectiveness for the least outlay over the period of use of the goods or services bought'*.

Infusing both descriptions and definitions above into a more holistic generic definition, Improvement Network (2009) defines V_fM as '*obtaining maximum benefits with the resources available, which is about achieving the local balance between economy, efficiency and effectiveness'*. This, Improvement Network (2009) further asserts, is premised on the concept of *spending less, spending well and spending wisely*. Given the aforementioned, there is relative consensus that the concept is not just about the cost of goods and services or reducing these costs but that it takes into account, the mix and balancing of cost, quality, resource use, fitness of purpose and timeliness amongst other dimensions which must be agreed upon (Green, 1996; Office of Government Commerce, 2007; Improvement Network, 2009).

Justifications for Value for Money

In a relevant study, Henjewele's (2010) synthesis of related literature identified five perspectives justifying rationale for value for money, which include: increased accountability in public sector, improve performance in delivery of services, measure success in project delivery, political slogan, and control of public spending, with the first two been dominant within the public sector. Emphasising this dominance, by drawing from the thesis of some literature (Morin, 2008; Hensher, 2007; Nisar, 2006; Hensher & Houghton, 2004), Henjewele (2010) posits that *'scholars in public administration and finance are in view that VfM is at the heart of the New Public*

Management (NPM) reform agenda [of the UK government at that time] to improve accountability of public bodies occurring throughout the world'. Further citing Morin (2003), Demirag et al. (2004) and Eaton (2005), Henjewele (2010) illustrates how the value of money concept and its audit is seen as a catalyst for changes and improvement that help managers improve their public organisations with accompanying government policy stimulant for improved performance.

On the issue of the third perspective i.e. as a success measure in project delivery, Henjewele (2010) indicates that there is relative agreement on this among authors in the construction side e.g. Yuan et al. (2009), Rutter and Gidado (2004), Li et al. (2004), Abrahams and Farrell (2003) and Chan et al. (2005). The client V_fM is accepted as an indicator of project success measured in terms of cost, quality and time, and viewed alongside the reform agenda, it seeks to improvement performance through better contracting regimes, asset ownership, and collaborative partnerships in delivery services (Henssher et al. 2007; Henjewele, 2010).

Measuring Value for Money

Two streams of thought exist on measuring V_fM in building projects probably due to the lack of operational definition of the concept. One of these streams believes that V_fM can only be measured at the occupancy stage. For instance amongst the earlier researchers on V_fM in building project, Bell (1994) is of the opinion that the *'achievement of value for money for the building client will be experienced on completion of the project and value realisation will come sometimes into occupancy when the client experiences the quality and functionality requested in the brief*'. The other stream suggests that V_fM can be adequately measured at the earliest stage of projects. Foremost among this school is Shillito and De Marle (1992) who not only

provided approaches to measuring value but also gave novel ways of designing for it at product conceptual stages. Bowen and Edwards (1996, p.400) also belongs to this school. They noted that the provision of building project price advice was *'a basic service . . . the raison d'etre'*. . . involved in the assessment of value for money in building designs. Hence, the measurement of value for money would entail the assessment of *'value'* on the one hand and *'cost'* on the other.

While the differing schools on the measurement of value for money may be arguing across boundaries, this research takes cognisance of the implications of these differences in project evaluations and therefore accepts both arguments to be true. However, it further realises and acknowledges the theoretical perspective for these two positions: the 'expectation – actual' transition, a major consideration in recent thinking in managing value (Thomson et al, 2013; Kelly, 2007; Thomson et al., 2003). This perspective, discussed in Section 2.4, is in line with managing value chains in organisations as suggested by Porter (1989); Cleland (1992) for relatively stable organisations; and by Walker (2002), Kelly (2007) and Males, Kelly, Gronqvist, & Graham (2007) for organisations that are temporary in nature particularly project-based organisations.

2.2.2 Dimensions of Value for Money

The lack of a unified working definition for V_fM after its entry in construction, the differing schools of thought on its measurability, and the various definitions outlined in the previous section, exposed the dissonances of the V_fM concept in construction. This is not surprising, giving that the V_fM concept has severally been viewed as synonymous with the 'value' concept. Researches that specifically addressed V_fM in construction (e.g. Bells, 1994; Green, 1996; Kelly and Male, 2006; Thomson and

Austin, 2006; Mills, 2013) did restrict treatment of V_fM to the aspect of understanding and/or defining value only (for instance by suggesting the VM methodology, value dialoguing and judgement etc) without taking into cognisance the ability and capacity to deliver and/or attain value.

However, in line with the 'understanding/defining value' thinking, the 'ability and capacity to deliver value' is assumed and/or implied, which may not necessarily be. Understanding and defining value is only one side of the double sided V_fM concept as is aptly inherent in the definitions above. The other side, i.e. the ability and capacity to deliver value, relates closely also to the '3Es' i.e. *economy*, *efficiency* and *effectiveness*. It is this latter side of V_fM that this research focuses on given that the client's organisation impacts the greatest therein. Clearly therefore, and as suggestive of the various definitions, to achieve V_fM there must be an *'optimum balancing'* of the two sides, taking into account the satisficing paradigm of design philosophy as suggested by Green (1998); Lawson (2005). In order to put the basic underlying laws and assumptions surrounding the V_fM concept in context for this research, four fundamental aspects channelling the theorisation of V_fM in building designs are discussed in the following sections. These aspects are the clients in construction; client value systems, construction project performance and building design management and process..

V_fM in its various forms and usage has always been one of the considerations for assessing the outputs of the construction industry. Over a period of 50 years and at different times, the concept has been viewed from different perspectives and has evolved over time thus: *cost reduction* under this perspective, *V_fM* is achieved through changes in specification, reduction in quality and changes in functional requirements (Ashworth, 2010); *critical success factors*, within this view several factors which are

believed to have direct link to project success are examined as a basis of improving project outcomes, this view takes an input view to systems thinking (Nguyen, Ogunlana, & Lan, 2004; Garbharran, Govender, & Msani, 2012); *project performance*, unlike the critical success factor perspective, this perspective focuses rather on project outcomes as the basis for achieving *VfM* e.g. considerations are given to key performance indicators (KPIs), design quality indicators (DQI) etc (Lim & Mohammed, 1999; Takim & Adnan, 2008; Westerveld, 2003). Other perspectives includes: *procurement systems* which views *VfM* from a relationships perspective looking mainly at the commercial benefit amongst the participants of a project and relies less on project outcomes (Masterman, 2002; Booth, 2010; NAtional Audit Office, 2003) and lastly, *management* this perspective to *VfM* links the input and output as the basis of project performance within a systems thinking persepctive and also considering both the hard and soft issues surrounding projects e.g. value management, design management lean construction etc (Bell, 1994; Atkin & Brooks, 2002; Cooper, Aouad, Lee, Wu, Fleming, & Kagioglou, 2005; Male, Kelly, Gronqvist, & Graham, 2007; Malach-Pines, Dvir, & Sadech, 2009).

2.3 Clients in Construction

2.3.1 Client Organisations and their Project Responsibilities

Within considerations of managing value in construction, Kelly, Male, & Graham (2004) defines a client as *'the person, persons or organisation responsible for the inception of a project and for its eventual adoption into the client mainstream business (p. 1)*. Within the context of this research, *'Client organisation'* is an umbrella term used to describe an entity who procures services and products from the construction industry in order to satisfy organisational needs (objectives/goals). Such needs are usually identified in terms of commercial or social pressures to change and/or to

satisfy some primary objectives, namely (Brooke, 2004): space requirement, investment opportunities, identity, location and politics.

Brooke (2004) asserts that two distinct categories of client organisations exist, those in the private sector and those in the public sector. Private sector clients include industrial, commercial, social, charitable and professional organisations, and individuals. The public sector on the other hand includes government departments, nationalised industries, statutory authorities, local authorities and development agencies. However, there has been several attempts classifying the client organisation into various categories in terms of: the nature of project they embark upon – *on-going, on-off* and *one-off* (Naoum & Mustapha, 1994); their needs (Chinyio & Olomolaiye, 1999); their roles in the industry – *primary* and *secondary* (Masterman, 2002); level of their industry-based experience – *repeat/frequent* and *occasional* (Construction Client Group, 2005); (Construction Industry Training Board, 2007), and their contribution to nation economy – *construction outputs* (Boyd & Chinyio, 2008). Irrespective of their classification, public clients are identified as important actors in the construction industry (Hermans & Eisma, 2015) not only because of the sizeable influence they have on the overall quality of the built environment (Manley, 2006) but also because they impact on the construction process itself (Ye, Shen, Xia, & Li, 2014) thus having significant potentials towards contributing to construction sector reforms (Winch, 2010).

Contrary to the notions held about construction clients as being unknowledgeable in terms of construction process, particularly those in the public, the evidences above shows that organisations that regularly procure construction products are indeed not only knowledgeable but also take charge of the processes involved and provide the

necessary leadership required (Eisma & Volker, 2014; Manley, 2006). To this end therefore, there has been some arguments that frequent and knowledgeable construction clients, referred to in this research as client organisations, should be responsible for providing the necessary management of their project.

Atkin & Brooks (2002) opine that client organisations need to act as informed or intelligent clients if they are to be sure of delivering customer satisfaction and achieving best value for money. They identified some roles (see Table 2.1) as those of an informed or intelligent client organisation specifically for outsourced services (which adequately describes the nature of the construction projects whereby design and construction functions are outsourced to designers, constructors, and operators either separately or wholly). Walker (2007) also provides the following activities, shown in Table 2.1 that client organisations should undertake in managing their project.

Table 2.1 - Generic Client Roles in Managing their Construction Project

Stage	Walker (2007)	Brooke (2004)
Planning	Establishment of the client's objectives and priorities for the project	Understand the organisation, its culture, its customers, and needs
	Assessment of impact of environmental forces	Understand and clearly specify service requirements and targets
Organising	Design of the project organisation structure	Manage the implementation of outsourcing
	Identification of ways in which the client organisation integrates into the project	Risk management – minimise risk to the organisations future
	Selection and appointment of the contributors to the project and the establishment of their terms of reference	Develop, with the supply chain, service delivery strategies
	Translation of the client's objectives into a brief for the project team and its transmission	
	Preparation of the programme for the project	
	Activation of the framework of relationships established for the contributor	
	Establishment of an appropriate information and communication structure	

Table 2.1 - Generic Client Roles in Managing their Construction Project

Stage	Walker (2007)	Brooke (2004)
Monitoring	Convening and chairing meetings as appropriate at all stages	Agree monitoring standards
	Monitoring and controlling feasibility studies, design and production to ensure that the brief is being satisfied, including adherence to budget; investment and programme plan	Managing contractors and monitor their performance
		Benchmark performance of outsourced services
		Provide relevant management reports to users
Controlling	Contribution to primary and key decisions and to making operational decisions	Review service levels/requirements to ensure they still meet user needs
	Recommendation and control of the implementation of a strategy for disposal and management of the completed project including commissioning the building, and advising arrangements for running and maintaining it when complete	
	Evaluation of the outcome of the projects.	

Source: (Brroke, 2004; Walker, 2007)

To better understand the roles of participants in the construction industry (building sector), occasioned by the lack of consensus on how to label the various responsibilities in the construction processes and to provide a *sufficiently comprehensive basis for the purpose of drafting legal agreements,* Hughes & Murdoch (2001) details the outcome of a research they undertook and *'developed a terminology of contract roles based upon an analysis of the processes of design and construction'*. Extracts from the report showing roles and responsibilities identified in eight (8) plans of work and schemes of construction process widely used in the UK construction industry is presented in Table 2.2. The roles and responsibilities presented in Table 2.2 focus on those of the client's organisations and for responsibilities up to design stages only, in line with the scope of the current research.

Table 2.2 – Client Roles between Inception and Scheme Design Stages

Stages		Client Organisation Roles and Responsibilities	JCT 1998	BPF 1983	BSI 1997	RIBA 1997	Phillips & Lupton 2000	CIC 1998	PACE 1998	Kagioglou et al. 1998
Inception/Feasibility	1	Consider need to build				●	●			●
	2	Organisational set-up				●				
	3	Appoint architect/design team leader			●	●				
	4	Prepare initial viability studies		●						
	5	Appoint Client's representative and consultants		●	○	●		●	○	
	6	Initial Brief			●	◙			●	
	7	Identify requirements and constraints	●			●	●	○	●	●
	8	Prepare and present feasibility studies	●	◙		◙	◙	○	○	●
	9	Prepare outline business case					●			●
	10	Prepare budget costs		◙		○			○	
	11	Prepare concept design proposals/execution plans		○		○		◙		◙
	12	Establish boundaries, levels, site investigations		◙		○	○	○		
	13	Establish advisory group/Stakeholders			●					○
	14	Preparation of strategic brief/Brief development	●	◙			●	●	◙	●
	15	Develop the concept/procurement process		●	○	◙		○		○
	16	Outline cost plan		●						
Outline Proposal/Concept Design	1	Appoint consultant team (re-appointments)	●	●				●		○
	2	Identify client's agent or other client					●			○
	3	Organise design teams				◙		●	◙	
	4	Programme of work for outline proposal	◙			◙	●		◙	
	5	Define split of design responsibilities		◙		◙				
	6	Develop strategic brief into project/design brief	●	◙	○	◙	○	○		○
	7	Establish boundaries, levels, soil investigations		○			○		◙	
	8	Develop (design) management procedures	◙	●					◙	○
	9	Prepare and maintain master programme		◙	○	○	◙	◙	○	○
	10	Establish work stage procedures and programme		◙		◙	◙			
	11	Develop outline/sketch proposals	○	◙	○	◙		○	○	○
	12	Assess need for outline dev'mt control approval	◙			◙	○			
	13	Review/advise on prog, procurement and contract	◙						◙	○
	14	Review need for additional consultants/services	◙						◙	
	15	Develop conceptual design strategy	○			○		○		
	16	Consider/assess constraints and options for design	○	○		○	●		◙	
	17	Consultations for statutory approvals	○	○		○				
	18	Investigate utility and services connections	○			○				
	19	Cost planning and estimates (Outline)	○	○		○		○	○	○
	20	Preliminary cash flow projections and cost control	○							
	21	Life cycle analysis and cost-in-use plan		○						
	22	Periodic progress reports	◙		○	○	○			○
	23	Work stage reports	◙		○	○	○			○
	24	Amend outline proposal					◙			
Scheme design	1	Programme of work for this stage	◙			◙	●	●	◙	○
	2	Evaluate outline proposals against brief					◙			○
	3	Complete design studies					○			○
	4	Finalise and prepare project brief/Design brief	●	◙	○		○		○	●
	5	Review programme, procurement etc	◙			○		○	○	○
	6	Review advice on additional consultants/services	◙				◙			
	7	Consider/assess constraints for this stage	○	◙				○	○	○
	8	Developing detailed design proposals with specs	○	○	○	○				○
	9	Review cost planning and estimates	○			○				○
	10	Prepare master cost plan and Finalise cost plan		◙		○		○		○
	11	Review design co-ordination					◙			
	12	Periodic progress reports	◙		○	◙	○		◙	○
	13	Work stage report	◙		○	◙	○		◙	○
	14	Amend detailed proposals					◙			

● *Core responsibility* ◙ *Delegable core responsibility* ○ *non-core responsibility*
Source: Hughes and Murdoch (2001)

In the bid to improve upon client organisation's efforts at achieving value for money for their projects through the principles of 'good design', the Commission of Architects of the Built Environment (CABE, 2010) developed a guide for clients. The guide indicate the need for client organisations to specifically engage two principal personnel charged with specific roles toward ensuring design quality, namely: a design champion and a lead client both of whom are responsible for discharging the client organisation roles within the implementation of projects. Amongst the responsibilities of the design champion's role are to: articulate the vision and the desire for high quality design; formulate client aims for quality of design, ensure these are clearly stated within the outline brief; help to define, check and evaluate quality throughout the process; if possible insist on changes to maintain quality. CABE (2010) notes that while *'a champion with a good grasp of the core design quality required is invaluable'* the role of design champion need not be performed by an expert on design issues but just be clear about why they are important, and may be undertaken by the chief executive, a board member, or other senior management member.

Specific responsibilities for the lead client role, who is the main person representing the client organisation and communicating with the rest of the organisation, includes (CABE, 2010): act as 'client' throughout the project, representing the whole organisation; develop an agreed management structure; set priorities to meet the client organisation's vision; sign of stages as the project progresses; ask searching questions of all those involved in supplying and interpreting information to make sure it is clear and relevant; accept risks that may be implied by options considered or adopted; and communicate with the change management team about likely implications. The client lead is required to be aware of the needs of all stakeholders and have a direct and open relationship with the interest group in the client organisation.

Furthering efforts at improving the outcomes of their construction projects, client organisations are also coming together to establish best practices for achieving greater value for money. For instance, the Construction Clients' Group (CCG) a body at the heart of the Constructing Excellence initiatives of the UK Government brought together six key areas as vital for delivering construction projects efficiently. These areas represent principles that enable client organisations get better value through their participation and effective collaboration with all the stakeholders in the supply chain (Construction Client's Group, 2013). The key areas include: client leadership, procurement and integration, health and safety, design quality, sustainability, and commitment to people.

An advantage of the CCG's (2013) clients' responsibilities framework, aside its categorisation of the responsibilities into six key areas, is that it relates these responsibilities with the following three aspects: *actions to be taken to achieve them*; *aspects the client organisation is required to challenge the supply chain for better performance*; and finally, *the benefits of engaging these responsibilities*. Tables 2.3 – 2.7 show the CCG's clients' responsibilities framework. The CCG framework was adapted for this research and provided input into the theoretical and conceptual frameworks developed for this research.

Table 2.3 – Client's Leadership Responsibilities for Delivering Efficient Project

Client's Responsibilities	Actions to be taken	Demands from Supply chain	Benefits
• Clearly identify client structure and responsibilities i.e. governance and assurance • Ensure adequate resource to maintain client continuity and leadership during the project • Clearly expressed business case for the project • Ensure detailed brief is developed prior to the design stage and shared with principle suppliers • Commitment to championing compliance as a minimum standard and working to best practice • Demand a qualified workforce from supply chain partners i.e. right people for the right job at right time • Drive clear, collaborative and flexible procurement policy to support delivery of core business objectives • Insist on project commission and proper testing before handover • Demand effective quality management processes and procedures • Insist on adoptions of collaborative behaviours.	• Spend time researching planning and developing business case • Communicate business case clearly to principal suppliers and their partners • Work with principal supplier and their partners to clarify need and agree on how best it can best provided • Procure on long term and overall best value rather than short term capital lowest cost • Provide detailed brief with clear financial objectives, programme and definition of what is meant by success before design stage • Champion best practice and collaborative working • Challenge principal suppliers and supply chain partner to innovate and improve performance • Ensure that payment policies are been adhered to throughout the supply chain • Reward team when it is successful	• Capacity to collaborate in a multi-disciplinary team environment • Commitment to integrated working throughout their supply chain • Ability to deliver on time on budget and to quality • Transparency and trust • Ability to manage risk and pro-active mechanisms to manage and resolve disputes	• Supporting core/primary business objectives • Better whole value from constructio9n projects • Better investment decisions • Better control of risk – assured outcomes • Enhanced predictability of cost, time and quality, • Improved Health and Safety on project and business • Enhanced reputation as a client

Adopted from Construction Clients' Group (2013)

Table 2.4 – Procurement and Integration Responsibilities for Better Value

Client's Responsibilities	Actions to be taken	Demands from Supply chain	Benefits
• Set behavioural and performance example • Use evaluation criteria to enable transparent decision making throughout the supply chain • Seek specialist client advice where appropriate • Identify principal supplier and their supply chain partners early in project life • Pay supply chain participants on time • Develop informal and no-confrontational approaches to manage disputes – focus on problem solving not dispute resolution • Insist on '*early-warning culture'* from all involved in the project • Be seen to be taking an interest in the employment practice of principal supplier and their supply chain partners • Assess and validate quality submissions as part of the supplier selection process • Establish long term relationships with suppliers that have integrated supply chain • Establish a business to business relationship to fully understand and align each other value system	• Engage supply chain early in the decision making process • Select partners on best value rather than lowest cost • Use collaborative working principles on fair payment and risk • Take advice from specialist advisors • Create a business case and detailed brief for project	• Competence and capability to undertake and complete the project • Commitment to integrated supply chain working • Ability to innovate • Understanding of sustainability issues • Zero defects at completion • Openness and honesty • Transparency and trust • Ability to manage risk • Problem solving/early-warning culture • Pro-active mechanism to manage out dispute • Approach to promoting diversity • Successful past performance • An understanding of Clients' Business and Core Objectives • Ability to challenge Clients pre-conceived solutions and deliver better value outcome	• A good client will attract good suppliers, will demand and get respect throughout the project • Achievement of client's core/primary business objectives • Better whole life value from project • Better investment decisions • Better control of risks • Enhanced predictability of cost, time and quality • Improved Health and Safety • Reduced dispute and their associated costs • Greater stability and security of supply chains • Competitive and sustainable supply chains • Enhanced reputation as a construct client

Adopted from Construction Clients' Group (2013)

Table 2.5 – Client's Committed to People Responsibilities for Best Value

Client's Responsibilities	Actions to be taken	Demands from Supply chain	Benefits
• Where appropriate attempt to engage local communities fully from the outset of projects • Facilitate supply chain partners to engage the community in local employment and training scheme • Up-skill competence as a construction client • Ensure that principal suppliers and supply chain partners have training and development plans in place that aligns with project needs • Ensure that principal suppliers develops and trains their supply chain partners • Use of equal opportunity policy by principal and their supply chain partners • Work environments should be kept clean, tidy and provide good quality facilities for use • Engage supply chain to run project considerately and with minimum impact on the local community	• Engage local communities • Make sure the principal supplier and their supply chain partner have the right policies in place • Take time to up skill your own competence as a construction client • Principal supplier and their supply chain partners to provide appropriate work facilities • Explain why the project matters to you and your business/activities	• Involvement of local communities in previous projects • The local communities are engaged in employment and training initiative • Commitment to up skilling their workforce • Proactivity in enabling clients to up skill their competence • Training and development policy and plans • Policies and plans for clean, tidy, safe and healthy workplace • Providing appropriate facilities for staff to standards acceptable to the client	• Enhanced reputation of your organisation with local community involvement • Enhanced return on project through investment in training and development • Obtain better value for money by having the right agreements in place • Considerate workplace create more interaction with your local community and are demonstrably safer • You get a better project, product and a value-add solution

Adopted from Construction Clients' Group (2013)

Table 2.6 – Client's Sustainability Responsibilities for Better Value

Client's Responsibilities	Actions to be taken	Demands from Supply chain	Benefits
• Identify your core/primary business objectives and implement a procurement strategy to achieve them while addressing sustainability • Consult and implement the principles outlined in the strategy for sustainable construction • Decide to what extent you are prepared to implement the strategy and stick to it • Develop and implement a business case and plan that addresses environmental, social and economic projects • Up-skill organisational competence as a construction client on sustainability issues • Engage and challenge supply chain partners by setting targets for sustainability performance • Use of environmental policies and practices by supply chain partners • Engage local community in the development process including employment/training policies • Consider and improve the impact on sustainability to the local community	• Engage local community in projects • Engage principal supplier and their supply chain partners early in your decision making process • Ensure principal suppliers and their supply chain partners have the right environmental policies and skills in place • Take time to up-skill organisational competence as a construction client • Measure and benchmark performance of supply chain partners • Commit to enhancing the local environment and community	• Evidence of environmental, social and economic policies in place and used on previous projects • Engagement of local communities in previous projects • Committed to engaging their local community • Commitment and records of engaging local workforce and material suppliers in their projects • Proactivity in enabling client to up-skill their competence • Environmental and community benefit policy and plan in place • Previous sustainability assessments	• Sustainable design, construction and operation of building resulting in more productive and healthier users • Delivery of projects by sustainable supply chains that are financially stable, technically competent and continually improve their performance • Enhanced reputation of organisation with local community • Enhanced reputation of organisation by implementing aspirational environmental standards in construction • Enhanced return on projects through investment in sustainable training and development

Adopted from Construction Clients' Group (2013)

Table 2.7 – Clients' Design Quality Responsibilities for Better Value

Client's Responsibilities	Actions to be taken	Demands from Supply chain	Benefits
• Have clear criteria for selection of design team • Take time to develop a clear and concise brief prior to design commencing • Ensure a robust change control process • Understand Procurement and acquisition strategies • Understand the key driver for the design • Ensure that the design delivers the functionality planned of the building • Take in account whole life cycle principles understanding the long term obligations of the final product • Enable the use of modern technologies and cost-effective solutions in the design • Make use of third party reviews to assess the design of building • Use Design Quality Indicators • Appropriately utilise modern design tools e.g. CAD & BIM to support efficiency throughout its life • Use best practice client guidance such as RIBA, CABE etc	• Have a clear and concise design brief for the project • Select partners/supply chain on best value rather than lowest cost • Make sure that design is functional and practical • Take advise from specialist advisors • Utilise whole life principles in assessing the design of project# • Use specialist guidance and tools specifically for the design process • Ensure the Design intent is maintained throughout the project including commissioning and handover	• Design competence • Ability to deliver a design on a clear concise brief • Ability to innovate • Understanding the sustainability issues • Engagement of key supply chain partners/suppliers • Openness and honesty • Transparency and trust • Previous use of Design Quality Indicators • Ability to manage design looking at value and functionality • Pro-active mechanisms to manage out disputes	

Adopted from Construction Clients' Group (2013)

A study of the roles and responsibilities of client organisations towards the successful delivery of their projects shown in Tables 2.3 - 2.7 indicates the level of involvement and needed leadership that clients must assume and provide within the construction industry, particularly for frequent and knowledgeable (repeat) clients. However, aside the overarching role of providing the necessary leadership, their eventual satisfaction with the outcome of their projects has been shown to be significantly related to the strategic decisions they take throughout the project life cycle (Pettit, 2000; Cheng, 2008).

Understanding of the direct relationship between their involvement and the decisions they make further redirect clients' efforts towards providing roles that are complementary to leadership e.g. design related roles, procurement roles etc. From the generic corporate literature, roles have been categorised into three: control role, service role and strategy role (Wan & Ong, 2005; Huse, 2007). This categorisation neatly mirrors that used in this study i.e. leadership role (as strategy role), procurement role (control role), and design role (service role). However, other categorisations of client roles within the construction industry do exist. For instance, roles have been categorised as base role, added-value role and interfering role (Pettit, 2000). Similarly, in describing the managing system of construction process (the other been the operating system) Walker (2007) identified three basic functions namely approval and recommendation function, boundary control, monitoring and maintenance function, and general and direct oversight function.

Taking off from the existence of relationships between strategic decisions undertaken by clients and their eventual satisfaction with their project, Cheng (2008) specifically establish that the *'design approach'* and *'procurement'* strategic decision clusters (comprising of 12 strategic decisions outlined below) had the most impact on clients

satisfaction out of 25 strategic decisions clients typically undertake throughout a project life cycle. These clusters include the following strategic decisions: ***design approach*** *– decision to build, organisational structure, work procedure, estimated costs, procurement review, details of project, control approval and coordination*; ***procurement*** *– procurement, consultants, other service providers and outline of project*. Deriving from the existence of these relationships i.e. between strategic decision and client role on the one hand and their satisfaction on the other, Pettit (2001) provides a methodology for: 1) measuring the impact of client's activities on value optimisation in projects; 2) demonstrating how particular clients may improve the value adding process of their projects by integrating the several client activities and their impacts; and 3) significantly improving clients' construction projects by introducing changes to client's activities that are known to have high sensitivity toward value optimisation.

2.3.2 Satisfying Clients' Requirements in Construction

Recognising that clients are the core of the construction process reveals the importance of achieving their satisfaction (Latham, 1994; Barrett, Hudson, & Stanley, 1996; Kamara, Anumba, & Evbuomwan, 2000). Bowen et al. (1999) states that to achieve client satisfaction two objectives have to be met. Firstly, the transition of client needs into a design, which specifies amongst others: technical characteristics, functional performance criteria and quality standards; and secondly, the completion of the project within a specified time in the most cost effective manner. Similarly, Ahmed and Kangari (1995) and Hudson (1999) opine that clients are most likely to be satisfied when the final product matches or exceeds their expectations. The V_fM concept has long been associated with meeting client's requirements (O'Reiley, 1987; Latham, 1994; Koskela, 2000).

A requirement is a robust definition of what is expected, it is tangible and measureable. Requirements are set at three different levels in organisations – strategic, business and project (Forgues, 2006). Alignment between these levels could be achieved by dynamically linking these layers of requirements through a value transition thread. Therefore, V_fM is achieved by meeting the client requirements set at each of the organisational levels within a project environment.

Evident from the aforementioned is the existence of a strong positive relationship between client's requirements and achieving V_fM in construction, corroborating the earlier statement associating V_fM with meeting client's requirements. These evidences are further reinforced thus:

Forgues (2006) argues that:

> *To achieve value for money, the client must take a lead role in defining and managing his requirements. V_fM is best achieved by maximising outcomes, a feat achieved not at a project, but at a programme level . . . and the need for a requirement management framework for dynamically linking such outcomes with the business strategy*.

Ashworth (2008) in providing a procurement-based approach to achieving V_fM and client satisfaction in construction through client's reliance on professional advice advances that:

> *The advice provided must therefore be both relevant and reliable and based upon the appropriate levels of skills and expertise which are available. The need to match the client's requirements, which is sometimes vague and generally imprecise, with the capability of the industry is of vital importance if customer satisfaction is to be achieved.*

Viewed from another perspective, the above evidences further reveals the double-sided nature of the V_fM concept –*'creating and/or providing value'*, and the *'capacity/capability to deliver value*', where achieving value is synonymous with (or a major ingredient of) client's satisfaction. However, the view that achieving V_fM is

same with client's satisfaction may be misleading. V_fM is just one of the ingredients for achieving client's satisfaction. Particularly, the Latham Report of 1994 specified that customer (client) satisfaction is a measure of the extent to which the project achieve the following ten (10) ingredients: V_fM, aesthetics, zero defects, timely delivery, fit for purpose, guarantee, reasonable running costs, durability and customer delight. These variables may as well also serve as the main constituents of the client's requirements.

Project requirements are translated by the designers through the design process into construction production recognisable formats e.g. drawings and specifications. The process of handling the client requirements is more of an issue in the delivery of V_fM than in the management of value. This process has long been recognised and described as both being critical to successful construction and problematic in its effectiveness (Latham, 1994; Barrett and Stanley, 1999; Lawson, 2005).

A major hindrance to achieving V_fM through requirement management is the problems inherent in the approach itself. Kelly et al., (2002) observed that the client's handling of the briefing process is often messy, fuzzy or ill-defined which in turn leads in ill-defined requirements. These *'ills'* necessitate numerous adjustments during the planning and delivery processes, generating a significant amount of waste or non-value adding activities (Forgues, 2006).

As a suggestion to solving the problem of V_fM relative to client requirements, Forgues (2006) put forward the following:

> *'Obtaining best value for money demands a paradigm shift from industry practices established around the traditional cost-based procurement process. Existing practices have to be challenged, both by the client and by supplier. These could be achieved not only by revisiting tools but by changing these processes as well: clients have to build capabilities for identifying and defining their requirements, and for measuring results against the requirements; they*

also need the capabilities and processes for dynamically linking construction projects with business and strategy'.

While the underlying principle of this thesis agrees with Forgues's three-dimension on achieving V_fM during EDS by calling on clients to build capabilities for managing their requirements as shown in Figure 2.2, it proposes that a fourth aspect be added to these dimensions of requirements management. This fourth aspect i.e. *'developing the capabilities needed to manage the supply partners and catalysing the embodiment of client requirements within design solution – managing the client value system'*, will further provide a basis for measuring results (i.e. the monitoring and controlling aspect of requirement management) right from the EDS. Figure 2.2 shows the infusion of the fourth dimension into Forgues' requirements management client's needed capabilities model for achieving value-for-money during early stages of construction projects. A detailed account of this fourth dimension is given in Chapter 3 on Study Framework.

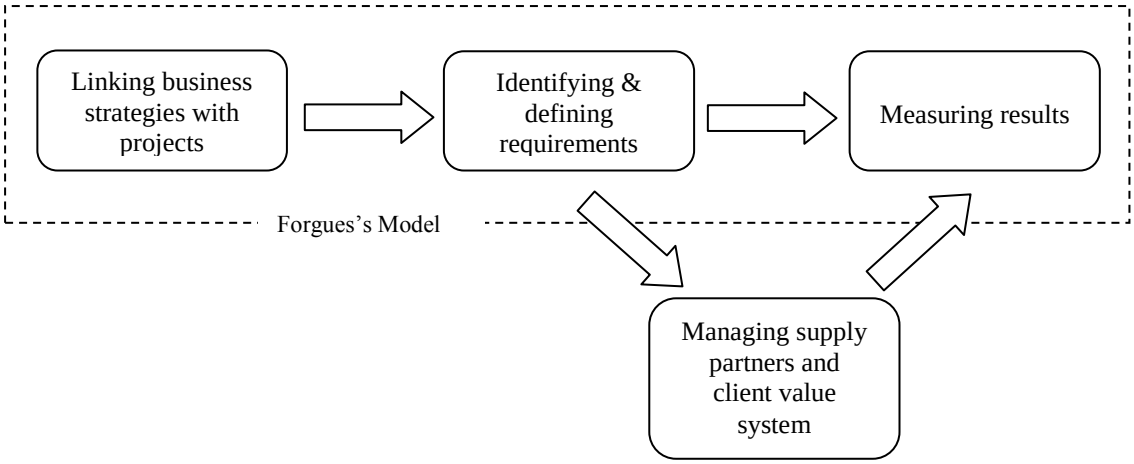


Figure 2.2 – Improvement of Requirement Management for achieving V_fM at Early Stages: Adopted from Forgues (2006) with author's inclusion

From the aforementioned, it is evidence the close interaction of the client organisation with the design aspect of their projects – developing capabilities for managing their requirement at early stages particularly during briefing, as considered by Forgues (2006). This interaction is further made complex given the dynamic nature of the

briefing stage of construction projects. Client requirements are contained in a document called the brief. The brief is a formal document which is the medium for expressing or communicating the objectives and needs of the client. Kamara (1999) suggest that the brief should contain the following information for project implementation:

- The background, purpose, content and desired outcomes of the project;
- The functions of the intended facility and the relationship between them;
- Cost and time target;
- Instructions on procurement and organisation of the project; and
- Site and environment conditions, safety, interested third parties and other factors which are likely to influence the design and construction of the facility.

The process that gives birth to the brief is termed briefing. Kamara (1999) defined briefing as '*the process running throughout the construction project by which means the client's requirements are progressively captured and translated into effect'*. Traditional thinking in building design sees briefing as a static process which must be started and finished within a predetermined period well in advance of the commencement of any design work. This thinking is fully supported by earlier versions of the RIBA Plan of Work (RIBA, 1997, 2006) which instructs that briefing must be finalised at the scheme design stage and any change made thereafter will lead to abortive work. However, emergent thinking on briefing advocates a more radical approach which sees the process as dynamic.

This state of dynamism matches the changing nature of client's requirements brought about by the fluid nature of client's organisation – made up of multiple stakeholders. Chapman (1997) cited in Othman et al. (2004) advance that *effective client organisations are those who adapt and change in response to their environment and*

market. In line therefore, recognising the possibilities of a non-static briefing process, Othman et al. (2004) introduces the concept of a dynamic brief development (DBD) process whose importance arises from two significant flaws in the current briefing practice as stated below:

1. Deficiencies of the current briefing process in achieving client satisfaction

   > *Client's ideas develop as the possibilities of a design unfold and a beneficial creative dialogue with the design team can occur. Many client organisations are in a state of dynamic change and the rate of change may be such that their requirements change during the course of the project. A static brief will prevent these changes from being accommodated*.

2. Managing project change orders and adapting to the influential internal and external drivers

   > *Very few projects are implemented without any change to the original scope of work (Hansen, 1994). Change orders are seen as a major cause of project delay and a source of many disputes in today's construction industry. On the other hand* (O'Brien, 1998; Project Management Institute, 2000) *client organisations use change orders to achieve their emerging requirements and adapt to influential internal and external drivers not available during the brief and design stage*.

2.3.3 Theory of Organisation

An understanding of organisations (and the consequence of organisational behaviour) has largely been sharpened by the scientific development in and approaches to management thinking and theory of organisation. These approaches were mainly concerned with improving organisation performances. Several categorisations of management and organisation approaches exist. However their categorisation is rather complex as pointed out by Walker (2007, p. 30) thus: *"classifying organisational approaches is fraught with difficulty as each phase does not have a distinct beginning and end . . . . . as each new approach draws something from previous approaches"*.

For this reason, Mullins (2010, p. 42) observed that *"it is usual to categorise the works of writers into various 'approaches', based on their views of organisations,*

their structure and management. Although a rather simplistic process, it does provide a framework in which to help direct study and focus attention on the progression of ideas concerned with improving organisational performance". Hence, the Mullins (2010) four-approach framework is adopted for this research and discussed in this section as shown in Figure 2.3. The influences of these approaches in understanding organisations in the construction industry provides a theoretical conception for the eventual study of client organisations and client's value system as discussed in Chapter 3 i.e. Study Frameworks. This section is based on the syntheses of Walker's (2007) reviews on '*organisations and the construction process'* and that of Mullins' (2010) on *'approaches to organisation and management'*.

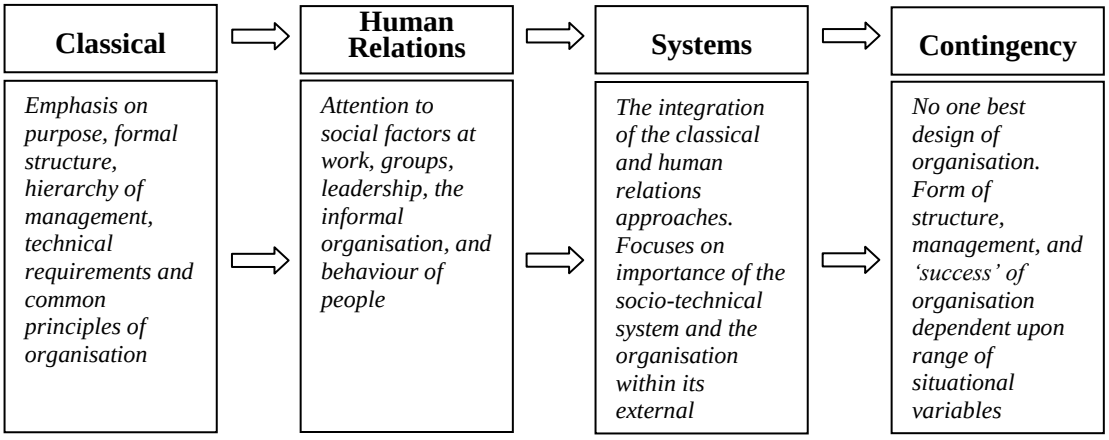


Figure 2.3 – Main Approaches to Organisation and Management (Source: Mullins, 2010)

2.3.3.1 The Classical Approach

Two major sub-groupings of the classical approach are scientific management and bureaucracy. The former is mainly concerned with the improvement of management as a means of increasing productivity while the latter on the other hand links productivity to administration based on either expertise or discipline. Generally, under this approach, organisations are considered in terms of their purpose and formal organisation. Emphasis is placed on the planning of work, the technical requirements of the organisation, principles of management, and the assumption of rational and

logical behaviours. The approach presumes that in order to have an understanding of how an organisation works and to improve upon its methods of working, it is essential to first have a clear understanding of the purpose of the organisation. This is further clarified by identification of general objectives which in themselves further leads to clarification of responsibilities within all levels of the organisation and the determination of the most effective structure. Fundamentally, attention is given to division of work, the clear definition of duties and responsibilities, and maintaining specialisation and co-ordination while emphasis is placed on hierarchy of management and formal organisational relationships.

Putting the above in context particularly for the primordial interest of this research, Walker (2007, p. 31) summates that the classical approach *'determines that it was possible to scientifically analyse and structure the tasks to be performed so that the maximum output could be obtained with the minimum input'*. This clearly relates the inputs – in this case client organisation parameters (with specific reference to the organisation structure only), to outputs – in this case value for money in building designs via team functioning.

Interestingly, the inputs stated above i.e. *division of work, the clear definition of duties and responsibilities,* and *maintaining specialisation and co-ordination,* are within the client organisation roles and context constructs of the conceptual framework as discussed in Section 6.3.2 and shown in the research questionnaire in Appendix D. The questionnaire is based on the Robbins and Judge (2009, 2013) team effectiveness model highlighted in Section 6.2.1.5. These roles include: *clearly identify client structure and responsibilities, ensure compliance to standards and working to best practices, getting the right people for the right job at the right time, evaluate decisions using evaluation criteria agreed upon, ensure that the design delivers the required*

functionality. Hence the CCG (2013), as is the case with those of the other client role frameworks considered in this research i.e. OCG (2007), Hughes and Murdoch (2001), and Pettit (2000) inherits traits of the classical approach to organisations.

While providing a link between formal structure and organisation outputs the classical approach ignores the transformation process – in this case the design process for instance. The non-consideration of the transformation process is basically responsible for the strong criticisms trailing the classical approach. Mullins (2010) posits that the classical approach have been criticised mainly for not sufficiently accounting for personality factors in organisation and *'for creating an organisation structure in which people can exercise only a limited control over their work environment'(p. 44)* due to the sets of principles guiding managerial actions. Hamel (2007) (Hamel, 2007) advance that studies have also expressed doubts about the effectiveness of the application of these guiding principles in practice given the particularistic nature of each organisation's situational make-up. Other reasons for the criticisms included: the repetitive and non-innovative nature of undertaking tasks, dangerously abducting high levels of uncontrolled power to management, over-emphasis on rules and procedure, officious bureaucratic behaviours and stereotypic behaviours (Mullins, 2010).

2.3.3.2 The Human Relations (or Behavioural) Approach

The recognition that informal organisations existed in parallel with formal organisation (because people cannot be treated as machine) led to the consideration of *'people in organisation'*. Unlike the classical approach which emphasises structure and the formal organisation, the human relations approach gives greater attention to the social factors at work and to the behaviour of employees within organisation. The main thrust of the human relations approach towards improving productivity revolves around enhancing interpersonal relations between employee and management,

employing counselling interviews, managers' acquisition of good listening skills, allowing group norms and informal social relations. A further development of the human relations approach, neo-human relations focused on relating productivity to leadership and motivation.

Contextualising the human relations approach within construction projects wherein the behavioural responses (i.e. informal structure) of people to their position within a formal organisation cannot be expected to subscribe to the pre-determined manner in which they are expected to perform, which also neatly aligns with the object of this research, Walker (2007, p. 33) states that: "*Contributing significantly to this scenario is goal complexity in organisations. There is often a disparity between the official goals of an organisation and the goals actually pursued which then governs the behaviours of participants. In such situations the existence of unofficial goals creates an informal structure intended to achieve them"*. Within the design process, the official goals of an organisation are set out in the project brief prepared by the client organisation while the 'unofficial goals' are set out in both the design brief and the design team's goals when converting the project brief into the design brief (Lawson, 2005).

Relating the human relations approach to the input – output model, the inputs namely *interpersonal relations, good listening skills, group norms* and *informal social relations* are the sole ingredients that would ensures improved organisation productivity in this case either improving the design process itself and/or achieving value in building designs. Clearly, these inputs are also depicted in the client organisation roles and context constructs of the conceptual framework as discussed in Section 6.3.2 and shown in questionnaire in Appendix D. These include: *drive clear, collaborative and flexible procurement policy, insist on adoption of collaborative*

behaviours, establish long term relationships with partners, understand and align with other partners' value system. Both the CCG (2013) and OGC (2007), unlike the case with those of the other two client role frameworks considered in this research i.e. Hughes and Murdoch (2001), and Pettit (2000), inherit traits of the human relations approach to organisations. Both specifically spell out client organisation roles that relates directly to aspects of the human relations aspects – during interactions.

Critics of the human relations approach have basically wondered on its scientific insufficiency in terms of methodology, unitary frame of reference and over-simplified theories on the one hand. While on the other hand it is criticised for its failure to sufficiently take into account effects of environmental factors and ignoring the role of the organisation itself in how society operates (Mullins, 2010 citing Silverman, 1970).

2.3.3.3 The Systems Approach

The popularity and success of the systems theory within the natural and physical sciences ushered in the consideration of organisations as 'systems' comprising of a number of interrelated sub-systems within the theory of organisation. Rather than treat organisations singly from either the standpoint of the classical approach – organisation without people or the human relations approach – people without organisation, the systems approach focuses attention on the total work organisation specifically concentrating on the interrelationships between structure (technical variables), behaviours (social variables) and the range of variables within the organisation. This approach encourages viewing organisations both as a whole and a part of a larger environment. The idea behind the systems approach is that changes in one part, technical or social, will affect other parts and hence the whole system (Mullins, 2010).

Walker (2007) emphasising on the systems approach asserts that it is '*essentially a way of thinking about complex processes so that the interrelationships of the parts and their influence upon the effectiveness of the total process can be better understood, analysed and improved' (p. 36)*. And relating the approach to construction projects, particularly the design process, Walker (2007) states that the *"success of the construction process depends to a large extent upon the way in which the architect, engineer, quantity surveyor, contractors and the others work together. It depends upon them perceiving the same objectives for the project and recognising that what each of them achieves depends upon what the others do" (p. 37).*

Interestingly, the above descriptions i.e. relating the interactions amongst the members of design teams – the transformation/conversion process, are within the client organisation roles, context and design process constructs of the conceptual framework as discussed in Section 6.3.2 and as depicted in the questionnaire in Appendix D. The roles outlined in Section 3.3.1.1 for classical approach and those outlined in Section 3.3.1.2 for the human relations approach indicates the CCG (2013), as is the case with those of the other client role frameworks considered in this research i.e. OCG (2007), Hughes and Murdoch (2001), and Pettit (2000) all combined inherits traits of the systems approach to organisations. Relating this to the Robbins and Judge's (2013) effectiveness model discussed in 6.2.1.5 indicating the process variables – communications, collaboration and conflict resolutions, gives credence to the research's consideration of the systems theory in conceptualising the framework.

Walker (2007) surmised the criticism of systems approach indicating that its main undoing stems from its 'supposed' disregard of the informal organisation by assuming that people in organisations *"act in a calculable and predictable manner"*. Also, given that the theories underpinning the approach originates from the natural and physical, it

can lead to mechanistic and overly rationalistic way of viewing organisations (Walker, 2007 citing Fincham & Rhodes, 2005). Further, the systems approach criticism also centres on the claim that it has oversimplified the problems of organisation design.

Buttressing this line of thought, Walker (2007, p. 44) illustrates this oversimplification within construction project wherein *"the idea of an organisation having a goal or single objective"* maybe nursed. He emphasised that firstly, organisations don't have goals but people within them do and secondly that there are likely to be multiple goals in most organisations. Though admitting that this may be less severe in the construction process Walker (2007) notes that *"whether the goal is so clear in the client organisation is another matter; and if it is not, this can lead to difficulties for the project team in achieving the client's goal"*. This adequately captures the interaction between client organisations and their design teams, and particularly at the interfaces responsible for transiting value through the thread connecting organisational objectives and design goals. Little is reported in literature of this relationship.

2.3.3.4 The Contingency Approach

The contingency approach, an extension of the systems approach, is predicated on the preposition that there is no one best way to organise but rather that organisation is a function of the nature of the task to be carried out and its environment. According to Bouchikhi and Kimberly (2000) (Bouchukhi & Kimberly, 2000)the reason for this consideration i.e. the contingency approach is predicated on customers and shareholders becoming more proactive hence resulting in: market-driven strategies, changing nature of work environment, increasing demand for flexibility, and growing concerns with the contextual factors influencing organisational structure, management and performance. Vecchio cited in Mullins (2010) asserts that the goal of the contingency view is to explain how differences in the contextual and structural

dimensions are related and hence does not seek to universal principles that can be used for every situation, but instead seeks to explain interrelationships between attributes or characteristics within the system. That is, the most appropriate structure is dependent upon the contingencies of the situation for each individual organisation and that these situational factors account for variations in the structure of different organisations.

According to Mullins (2010) situational factors can be identified in a number of ways including the type of organisation and its purpose, power and control, history, characteristics of its members in terms of their abilities, skills and experience. Others include preference of top management, culture of the organisation, its size, technology and environment. The contingency approach draws attention to these situational factors thus rejecting the idea of 'one best form to structure and organisational performance' and assumes that organisational performance is dependent upon the degree to which the structure of the organisation matches the prevailing contingencies. Despite these milestones toward making organisation more efficient through organisation design and structuring, the contingency approach is not without criticisms and limitations as follows (Mullins, 2010):

1. Causal relationship – The nature of the causal relationship between organisation and performance is open to question whereby contingency model may imply a causal relationship between structure, as an intervening variable, and performance, as a dependent variable. While it is probable that certain factors may influence performance independently of structure, for instance members' characteristics etc.
2. Organisational performance – implicit in contingency theory is the notion that the fit among components of the organisation and situation variables is related to maximising organisational performance. However, organisation

performance is multifaceted, it is impossible to derive a single criterion for the appropriateness of the fit among various features of organisation and improved performance.

3. Independent variables – the supposed status of the independent 'contingent' variables as the 'given' and beyond the control of members of the organisation is open to question. Some circumstance may bring about organisations having control over certain aspects of their environment e.g. through monopoly, market niche, advertising and political pressure groups, hence making them less dependent upon their environment. Hence any mismatch in contingency factors is likely to have less severe consequences for survival and level of performance.
4. Multiple contingencies – different patterns of contingency factors have distinctive implication for organisational design. Hence, Organisations face multiple contingencies, and there is high potential for multi-way relationships among the range of organisational variable. Therefore, different contingencies may result in the need for different patterns of structure.
5. Planned change – contingency models of organisation fail to give sufficient emphasis to unanticipated consequences of planned changes.
6. Power factors – Organisation structure is not necessarily determined only by impersonal contingency conditions, but also by what is referred to as 'power' factors. These may include pressure of external control, political context, the power needs of various stakeholders, the culture of the organisations, and the power social norms.
7. Timing of organisational change – Organisations operates under conditions of constant change, and this raises the question of the frequency and timing of organisational change. While organisations may find it difficult changing their

formal structure frequently, and since there must be a significant change in contingency factors before organisational response, changes in structure tends to lag behind situational change. Hence, the fit between structure and prevailing contingency factors depends on some degree of luck.

2.3.4 Client Organisations as Complex Systems

The Construction Industry has severally been recognised as consisting of, amongst others, the process of delivering value to client with a unique nature – a temporary production system consisting of elements shared with other unrelated projects – differentiating it from other production industries, and as such described as complex (Bertelsen and Koskela, 2002; Koskela and Howell, 2002, Bertelsen, 2003a, 2003b; Emmitt et al., 2004). Bertelsen and Emmitt (2005), however recognised that the complex production system i.e. construction is only one part of the process, the other been the client. Bertelsen and Emmitt (2005) opines that a more extensive investigation of the client organisation can reveal that the client organisation is just as complex if not even more as the production system.

In describing or understanding the client organisation, Bertelsen and Emmitt (2005) informs that practitioners within the industry tends to assume that the client organisation is 'a well defined entity and that this entity has some clear and well defined value parameters, which can be expressed in clear terms at the outset of the design process'. The complex dimension of the client organisation e.g. multi-stakeholders, diverseness in and conflicting objectives and values system, conflicting and or clash of interest, power and influence etc, makes the capture and communication of client value particularly difficult to achieve in practice (Bertelsen and Emmitt, 2005; Walker, 2007). Demonstrating the complex nature of the client organisation in managing just one aspect of its construction project i.e. value,

Bertelsen and Emmitt (2005) brings in three perspectives of the client – owner, user and society – and how each conceptualises the value criteria (e.g. durability, usefulness, beauty etc) over the project life cycle – inception, design, construction, in use and disposal. The multiple perspectives to value consideration are shown in Table 2.8.

Table 2.8 – Multiple Value Perspective in Construction

Primary Vitruvian Perspective	**Owner** **Firmitas (durability)**	**User** **Utilitas (Usefulness)**	**Society** **Venustas (beauty)**
During Construction	Respect for cost and time Error and accidents	User involvement Schedule	Noise Dust Traffic hindrance
When finished	Capital cost value Cost of operation and maintenance Durability	Flexibility for initial use Indoor climate, lighting Looks, landscaping Safety	Architecture Compliance with surroundings Environmental aspects
In the future	Long time investment	Flexibility for future use	Landmark Aging in beauty

Source: Bertelsen and Emmitt (2005)

In backing up their assertion about the client organisation been a complex system, Bertelsen and Emmitt (2005) further makes the following points:

1. Value is a matter of personal opinion, which can and does change over time. Thus it cannot be measured or expressed and communicated explicitly but must be learned and understood through a process;
2. The learning process gives rise to numerous ‘wicked problems’ during the design and construction processes, which can be seen as a symptom of the complexity of the processes;
3. The prevailing understanding of construction as an ordered process is completely wrong – which maybe the root-cause of the problems construction management faces in practice;
4. The construction process is complex, thus, using the term ‘emergent’ as used in complex systems literature, construction process can be described as an emergent phenomenon used by an emergent system in an emergent setting;

5. Bringing the perspective of an emergent customer, the construction industry is the interplay between two very complex emergent and highly dynamic systems – the client and the construction process

Providing ample evidences, Berteslen and Emmitt (2005) uses the Lucas (2005) theorisation to describe complex systems to characterise the client organisation as a complex system by paralleling them thus:

- Autonomous agents – that is elements that may act on their own. Clients in construction have many interests they are trying to satisfy which may bring about the differing agents relating to the kind of interest.
- Nonlinear relations – that is relations between the agents, which are not simple and linear but characterised by feedback loops. Feedbacks loops are constancies in construction and which has been the basis for clients changing previously held position and changing their decisions thereby having an impact on the entire processes.
- Non-uniform parts (agent and relations) – that is that the agents as well as their relations are not the same all over the system. Both the autonomous and nonlinear nature of client organisations indicates their non-uniformity.

Drawing conclusions from their research, Berteslen and Emmitt (2005) opines that accepting the client organisation as a complex system would require concerted research effort at: 1) gaining understanding of the client-supplier interactions (cooperation and collaboration) toward value delivery; 2) engendering greater active participation of client organisation during the design phase; and 3) furthering understanding on why the industry is failing at satisfying its clients in delivering value. These points provide valuable insights to the consideration of client organisations in value delivery in construction particularly their value systems.

2.4 Client Value System

Amongst the early contributors to defining and understanding of the client value system towards improving client organisations' capacity at delivering V_fM in the construction industry is Bell's (1994) doctoral thesis which focused on the strategic management of projects. The work notes that response to improvements in productivity in the construction industry by the contracting and management organisations (which had always been the recommendations of earlier industry reports) were only partially effective and that only a cultural shift was capable of bringing any significant improvements in the industry. Advancing the attempts client organisations take towards seeking and activating improvements and providing leadership in the cultural evolution of the UK construction industry, Bell specifically cited BAA as one of the earliest client organisations that was actively involved in the search for better value for money from the construction industry due primarily to its successful shift into the private sector. This further led to the increased awareness of its customers' needs and the importance of providing them value for money. Major directions emerging from Bell's research, which are still recurring decimals in present day construction projects albeit slight improvements, includes:

i. Out of the researches conducted concerning the problems of the construction industry only a few prescribed ways for improvement.
ii. Clients have been poor in providing information to the construction industry moving too fast in the early stages without understanding their need.
iii. In order to create value all parties to the project must understand the client's expectations, adding value accordingly to holistically create value to the customer.
iv. The client organisation must define value prior to embarking upon projects.

It is worth noting that Bell's (1994) research was instrumental to the recommendations contained in the Egan's (1998) *'Rethinking Construction Report'* which charged construction clients with the responsibility of providing *'committed leadership'*. Further, Bell's research is one of such that contributed to the realisation that there are differing value systems within the service delivery systems in the construction industry and particularly to the understanding of the client value system. Standing (1999) further identified and examined the other perspectives to value systems in the construction industry namely: designer value system, constructor value system, and user value system.

Realisation of the multi-stakeholders' influence on value judgement and the multi-parameterisation of value definition and determination – the complex dimension of the client organisation (customer), led Payne and Holt (2001) cited in Mills (2013), to develop an integrative value framework to manage customers relationship in the field of marketing. The framework, shown in Figure 2.4, comprises two main aspects: a central value process and key stakeholder group. The value process of made of four elements namely: determination, creation, delivery and assessment. The key stakeholder groups, consisting of employees, stakeholders and customers, interact with and influences the value process. Payne and Holt (2001) explains that each of the three major stakeholder groups represents opportunities for value creation and delivery and that within each group there is a sub-process of 1) recruitment/engagement/attraction, 2) measurement of satisfaction, and 3) retention. The Payne and Holt (2001) Value Framework therefore provides a useful conception to the value process and its relationship with stakeholders, and provides a framework from which to conceptualise broad involvement in the value delivery process as is the approach in construction projects.

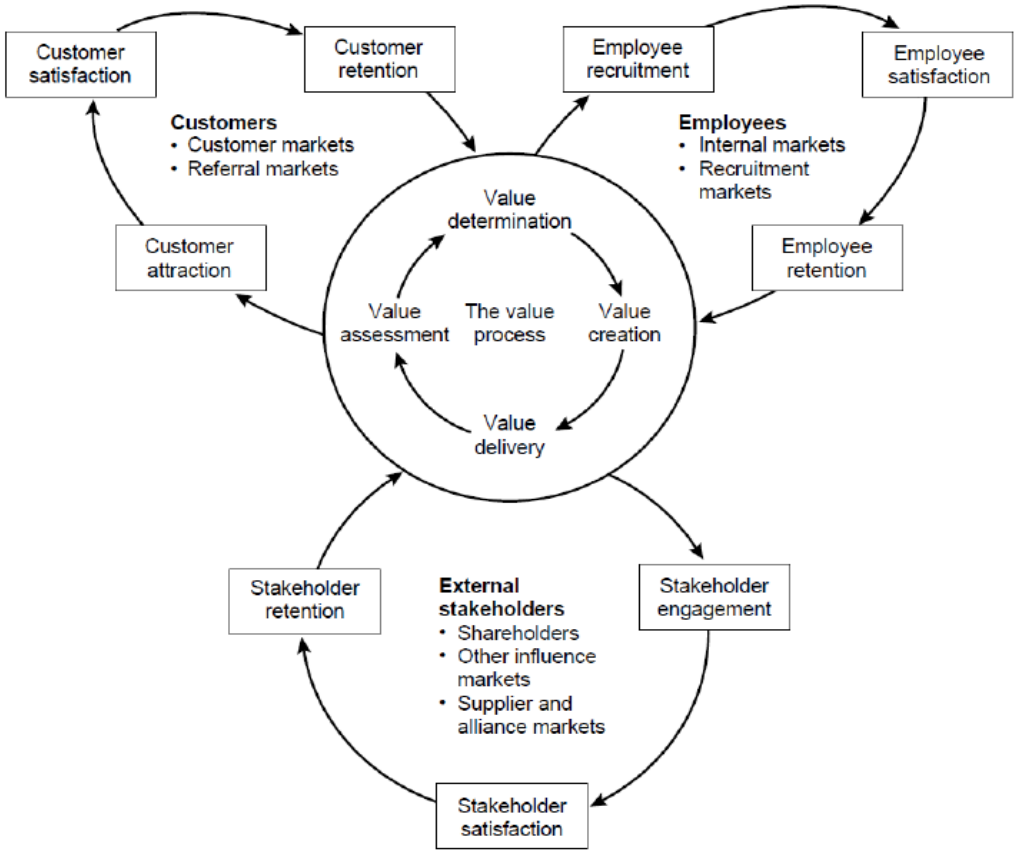


Figure 2.4 – Framework for Relationship Value Management (Payne and Holt, 2001)

Indeed, determination of the client value system towards effective delivery of value during the design stage has had much influence from the Payne and Holt (2001) integrative value framework. Three frameworks relative to client value systems have been developed and applied in the industry over a period of time and they have been subject of interest in construction management researches. These frameworks are the Kelly and Male (2006) Client Value System Matrix, the Thomson and Austin (2006) VALiD Framework, and the OGC (2007) Framework for Achieving Construction Excellence.

2.4.1 The Client Value System Matrix

Recent contributions to understanding client value system as a consideration for delivering value to clients of the construction industry is the works of Kelly and Male.

Over a 6 year period i.e. between 2000 – 2006 they came up with and tested the validity of a client value system matrix developed in 2002. The reason for developing a matrix for the client value system is hinged on three factors. First, the all important need to make explicit the functional benefits of a project consistent with a value system determined by the client through value management as occasioned by several researches and industry reports (Bell, 1994, Green, 1996, Egan, 1998, NAO, 2002) and secondly, the trialling process of designers in determining and briefing the client value system which often times leads to dissatisfactory outcomes (Kelly and Male, 2002). Third, newer procurement systems are not sympathetic to the slow, iterative and dissatisfactory process of existing methods at understanding the client value system thereby warranting that the client value system be made explicit in a single operation through a process of discovery (Kelly and Male, 2004).

Kelly and Male (2004) have advocated that for the client value system to be meaningful the variables of time, cost and quality must be capable of description and measurement and that the key to making the system overt and auditable lay in understanding of the description of quality. For this reason, Kelly and Male (2004) further represented quality by the following: Environment, Exchange, Politic/Community/Popularity, Esteem, Flexibility and Comfort, thereby proposing a Client Value System Matrix comprising of 8 measureable facets as follows:

i. Facet A Capital Cost (CAPEX) – This exemplifies the concept of capital cost and is well understood by all team members in a value determination exercise and behaves differently when budgets are fixed or not.
ii. Facet B Through Life Costs (OPEX) – This take into account the costs associate with project over its life cycle and not only the capital cost. Such cost

could be problematic when procurement such as design, build, finance and operate.

iii. Facet C Time – Time is easily interpreted amongst project team members to mean the time from the present until the handover of the project to the client organisation.

iv. Facet D Politics/Popularity/Community – Community relates to the local community where the project is domiciled, and that politics relates to local politics. This facet addresses the extent to which the client is willing to compromise on other facets to ensure that the whole project sits well within its local community.

v. Facet E Environmental Impact – Impact is a measure of the extent to which it is important to ensure that a project sit concurrent with the corporate policies of the client organisation.

vi. Facet F Exchange – This is a measure of the importance of the exchange value of the project compared to the other criteria.

vii. Facet G Esteem – A measure of the importance of the element of design that seeks to portray the organisation in a global context which is often expressed through the building's architectural aesthetics.

viii. Facet H Comfort – represents the users' internal feeling of the building from an aesthetic and environmental perspective covering aspects as utility and 'fitness for purpose'.

ix. Facet I Flexibility – Flexibility facet relates to the ability to change the internal and external allocation of space and the ability of the facility to expand/contract.

2.4.2 The VALiD Framework

VALiD an acronym for 'value in design', was developed by Thomson and Austin (2006) as an approach to value delivery that integrates stakeholders value judgements into the project process. It is based on six principles:

i. Value delivery is the goal of all projects.
ii. Value is subjective and based upon stakeholders' underlying values.
iii. Successful projects deliver value for all stakeholders.
iv. Project teams have provider and customer stakeholders, each with their own understanding of value and expectation for its delivery.
v. Value is judged by each stakeholder from their own perspective and aggregated to provide a project view.
vi. Effective project value delivery requires an ongoing dialogue between all stakeholders to negotiate appropriate compromises and balance stakeholders views.

The benefit of VALiD includes:

i. Stakeholders values and expectations can be integrated into the project's business case;
ii. A clear definition of value to each stakeholder can be agreed on;
iii. Design decisions are made from the perspective of stakeholder value;
iv. Understanding of stakeholder value is maintained through design, construction and use;
v. Value delivery performance is clearly documented in project and stakeholder dashboards;
vi. A transparent approach builds confidence and trust in stakeholders' views and focuses provides a key area requiring attention;

vii. Value in use is predicted during delivery;

viii. VALiD has proven effective in construction projects and building management.

The VALiD Framework provides a logical structure to help project teams understand the issues that must be discussed among stakeholders if value, and the drivers for its delivery, are to be fully understood. The Framework links stakeholders' values with their definitions of value and ongoing assessment of project performances. Specifically, the Framework has three elements which guide stakeholders through the discussion of their values to assessing project performance in delivering value. These elements are: 1) Understand Values i.e. the business strategy and is applicable to both stakeholders and the project; 2) Define Value i.e. the project objectives which requires the determination of value criteria and their targets; and 3) Assess Value Propositions i.e. product qualities which includes assessing associated benefits, sacrifices and resources. Accompanying VALiD are two tools and instruments – the Values Survey and the Dashboard. The Values survey provides a structured method of revealing values to help organisations understand itself and derive their business strategy. It also helps individuals understand how their values frame their judgements of value. The Dashboards provide quick and simple 'at-the-glance' summaries of value delivery for the team. They present information that steers the project to a successful conclusion and, in particular, give designers insight into what stakeholders seek and how well they are fulfilling these expectations.

2.4.3 The Framework for Achieving Excellence

The OGC (2007a) formulated several procurement guides for public client organisations in the UK in a bid to actualise its *Achieving Excellence Programme* launched in 1999 geared toward improving the achievement of value for money for

public client. Specifically, these guides *'. . . reflects developments in construction procurement over recent years and builds on government clients' experience . . . . (p. 3)'* and through which *'. . . government clients commit to maximise, by continuous improvement, the efficiency, effectiveness and value for money of new works, maintenance and refurbishment' (p. 5)*. The OGC approach towards client value system gives more attention to getting the client organisations to first understand their organisation as a prerequisite for successful project delivery. This consideration differentiates it from that of Bell's and Kelly & Male's. This concept of understanding and exploring (explaining and predicting) the client organisation is conceptualised in this research as *'client organisation parameters and design team functioning'*. This approach is in line with the principles of organisational behaviour which forms a theoretical base for the development of the conceptual framework, its hypothecation and eventual investigation carried out in this research.

2.4.4 Tentative Prepositions of Client Value Systems

Walker (2007) outlines Cherns and Bryant's study on the effect of power play and internal politics within client value systems on the project teams in terms of lack of objectivity, distortion of objective and other related problems as listed below. Walker (2007) further makes the point of the project team having not only knowledge of the existence of these problem but also an understanding of them thus: '*Whilst in most cases the problems they [clients] generate are unlikely to be resolved, their importance lies in project teams knowing of their existence and being prepared to understand and adapt to the dynamics at work to the benefit of the project outcome'* (p. 123). These client value system related problems include:

1. Most client systems are very much more complex organisationally (in terms of who wants the building, who will use it, who approves it, who controls the money etc) than is commonly acknowledged by project teams.
2. Members of project teams seems to be impatient of this complexity, sometimes over embarrassed by it, and insist on dealing with a single client representative within whom all the internal politics of the client system can be contained.
3. Many of the problems concerning design changes, delays, and difficulties during the construction phase have their origins in the unresolved conflicts within the client organisation and are exacerbated by too early an insistence on an oversimplified client representative function.
4. The earliest decisions taken by the client system have more influence the way the project organisation is formed and its subsequent performance than those taken later.
5. The reasons for these earliest decisions have their origins in the client's organisation culture, procedures and structure; they are often idiosyncratic, shaped by social and political forces as well as by economics and technical considerations, and may be unduly constrained by residuals of the client's per-project history.
6. Any serious attempt to understand and hence disseminate usable knowledge about the client role in the organisation and management of construction project must take into account not only the economic and technical factors that but also the social and political forces acting within the client organisation, especially the client pre-project history on the decision to build.
7. The decision to build is a large-scale innovative decision with consequences for existing patterns of resource sharing and the risk taking in terms of power conflicts, and political behaviours within the client organisation.

8. These conflicts and behaviours can critically affect the formation, development and subsequent performance of the project organisation which is set up to manage the project and of which the client system is an initiating component.

2.5 Construction Project Performance

2.5.1 Performance Evaluation - Success Criteria

Several criteria have been used to measure construction project performance. The extent to which a project performs is also measured in term of its *'success'*. Success is defined as *"achievement of intention i.e. the achievement of something planned or attempted . . . . . or something that turns out well i.e. something that turns out as planned or intended"* (Microsoft, 2006). Baccarini (1999) opines that a synonym for success in construction is *'effectiveness'* i.e. the degree of achievement of the project objectives. From a general viewpoint, projects are formed to accomplish objectives, (Takim & Adnan, 2008) asserts that success is measured in terms of how well these objectives have been met. Industry-wide consensus on criteria upon which objective are measured include: meeting project time, budget, technical specification and mission to be performed – commonly referred to as the triangle of performance measures. These are broadly generated and classified into a set of success criteria.

Saqib, Farooqui, and Lodi (2008) provide a dynamic perspective to the consideration of project success in construction particularly the success criteria. They advanced thus:

> *Success criteria or a person's definition of success as it relates to a building often changes from project to project depending on participants, scope of services, project size, sophistication of the owner related to the design of facilities, technological implications, and a variety of other factors.*

However, on the other hand, common understanding relating to success criteria do develop not only within an individual project but across the industry as success also relate to the differing perceptions and expectations of the owner, designer, or

contractor. Due to the possible variability inherent in the *'success'* concept within construction, Saqib, Farooqui, and Lodi (2008) drew up an un-prioritised summary of success criteria within the client-designer-contractor divide. Table 2.9 below show these criteria.

Table 2.9 – Criteria for Measuring Success in Construction Projects

Categories	**Criteria for measuring Success**
Client/Owner	*On schedule*; *on budget*; *function for intended use* (satisfy users and customers); *end result as envisioned*; *quality* (workmanship and product); *aesthetically pleasing*; *return on investment* (responsiveness to audience); *building must be marketable* (image and financial); and *minimise aggravation in producing a building*
Designer	*Satisfied client* (obtain or develop the potential to obtain repeat work); *quality architectural product*; *met design fee and profit goal*; *professional staff fulfilment* (gain experience, learn new skills); *met project budget and schedule*; *marketable product/process* (selling tool, reputation with peers and clients); *minimal construction problems* (easy to operate, constructible design); *no 'ghost' liability, claims* (building function as intended); *socially accepted* (community response); *client pays* (reliability); and *well defined scope of work* (contract and scope and compensation match)
Contractor	*Meet schedule* (pre-construction, construction, design); *profit*; *under budget* (saving obtained for owner and/or contractor); *quality specification met or exceeded*; *no claims* (owners, subcontractors); *safety*; *client satisfaction* (personal relationships); *good subcontractor buy out*; *good direct communication* (expectations of all parties clearly defined); and *minimal or no surprises during the project*

Source: Saqib, Farooqui & Lodi (2008)

The concept of *'success'* in the construction industry corresponds to the *efficiency* and *effectiveness* measure (Brudney and England, 1982; de Wit, 1988; Pinto and Slevin, 1988: 1989; Smith, 1998; Belout, 1998; Atkinson, 1999; Crawford and Bryce, 2003, all cited in Takim & Adnan, 2008) which are themselves variables for the attainment of *'value for money'* (Ashworth, 2010) . In broad terms, *efficiency* is the maximisation of output for a given level of input or resources, while *effectiveness* is directed to the achievement of goals or objectives.

Efficiency measures relates closely to strong management and internal organisational structures which influences output in terms of adherence to schedule and budget, and basic performance expectations. Thus, efficiency measures deal with time, budget and specifications. Effectiveness, on the other hand, refers to the achievement of project objectives, user satisfaction and the use of the project. The differentials between efficiency and effectiveness can be explained in that a project delivered on time, within budget, and meets performance specifications (efficient) may not be well-received by the client/users for whom it is intended (Takim & Adnan, 2008).

Takim and Adnan (2008) reports that Smith (1998) and Nyhan and Martin (1999) found that *project efficiency are concerned with the utilisation of equipment and workforce, whereas effectiveness is concerned with the achievement of outcomes*. Maloney (1990) also asserts that the efficiency of construction projects involves the utilisation of resources, which may be represented by the ratio of the resources expected to be consumed divided by the resources actually consumed. The effectiveness of a construction project, on the other hand, is when the organisation's objectives are fully attained. In this research, efficiency relate to the extent to which the design process allow members work under a 'team' environment while effectiveness relates to the design output i.e. the extent to which value for money is achieved in the design.

Despite the attempts at categorising the aspects of success measure/criteria, Morteza and Kamyar (2009) informs that the term 'success' as used to describe project outcomes or (design outcomes in the case of this research), covers a broad area making it difficult to define, given that the dimensions of success differs between different projects and that what appears to be accepted in a particular project may have opposite effect in another. (Prabhakar, 2008) shares this view. And based on the

failure of existing models to align the criteria with company's success in the long-term, (Al-Tmeemy, Abdul-Rahman, & Harun, 2011) developed a framework to evaluate project success based on 13 criteria grouped into three aspects – project management success, product success, and market success. (Kylindri, Blanas, Henriksen, & Stoyan, 2012) review of related literature reveals that continuing attempts at understanding project success and how to evaluate them brings about the introduction of new variables in addition to the traditional iron triangle of cost, time and quality, some of which includes creativity, satisfaction, social connectivity and knowledge.

Giving the aforementioned discussion on efficiency and effectiveness as measures of success within construction projects, the client organisation who in all intent owns the supply chain (Booth, 2010) for delivery of its projects is equally, if not even more responsible for achieving success thereof. This is completely supported by Pryke (2009, p. 5) who vividly anchors the success of the supply chain on the client organisation describing supply chain management thus: "*SCM involves intensive management activities from a central position within the construction coalition or networks either by the client organisation, or .... the client's agent. The time consuming and demanding activities comprising effective supply chain management in construction .... requires capacity and knowledge .... certain commitment from client organisation".*

The above arguments on existence of differing perceptual criteria upon which project success can be and are indeed measured in terms of effectiveness and efficiency clearly supports the proposition that project success within the construction industry should solely be based on a well definite client value system put forward by Bell (1994); Thomson and Austin (2006); Kelly (2007); and Mills (2013). Furthermore,

considerations of providing the needed management towards achieving success, which in this case is the achievement of value for money in building designs, by the client organisation fully resonates with the client roles in terms of leadership, procurement and design quality discussed in Section 2.3.1 i.e. client organisations and their project responsibilities amongst others.

2.5.2 Critical Success Factors (CSFs) in Construction

Project successes have also been linked to CSFs and there is no doubt as to the relationship that exists between them and the significance of such relationships. For instance, the high rate of project failures in emerging economies instigated (Garbharran, Govender, & Msani, 2012) to *'suggest the existence of underlying critical success factors which have not been identified'*. While it is not too clear under what context such suggestion was made, applied to the wider construction industry (i.e. taking their study outside South Africa, where data was collected), it is known that CSFs have long been in existence and are indeed subject of studies as highlighted above. However what differentiates Garbharran et al.,'s (2012) study from earlier attempts is the adoption of the model proposed by Nguyen, Ogunlana, and Lan (2004) to investigate CSFs in emerging economies.

The Nguyen et al.'s (2004) model referred to as the Four COM model, groups success factors under four categories namely: comfort, competence, commitment and communication. Under the *comfort* category considerations were given to the following aspects: project stakeholders management, engagement of competent project manager, resource management and comprehensive contract documentation. The *competence* dimension also identifies four aspects as being central to project success vis: adoption and utilisation of new technology, emphasis on past knowledge, the use of competent project teams, and awarding bids to the right project manager/contractor.

Four aspects were identified in the *commitment* category namely: the support of top management, stakeholders' commitment to the project, clear project objectives and scope, and political support. The last category of the four COM model, *communications*, identified five aspects as follows: shared project vision, constant update of project plans, frequent project meetings, local/commuinty involvement, and proper handover procedure.

Most of the components of the 4 COM models mirrors those of the constructs used in developing the conceptual Framework in Section 3.6 which derives its structural components from Robbins & Judge's (2013) team effectiveness model and their OB input-process-output model. For instance, the comfort category aligns with the client roles; commitment aligns with the contextual factors, competence category replicates the variable in composition construct while most of the components of communications align with the variables under the design process construct. Hence, the incorporation of CSFs within the conceptual framework in explaining the influences of client organisations on achieving value for money in building designs.

2.5.3 Achieving Success by linking Success Criteria and CSFs

Over time, as discussed within *V_fM* perspectives, the management of projects in the construction industry have been undertaken by considering project success criteria separately from the critical success factors. This is evident in researches conducted in these areas wherein these two concepts were considered as mutually exclusive events. This approach to managing construction projects has been criticised in that it is insufficient to meet up growing demand for modern management model to match the complexities of present day projects (Barnes & Wearne, 1993; Project Management Institute, 2000; Walker, 2007). Westerveld (2003) citing Turner (1994) and Morris (2000) reports that *'several authors state that a possible way to develop an overall*

framework for the management of projects is to link the research on project success criteria and critical success factors'. An attempt at integrating these two concepts in construction is the development of the 'Project Excellence Model' (PEM). The PEM is adequately described by (Westerveld, 2003). Below is a brief excerpt of Westerveld's description that is fundamental for the present research, particularly the concept of clustering both the success criteria and CSFs within project environments.

The PEM is based on the European Foundation of Quality Management (EFQM) business model which is used to measure and improve overall quality of an organisation. Though the EFQM model is suited for permanent organisations (where the aim is achieving *efficiency* in routine processes), it is therefore not suitable for project-type organisations which are temporary in nature (where the aim is achieving certain project goal – *effectiveness*). However, applying the model's principles within the client's organisation which is relatively stable (wherein project goals are a reflection of organisational goals) suffices.

The EFQM model essential characteristics is distinguishing the WHAT (results the organisation has achieved) and the HOW (management of the organisation) of an organisation which differs from the approaches found in managing projects in construction i.e. only focusing on the HOW. The WHAT aspect of the EFQM model is classified as the ***'Result Areas'*** while the HOW aspect is ***'Organisation Areas'***. Based on research findings and a critical review of literature in construction, Westerveld (2003) observed that project success criteria can be seen as *'result areas'* while CSFs as *'organisational areas'*. The PEM presumes that successful project management is dependent on focusing on both result areas and organisational areas.

On the result areas i.e. project success criteria Westerveld's (2003) review identifies the following issues which influence this current research (these are discussed in detail in chapter 3:

1. Contrary to earlier thinking, success criteria are far more than the triangle of time, budget and quality;
2. Consideration of success criteria in construction is variable in that judgement on them are made by wide range of stakeholders over different time horizons;
3. It is impossible to generate success criteria suitable for all projects due to their particularities, hence the need for flexibility in modelling it;
4. To accommodate this flexibility, a method of criteria clustering is recommended to cover the whole issue of project success irrespective of project characteristics.

The outcome of Westerveld's (2003) study, putting together findings of researches on project success (Wateridge, 1998; Kerzner, 1992; Lim & Mohammed, 1999; Turner, 1997) and based on two guidelines: that '*all result areas together had to cover the whole issue of project success in the broadest sense'*; and that '*each result area had to represent a clear and distinctive set of goals or interest'*, resulted to the result areas of the PEM as shown in Table 2.10 below.

Table 2.10 – Result areas of the Project Excellence Model

No	Result Area	Explanation
1	Project results Budget Schedule Quality	The original golden triangle of project goals. Almost all projects will have specific scheduling, budget and quality constraints.
2	Appreciation by the client	The client initiates the project to fulfil a specific need. What aspects and factors does the client value in judging the success of the project?
3	Appreciation by project personnel	The workers of the project will be concerned with reaching their personal goals as well as a good working atmosphere
4	Appreciation by users	Users are concerned with their overall influence in the project and the functionality of the end product.
5	Appreciation by contracting partner	Contracting partners try to make a profit at the project. They are also concerned with getting new orders and learning possibilities.
6	Appreciation by stakeholders	Those parties that are not directly involved in the project but have a large influence. For example environmental groups, citizens and government agencies. These parties manage their specific interest.

Source: Westerveld (2003)

2.6 Building Design Management & Process

Design, in its entirety as a sub-system within project procurement, is described as the most critical aspect of the project life cycle and its effective management is also seen as critical to the success of a project. This view is aptly supported by Rimmer (2001) commenting on concentrating on the production aspect of projects i.e. the construction process, at the expense of the product thus:

> *The focus on the supply chain relationships, such as those between contractors and subcontractors/specialists will only yield modest percentage gains. More would be gained by placing the spotlight on design. . . . Design in its widest context, creates most of the value for customers – and most of the waste . . .*

The building design process is becoming more complex over the years. This is occasioned by the increasing popularity newer procurement routes are gaining within the industry. These methods are championing the shift of design responsibilities and their management away from the architect under the traditional approached to the

contractor (Beard, Loulakis, & Wundram, 1998; Gray & Hughes, 2001; Bibby, Austin, & Bouchlaghem, 2003; Tzortzopoulos & Cooper, 2007). Added to the complexity of the design process is the increased intricacy of buildings. Thus, placing design responsibilities on contractors creates the need for greater coordination and increased control throughout the project cycle. This calls for change in the design leadership towards actualising client's design goals. The concept of design management, discussed in Section 2.6.2, was introduced to help pursue this needed change to some extent.

In order for this change to take place, Egan (2004) calls upon leaders of the delivery process to come together to attain 'common goal'. As is argued later, clients are at the core of the delivery system, making them owners and managers of the supply chain as is the case for most public clients. Given that governments are the largest and most frequent client organisations in the construction industry (Bennett & Crudgington, 2003; Adetunji, Price, Fleming, & Kemp, 2003), they therefore are empowered to provide the necessary leadership and are motivated to facilitate this change since they are the agent and vanguard of societal advancement.

2.6.1 Design and Organisations

Design can be viewed from two perspectives – as a noun or a verb (Bessant, Neely, Tether, Whyte, & Yaghl, 2006). As a noun, it signifies a product or a service i.e. it is considered in terms of outcome, e.g. a product design. The outcome can be tangible forms (e.g. product size, shape) or intangible forms (e.g. vision, concepts). Where design is viewed as a verb, it depicts a process e.g. the act of designing. The process is one which requires creative thinking and involves tangibles (e.g. things, models) or intangibles (e.g. can be abstract, using visualisation for instance).

Bessant et al. (2006) define design as *"the purposive application of creativity to all the activities necessary to bring ideas into use either as product (service) or process innovations"*. This definition covers the following design aspects: design for aesthetic appeal (styling, image, and fashion status), design for function, and design for reliability and quality in use. Importantly, these and others aspects all represent ways of contributing competitive advantage to the client organisation and further shows that design is more than simply styling or image creation which is more the case for building design.

In an attempt at describing and classifying design, Tunstall (2007) defined design in terms of a noun as *"a combination of a group of objects and requirements, which have been designed to create something new as a result of, or in anticipation of their collective performance"*, and in term of a verb as *"the selection of facts, requirements or perceptions about the properties or behaviour of individual elements which can be combined into a large whole"*.

Further to identifying the various forms of design in terms of its tangibility and intangibility (as demonstrated by the complex nexus of actions outlined above), Tunstall (2007) notes that:

> *Some of the elements are immediately apparent such as materials, textures and colours which can be seen and touched but others like cost, durability etc are invisible and not so easy to appreciate. The principle elements of any product are materials, processes, forms and appearance, each influenced by the response of client, designers, manufacturers and the users to a wide range of factors*

Apart from the influences clients can have on building designs, the recognition of the importance of designs to organisation have also been recognised as one of the step towards achieving success in projects and programmes. There is significant relationship between design and organisation in that business strategies that enables

and promotes *creativity* and *design* as part of a process of *innovation* (or efficiency) have beneficial effect on organisational performance. This is supported by research-based evidences on the positive relationship between creativity, design and performance in both product and service based industries (Bessant, Neely, Tether, Whyte, & Yaghl, 2006; Teknikforetagen & SVID, 2004; Gernser & Leenders, 2001).

Apart from the strong positive relationship between design and organisational performance, these researches further suggests that this relationship is not just a product of isolated happenstance and individual flair, but rather of a well-managed design process towards achieving organisational value. This assertion therefore provides a focal point for the integrative consideration of *'design as a value driver'* within an organisation from a systems thinking point of view – thus putting the client's organisation in the leadership position within the design stages. This agenda is further pursued in Chapter 3 where theoretical and conceptual frameworks are suggested as explanations towards solving the research problem i.e. the lack of a mechanism linking client organisation behaviours and achieving value for money in building designs.

Expanding the scope of the snowballing effects of design beyond the boundaries of an organisation, its importance stops not only as a potential value driver in organisation but also as a business function of the construction industry. This was aptly captured by Ove Arup Director Richard Haryott's paper for the 2000 Birmingham M4I Conference which expounded the business function of design, thus:

> *The five (Egan) drivers for change, the four process improvements and the seven targets cannot be achieved unless by design, and through design. . . . Committed leaders in construction . . . have to understand, respect and exploit the design process, and not close it down into simple compartments. If that is done, there is an inevitable certainty to optimise sub-processes and not enhance the whole.*

Egan (1998) rethinking construction called for drastic improvements in the performance of the construction industry by setting some targets. While Egan specifically mentioned that the clients must provide the necessary leadership required to achieve the improvements (for which there are evidence that they are living up to expectation (Commission of Architects for the Built Environment, 2010; Construction Clients' Group, 2013), Haryott (2000) relates that such improvements cannot be achieved in isolation of the design process. Haryott further surmised that the design process itself should not be considered in isolation of the organisation within which it is required in other to avoid sub-optimisation of clients' requirements in their request for buildings (this call amongst others might have led to the aggressiveness of the construction industry's focus on value management). This is in line with Booth's (2010) (Booth, 2010) position that client organisations should own and manage aspects of their operations which are outsourced, for instance the design function, as a part of their supply chain management responsibilities.

For most client organisations particularly those who outsource the procurement of building projects as is the case with public clients, design functions will fall within the first tier of their supply chain irrespective of the procurement route adopted (Briscoe, Dainty, Millett, & Neale, 2004; Love, Irani, & Edwards, 2004). Supply chain, defined as *"the sequence of organisations – their facilities, functions, and activities – that are involved in producing and delivering a product or service"* (Stevenson, 2009, p. 511) is considered a potential part of the value chain in construction project delivery (Standing, 2001). Supply chain management – *"the strategic coordination of business functions within a business organisation and throughout its supply chain for the purpose of*

integrating supply and demand management" (Stevenson, 2009, p. 512) has been identified as a value-adding mechanism in the procurement of construction projects (Thomson, Austin, Root, Thrope, & Hammond, 2006; Walker, 2007; Nicholas & Steyn, 2008; Chitkara, 2011). The principles of supply chain and its management are given specific consideration in Section 4.3.

Giving specific considerations to supply chain management in construction, Constructing Excellence (2004) advances that supply chain is the term used to describe the linkage of companies that turns a series of basic materials, products or services into finished product for the client, giving further that all construction companies, be they client, main contractor, designer, surveyor, sub-contractor, or supplier are considered part of a supply chain. And that because of the nature of the construction industry – being project-based – and the way of its procurement, participants in the industry are usually members of different supply chains operating on different projects. Constructing Excellence (2004) further makes the point that the key objective of supply chain management is to offer better underlying value to a client than the competition. This is done through a combination of defining client value, establishing supplier relationships, integrating activities, managing costs collaboratively, developing continuous improvement, and mobilising and developing people.

Deriving from the detailed debates and thorough critiquing of the principles and theories of supply chain management as applied to the manufacturing industry for adoption in the construction industry undertaken by members of the academia and industry, Pryke (2009) surmises as follows while acknowledging that the concept may not necessarily be a fad as considered by Green (2006) but somewhat *'acontextual'* as established by Fernie (2005):

i. Discussion of construction supply chain management is usually informed by a wide range of definitions thus presenting challenges at understanding the nature of supply chains in construction.
ii. Supply chain is the focus for more effective ways of creating value for clients; as a vehicle for innovation and continuous improvement, integration of systems and improved industry-wide profitability levels.
iii. While supply chains must build networks to provide complementariness in abilities to be effective they need to be supported in networks that extend beyond the immediate linkages of exchange in order to create value in each link.
iv. The concept of partnering which strives on the principles of lean thinking promoted by mass production, and forming the backbone for lower cost in the supply chain provided both a threat – escalating cost and poor performances; and an opportunity – collaboration and integration in long-term relationship for the construction industry.
v. The management of a variety of actors is a must in a supply chain and hence view differs as to the nature of such a supply chain and arguable whether such a complex network of organisations working together in a number of 'non-trade' related clusters are best described as chains rather than networks.
vi. While the term supply chain management tends to be used to refer to management processes as well as structures of organisations within generic literature, used in construction projects it assumes a much more complex dimension than merely managing a group of subcontractors and supplies to include remaining competitive and satisfying clients.

vii. The relevance of supply chain management to construction lies not in the presence of supply chains but in their exploitation through the management of actors far removed from the dyadic contractual relationships inherent in construction contracts.

viii. Supply chain is the network of organisations that are involved through upstream and downstream linkages in the different processes and activities that produce value in the form of products and/or services in the hands of the ultimate customer.

2.6.2 Managing the Design

Designing of buildings is a multi-disciplinary, highly information processing task, hence its effective management relies on established frameworks within which its tasks, objectives and interfaces are kept in focus throughout its developmental stages (Austin, Baldwin, & Newton, 1996; Emmitt, 2002; 2007). The ability to adequately manage the objectives of a project is a prerequisite for project success for instance design output, a particular interest of this research. Success of construction projects has been shown to have a significant relationship to the involvement of, and management provided by client organisations as discussed in the previous Section. These relationships are against the backdrop of successes recorded with the introduction and implementation of project management and supply chain management in the construction industry and as a consequence, design management.

Mills (2013) defines and describes design management as the management of people and resources in a multidisciplinary process, performed in a series of iterative steps, to conceive, describe and justify the value of increasingly detailed solutions to meet the needs of stakeholders. Design management provides the direction, structure and control for the creative and often abductive decision-making process to reconcile

stakeholders' project and organisational propositions. Design and design management integrates the process of the emergence of design propositions (products and services) with human centred user perception. The reason being that it applies sense-making to build stakeholder competencies around the problem to enable the very best value judgements

Problems associated with design management include amongst others: the inherent nature of design, in particular its iterative nature; acquiring technical information; client induced changes; difficulties in managing information (such as the problem of missing information); and difficulties in planning and scheduling design work (Emmitt, 2007). Within these dimensions, (Baldwin, Austin, Hassan, & Thrope, 1999) highlights the following problem areas as information related events: *starting a design task earlier than anticipated based upon assumed information; gate keeping (or withholding of design information) among design team members; predicting the impact of changes in design information*. Others include: *assessing the result of missing information; evaluating the variation in the quality of information exchanged between different design tasks; and releasing the information from different design tasks in packages or phases.* Fundamentally, and of significant importance for the current research, these problem dimensions point to a crucial aspect of the design process – *communications*, which is essential for team effectiveness (Mullins, 2010; Robbins and Judge, 2013) .

Evidences abound to the relationships between client's involvement at EDS and project success (Pettit, 2000; Kelly, 2007; Male *et al*., 2007; Cheng, 2008; Construction Clients' Group, 2013). This suggests not only the importance of client organisations to project success but also the need for them to provide leadership and management functions during the EDS of project (design function inclusive). It is also

noteworthy to reiterate that the EDS are the stages at which the greatest positive impact on change can be achieve. Therefore, the client organisation has a greater opportunity of influencing the design outcome by providing the necessary leadership and management role. Below are some studies that have demonstrated the need for clients to not only provide leadership but also actively engage with the design team.

Mohammed (2007) suggests, though with particular reference to errors in construction documentation, that *"the owner – or his representative - and the designer must have a mechanism to reduce the likelihood of design errors occurring in a project, and practitioners need to have a mechanism to test various alternative scenarios so that the design and documentation process can be managed more effectively"*. The analysis of the interrelated factors in the early design stages, based on specific context or situations (types of errors and their causes, most of which are client related) can assist industry professionals in making rational decisions as to which factors need the most attention in reducing the number of errors to prevent or at least to minimize their influence (Mohammed, 2007).

Similarly, but extending the frontiers of managing value in design to recognising the relationship between values and value within the framework of understanding and defining a client's value system, Mills (2013, p. 343) advance thus: "*Clients provide the resources and direction to enrol stakeholders in project. Therefore is for them to define what values and value systems they would like realised. The earlier that values and value definitions are shared the better for building relationships and trust"*. And due to the complex multiplicity of value systems which exists during value dialogues, most of which may be at variance to that of the core client's organisation, Mill (2013) further suggests that: "*Multi-stakeholders values and value should be aligned and integrated into design solution that contain any number of product and service*

offerings that make best use of customer and provider resources and competencies to deliver value".

While Mohammed (2007) focused on the importance of modelling the factor leading to documentation errors as a means of understanding their effect on project during early stages of projects particularly early design stages, a lesson derived from the above for this present research is the importance to model *client organisation related determinants of value for money within design solutions as a means of understanding their influences therein*. This will further lead to better managing these determinants during EDS towards enhancing efficiency and effectiveness i.e. achieving $V_f M$ within design solutions of building projects.

Design Process and its Interface with Building Projects

Hendrickson and Au (2008) characterised the typical design process as comprising of a series of highly interactive actions – formulation, analysis, search, decision, specification and modifications, shown in Figure 2.5 and explained below.

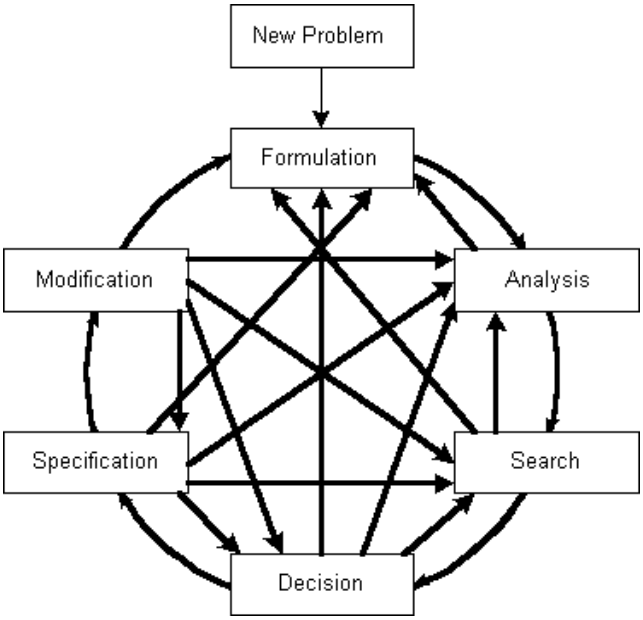


Figure 2.5 – Typical Design Process (Source: Hendrickson & Au, 2008)

These series of actions may go through many iterations of redesign in order to refine functional requirements, design concepts and financial constraints, and are described as follows (Hendrickson & Au, 2008):

i. Formulation refers to definition or description of a design problem in broad terms through the synthesis of ideas describing alternative facilities.
ii. Analysis refines the problem definition or description by separating important from peripheral information and by pulling together the essential details. Interpretation and predictions are required as part of the analysis.
iii. Search involves gathering a set of potential solutions for performing the specified functions and satisfying the user requirements.
iv. Decision means that each of the potential solutions is evaluated and compared to the alternatives until the best solution is obtained.
v. Specification is to describe the chosen solution in a form which contains enough details for implementation.
vi. Modification refers to the change in the solution or re-designs if the solution is found to be wanting or if new information is discovered in the process of design.

There exist several frameworks for classifying the various stages of building projects, further detailing the various stages that defines and describes the design process. Some of the most recent and commonly used frameworks are the: RIBA Work Stages (Royal Institute of British Architects, 2008); CABE guide stages (Commission of Architects for the Built Environment, 2005) and OGC Gateway (OGC, 2005). Table 2.11 shows the various building project stages of these three classification frameworks.

Table 2.11 – Common Frameworks for classifying stages of building projects

CABE Stages	**RIBA Stages**	**OGC Gateways**
Prepare		Business strategy
	A. Appraisal	Establish business need
		0. Strategic assessment
	B. Strategic briefing	1. Business justification
		2. Procurement strategy
		3. Investment decision
Design	C. Outline proposals	Decision point 1
	D. Detailed proposals	
	E. Final proposals	
	F. Production information	Decision point 2
	G. Tender documentation	
Construct	H. Tender action	4. Readiness for service
	J. Mobilisation	
	K. Construction	
Use	L. After completion	5. Benefits evaluation
	M. Feedback	

In an earlier attempt, (Hughes & Murdoch, 2001) synthesized and analysed 10 frameworks for classifying the roles and responsibilities of design teams and that of client organisations (BPF, 1983; BSI, 1997; CiB, 1997; CIC, 1998; JCT, 1998; PACE, 1998; Philips & Lupton, 2000; RIBA, 1997). They found that the RIBA plan of work provides comprehensive and representative classifications of the roles and responsibilities for ease of administering building contracts. The Royal Institution of Chartered Surveyors (RICS, 2012) describes the RIBA Plan of Work as '*a construction industry recognised framework that organises the processes of managing and designing building projects and administering building contracts into a number of key Work Stages'*. Hence, the RIBA Outline Plan of Work 2007 is adopted herein to discuss the various aspects of the design stages in terms of the processes.

The conceptual design stage, the focus of this research is described as often complex, confused, changing and disorganised and lacks consistency and direction (Macmillan, Steele, Austin, Kirby, & Spence, 2001), aided by the intractable problems of user involvement, uncertainty, and lack of cohesion between stakeholders. This inherent complexity suggests that the design process cannot be fully rationale and plan-driven. Given these characteristics of the design process, and to achieve a more meaningful built outcome, designers and stakeholders need to be aware of values and value perspectives throughout the design process directed and facilitated through dialogue and measurement (Mill, 2013).

Design Team Members (DTM) & their function

Teams and teamwork are a necessity in the construction industry and a characteristic of project-based industries. Their importance within the industry has been severally stressed to include been a major catalyse for solving most of the industry's problem (Latham, 1994; Egan, 1998; Sheard & Kakabadse, 2002; Rezgui, 2007) through their central role in the organisational learning process (Murray & Moses, 2005). Specifically, Constructing Excellence (2008) emphasising on the overarching purpose of teams in the construction industry advances that *'construction is a collaborative activity – only by pooling the knowledge and experience of many people can buildings meet the needs of today, let alone tomorrow'*.

The design (project) team is mainly responsible for managing the design process. There has been argument as to the membership and composition of the design team. Some descriptions and definitions of design teams in support of the argument include: '*The group of consultants that develops the design. This isn't just the architect, it includes cost consultants, structural engineers, services engineers and potentially many types of specialists – landscape, sustainability and so on*' (Commission of

Architects for the Built Environment, 2010). *A group [of design professionals] with complementary skills, competencies and knowledge, who are committed to a common purpose, set of performance goals and approach for which they will hold themselves mutually accountable* (Walker A. , 2007).

Studies on the influences of the membership of the design team on project outcomes in general have received quite some patronages in recent times in the field of construction management, though not commensurate to studies of teams outside the construction industry. Majority of the studies on teams within construction management have been pursued from a profession-based perspective i.e. looking at the various disciplines making up the design/construction team with each providing strong evidences of the existence of significant influences of membership on outcomes. For instance, in a study of the influence of personality traits on performance of project managers during briefing process (a team-based process), (Prince, 2011) reveals that project manager performance is connected to sixteen personality traits dimension and that these traits are strongly associated with effective briefing performance. (Liu & Fellows, 2008) making a case for the influence of individual's collectivistic (IC) orientation in group goals and task activities towards productive teams, finds that there exist significant correlates between quantity surveyors' IC orientations and their organisational citizenship behaviours which are known to affect job performance and job satisfaction (Mullins, 2010).

While the reductionist approach to studying influences of project team members on project performance i.e. design performance in the case of this research, may be important in retrospect, its appeal in terms of expected team outcomes can easily be lost. This is especially true when considered from a systems and contingency point of view – which recognises the various levels and contributions of specialisations

required in project organisation thus leading to *'increasingly complex project organisational structures involving numerous specialist firms with each having its own boundary to delineate functional and/or economic activities'* (Fellows & Liu, 2012, p. 656).

Emmitt & Gorse (2007) identifies three basic boundary conditions that exist in construction projects which are created by the presence and interactions of the following organisations, contracts, projects, construction phases, professional groups, and interest/user groups. Boundary condition 1 described as the client-designer interface is referred to as the briefing stage encompassing as it should in addition to the client–designer interaction to establish the brief, relationships with the client before, during and after the execution of the contract. Boundary condition 2 described as designer–contractor interface is referred to as the contract stage and encompasses issues that borders on early involvement of contractor, communications during construction, design related issues and client–contractor relationship. The last, boundary condition 3 described as the construction manager–site operatives interface, encompasses mainly relationships between contractor and manufacturers.

Boundary issues have been shown to be a common denominator in project performance in temporary multi-organisation environment (Berggren, Soderlund, & Anderson, 2001; Bresnen M. , 2010), which are exemplar of the construction industry. This is predicated on the fact that performance within such setup is dependent on how well boundary activities are managed and the permeability of the boundaries to information and knowledge management (Fellows & Liu, 2012). Consideration of boundaries and their interfaces implies that client not only procure projects but also the inherent complex performances (Caldwell, Roehrich, & Davies, 2009). Boundary issues are highly visible in design teams (Marks et al., 2005; Marrone, 2010).

Some boundaries related issues caused by fragmentations amongst project participants and participants diversity, which are known to cause poor performance include: poor initial planning, lack of clear project objectives and deliverables, lack of understanding of dependencies, inadequate resource allocation, poor change management, poor understanding of priorities, and inadequate communications (Flyvberg, 2009; Lawernce & Scanlan, 2007). These issues can simply be attributed to lack of essential managerial interventions from client organisations. Therefore understanding how the multiplicity of diverse interfaces may affect design outcomes is the client's responsibility at least within the context of achieving organisational goals. This is discussed further in Section 3.4 within the principles of supply chain management. Again, as can be seen in Tables 2.3, 2.4 and 2.7 the boundary related issues raised earlier resonates fully well with specific client roles within the Leadership, Procurement, and Design Quality roles categories.

The understanding of value perspectives from a 'multi-stakeholders-interventions-through-value-dialogues' approach aptly differentiates value consideration within construction from that of an economic view of shareholder wealth and profit maximisation. Bringing multiple stakeholders together in the understanding and determination of client value system within the values-value relationship, the main proposition of Mills (2013) thesis, comes with its own challenges as earlier noted by (Kochan & Rubinstein, 2000) thus: *"by bringing together multiple interests that share power, stakeholder firms have a high potential for conflicts that need to be managed effectively. This requires aggregating interests, surfacing differences, and resolving conflicts in ways that produce high-quality outcomes"*. Hence, coordination, cooperation and conflict resolution are the key determining factors towards success at the design stage when multi-stakeholders are engaged as members of the design team.

Given their importance to successful outcomes, these three variables therefore are of interest for the design process construct, discussed further and fuller in Section 3.6.5 under *communication, collaboration* and *conflict resolutions*.

2.6.3 Exclusivity in Design Management

Design management practices seem to exclude the involvement and participation of clients in core design decisions through their involvement in terms of their roles and responsibilities throughout the project life are well known. Such exclusivities during design are clearly demonstrated by the following scenarios:

By reference to definitions and descriptions of construction documents of which design is a part of, for instance, Murdoch et al (1997) cited in Mohammed (2007) defines contract documents *'as the means by which designers' intentions are conveyed to the clients, the statutory authorities, the quantity surveyors, the contractor and the sub contractors'*. This clearly leaves out the *'client's requirement'* which should be the only intentions to be considered when viewed from a *'value for money perspective'* where satisfaction exists only upon the fulfilment of the client's intentions. This is further supported by Emmitt (2002) who assert that contract document conveys the intentions of the client and not that of the designers or design team thus:

> *'Individuals, groups and organisations responsible for building designs and construction are essentially concerned with interpreting a client's requirements: exploring, exploiting and enhancing those requirements in the forms of a design which satisfies planning legislations and build codes; is buildable within a defined budget and within a defined time period; satisfies user demands and also recognises ecological constraints'*.

The traditional approach – whereby client organisations do not recognise the need to be responsible for managing their supply chain – has hitherto promoted the non-

involvement of clients in the core design processes. Once the client hands over the brief to the design team, he literally transfers design *'authority'* to the team and completely hands off the design process as exemplified in earlier versions of RIBA Plan of Work Stages i.e. from the 1967 to 1999 Versions. However, under contemporary approaches – where the client organisation is responsible for the total delivery of the project (of which the design is just a part of and which is procured through outsourcing, as has been reflected in the 2007 and 2013 Versions of the RIBA Work Stages), the responsibility of making sure that the design meets the organisation's objectives, which in this research is *'value for money in building designs'*, is solely that of the client's organisation and not that of the design team. This is even most true where members of the design team are part of the supply chain partners of the client's organisation. This position is supported by Booth (2010) who emphasises that: *"Any company [for instance the client organisation] that still thinks that it can shield itself from bad publicity when something goes wrong is naïve. The supplier [for instance the design team, contractor, materials supplier etc] may be responsible for the service but the procuring organization is always going to be accountable" (p.2).*

The recognition of this added responsibility to the client organisation i.e. managing the supply chain, was brought to the fore when it became apparently necessary that for improvements to be gained in the construction industry, and given its nature, the clients of the industry has to take the lead and become actively involved in the affairs of the industry (Atkin & Brooks, 2002; Commission of Architects for the Built Environment, 2010; Construction Clients' Group, 2013).

This active participation of the clients in the development processes of projects of construction nature markedly differentiates the construction industry from that of

others engaged in the production of goods and services for mass consumption. In these latter industries, client/consumer participation in the design process of products and or services they consume is either passive or non-existent. Their participation is described as passive or non-existent for these reasons:

i. The consumers of these goods do not engage the factors of productions in their bid to acquire the goods and/or services they consume. Rather, the producers or providers of the service are the ones who engage the factors of production.
ii. Where 'projects' are initiated to meet up consumers demand for products or services, they are managed by the producer or provider and not by the consumer or *'clients'* as is the case in the construction industry
iii. Customers' needs and likely demand patterns for goods and services are synthesised through the marketing function
iv. To get the manufacturer to understand their wants and needs, consumers do not have to engage in submitting 'briefs'. Rather their spending behaviours and patterns suffice.

Despite the passive participation of the client/consumer in the production/manufacturing industry, value to the consumer is the ultimate goal of suppliers/manufacturers. Thus, in the manufacturing industry, value for money is solely driven by the supply side and not the client/consumer (demand) side as is the case in the construction industry. Why then is this so? Why is value for money the sole responsibility of the supply side in other industries compared to that of construction? The answer actually lies in the nature of the products of these industries. The reason for these differentials between construction and other industries reinforce the placement of the leadership role on and active participation of, the client's organisation in the achievement of value for money.

Supporting the evolving leadership role of clients in construction, current design paradigms are moving away from this exclusivist position and embracing a more client-involved approach. Of late, the newest design approach – *'design thinking'* is bringing to bear successes to innovative design via multidisciplinary collaborations and multiphase (Vianna, Vianna, Adler, Lucena, & Russo, 2011). Design thinking is described as a problem solving approach based on abductive reasoning[3] wherein '*the (design) solution does not derive from the problem (but rather) it patterns itself after the problem*'.

Furthermore, demonstrating and exposing the extent of exclusivity even amongst members of the design team in their attempts at providing value for money to clients during the design stage, while supporting the engagement of stakeholders in value dialogues in line with contemporary approaches to value delivery whilst also promoting the abductive reasoning approach to design, Mills et al. (2006) notes as follows:

i. Rather than a team approach to value, disciplines have built their own understanding of how it is defined and delivered. All construction disciples, who pride themselves on professionally delivering construction solution on behalf of their customers, may have conflicting views
ii. Designers may be guilty of thinking they are the single best judges of value and so select building solutions against their own values, without a full understanding of all customers' priorities and expectations

[3] Vianna et al., (2011) describes abductive thinking as an approach that endeavours to formulate inquiries through the apprehension or comprehension of phenomena using information gathered from observation of the context pervading the problem. In building design, this would largely involve understanding the client organisation in its entirety i.e. understanding the client value system.

iii. Quantity surveyors may tend to eliminate costs without a clear understanding of associated stakeholder benefit, due to their detailed understanding of elemental cost break downs

iv. Project managers may quickly arrive at design solutions by minimising stakeholder involvement while Engineers may search for a functional solution, without an understanding of how they could achieve or even exceed stakeholder expectations

v. Clients may seek to reduce design spend and objectively specify design requirements that acts as a constraint and limit design creativity whilst Value Managers may limit their definition of value to objective and functional criteria, eliminating more subjective cultural factors that define the very nature of the people affected by the project.

2.7 Chapter Summary

Recent considerations at improving the performance of the construction industry are focused on the client organisations – concerning matters of reinventing themselves and re-engineering their business processes towards developing capabilities and capacities at providing the necessary leaderships needed in achieving the change agenda for the industry as suggested by some prominent construction reports. These reports include: Latham (1994), Egan (1998), Strategic Forum for Construction (2002), NAO (2005) and Wolstenholme (2009) as outlined in Chapter One - the Background of the study. These considerations specifically focused the conduct of the literature review towards exploring the relationship between client organisations and achieving *V_fM* in building designs.

Reviews on *V_fM* concept indicate that though coming from an industry where its application had excelled i.e. the manufacturing industry; its application in construction

has rather tarried. This is largely due to the nature of projects within the construction industry and 'misconceptions' as to whose value should be the main focus. However, current understandings are recognising that the industry should focus more on that of the client, as demonstrated by the definitions reviewed and that public sector client organisations are the ones to benefit the most from *$V_f M$* considerations.

The review also points out that despite the understanding amongst theorists and practitioners of the different dimensions to *$V_f M$* – understanding value, defining value, value dialoguing and value judgement – one aspect has continually been neglected i.e. the ability and capacity to deliver value. Surprisingly, this aspect, though silently projected in most of the popular definitions, is yet to be given the serious attention it demands thus forming the central premise of this research. Explicitly bringing out the 'ability and capacity' aspect of the *$V_f M$* concept and linking it up with its other dimensions provides four candidates as influencers of value delivery relative to client organisation – the client organisations themselves, their value systems, project performances and involvement with the design process.

Recognising that client organisations are more than mere consumers of the products and services of the construction industry, reviews on clients in construction points to the fact that their active participation will not only improve the success rate of the industry but also serves as a main determinant of their satisfaction with the outcomes of the industry particularly in terms of achieving *$V_f M$*. This is evidenced in the nature of roles client organisations play in the industry, which has been the subject of much research agenda recently, thus making client organisations describable as intelligent, informed and knowledgeable. This is most particular to those that are frequent procurer of the industry's products and services. More importantly, the roles they play are strategic in nature and for best outcomes while engaging with design teams, these

roles are assigned to specific persons with the necessary and representative authority within the client organisation. One of the outcomes of this review is drawing parallels between the roles played by board of directors of corporate organisations and those required to be played by the client organisation for their building projects. These include: strategy role, control role and service role performed by boards, mirroring those of leadership role, procurement role and design quality role respectively performed by client organisations.

Notwithstanding the realisation of the executive/strategic nature of the roles client organisations play at the designing stage of their building projects and the importance of this to project success, the lack of consideration of the client organisation's ability and capacity at managing its requirements during early stages is an indication of a major failing of construction management to deliver value for money to clients. This failing is further exacerbated by the non consideration of project organisations from a system/contingency perspective. This position of the industry is justifiable due to the complex nature of the client organisation which comprise of autonomous agents, nonlinear relations and non-uniform parts.

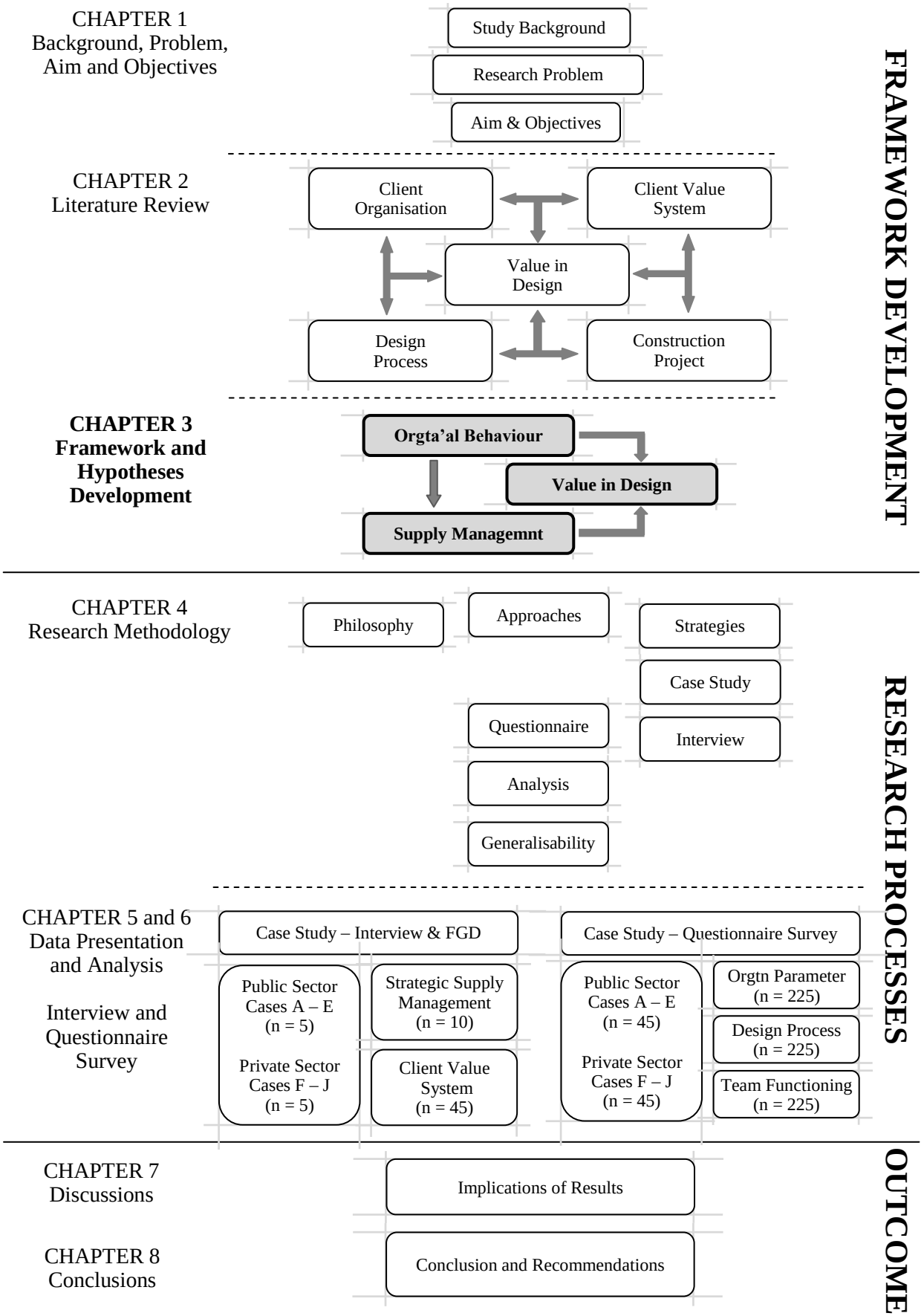
Success in value delivery in the construction industry is dependent on the determination of the client value system which is accomplished within a complex configuration – multi-stakeholders and multi-parameterisation of the process. Amongst the existing frameworks for determining the client value systems, three were reviewed one of which was adopted for data collection. Still famous in the determination of client value system is the reliance on the iron triangle in construction – cost, time and quality, though to varying degrees. On the one end of the value system framework spectrum lie the deterministic reliance on the iron triangle while on the other extreme is a flexible and dynamic system which allows stakeholders

determine the criteria to consider in the determination of the value system in recognition of the complex nature of client organisation, for which design team members should have an understanding of. This greatly enhances value delivery.

Project success is variable and stakeholders' dependent, so are the criteria for measuring it. However two concepts fully conceptualises it – effectiveness and efficiency. Overtime, these two concepts have been thought to be mutual exclusive toward attaining V_fM in buildings in terms of success criteria and critical success factors. This approach have received so much criticisms in that they only give sub-optimal outcomes and a holistic approaches which consider both success criteria and the CSFs together have been suggested and developed for use in the industry. This approach is consistent with the principles of supply management and those of determination of client value systems and their inherent flexibility.

Building designs do have a much deeper relevance and significance to client organisation as is normally perceived by both the demand (client organisations) and supply (supply partners) side, which transcends beyond merely meeting the set requirements to include as it should, enhancing organisational performance. And also emerging from the review is not only the significance of the design process to the success of building designs but also the significance of client organisations influence on such outcomes. This again points in the direction of supply management. Such consideration must realise the complex and multiplicity relationships involved in the knowledge-driven decision-making processes required during the design process and whose success is entirely dependent on the client value system. Despite the significance and influence of the client organisation to design success, their contributions towards value delivery tend to end at the point of defining their value systems, thus excluded in the core design process.

Chapter 3 – Frameworks and Hypothesis Development



3.1 Introduction

Chapter 2 provides the understanding that value (for money) in building design is achieved and can be improved upon by the interaction of three aspects: organisational parameters (inputs), design process (processes) and design team performance (outcomes). However, attempts at undertaking an integrative study of these aspects within construction management have rather been challenging. This is mainly due to the nature of construction projects and their related organisations in terms of complexity (Bertelsen, 2003a; Pryke & Smyth, 2006; Caldwell, Roehrich, & Davies, 2009), uniqueness (Walker, 2007; Winch, 2010; Fellows & Liu, 2012) and temporariness (Emmitt & Gorse, 2007; de Valence, 2012). Adopting a nested multi-theoretic and multi-framework approach shown in Figure 3, two distinct frameworks are developed. This Chapter discusses the components of the frameworks.

The Chapter is organised in three sections. The first section discusses the development of the theoretical framework involving three fundamental fields and theories i.e. organisational behaviour, strategic supply management and the input-process-output model. The theoretic framework provides an integrative approach to investigate the influence of client organisation on achieving value in building designs, cumulating to the development of the conceptual framework. The conceptual framework explains the relationships between the determinants of value in building design in terms of client organisation parameters, design process and design team functioning. The development of the framework draws heavily from the small team literature. And bringing several related models within organisational behaviour, supply management and client value system to bear, a seven construct framework is proposed.

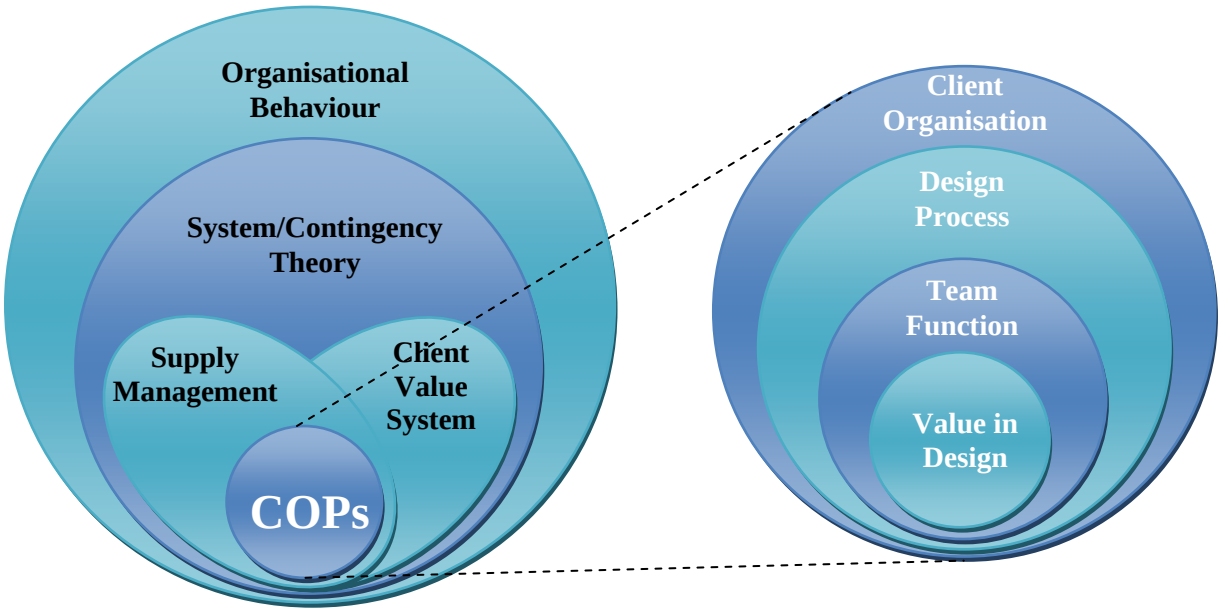


Figure 3 – **A** Nested Multi-Theoretic and Multi-Framework Approach

3.2 Theoretical Framework for the Study

While there are considerable generic researches on the three aspects of achieving value (for money) in building design i.e. organisational parameters, design process and design team performance; they however have been considered separately and in isolation within construction management i.e. the reductionist approach. Specifically, issues of organisational parameters have concentrated on influences of client's involvement on project performance (Bell, 1994; Pettit, 2000; Cheng, 2008) neglecting the context (i.e. situational factors upon which organisational performance is contingent upon) within which they operate i.e. client organisation; while research on team performance mostly looks at issues of memberships and cross boundaries interfaces (Berggren, Soderlund, & Anderson, 2001; Marks, De Church, Mathien, Panzer, & Alonso, 2005; Liu & Fellows, 2008; Bresnen, 2010; Fellows & Liu, 2012) also leaving out the context within which these aspects operate and contingent upon for instance organisational culture and design process.

While these studies and their approaches i.e. either directly linking inputs to outcomes e.g. studying client's involvement or team members personalities on project performance; linking inputs to processes e.g. studying communications in design (Xie, 2002); or linking processes to outcomes e.g. characteristics of teams (Chow, Then, & Stikmore, 2005) without considering mediating variables, may be sufficient on their own strengths, X-raying them through the lenses of either the systems or contingency approaches to organisation management – say supply management, however brings out their inadequacies – sub-optimality. Whereas the systems approach pays attention to integrating the technical requirements (i.e. classical management e.g. formal structure, common principles, operating standards etc.) and social factors (i.e. human relations management e.g. motivation, teamwork, leadership, informal organisation etc.) of organisation, the contingency approach extends these *'one-solution-fit-all'* approaches to recognising that organisational successes are not based on *'one best design of organisation'* but rather dependent on a range of situational variables (Mullins, 2010, p. 43).

Considerable efforts have been made at establishing relationships at sub-systems level of organisations e.g. input-process, input-output and process-output as suggested above within construction management. These efforts are indicative that relationships have hitherto been studied within each distinctive management approach particularly classical and human relations. However, attempts at linking these seemingly separate approaches (see Section 2.2.3 for detail explanation) i.e. classical and human relations within the systems and/or contingency approaches on the basis of 'input-process-output' perspectives are inherently marred with difficulties.

This is largely due to the complexities surrounding 'performance' and its associated variables in construction (Bertelsen, 2003a; 2003b), thus making it almost impossible

linking causality to any one single situation or factor. As a nexus for coping with the complexities of these relationships and difficulties in establishing them, a theoretical framework is developed for this research. Its theoretical underpinnings are embedded on theories of organisation behaviour, strategic supply management, systems theory, and the client value system. The theoretical framework is depicted in Figure 3.1. This section concentrates on organisation behaviour and strategic supply management

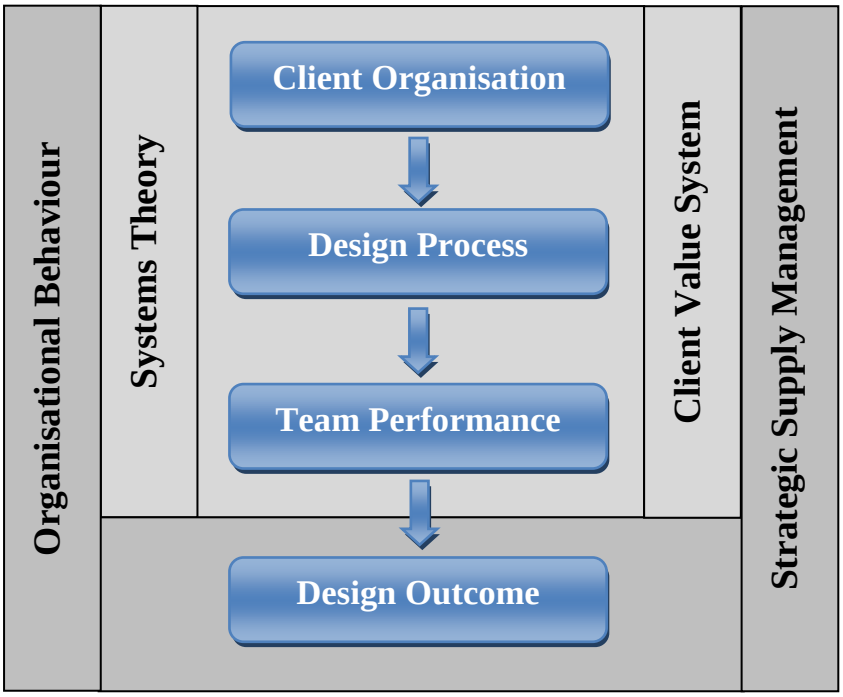


Figure 3.1 – Theoretical Framework of the Research

3.3 Theories of Organisational Behaviour

Outcomes in organisation – productivity and/or performance, have recently been considered as the direct consequence of behaviours inherent in the organisation rather than on the once most famous considerations of critical success factors or reliance on some key performance indicators or success criteria as discussed in Sections 2.4.1 – 2.4.3. This section discusses these behaviours from an organisational behaviour

perspective and draws upon its frameworks (theories and principles) to explain how the concept fits within the field of construction management and the current research.

3.3.1 Definition and Contextualisation

Robbins and Judge (2009) describes organisational behaviour as *'a field of study that investigates the impact that individuals, groups, and structure have on behaviour within organisations, for the purpose of applying such knowledge toward improving an organisation's effectiveness' (p. 10).* Mullins (2010) describes organisational behaviour as the study of behaviour of people within an organisation setting consisting of the understanding, prediction and control of human behaviour. Specifically, Mullins (2010) defines organisational behaviour as *'the study and understanding of individual and group behaviour and patterns of structure in order to help improve organisational performance and effectiveness'*. Griffin & Moorhead (2010) (Griffin & Moorhead, 2010) further defines organisational behaviour as *'the study of human behavior in organizational settings, of the interface between human behavior and the organization, and of the organization itself'*. From the aforementioned descriptions and definitions, the essential three determinants of behaviours in organisation are: individuals, groups, and structure/organisation. They have also come to be known as the levels of analysis of organisational behaviours. The study of OB therefore specifically focuses on the people aspect of organisation.

3.3.2 Construction Management and Organisational Behaviour

Construction management over the years have come under severe scrutiny. This is due to the *'relevance-survival'* paradigmatic waves engulfing most management related disciplines globally. One of the outcomes of such wave, towards the relevance and survival of construction management, was de Valence (2011) (de Valence, 2011) finding that the links between construction management, construction economics and

theory *'are not strong'*. A reason advanced for the weaknesses is the nature of construction projects and construction (project) management which is quite different from the products and production perspectives of generic management and economic theories (de Valence, 2012). Drawing from the complexity of the economic theory of production and its antecedences, and given its similarities with that of the production-side of the construction industry, de Valence (2012) pondered on three fundamental issues: 1) If contemporary construction management can be reinterpreted within the economic theory of production, 2) Whether this reinterpretation would improve industry performance, and 3) Can an industry specific theory be founded?

In attempt to answering the aforementioned questions and further identify actions which would help construction projects and companies to be more efficient, Radosavljevic and Bennett (2012) provide foundations toward proposing a theory of construction management. The thinking behind the theory is to raise the viewpoint of construction management from project – which is the conventional approach – to those that manage projects, for instance the client organisation and by a large degree via supply management. The main concepts that form the basis of understanding construction management within the theory proposed by Radosavljevic and Bennett (2012) are: construction products and processes; organisations, interactions and relationships; and learning and performance; while the main factors surrounding these concepts are communication, feedback loops, and how well established relationships are (which they called internal) or are not (which they called boundary relationships).

Radosavljevic and Bennett's (2012) attempt at building an industry specific theory led to the consideration of some core aspect of relationships which were hitherto lacking in earlier definitions of construction management, and defined within Radosavljevic and Bennett (2012) considerations as *'taking responsibility for the performance of construction organisations, measured by efficiency, which is inversely affected by*

complexity and external interference thereby preventing organisations achieving agreed objectives'. Through a series of prepositions about construction management, teams and related efficiency conditions Radosavljevic and Bennett (2012) propounded six measures that crucially impacts on construction management decisions. These they called the inherently difficult indicators (IDI) (de Valence, 2012).

Summarising Radosavljevic and Bennett (2012) theory foundation, de Valence (2012, p. 96) outlines the six IDIs as: 1) Established relationships – *relationships existing between interacting teams before project starts*; 2) Relationship fluctuation – *differences in relationships during the project for teams with and without established relationships*; 3) Relationship quality – *time teams of spent previously working together*; 4) Relationship configuration – *the pattern of team interactions over the project (this is a quite complex indicator because it can vary greatly over time during a project)*; 5) Performance variability – *team performance may not be consistent between projects*; and 6) External interference – *factors outside the control of those managing the project*. Clearly, the fundamental variables i.e. IDIs used to determine the most appropriate construction management strategy as suggested by Radosavljevic and Bennett (2012) revolve around the people aspect of organisations. This consideration resonates with the principles and theories underpinning organisation behaviour.

The people aspect of organisation have long been recognised as the most important resource compared to other factors of production e.g. materials, equipment, technology etc as depicted in the progressions of management and organisation approaches over the last 10 decades as shown in Section 3.3.1 and also supported within the context of generic project management (Cooke-Davies, 2002; Thamhain, 2004; Dolan, 2005; Zhang & Xu, 2008; Guiney, 2009). Putting OB in proximal

perspectives within contemporary construction management as defined by Radosavljevic and Bennett (2012) and bringing out its importance as a field of study (which this research explored towards achieving V_fM in building designs) (Knights & Willmott, 2007) Knights and Willmott (2007 states that:

> *People are organised and managed at work . . . Managing people is repeatedly identified as most demanding as well as important . . . and often troublesome. Unlike other factors of production, human beings are wilful and comparatively unpredictable. Their creative power is crucial to production but it can also be deployed to frustrate, and not just facilitate, what they are paid to do. Organisational Behaviour identifies, explores and frequently suggests methods of controlling or 'empowering' the tricky 'people dimension' of managing and organising (p.3).*

Hence, given the aforementioned, attempts at predicting situations are typically based on an understanding and interpretation of behaviours surrounding the situation (behaviour thus been a concept for operationalising human activities within the studies of organisations). In making a case for having a more scientific and defendable approach to making predictions, in spite of the fact that *'human being are comparatively unpredictable'*, Robbins & Judge (2009) advanced that *'unfortunately casual or commonsense approach to understanding can often lead to erroneous predictions. However, predictive ability can be improved by supplementing intuitive opinions with a more systematic approach'*. A systematic approach uncovers important facts and relationships that normally provide a base from which more accurate predictions of behaviours can be made.

Underlying the systematic approach is the belief that behaviours are not random. Rather, there are certain fundamental consistencies underlying the behaviour of all individuals (groups or organisation) that can be identified and then modified to reflect individual (group or organisational) differences. These fundamental consistencies are very important because they allow predictability. Since behaviour is generally predictable, the systematic study of behaviour is therefore a means of making

reasonably accurate predictions. Robbins & Judge (2009) explains that systematic study means *'looking at relationships, attempting to attribute causes and effects, and basing our conclusions on scientific evidence – that is, on data gathered under controlled conditions and measured and interpreted in a reasonably rigorous manner' (p. 11).*

For the current research and from the foregoing, in order to understand client organisation determinants of value for money in building design, a systematic study to uncover the consistencies fashioning out behaviours that results to the design solution proffered during the design stage, is desirable. This essentially entails undertaking an endeavour in *'organisational behaviour'* by establishing the determinants of design-related behaviours i.e. client organisation parameters (COP) that influences the achievement of value in building design and bringing out the relationships that exists between them and the design-related behaviours (i.e. design process) in order to predict likely outcome behaviours (team functioning). Knowledge gained from this endeavour is fundamental to improving the V_fM potentials of design solutions through investigating the influences of these relationships and the implications of their influences.

3.3.3 Concept of Groups within Organisations

A group as defined by Robbins and Judge (2013) is *'two or more individuals, interacting and interdependent, who have come together to achieve particular objectives' (p. 272).* Another definition given by (Martin, 2005) is *'two or more people who have some purpose and interact with each other in such a way that they are psychologically aware of each other and are influenced by each other' (p. 834).* Groups could either be formal of informed. Formal groups are those that are defined by the organisation's structure with predetermined work assignment and established

task. On the other hand, informal groups are formed as a result of social assemblage of individuals within an organisation. In formal groups, behaviours that are expected of members are stipulated by and directed towards organisational goals (Robbins & Judge, 2009). Hence, since building designs are meant to, among other things, fulfil the space requirements of an organisation – which in that context is an organisational goal, this research work concentrates only on formal groups.

Apart from the two broad classifications, groups could be further sub-classified into command, task, interest, or friendship groups. This is shown in Figure 3.2.

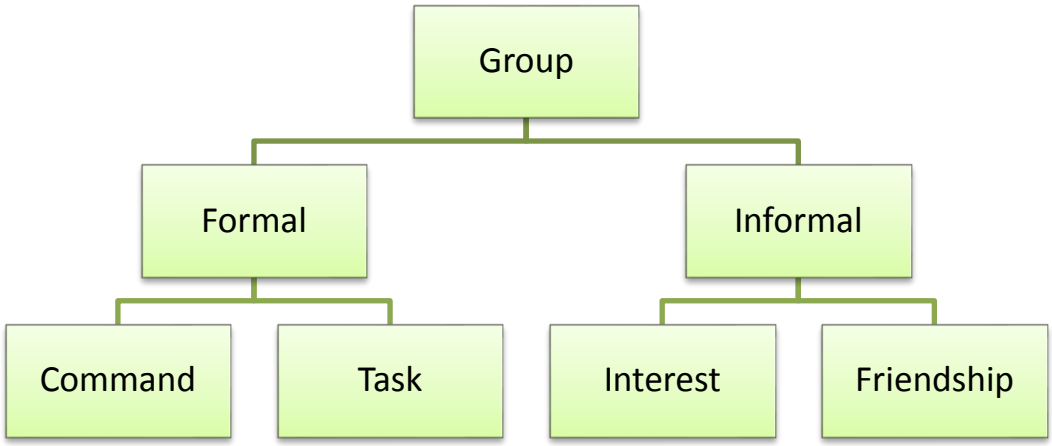


Figure 3.2 – Classification of Groups (Robbins and Judge, 2013)

Command group is determined by the organisation chart, composing of the individuals who are directly under a given manager. Task groups, also organisationally determined, represent individuals working together to complete a job task. However, a task group's boundaries are not limited to its immediate hierarchical superiors, it can cross command relationships. The task group easily leans itself for consideration in this research, particularly under a multi-organisational cross-functional arrangement, wherein an assemblage of individuals – client organisation representatives, project manager(s) and designers – are responsible for the initiation and development of the design of building required by the client. Under such arrangements, the boundaries of

such assemblage go beyond that of the client's organisation (Pryke and Smyth, 2006) involving as it should those of the parent bodies of various participating members of the supply chain, for instance project management firms, architectural firms and engineering firms – structural, electrical, mechanical etc.

3.3.4 Group Development Stages

A framework for understanding group development is the five-stage model of group development (Mullins, 2010). This is a standardised sequence which group generally pass through. The five distinct stages are – forming, storming, norming, performing and adjourning. Framing is characterised by a great deal of uncertainty about the group's purpose, structure and leadership. Group members test out what behaviours are acceptable until they begin to see themselves as part of the group. Storming stage consists of intra-group conflicts on issues pertaining to control, resistance to group constraints thus leading to relatively clearer hierarchy of leadership within the group. The norming stage brings about development of close relationships and group members begin to show much cohesiveness bringing about a strong sense of group identity. The fourth stage is the performing stage where in the group's effort shifts from getting to know and understand each other to that of performing the task at hand. Adjoining stage is the last stage and prepares the group for its disbandment with attention moving from task performance to wrapping up activities.

The Five-stage model assumes that a group becomes more effective as it progresses through the first four stages. A basic problem however with the model, in terms of understanding work related behaviours, is that it ignores organisational context. This is even a truism in situations where group members ab initio knows what is expected of them – i.e. behaviours are pre-determined and are based on specific assignments given to each member of the group. Robbins and Judge (2009) give the following

example to buttress the inappropriateness of the five-stage model in terms of non-consideration of organisational context:

> *A study of a cockpit crew in an airliner found that within 10 minutes three strangers assigned to fly together for the first time had become a high-performing group. What allowed for this speedy group development was the strong organisational context surrounding the tasks of the cockpit crew. This context provided the rules, task definitions, information, and resources needed for the group to perform. They didn't need to develop plans, assign roles, determine and allocate resources, resolve conflicts, and set norms the way the five-stage model predicts.*

An Alternative Model

However, not all groups follow the patterns of the five-stage model (Martin, 2005). Temporary groups with deadlines don't seem to follow this pattern. Studies indicate that temporary groups have their own unique sequencing of actions (or inactions) referred to as the punctuated-equilibrium model thus (Knights and Willmott, 2007; Robbins and Judge, 2013): At their first meeting the directions to follow are sets by team members – referred to as the first Phase; this phase of group activities is characterised by inertia. At the end of the first phase a transition takes place, which occurs exactly when the group has used up half of its allotted time – referred to as the transition phase. The transition phase initiates major changes and is followed closely by a second phase of inertia. The group's last meeting is characterised by markedly accelerated activities. The punctuated-equilibrium model typifies the nature of teams in the construction and even more so for design teams (Lawson, 2005).

3.3.5 Teams and Team Effectiveness

Teams and groups are not synonymous. However, all teams are themselves groups but not all groups are teams. The differentiating factor between them has been attributed to the fact that groups *'have no need or opportunity to engage in collective work that requires joint efforts. So their performance is merely the summation of each group member's individual contribution'* (Robbins and Judge, 2013, p. 309). Martin (2005)

defines teams as *'a small, cohesive group that works effectively as a single unit through being focused on a common task' (*p. 839). Providing more depth to the definition of teams, Mullins (2010) citing Crainer (1998) describes them thus:

> *Teams occur when a number of people have a common goal and recognise that their personal success is dependent on the success of others. They are all interdependent. In practice, this means that in most teams people will contribute individual skills many of which will be different. It also means that the full tensions and counter-balance of human behaviour will need to be demonstrated in the team (p. 307).*

Project teams within construction have been defined in several ways though these definitions mirror those of general definitions but recognising the inherent inter-organisational boundaries. Senarantne & Hapuarachchi (2009, p. 216) presents a review of construction project teams, providing some definition of teams by Chan, Ho, & Tam (2001) and Winch (2002) thus: *'a group of construction professionals and personnel from one or more organisations who combine to fulfil the necessary design, detailing and construction functions comprising the construction'* (Chan, Ho, & Tam, 2001); and *'the consultants, contractors, specialists and others who come together to design, manage and construct a product'* (Winch, 2002).

While the definition of team requires that the business objectives of organisations are aligned within teams through shared common design/project objectives which is the ideal case (Walker A. , 2007), conflicting and contrasting business objectives and lack of mutual accountability are known to exist (Cornick & Mather, 1999; Takim & Adnan, 2008; Saqib, Farooqui, & Lodi, 2008; Garbharran, Govender, & Msani, 2012). This is mainly ocassioned by the fact that each participating member of the construction team is drawn from different firms each having their own specific business objectives which are expected to be at variance with each other. Therefore, as a result of this multi-organisational nature of construction projects, construction teams

are described as inter-organisational teams of cross-functional types with multple reporting relationships (Walker, 2007).

These characteristics of teams within the construction industry are bound to have some effect on their effectiveness. Further, Gibson et al. (2003) notes that the effectiveness of an organisation's team is a key junction toward enhancing the team performance through development of theory while Levi (2007) and Lowe (2009) submits that team performance can be increased by looking at the antecedents of team effectiveness. Despite the fact that studies on teams within the construction had not been popular among researchers in construction management (Spatz, 2000), it is however recieving some form of attention. This is evident from the team studies published in major journals within construction/project management disciplines e.g. Construction Management and Economics, International Journal of Project Management, Journal of Construction Engineering and Management, International Journal of Property and Finacial Management between 2004 – 2015. However, these studies have focused mainly on factors necessary for team success (Fong & Lung, 2007; Bresnen, 2010; Cheung et al., 2013; Manu, Ankrah, Chinyio and Proverbs, 2015), not minding the influence of the process involved nor the contexts under which teams operates.

Within a project organisation, OGC (2007b) described three major teams required for the successful delivery of projects namely: client team, project management team and supply team. The client team is responsible for the strategic aspect of the project, vested with executive powers in ensuring that project is delivered successful. Its membership are drawn from organisation's board members and senior members of the client organisation to perfom functions specific to the roles of the investment decision maker, senior responsible owner, project sponsor and where required independent client adviser(s) as described by OGC (2007b). The project management team is

responsible for leading, managing and coordinating the integrated project team on a day-to-day basis. It is typically composed of senior members of the client organisation – project sponsor and project manager who may be independent of the supplier team. Lastly, the supply team is responsible for dilever of the required outcomes and deliverables. The supply team may be made up of designers and other consultants (say, cost comsultants, engineers, etc, constructor and specilist suppliers. The successful delivery of project is dependednt on the effectiveness of the teams within a intergrate project delivery environment (OCG, 2007b).

In describing effective team, many attempts have been made to identify the associated and defining characteristic features (Hackman, 1987; Campion, Medsker, & Higgs, 1993; Hyatt & Ruddy, 1997) while others have attempted at organising the factors into a unifying and focused framework (Campion, Papper, & Medsker, 1996; Hyatt & Ruddy, 1996; Cohen & Bailey, 1997; Thompson, 2000; Hackman, 2002; Mathieu J. , Maynard, Rapp, & Gilson, 2008). Robbins and Judge (2013) summarised these attempts into a three-dimensional model comprising: contextual influences – *defining organisational settting within which teams operate*; composition related variables – *pertaining to team's make up* and lastly the process dimension – *describing events, activities and actions within teams that influence effectiveness*. These dimensions and their variables are shown in Figure 3.3.

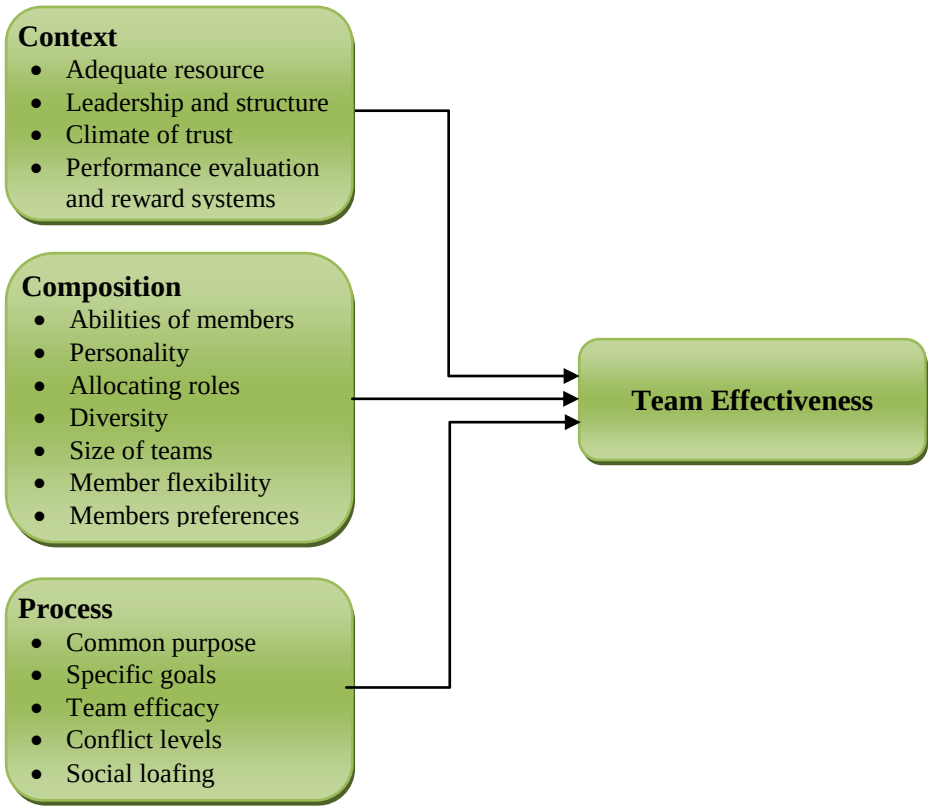


Figure 3.3 – Team Effectiveness Model. (Robbins and Judge, 2013)

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The Robbins and Judge's team effectiveness model is adapted to suit the purpose of this study as discussed below. Whilst the intent of the research is not to measurement effectiveness of design teams in coming up with the design solutions that provides the client with value for money per se, the survey instrument is designed to determine and establish percieved performance levels of the design teams investigated based on the various dimensions that measures effectiveness, as a means of characterising teams. There are several instruments for measuring team effectiveness as outlined above including those of Campion, Medsker, & Higgs (1993), Cornelius Associates (2004), Lefton & Buzzotta (2005), Linkage Assessment Services (2004), Reliable Surveys Online (2005), and Van Der Vegt, Emans, & Van De Vliert (2001).

However, the most popular and widely used are the Team Diagnostic Survey (TDS) instrument developed by Prof Richard Hackman of Harvard University and his team in 2006 available online at http://www.wjh.harvard.edu/~tds, and the Group Management Questionnaire (GMQ) developed by the Napier Group in 2006 (Napier & McDaniel, 2006) also available online at http://www.thenapiergroup.com. The TDS is based on a 58 self-assessment statement tool divided in five main dimensions – real team, compelling directions, enabling structure, supportive context and team coaching. Further the instrument incorporate a process dimension to cater for socialness and causality that exists and mediates between the input-output relations. The GMQ on the other hand is a 72 self-assessment item instrument based on eight team assessment areas (dimensions) – goals/purpose/direction, team climate, conflict, reward, communication, group processes/meeting design, leadership, supervision/performance management. Figure 3.4 shows the mapping of the dimensions of both the TDS and GMQ to the Robbins and Judge's effectiveness model referred to herein as RJM.

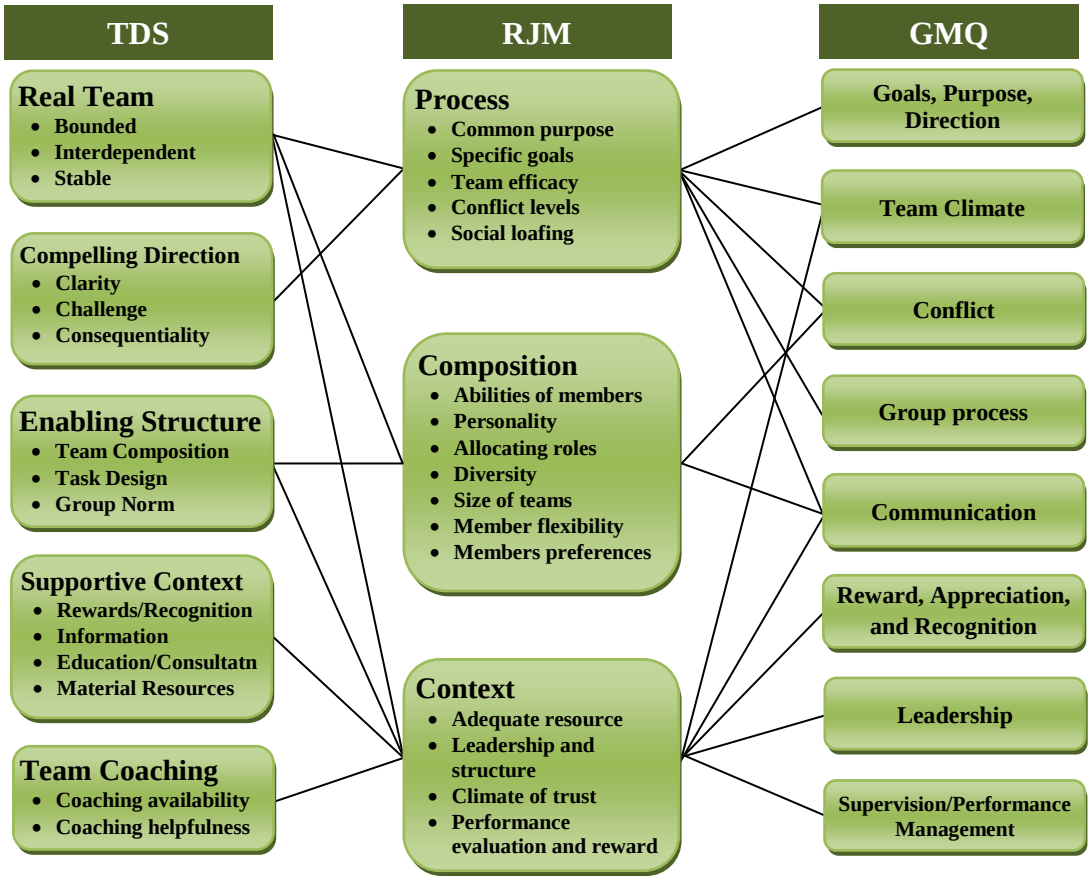


Figure 3.4 – Mapping the TDS and GMQ Dimensions to Robbins and Judge's Team Effectiveness Model. (Adapted: Wageman et al., 2005; Napier Group, 2006; Robbins and Judge, 2013)

Figure 3.4 reflects the representativeness of RJM in terms of the dimensionality of the TDS and GMQ. Based on the descriptives and narratives of each model's dimensions as given by the developers, *real team* and *compelling direction* of the TDS on the one hand, and the following dimension of the GMQ: *goal/purpose/direction*, *team climate*, *conflict*, *group process* and *communications* on the other, maps adequately to the *process* dimension of the RJM. Mapped to the *composition* dimension of RJM are the *enabling structure* dimension of the TDS and the *conflict* and *communcation* dimensions of the GMQ. Though both mapped and associates more to the RJM's *process* dimension they were further described in terms of members abilities and personality hence their mapping to the *composition* dimension of RLM.

Mapped to the RJM's *context* dimension are *real team, enabling structure, supportive context* and *team coaching* of the TDS while from the GMQ are: *team climate, communications, reward/appreciation/recognition, leadership* and *supervision /performance management*. *Real team* and *enabling structure* of the TDS also maps to *process* and *composition* respectively of the RJM as they did to the *context* dimension. These associations may be considered of equal strength hence, both the *process* and *context* dimensions of the RJM can sufficiently represent *real team* and *enabling structure* of the TDS.

While the TDS did not specifically make mention of leadership in its dimensions to team effectiveness, it however emphasises *team coaching* whose description characterises functions within leadership. Hence, the *team coaching* dimension maps neatly to that of RJM's *context*. From the GMQ, *team climate* and *communication* dimensions also maps to those of RJM's *process* and *composition* respectively, as they did to the *context* dimension. While *team climate* is described thus: *members feel open, supported, and trusting of one another. They easily share ideas and feelings . . .*, it associates more with the *process* dimension of the RJM. Similarly, the *communication* dimension of the GMQ associates more with that of RJM's *process* than it does with either *composition* or *context.*

The above theoretic synthesisation of the effectiveness dimensions of the TDS and GMQ within the RJM indicates that the RJM is a good representation of existing team effectiveness models, hence its adaption for this research. Robbins and Judge (2009, 2013) adequately describes the three dimensions of team effectiveness (see Figure 3.3 and 3.4). Below are summaries of these dimensions explaining each of their sub-dimensions as given by Robbins and Judge (2013).

3.3.5.1 Contextual Factors

Four factors defines the context dimension to team effectiveness – adequate resources, leadership and structure, climate of trust and performance evaluation and reward systems. Since teams (even more so for project-based ones) are part of a larger organisation, they would rely on resources from their parent organisation. This has a substantive impact on team performance thus *'perhap one of the most important characteristics of an effective work group is the support the group receives from the organisation'* (Hyatt & Ruddy, 1996, p. 577). The support includes amongst others timely information, proper equipement, adequate staff, encouragement, and administrative assistance. For teams to be able to function, a system for managing their workload in terms of planning, organising, coordinating, motivating etc, must be put in place. This is the function of the leadership and structure aspects to team effectiveness. The absence of this aspect of the context dimension in teams is known to make them less effective (Chen G. , Kirkman, Kanfer, Allen, & Rosen, 2007; Mathieu, Gilson, & Ruddy, 2006).

A culture of trust within teams increases their effectiveness by facilitating cooperation, reducing the need for constant monitoring, and increasing the bond among members. In an atmosphere of trust, team members are more likely to take risk and expose vulnerabilities since members are willing to submit to their leader's directions (Robbins and Judge, 2013). However, team's climate and the resulting level of trust are the outcome of the interaction of a wide variety of behavioural variables (Napier & McDaniel, 2006). For teams to be effective yet, members would have to be both individually and jointly accountable. This is achieved by adopting a system of performance evaluation that focuses on evaluating teams rather than individuals and a rewarding system that recognises individual members for their exceptional contribution and yet rewards the whole team for positive outcomes. Group-based

appraisals, profit-sharing, incentives do reinforce team efforts and commitment (Aime, Meyer, & Humphrey, 2010).

3.3.5.2 Composition Factors

Seven factors define the composition dimension of RJM to team effectiveness namely: abilities of members, personality, allocating roles, diversity, team size, member flexibility, and member preferences. These factors relate to how teams should be staffed (Robbins and Judge, 2013). However, only three of these are considered for the purpose of this research: members' abilities, personality and roles. The reasons for not considering the others are mainly due to the specific nature of teams in construction industry where: (a) membership is determined by the nature of the design tasks to be undertaken (hence size and allocation of roles are highly dependent on this), (b) team composition is based on selecting professional firms, mostly through competition, who then appoint members as they deem appropriate to serve on the team (hence diversity, member preference may be outside the control of the client organisation composing the team). For this reasons, and given that the purpose of investigating teams is to determine the influences organisations (via design teams) have on achieving value in building designs mediated by the design process and not to measure their effectiveness, diversity, team size, members preference and flexibility do not form part of the variables operationalised for the constructs discussed in Section 3.6.4.

Fundamental to team's performance are the knowledge, skills and abilities of its individual members. Though, team's performance is not the mere summation of the abilities of its individual members but rather their collective efforts, the individual abilities set limits on what the team can collectively and effectively achieve. Team performances based on nature of the tasks to be performed have been found to depend on their composition (Robbins and Judge, 2013). Of equal importance, within the

consideration of team members' abilities are those of its leader (Jackson & LePine, 2003). Leaders' abilities are most felt where team members require assistance at undertaking tasks assigned them. Another aspect of team composition is members' personality, also known to effect team performance. Specifically for this research, the Big Five Personality model was adopted (more detailed discussion is given in Section 3.6.4). The model identifies extraversion, agreeableness, conscientiousness, emotional stability and openness to experience as measures of personality. While these factors have been known to strongly affect job performance (Hogan & Holland, 2003; Oh, Wang, & Mount, 2011), their influences on team are also well documented (Barrick, *et al.*, 1998; Bell, 2007; Neill & Allen, 2011).

The third composition factor considered in this research, roles specific to teams, is identified as having significant influence on the performance of teams. Team roles have their specificities and members should be selected to fill these specifics. Generically, there exist nine potential roles teams must fulfil to be effective. These are roles that (Robbins and Judge, 2013): coordinates and integrates – *linker*, initiates creative ideas – *creator*, champions ideas after they're initiated – *promoter*, offers insightful analysis of options – *assessor*, provide structure – *organiser*, provides direction and follow-through – *producer*, examines details and enforces rules – *controller*, fights external battles – *maintainer*, and lastly encourages the search for more information – *adviser*. Margerison & McDann (1990) demonstrates how members' skills and preference play out in the selection of team members towards fulfilling these team roles. In a similar fashion but given changes in contemporary considerations of teams and their dynamism, Humprey, Morgeson, & Mannor (2009) highlights the importance of appropriately assigning roles amongst team members.

3.3.5.3 Team Processes

Five factors defines the process dimension to team effectiveness within the RJM – common purpose, specific goals, team efficacy, conflict level, and social loafing. This aspect of team work relates to the activities members must engage in in order to transform resources into outputs. These activities assists team members produce positive synergies thereby improving their performance. A first consideration in ensuring teamwork is the existence of common plan and purpose for the team in terms of missions, goals and strategies. The existence of a clear sense of what is expected of team relates positively to teams performance (Mathieu & Rapp, 2009). However, there must be collective consensus amongst members on the commonality of plan and purpose. The second factor under process is goals which are derivatives of the team's common plan. They should be framed in terms that demonstrate their achievability, measurability, specificity, and that they shoiuld be focused and challenging in nature. Criteria used in setting goals indeed raises team performances along these measures (Pieterse, van Knippenberg, & van Ginkel, 2011) hence their importance in team effectiveness. Team efficacy is the third factor under the process dimension. Robbins and Judge (2013, p. 321) notes that *teams that have been successful raise their beliefs about future success, which in turn, motivates them to work hard*. Jung & Sosik (2003) calls this team efficacy which is a measure of the extent to which team members have confidence in themselves to succeed at accomplishing tasks assigned them. Closely related to team efficacy are the mental models within teams which are *organised mental representations of the key elements within a team's environment that team members share* (Mohammed, Ferzandi, & Hamilton, 2010). Under conditions of stress, if team members have differring or wrong mental models about their team, their level of interaction with one another reduces, they become less motivated and have

less positive attitudes towards their work, hence their performance suffers (DeChurch & Mesmer-Magnus, 2010).

3.4 Theories of Strategic Supply Management

The link between design and organisation was established in Section 2.5.1 indicating not only the importance of such linkage but also the need for client organisations to own and manage those aspects responsible for the design function i.e. the design supply chain. Conversely, Section 2.5.3 illustrates the exclusivity of the client organisation in the core design process, limiting their involvement to that of defining value only. The point was also made on the potency of client organisations of not only achieving design output but also doing so effectively when they assume the strategic leadership of the design process by managing the design supply chain. This Section conceptualises the theories of supply chain within the pre-construction stage of building projects based on the conceptual, theoretical and empirical synthesisations of Cousins et al. (2008) supported by those of Stevenson (2009), Blanchard (2010), and Booth (2010). This is further substantiated by researches on supply chain management within construction management drawing heavily from conceptualisation of construction supply chain management edited by Pryke (2009).

Pryke's (2009) work played an imperative and supportive role due to it's non-consideration of the design process as part of the supply chain, which is a major and integral consideration within the automotive and aerospace industries where SCM was adopted from (Rossetti & Choi, 2005; Jafari *et al*., 2007; Rose-Anderssen, Baldwin, & Ridgway, 2010; Wiengarten, *et al.*, 2010; Godlevskaja, Iwaarden, & Wiele, 2011; Xia & Tang, 2011). The reason for the non-consideration of the design function may not be unconnected to the nature of the supply chain considered i.e. 'construction' supply chain management which clearly discriminates against 'design' supply chain – the

focus of this research; or on some other considerations reflective of the changing nature of procurement in the industry whereby design responsibilities is becoming that of the contractor (say in design and build arrangementt) or concessionairing (say in a BOT/PPP arrangement). The supportive role played by Pryke's (2009) does not in anyway demean the importance and efficacies of conceptions, principles and theories contianed therein as they apply to the construction industry.

Contextualising supply management within the purchasing lexicon, Cousins et al. (2008) indicate that the term 'supply' has over the years been linked to 'purchasing' described as the *'integral nature of buying something and having it provided or bought'* (p. 7), and having undergone some metamorphosis in its nomenclature viz: materials management, logistics, supply chain management, supply management and currently supply networks rather than *'supply chains'*. This emerging trend is a response to the need to acknowledge the business network context within which the current terminology subsists. Traditional considerations of the importance of purchasing to an organisation had focused on the area of businesses that only manages inputs into organisations. This approach referred to as the first generation views the importance of purchasing from two perspectives: economics and strategic congruence. The second generation viewed its importance from a collaborative relationship perspective whereby managing the supply structure brought about opportunities for negotiation tactics for firms. The third generation saw the introduction of firms managing their supply chain coupled with developing relationships, which was viewed as a key strategic issue. Hence, within this approach, supply management is considered strategic to firms' successes.

3.4.1 Concept of Strategic Supply '~~Chain~~' Management

The ability of, and extent to which, the supply management function (another term for 'purchasing function', both terms used interchangeably herein) of an organisation contribute to the organisation's strategy and impact on its performance has long been recognised. Strategy is defined as *'an integrated set of choices positioning a firm in an industry to earn superior financial returns over the long term'* (Cousins et al., 2008, p. 10); or set of *'plans for achieving organizational goals [that have] a major impact on what the organization does and how it does it [in the] long term, intermediate term, or short term'* (Stevenson, 2009, p. 43). Over time, supply management evolved from mainly technical considerations i.e. purchasing operations, to address more strategic issues i.e. purchasing strategies to been considered as a strategic function.

Strategic supply, also referred to as strategic sourcing, aptly describes the process needed in order to create an effective supply chain. Stevenson (2009, p. 539) defines strategic sourcing as *'a systematic process of analysing the purchase of products and services to reduce cost, by reducing waste and non-value-added activities, increase profits, reduce risks, and improve suppliers performance'*. According to Stevenson (2009) strategic supply differs from traditional supply in that it:

a) Emphasizes total cost (i.e. storage, repair, disposal and sustainability) rather than purchase price only;
b) Seeks to consolidate purchasing power to achieve lower cost, relies on fewer suppliers and collaborative relationships;
c) Works to eliminate redundancies, and employ cross-functional teams to help overcome traditional organisational barriers.

Stevenson (2009) opines that an appropriate supply strategy is developed to minimize a combination of costs and risks based on the nature of the purchase or purchase behaviour in terms of what is bought, who supplied it and from where, what other suppliers are available;. Viewing supply management from the strategic function perspective, i.e. given that it is included as a key decision maker and participant in the firm's strategic planning process, Cousins et al. (2008, p. 18) identified three distinct types of 'purchasing strategy'. These include strategies that: implements competitive strategy *i.e. implementing strategy*; supports strategy of other functions and those of the firm as a whole i.*e. supporting strategy*; and drives the formation of strategy of the firm i.e. *driving strategy*.

In pursuant of implementing strategy, supply management merely manages the requisition and logistics issues of the organisation to ensure deliveries on time, at the right price and acceptable quality. At this basic level, the supply management is not involved on the formulation of organisational strategy. As a function that supports organisational strategic goals and objectives i.e. the supporting strategy, supply management functional strategies and activities are aligned with that of the organisation's overall strategy. In terms of driving strategy, which is the most challenging, supply management drive strategy by providing the firm with a long-term competitive advantage. The stronghold of this function is that supply is the key driver of the firm's strategy and with the combination of excellent supplier relationship and best supply practices it becomes extremely difficult for competitors to imitate.

3.4.1.1 Development and Taxonomy of Purchasing Function

The growth of supply management (as functional units in client organisation) and its development can be evaluated based on the role they play in enabling and implementing a firm's strategy. This is possible since the priorities of supply

management must be derived from the firm's overall strategy. Reck and Long (1988) cited in Cousins et al. (2008) developed a four-stage model for purchasing function development which can be used to evaluate the competitive and/or contributory role of supply management to firm. Table 3.1 outlines the strategic stages of the development of supply management.

Table 3.1– Strategic stages in the development of a purchasing function

Stage	Definition and characteristics
Stage 1 **PASSIVE**	**Definition:** Purchasing function has no strategic direction and primarily reacts to requests from other function **Characteristics:** • High proportion of time spent on quick-fix routine operations • Purchasing function and individual performance based efficiency measures • Little inter-functional communication due to Purchasing's low visibility • Supplier selection based on price and availability
Stage 2 **INDEPENDENT**	**Definition:** Purchasing function adopts the latest purchasing techniques and practices, but its strategic direction is independent of the firm's competitive strategy **Characteristics:** • Performance primarily based on cost reduction and efficiency measures • Coordination links between purchasing and technical disciplines are established • Top management recognises the importance of professional development • Top management recognises the opportunities in purchasing to profitability
Stage 3 **SUPPORTIVE**	**Definition:** Purchasing function supports the firm's competitive strategy by adopting purchasing techniques and products, which strengthen the firm's competitive position **Characteristics:** • Purchasers are included in core operations/sales proposal teams • Suppliers are considered a resource, which is carefully selected and motivated • People are considered a resource, emphasis on experience, motivation & attitude • Markets, products and suppliers are continuously monitored and analysed
Stage 4 **INTEGRATIVE**	**Definition:** Purchasing's strategy is fully integrated into the firm's competitive strategy and constitutes part of an integrated effort among functional peers to formulate and implement a strategic plan. **Characteristics:** • Cross-fnctnal training of purchasing professional an executives in made available • Permanent lines of communication with other functional areas are established • Professional dev'mt focuses on strategic elements of the competitive strategy • Performance is measured in terms of contributions to the firm's success

Source: Reck and Long (1988)

Stage 1: **Passive** – is the poorest level of contribution by purchasing function, having no strategic direction for itself and merely reacts to requests from other departments in terms of filling requisitions, expediting shipments and auditing invoices, with little opportunity to add value to the organisation since they are kept busy attending to more immediate supply problems. Stage 2: **Independent** – purchasing function continuously embrace latest purchasing techniques and tools (e.g. value analysis, IT links, supplier partnership) used within industry, though it may not necessarily contribute to advantage but by benchmarking with competitors, it ensures that parity with the competition is maintained with efficiency still been the primary focus but now they are seen as 'professional'.

Stage 3: **Supportive** – purchasing function would have reached 'top division' in their market been 'broadly up with the best' but not necessarily better than competition on every aspect of purchasing, and is thus 'supportive' of the firm's strategy in terms of consistency when making purchasing decisions given that top management views it as an essential business function thereby strengthen the firm's competitive advantage by sharing information with all departments on mattes that may impact the firm's strategic goals. Stage 3 is the limit of purchasing function of many firms Stage 4: **Integrative** – Purchasing function would have attained the status of forming the basis of its firm's competitive success, enabled by the skills and capabilities built over stage 1 – 3; thus viewed as an integral part of the firm's competitive strategy by looking to long term, attending strategic sessions and likely changes in supply markets and being *'one step ahead'* of competitors thereby taking advantage of opportunities and minimise potential threats before they become a problem.

Based on Reck and Long's (1998) model, Cousins et al. (2006) (Cousins, Lawson, & Squire, 2006) provides an empirical taxonomy of purchasing functions based on four

variables namely: purchasing status of the organisation, internal integration, purchasing skills, and involvement in strategic decision making. Their investigation brings out four distinct types of purchasing function within firms: strategic, celebrity, undeveloped and capable as shown in Table 3.2. Table 3.2 shows Cousins et al. (2006) taxonomy of purchasing functions and based on the aforementioned characteristics, in relations to Reck and Long (1988) four-stage development model for purchasing function in firms.

Table 3.2 – Taxonomy of Purchasing Functions

Characteristics	**Cousins et al.'s Taxonomy**			
	Strategic	**Celebrity**	**Undeveloped**	**Capable**
Strategic Planning	Average	Low	Low	Average
Purchasing Skills	High	Average	High	Average
Purchasing Status	High	Average	Low	Average
Internal Integration	Average	Low	Low	Low
Rock and Long's	**Integrative**	**Not Applicable**	**Independent**	**Supportive**

Drawing from the concepts/theories of purchasing approaches, purchasing strategy, purchasing function development and its taxonomy as outlined above, and given Cousins et al.'s (2008) assertion that '*with pressures of increasing competition [say competition for funding in the public sector], improve time-to-market [including quality considerations], and cost reduction, [all ingredients in value for money considerations,] organisations have to respond by re-engineering their supply structures to match the strategic pressures and priorities that are being placed on the firm'*., an understanding of how supply management contributes to achieving value for money in building design may as well begin with the classification of supply management within client organisations based on their strategy, development and/or taxonomy.

From a client perspective, embarking on a project is considered a strategic decision in itself (Pryke & Smyth, 2006). Within the public sector, achieving value for money in projects (and by extension building designs), is considered a strategic goal, for instance, towards *'the attainment of transparency, competitiveness, cost effectiveness and professionalism in the public sector procurement system'* (PPA, 2007, p. 4); Similarly, the OGC (2003) in outlining the essence of its Achieving Excellence initiative launched in 1999 indicates that it is '*to improve the performance of central government departments, their executive agencies and non-department public bodies as clients of the construction industry. . . . . through a strategy of sustained improvement in construction procurement performance and in the value for money achieved by government on construction projects' (p. 2)*. Hence, given the strategic nature of public sector projects, Procurement Units within client organisations are expected to serve strategic functions therein. Therefore a classification of client organisation based on the nature of their strategy, development and taxonomy will assist the research in determining the extent to which they are strategic in performing their functions.

Given the strategy role that projects assumes in the public sector as outlined above, and relating this to organisational objectives i.e. the business need, the OGC (2007d) for instance, in drawing up a good starting point in the procurement process, advices client organisations that apart from defining clear objectives and the success criteria at the outset of the project, *'Expert advice may be needed on how to meet the business need – the obvious solution may not be the best, consider the need for flexibility as well as the immediate business need; confirm that the project will contribute to strategic objectives' (p. 6)*. The OGC (2007d) further emphasised that *'Clients with regular construction requirements should seek long term relationships with the supply*

teams ..... This should ensure that key members of the project team can provide valuable input from the earliest stages of the project, it can also ensure a culture of continuous involvement' (p. 9).

Relating the aforementioned to the characterisation of supply management within public sector in terms of approaches, strategy, development and taxonomy, parallels can easily be drawn to suggest the nature that supply management should assume to ensure the achievement of value for money in designs thus: that the purchasing function should be at least of the *'second generation'*, adopt the *'supporting strategy'* at the minimum, should have developed to *'Stage 4 – Integrative'* on the Rock and Long's four-stage development model and classifiable as a *'Strategic Purchaser'* on the Cousins et al.'s taxonomy. These benchmarks are used as the basis for characterising client organisations during the case study phase. Purchasing functions in client organisations that are benchmarked lower gives an indication of their inferred incapability (via deductive reasoning) of influencing the design supply team towards achieving value for money in building designs which are strategic considerations in public projects.

3.4.1.2 The 'Make–Buy' Decision

The decision to either 'make' or 'buy', a fundamental to supply management, is contingent on some critical factors e.g. capability, industry positioning, firm's boundary (in terms of scale and scope of production). While this may not be a fundamental consideration for public sector organisations – where the decision is mostly to buy (given the inherent underlying principles of procurement therein e.g. transparency, equity, fairness, competitiveness etc), three fundamental theoretical perspectives seeks to explain the decision making process. These perspectives are the neoclassical economic theory, transaction cost economics theory and the resource-

based view theory. While these theories may not have a significant impact on this study i.e. focusing largely on the public sector organisations, an understanding of how the theories influence the make-buy decision within purchasing functions suffices. Further, an understanding of the approaches considered by client organisations in framing their make-buy decision will also give valuable insights into their value system.

Neoclassical Economic (NCE) Theory

Under the neoclassical economic theory, firms are viewed as units of production consisting mainly of transforming inputs into outputs with the sole purpose of profit maximisation which in itself is reliant on complete rationality and full information i.e. the economics concept of perfect information (Hart, 1989; Chandler, 1992 cited in Cousins et al., 2008 p.30). For this reasons, and the fact that the theory views firm as only existing for the purpose of profit making, firms are seen to be homogeneous entities and hence have equal access to production resources particularly technology (Conner, 1991 cited in Cousins et al., 2008). Given that since firms exist only to maximise profit, it assumes that there is no cost to economic exchange hence firms may have no apparent reason for existing in the first place (Barney & Ouchi, 1986; Kay, 2000). The above arguments leads Cousins et al. (2008) to conclude that neoclassical economic theory offers little to nothing to the make-buy decision of purchasing functions given that it is premised on increasing production until marginal revenue equals marginal cost, thus maximising profit.

Contextualising the NCE theory within construction may only appeal to the supply partners and still yet it would not have mattered in their make-buy decisions. Within client organisations and with specific reference to building designs, the need for buildings are not motivated by profit (as would have been the case had the buildings

were meant for either outright sales or rentages), hence their designs would not be seeking to maximise profit. Rather, such buildings, needed to fulfil the demand for social amenities, for public projects in particular, are driven by the need to maximise value or give value for money. And given that these are more of social demand than economic demand (profit), the NCE theory may not explain client organisations' decision to either do their designs themselves or outsource them based on profit maximisation but rather on the basis of cost minimisation or crudely termed cost savings. An insistence towards cost minimisation by client organisation in procuring design services may be a good indication of adopting the NCE theory.

Transaction Cost Economic (TCE) Theory

TCE theory is premised on the understanding that firms exist due to 'transaction cost' (i.e. *'the costs of planning, adapting, coordinating and safeguarding exchange'*) or the price of using open market price mechanism (Cousins et al., 2008). And as the level of these transaction costs increase firms are more likely to 'make' rather than 'buy'. TCE theory is based on the interaction of two behavioural assumptions i.e. bounded rationality (focusing on satisfying organisational objectives through ways that does not optimise or maximise profit) and opportunism (achieving one's goal through calculated efforts to mislead the other party); and two transaction assumptions i.e. asset specificity (the transferability of an asset say training, within an exchange relationship) and uncertainty (e.g. inability to predict the behaviour of the exchange partner or future states of technology, demand and supply).

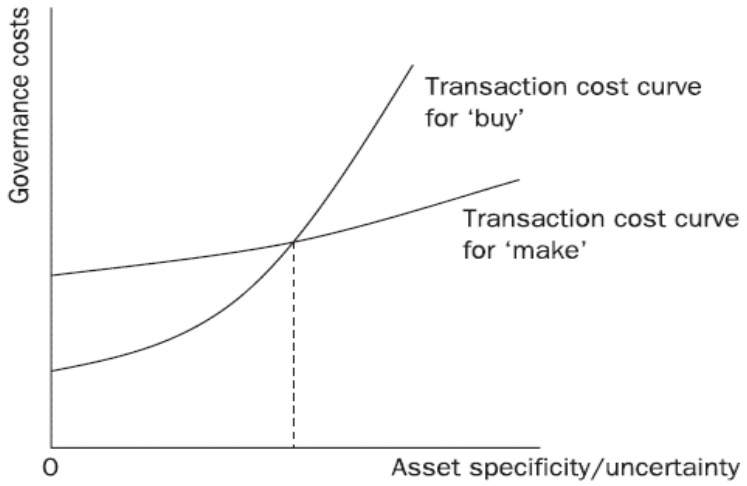


Figure 3.5 – Transaction cost curves for make versus buy (Source: Cousins et al., 2008)

The TCE is considered a clear and structured framework to assist in the decision-making process in that it demonstrates how the level of transaction costs of the exchange will be determined by interactions between the terms within the behavioural characteristics and those of transaction. While a detailed understanding and explanation of the TCE is outside the scope of the research (See Cousins et al., 2008 for detailed explanation of how these interactions leads to the make-buy decision), Figure 3.5 showing the transaction curve costs for make verse buy suffices. The reason for this being that the essence of considering the make-buy theories for the purpose of this research is to show their relevance to supply management and to assist in understanding the client value system, specifically investigating whether or not these considerations are made and where they are, which of these theories are applicable.

Essentially, since the study focuses on public client organisations, the nature of procurement therein (public procurement generally requires that design functions be outsourced) may determine the make-buy decision which is to 'buy' rather than a decision made by the purchasing functions. However, given that data were collected from private organisations, the inclusion of investigating the approaches client

organisations' adopt in their make-buy decision is justified. In the event that the make-buy consideration is made, Figure 3.5 indicates that though both curves being nonlinear given that the interactions between the behavioural and transaction variables are positive (i.e. as the cost related to behavioural characteristics increases, the governance costs also increases), the rate of change of the transaction costs curve for 'buy' is more exponential compared to that of the 'make' curve which can easily in fitted to a linear function with a gentle slope.

Applying the transaction cost curves as shown in Figure 3.5 to the 'make-buy' decision within design supply management based on optimal choice i.e. the one that minimises the transaction costs, the following decisions may arise:

i. That where the purchasing functions of client organisation adopts the 'implementing strategy' and/or is at the 'undeveloped' stage (an indication of low levels of asset specificity and uncertainty) the decision to buy would be more efficient and therefore should be preferable. However, when purchasing functions pursues either a 'supporting' or 'driving' strategy and/or are either at the 'supportive' or 'integrative' stage of development then it becomes efficient for them to 'make' or they may choose to integrate rather than 'buy'.
ii. Where purchasing function is focused on the 'implementing strategy' and/or either they are at the 'passive' or 'undeveloped' stage of development the nature of relationships may be that the client organisation engages design consultants only when there is the need to procure buildings. No long-term relationship exists between design consultants and the client organisation after the completion of the project. This typifies the traditional procurement method or design-bid-build method, particularly in the public sector for simple projects.

iii. Where the purchasing function is based on the 'supporting strategy' and have attained either the supportive or integrative stage of development, the nature of relationship between the design supply partners and the client organisation would be one based on long-term, with the client organisation investing in the supply partners. Such relationships may continue even after completion of the project. This is typical of integrative approaches to procurement e.g. design and build, BOT, PPP on the one side and in procurements that make us of framework agreements.

iv. At a point where the nature of the technical characteristics reflects the same behavioural characteristics (governance cost) for both the 'make' and 'buy' transaction costs i.e. where both curves intercept – the point of equilibrium, both the choice to either 'make' or 'buy' are considered efficient. This would describe a purchasing function that pursues a 'supporting strategy' and/or is at the 'independent' or 'supportive' stage of development. This would best describe the situation where in some design partners are retained on a long-term basis for some projects and in some other instance, where they are not retained each design partner may serve on multiple projects at the same time.

Despite the benefits and superiority in application of the TCE over that of NCE, two critiques apply: its inability to address the limitation of firms, and been a theory of cost minimisation rather than value maximisation. In the former instance, by equating production functions across firm, the TCE assumes that all firms have equal capabilities. However, capabilities have been shown to differ across firms and are path dependent based on the unique trajectories of individual firms (Hodgson, 1998; Madhok, 1996; Nelson & Winter, 1982; Barney, 1991 cited in Cousins et al., 2008). In the latter instance, i.e. TCE being a theory of cost minimisation, transaction within the

TCE may be viewed inefficient but hitherto would have created value that may be the greatest otherwise. The reason being that firms do not exist simply due to market failures but have positive, value-creating attributes not found in markets Zajac & Olsen, 1993; Lazonick, 1991; Ghoshal & Moran, 1996 cited in Cousins et al., 2008).

Resource-Based View (RBV) Theory

Unlike the NCE theory which views firms as one of a productive set i.e. transforming inputs into outputs, the RBV theory view firms as 'a bundle of productive resources under the direct control of the administrative unit' (Cousins et al., 2008 citing Penrose, 1959). Resources include the tangibles – plants, equipment, land, raw materials, and inventory; and the intangibles – human resources in terms of skills, knowledge. RBV is premised on the assumption that resources are heterogeneous (limited in supply) and are characterised with differential levels of 'efficiency' (Peteraf, 1993 cited in Cousins et al., 2008). The strength of the RBV theory over the others lies in its ability to identify conditions under which the returns of *'superior resources'* are sustained over the long term. Superior resources are those that are more efficient and they enable firms produce at lower cost or better satisfy customer demand.

The condition under which competitive advantage can be sustained is governed by three criteria namely *imperfect imitability*, *imperfect substitutability* and *imperfect mobility*. Imperfect imitability is the condition where firms that do not have certain resources cannot obtain them and this i.e. inimitability of resources is possible for one or a combination of the following: unique historical conditions, causal ambiguity and/or social complexity (Lippman & Runmelt, 1982; Dierickx & Cool, 1989 cited in Cousins et al., 2008). Imperfect substitutability is the condition where resources are resistant to substitution hence, resources that can be substituted cannot sustain competitive advantage over the long term. Imperfect mobility depicts the condition

whereby resources are not movable between firms due to their significantly lower value outside their current use or their prohibitively high transfer transaction costs (Arrow, 1974; Williamson, 1985 cited in Cousins et al., 2008). Hence only superior resources that are non-tradeable or significantly less valuable to others will be capable of generation sustained competitive advantage (Cousins et al., 2008).

To aid the make-buy decision, the RBV theory acknowledges the existence and boundaries of firms independent of the effects of opportunism but rather that they are positive entities that exist because the combination of specific resources engenders advantage that is not available in market forms of transactions. This focuses attention on the capabilities specifically control of superior resources. Hence, within the RBV theory, the decision to make or buy is depended on the extent to which the new undertakings are specific to current capabilities and the cost of developing or acquiring the necessary capabilities (Conner, 1991; Hodgson, 1998; Williamson, 1999 cited in Cousins et al., 2008). Again, as observed earlier for public sector organisation, the make-buy decision is policy driven at national level rather than firm-based. Hence, the consideration of the RBV may apply only to the private sector organisations.

3.4.1.3 Sourcing Strategies and Supply Structure

Various sourcing strategies are open to firms however their choice is contingent on the importance of a good or service to the firm, the competitiveness of the supply market or market complexity, and technical complexity of the product. Under supply market complexity which focus on issues external to the firm, the main factors to consider include: *power relations* – ability of buyers (supply exceeds demand) and suppliers (demand exceeds supply) to control market; the *availability of supply* – attractiveness of the market to new entrants and barriers to entry, and intensity of competition among

current participants; and *substitution possibilities* – availability of replacement goods or services in market will affect the supply-side risk of the buyer firm.

The Impact on business consideration in the choice of sourcing strategies focuses on factors that are 'internal' to the firm. However, Cousins et al. (2008) notes that identifying the factors to consider in determining the extent to which a product or service can impact on the firm is 'reasonably' difficult because of the contradictory nature of the terms within this variable. Three factors have hitherto been considered: cost, value and risk with cost being the main focus given that risk and value are relatively much more difficult to calculate. Under the cost approach, the Pareto 20/80 analysis is widely applied. The rule recognises that up to 80% of the cost of a system is accounted for by only 20% of its constituents. Hence in these product or services under these categories are placed in the high area of the impact spectrum and then there risk and value computed in order to appropriately determine the best sourcing strategies for them.

Based on the aforementioned internal and external factors i.e. impact on business and supply market complexity respectively, Cousins et al. (2008) outlines the Kraljic (1983) positioning matrix designed to help, and very popular, in the formulation of appropriate sourcing and competitive strategies. Booth (2010, p. 92) also provides similar explanations of the matrix. The positioning matrix, outlining the key features of each quadrant in terms of category and nature of spend, is shown in Figure 3.6.

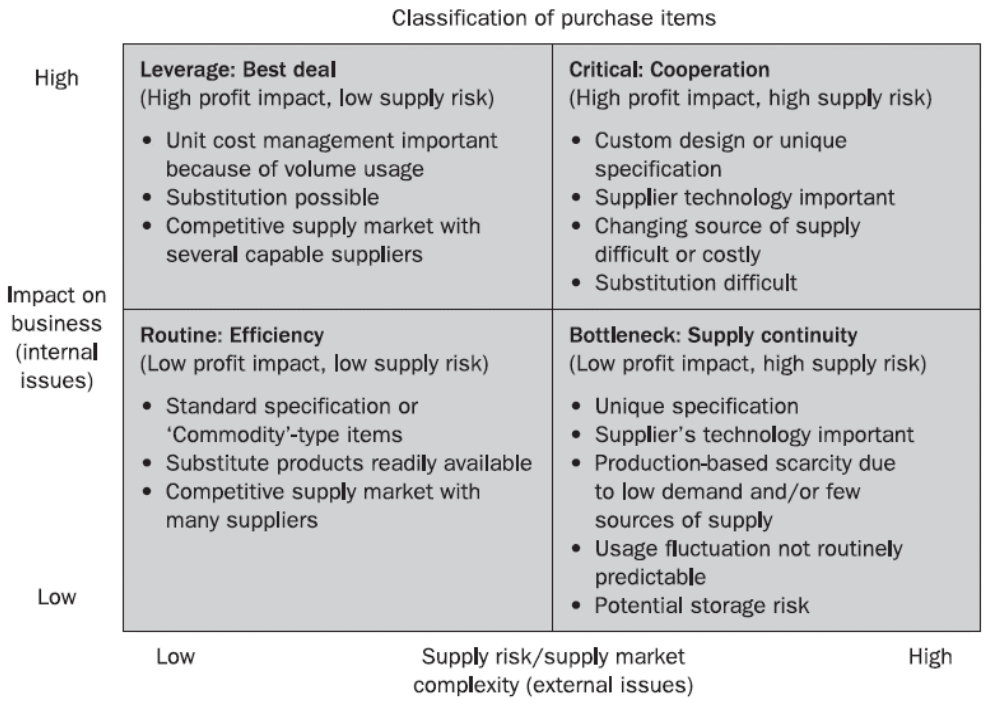


Figure 3.6 – Kraljic positioning matrix (Source: Cousins et al., 2008)

The matrix provides four distinct sourcing strategies in terms of spend categories as follows:

i. **Strategy 1** – aimed at the spend category that is known as ***routine*** items i.e. products or services of low value or cost and low technical or supply risk. And since switching cost is low and market highly competitive, buyers would negotiate a price. This calls for an approach based on a strategy based on *efficiency* i.e. paying the most competitive price while maintaining delivery and quality standards.

ii. **Strategy 2** – aimed at the spend category known as ***bottleneck*** items i.e. items that seriously affects the delivery of the buyer's products or services but of relatively low value and rare in the supply market. The approach here is to follow a strategy that maintains supply continuity through establishing long-

term contracts. Under this buyer will tend to focus on total cost rather on purchase price.

iii. **Strategy 3** – aimed at the spend category known as ***leverage*** i.e. pulling together a range of similar products to increase contract size and therefore buyer bargaining power. The approach here is to follow a strategy that provides the best deal possible since buyer power is high and supplier power is low. This strategy is consistently followed by firms pursuing a cost reduction strategy.

iv. **Strategy 4** – aimed at the spend category known as ***critical*** items i.e. products or services characterised by high supply risk and having high impact on firm's business. Suppliers under this segment are referred to as strategic suppliers. These involves large amount of investment and switching costs are generally very high with mutual dependencies. Hence the approach here is to adopt a strategy that promotes collaboration, cooperation and mutual development.

The quadrants in the Kraljic positioning matrix each suggests a sourcing strategy which in turn dictates a related sourcing or supply *structure* that is most appropriate there for. Cousins et al. (2008) identifies four primary sourcing structures that can be used: single, multiple, delegated and parallel which they juxtaposed on the Kraljic matrix to explain the suitability of each structure relative to the sourcing strategies as shown on Figure 3.7. The complexity of the various structures ranges from the simplest structure – single or sole sourcing to the more complex structures – delegated and parallel sourcing.

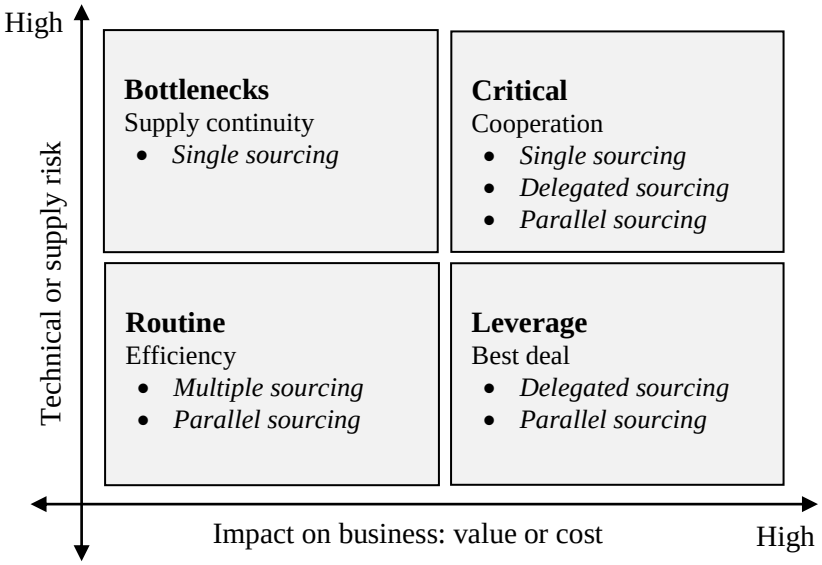


Figure 3.7 – Mapping of sourcing strategy and sourcing structures (Cousins et al., 2008)

The decision on when and where to apply each of these structures depends on the: i) needs and wants of the firm, ii) type of relationship desired, iii) acceptable level of dependency between buyer and supplier, and iv) nature of market-based competition. Below is a brief description of each of the supply structures (Cousins et al., 2008):

a) **Single sourcing** – characterises a buyer with only one source of supply for a particular good or service. This may be the case where such choice is deliberately made by the buyer due to high cost or strategic importance to the end product, as a result of market instigation, or that there may only be one source of supply. The advantages include: easy exchange of ideas i.e. knowledge exchange, clear understanding of cost structures, encourages continuous improvement on product and process, focus on long term and relationship development. Its disadvantages includes buyer over reliance on supplier, customer could be highly exposed in the marketplace, restriction in buyer's flexibility to acquire new technologies thereby jeopardising competitiveness.

b) **Multiple sourcing** – this describes the securing of multiple supply sources to supply a particular product or service on a price competition basis. A range of suppliers is available from which choice can be made by playing suppliers off against each other to achieve best price. The advantages includes continuity of supply in the short term, achievement of price reduction while its disadvantages are collusion and prices rise and adversarial in nature. This has traditionally been the mainstay of procurement strategy, it is however being replaced by delegated and parallel sourcing because they are more sophisticated and value-adding.

c) **Delegated sourcing** – this describes the sourcing that involves making one supplier responsible for the delivery of an entire sub-assembly as opposed to an individual part. This is a way effectively managing the supply since the buyer works with one supplier who in turn manages the other suppliers. The advantages includes reduction in day-to-day transaction costs, exchange of more detailed information, capability and technologies transfer from buyer to supplier,, increased supplier dependence on buyer and increased authority and control of supplier over delivery and production. A main disadvantage is the creation of 'mega' supplier who may become very powerful leading to increase in prices.

d) **Parallel sourcing** – this structure allows the buying firm to work on a single or sole-sourced basis with each component supplier within a product group while maintaining a multiple-sourced relationship across product groups. Its main advantages include maintenance of price competition, reduced complacency, protection against capacity constraint issues, close working relationships, improved information sharing (cost and design specifications), and continuous process improvement.

3.4.2 Framework of Strategic Supply Management

Stevenson (2009) refers to a framework for effective supply chain as one consisting of trust, effective communication, information velocity, supply chain visibility, event management capabilities and performance metrics. These are the main ingredients needed for the *'integration of all aspects of the supply chain . . . . . to have a cooperative relationship among supply chain partners that will facilitate planning and coordination of activities'* (p. 539). Trust plays a focal point in ensuring that trading partners feel confident that goals are similarly shared and that actions taken are mutually beneficial. Information velocity i.e. the speed at which information is communicated (two-way) in a supply chain is important to its success. Event management is the ability to detect and respond to unplanned events and requires four capabilities namely monitoring, notifying, simulating and measuring. Performance metrics are necessary to confirm that the supply chain is performing as expected or identify areas where improvements are needed.

Cousins (2002) developed a comprehensive conceptual model that provides a way of analysing the behaviour and preferences exhibited by organisations as they approach the need for strategic purchasing and supply. The model also provides the means of planning such an approach in practice (Cousins et al., 2008). The Cousins' (2002) model is adopted in this research as a basis of exploring the concepts of strategic supply management and for their conceptualisation within design supply in client organisations. This will further assist in operationalising the concept towards investigating client organisations and their value systems and how these impact on achieving value for money in building designs. This section discusses excerpts of Cousins et al.'s (2008) synthesization of the Cousins' (2002) model.

The model identified three interactive constituent parts to strategic supply management which also serves as the main drivers for its development. These are: policy-based approaches, process-based approaches and procedure-based approaches. The policy-based approaches sits at the centre of the model and are concerned with the formulation of the supply strategy with strong emphasis on the need for aligning and understanding policy and strategy within the supply chain. This function is central to the successful implementation of the supply strategy.

Process-based approaches refer to those factors linked to specific organisational processes that are prerequisite for the facilitation of strategy implementation. These include the development of appropriate skills and competencies, organisational structures and relationship portfolio. Procedure-based approaches are concerned with organisational procedures that are needed to facilitate strategy implementation through organisational systems. These include use of performance measures and total cost-benefit analysis. The composition of these constituent parts i.e. six elements is shown in Figure 3.8. The following sections discuss each of the parts and relate them to design supply management.

3.4.2.1 Aligning Corporate and Supply Strategies

Aligning corporate strategy with that of supply represents the hub of the strategic supply model and is also considered the most important of its six elements as shown in Figure 5.8. This section outlines three basic aspects that impacts on strategic alignments: levels within organisations, strategic alignment and the process of alignment. Deriving from Quinn's (1980) definition of 'strategy' three important functions emerged (Cousins et al., 2008, p. 101):

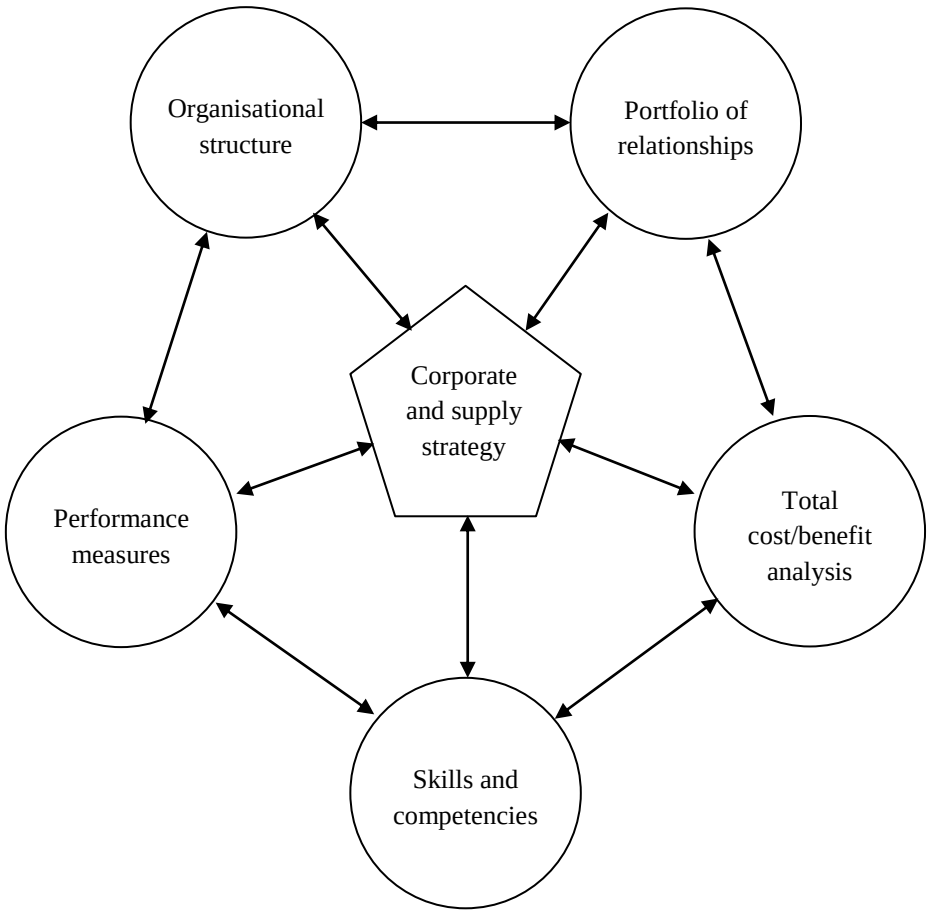


Figure 3.8 – Framework for analysing strategy behaviour (Source: Cousins, 2002)

i. *Strategy affects the scale and scope of an organisation's activities over the long term*. This helps determines extent of vertical integration, decisions to expand and the boundaries of organisation over the long term.

ii. *Strategy is about being responsible to changes in the external environment*. This is achieved by being responsive to current and future states of external market.

iii. *Strategy is about aligning activities with strategic resources and capabilities*. In line with the RBV, strategy is about matching activities with capabilities.

Levels of Strategy within Organisations

For the purpose of supply management, three levels at which strategy is developed within organisation are corporate, business and functional. Corporate-level strategy asks *'what business are we in'*? This is more of defining organisational boundaries. Business-level strategy asks '*how do we compete in our chosen markets'*? Since markets differ this would necessitate different strategy. Strategies at this level are product dependent. Functional, functional-level strategy asks *'how can our function support business- and corporate-level strategies'*? Strategies at this level involve the development and coordination of resources and capabilities to help execute business-level strategy.

Purchasing function should be involved in the process of strategy formulation at the business and corporate levels to infuse knowledge of their skills and capabilities, customers and competition into these high-order strategies. Such involvement would also accord them the ease of translating both corporate- and business-level strategies into short- and medium-term plans for their implementation. However, for client organisations such hierarchy of strategies would not reflect a core function but rather that of a support function. This is due to the fact that the buildings procured by sure clients will only serve to provide functional spaces for the organisation's core activities. Giving specific example is the case of tertiary institutions – universities which were case studied. Their core function is that of educational services while providing buildings for lecture halls, student hostels, and libraries is a support function which facilitates the provision of the educational services.

Strategic Alignment

Strategic alignment is achieved when functional strategies connect with business- and corporate-level strategies and such an alignment is important so that resource

allocation and activities at the functional level are consistent with high-level objectives. Strategic development can be both 'top – down' i.e. from corporate to functional, and 'bottom – top' i.e. from functional to corporate ((Brown & Cousins, 2004; Brown, Squire, & Blackmon, 2007). Strategic alignment between supply chain and corporate strategies is achieved where the goals of the supply function are aligned with one or a mix of the following competitive priorities of the organisation which are developed overtime to depict the organisation's reputation: cost, quality, flexibility, delivery, and innovation.

Process of Aligning Supply and Corporate Strategies

Cousins et al. (2008) recognises a four-step process in the alignment of strategies within organisations. These are developing corporate strategy, determining competitive priorities, developing supply function objectives, and lastly formulating supply chain practices. The first step of aligning supply and corporate strategies is developing the corporate strategy.

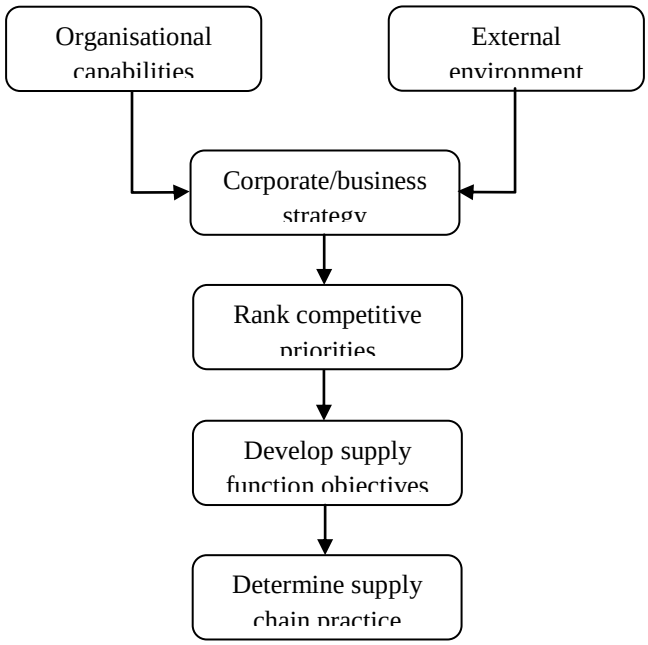


Figure 3.9 – Process of aligning supply and corporate strategies (Source: Cousins et al., 2008)

Developing the corporate strategy is influenced by the organisational capabilities and external environment as shown in Figure 3.9. Critical to this aspect is the involvement of the supply function i.e. the extent to which the supply strategists actively participate in corporate- and business-level strategic decision making. Narasimhan & Das (2001) argues that supply involvement lead to improved performance. Despite this, the extent of involvement of purchasing functions in strategy development within the UK is still very low (Cousins et al., 2008).

The next step is the setting of competitive priorities. These are generally developed by the operations function in conjunction with corporate planners. This exercise would require some form of trade-offs among the competitive priorities which are narrowed down to one or two and then ranked in order of relative importance for the supply function. The ranked competitive priorities are then operationalised in form of *'supply function objectives'* for implementing their supply function. The final set in the process of aligning strategies is the move from objectives to the determination of supply chain practices – the major tools and techniques applied within the supply function. These include supplier base rationalisation, supplier selection, supplier development, supplier performance measurement and relationship management. Cousins et al. (2008) advise that these practices be applied with full consideration of the competitive priorities and objectives of an organisation i.e. they should be driven by firm-level priorities.

3.4.2.2 Competencies and Skills for Strategic Supply

The concept of strategic supply over the past two decades have seen an evolution in supply management from a tactical to a strategic function which presently and emergently requires strategic alignment with and supportive of, overall corporate objectives. These emergent trends also have significant implications for the skills and

competencies of the purchasing professionals within it. Supply can only perform strategically and in consonance with corporate strategies if the people working therein possess the requisite skills and competencies to operate that way (Narasimhan & Das, 2001; Brown & Cousins, 2004; Cousins, Lamming, Lawson, & Squire, 2008).Within the skills and competencies component of the Cousins (2002) strategic supply framework, two distinct aspects were identified as key to the success of supply management namely competency requirements for strategic supply and purchasing competency development.

Competency Requirements for Strategic Supply

Competencies needed for supply varies depending on the type of supply and the level of its strategic intent within the firm. Based on a listing of 97 descriptions of purchasing competencies articulated from literature and empirical evidences, Cousins et al. (2008) populated the Kraljic's positioning matrix with selected competencies. This is shown in Figure 3.10. Based on the wide variance observed across companied in the identification of competencies, Cousins et al. (2008) concludes that it is very difficult to identify list of generic competencies that is supportive of effective purchasing behaviour for all firms, therefore competencies should be viewed as situation specific.

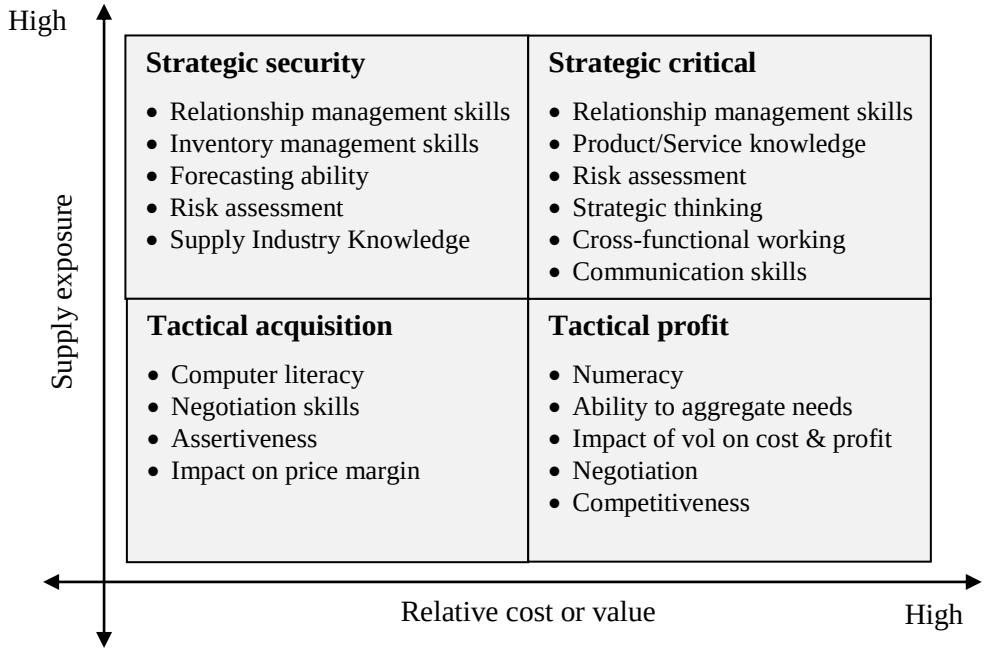


Figure 3.10 – Strategic supply competency table (Cousins et al., 2008)

Further to these competencies, Cousins et al. (2008) outlines key competencies required of purchasing professionals within five areas Strategic planning: *planner, goal setter, completer-finisher*; communication: *presenting, public speaking, listening and writing*; Financial: *cost accounting, making a business case, and economics*; Technical: *computer literacy, mathematics, and process development*; Team building: *leader, decision maker, and influencer*.

3.4.2.3 Performance measurement

Critical to the successful management of a firm's supply chain is performance measurement, and a key means of monitoring and evaluating the actions of individuals and work groups within the function. Traditionally, performance measures focused on the internal operations of the purchasing function neglecting supplier performance. The fundamental objective of a purchasing and supply chain performance measurement system is '*to aid in strategy implementation through a formal,*

systematic approach to monitoring and evaluating purchasing activities' (Cousins et al., 2008). Management can also use performance measures as a means of signalling and influencing the actions of people relative to the purchasing function and for this reason, performance measures must be carefully designed to suit the needs of the organisation in order to avoid resources been allocated to a sub-optimal way. Hence, a well-balanced and well-structured system should support and encourage performance in the areas which are more critical to the firm's success.

Essentials in Performance Measurement

Performance defined as the *'extent to which Purchasing achieves set goals with given resources'* (Cousins et al., 2008, p. 149) is commonly associated with two dimensions namely *efficiency* (relationship between planned and actual sacrifices made to achieve agreed goals) and *effectiveness* (extent to which a goal can be met using a chosen set of action). Traditional approach to performance management has mainly been efficiency-based e.g. achieving price saving i.e. price performance. However, such considerations do not fully reflect the extent of purchasing activities etc supplier development, value analysis, etc. Cousins et al. (2008) explained the dysfunctional nature of focusing on efficiency measure in performance measurements and advised the careful balancing of both efficiency and effectiveness measures. For instance, to be meaningful, Cousins et al. (2008) advised that *'price savings should be considered in the light of those other planned, predetermined actions . . . .which result in measureable cost/price reduction, value improvements or avoidance of higher costs'*.

Similarly, most organisations have relied overtly on financial measures (e.g. transaction costs) compared to those that are non-financial (e.g. interdepartmental relationships, negotiation skills). While suitable non-financial measures can be described as the 'cause' and successful financial performance the 'effect', it therefore

is doubtful that reliance of financial measures would assist in the monitoring of activities and capabilities that enable such performances. Therefore, the point is made for the integration of non-financial measures of performance into organisational measurement criteria. Attention is however drawn to the difficulties in quantifying such measures the point is again made that they are often the very activities that need be monitored and simulated for effective supply management.

Two further considerations for performance measurement are identification of the stakeholders upon which the measures would impact and gaining buy-ins across organisational level and functional units. Cousins et al. (2008, p. 152) citing Dumond (1991) posits that *'good or bad purchasing is largely determined by the perception of internal customers to whom purchasing provides its services . . . purchasers will clearly be at their best when they fully appreciate that their performance will be evaluated in the light of its impact on the performance of their internal customers'.* Such considerations of stakeholder should also include external members of the supply chain i.e. suppliers. Aside engaging the appropriate stakeholders, a further important principle of performance measurement is that the measures designed at each organisational level should include specific input of the teams which will be responsible for delivering the progress against those goals rather than having the measures imposed on them by top management. For this reason Cousins et al. (2008) advises that *"objectives 'owned' by those responsible for achieving them are far more powerful motivators of performance"*.

Categories of Performance Measures

Several different ways of measuring the various elements of supply chain performance exists ranging between those measures that assess the supply base, Purchasing Department performance, to those that measure the interface between Purchasing and

other functions. There is some consensus amongst scholars and practitioners (e.g. Kaplan & Norton, 1996; Cousins et al., 2008; Stevenson, 2009; Booth, 2010) that the most effective performance measurement system is one that considers assessment across the whole spectrum of the supply chain, from supplier through internal processes to customers. Five main categories of measures applicable to purchasing are cost, quality, time, supplier performance and customer satisfaction.

Cost-related measures help evaluated the efficiency and effectiveness of the purchasing spend mostly relating to the analysis of variance of deviation between actual and planned spending. Benchmarks could be based on budgets, market values or across different delivery modes etc. Quality, a prime criteria, is assessed across three levels: manufacturing/production-related in terms of production quality e.g. conformance to specification; supplier-related in terms of defects per supplier through inspection or sampling of suppliers' deliveries, trend analysis etc; and customer-related in terms of customer returns or complaints on failures etc.

Another main category for measuring performance is time, assessed based on responsiveness to customer and the reliability of the delivery process. Hence, two aspects are of great importance: production and delivery times. Supplier performance is another category which is measured using non-financial measures e.g. level and degree of information sharing, number of cost-saving initiatives, extent of mutual assistance in problem-solving efforts. Lastly, customer satisfaction, a measure of the extent to which purchasing impacts on customers (both internal and external) using measures such as customer query on availability and delivery, and other post-transaction measures.

Performance Measurement System

For a performance measurement system to be effective it requires top management support, organisational buy-in, and resources needed for appropriate data collection. Basically, setting up such a system would require the following; determination of goals to measure, establishment of performance measures and standards for comparison, monitoring and evaluation of progress then lastly implementation of improvement actions. Cousins et al. (2008) outlines the characteristics of an effective performance measurement system. This is shown in Table 3.3.

Table 3.3 – Characteristics of effective performance measurement systems

Measurement system should	
1	Be linked to corporate objectives ('goal congruence')
2	Combine different measures to meet the requirements of different organisational level (cascading goals i.e. the goals of one level are the means of another)
3	Capture elements of both efficiency and effectiveness
4	Allow the identification of trade-offs between different dimensions of performance
5	Include a balanced mix of qualitative and quantitative measures
6	Include a mix of leading and lagging indicators of performance
7	Be incapable of manipulation
8	Allow data to be collected systematically and analysed over time
9	Differentiate between incremental/control measures and radical objectives
10	Encourage cross-functional working

Source: Cousins et al. (2008)

In a bid to cater for both the financial/non-financial measures and the efficiency/effectiveness measures of performance measurement, the Balanced Scorecard developed by Kaplan and Norton (1992, 1996) (Kaplan & Norton, 1992) is offered as the most effective tool to use. It is a 'means of measuring corporate performance in a manner which reflects not only financial indicators of performance, but also those other critical value drivers' (Cousins et al., 2008, p. 157) that enable an organisation operate successfully. And as a planning tool, it does not place undue emphasis on simple control measures but rather pulls activities into line with corporate strategy thus aid in focusing the organisation, improving communication, setting

organisational objectives and providing feedback strategy. Aside showing the critical measures for firm success, it also shows the relationship between these measures in a cause-and-effect manner. The Scorecard is based on four perspectives: financial, customer, internal business processes, and innovation and learning to which Cousins et al. (2008) add a fifth perspective, supplier performance, to fully cater for supply management. Below are descriptions of these measures as they relate to the philosophy of the Balance Scorecard based on Cousins et al.'s (2008) account:

a. Financial perspectives – reflects the underlying financial performance of the firm. It includes the traditional measures of corporate performance, focusing on profitability, cash flow, and shareholders.

b. Customer focus – this is essential to understand how customers view the business since it for them that firms create value. The area would require that managers translate broad goals on customer service into measures that really matter to the customer. This comprises of issue such as time, quality, performance and service, thus getting the manager to view the firm from the customers' perspective.

c. Internal business processes – this refers to the way operations are carried out within the company, which enables customer satisfaction to be achieved. Attention should be given to those internal processes that have the greatest impact on customer satisfaction which can affect cycle time, productivity, quality and design. Reliance on a capable information system is necessary to achieve this.

d. Innovation and learning – this is the ability to change and improve on a continuous basis. Continuous improvement is a necessity in unstable business environment as it enables effective and efficient utilisation of resources toward maintaining and/or

improving customers' satisfaction particularly relying on the intellectual assets and human resources inherent in the organisation.

e. Supplier performance – relates to the extent to which suppliers meets or exceeds the firm expectations and how efficiently this is done towards the firm's efforts to satisfying its customers.

3.4.2.4 Total Cost/Benefit Analysis

Principally, supply management decisions should be based on sound management principles such as transparency, analysis and alignment. And in order for this to take place, firms often produce a document called the 'business case' which is central to management decision-making process. For projects that are significant in nature or having strategic importance to firms, the business case should be produced and presented. This particularly so for instance where the following are needed: clear understanding of supply implications; implications of strategies such as supply base rationalisation or reduction, supply tiers, major collaboration deals etc. One of the major aspects of the business case is the measurement of cost implication of strategies in terms of performance or suitability. Conventional approaches to cost considerations had been on the management of price rather than on a more proactive approach that give considerations along the lines of total cost management.

Cousins et al. (2008) illustrates the link between cost considerations from a 'total cost' perspective to the strategy function of Purchasing, particularly in terms of its strategic capabilities. Such capabilities can help purchasing avoid the pitfalls of over-reliant on price reduction strategies relative to the 'business cycle' effect. Within this perspective, the total cost of ownership thinking, consideration is given to all the cost involved in a company's supply chain, giving specific particularisations to a supplier,

a good or service, or a process. This approach takes a 'big picture' perspective, considering costs beyond simply price incorporating such others crucial cost factors related to quality, delivery services, reception, inspection etc. The TCO concept requires an analysis of all activities performed by the firm to identify explicitly cost incurred across the entire purchase value chain, thus giving an indication of the true cost of supply.

Degraeve and Roodhooft (2001) (Degraeve & Roodhooft, 2001) developed a matrix that enables assessing cost along the length of the procurement value chain at all levels of its supplier relationship. Table 3.4 outlines the Degraeve and Roodhooft (2001) total cost matrix. Along its horizontal axis are the various sequential stages in a typical procurement value chain starting from initial acquisition through, reception, possession and use, and finally to disposal or recycling of the product. These five stages are:

i. Initial acquisition – these are costs of activities which take place prior to receiving the product from the supplier. These include the product price, costs related to negotiation and contracting, and supplier vetting cost.
ii. Reception – are cost that occurs when receiving goods, processing involves and payments, and performing inspections on a sample of good received.
iii. Possession – these costs relate to those that occur between receiving goods and actual utilisation of goods in production or service e.g. transportation costs.
iv. Utilisation – are cost incurred when the product is in use and may include installation, personnel training and impact of failure costs.
v. Elimination – these are cost associated with the disposal of a product after completing its life cycle but are often omitted from initial procurement decision though they can represent a considerable cost to the buying firm.

Table 3.4 – The total cost of ownership matrix

TCO-matrix	Acquisition	Reception	Possession	Utilisation	Elimination
Supplier-level					
Cash	Total purchase discount				
Non-cash	Supplier vetting costs RFP costs Contract administration Supplier follow-up costs Supplier change costs	Legal costs for beach of contract		Engineering costs Personnel training costs System adaption costs	
Order-level					
Cash	Payment delay savings or costs	External transportation costs			
Non-cash	Ordering costs	Receiving costs Invoice and payment processing costs Quality testing costs Quantity testing costs Legal costs for problems with quality	Internal transportation costs	Quality control costs Production delay	Waste collection costs
Unit-level					
Cash	Price Product discount			Intrinsic efficiency Replacement costs	Recycling costs or revenue Disposal fees or revenue
Non-cash	Service costs for installation and assembly Testing costs		Inventory holding costs Order picking costs	Production failure costs Maintenance costs Installation costs	Cost of removing obsolete materials Disposal management costs

Source: Degraeve & Roodhooft (2001)

The vertical axis represents three main levels at which cost may be aggregated: supplier, order and unit. At each cost level Cousins et al. (2008) distinguishes between potential savings that are realised as cash, versus savings that result from freeing up capacity or other resources (non-cash). The three hierarchical levels are as follows:

i. Supplier-level. At this level costs occur each time a given supplier is used. For example the cost of supplier audits and the salary of the buyer responsible for managing the relationship.

ii. Order-level. Order-level costs occur each time an order is placed with a supplier. These costs might include receiving, invoicing, and external transportation.

iii. Unit-level. Unit-level costs are incurred on a per unit basis, and are often incurred in the utilisation and elimination phases of the procurement life cycle. They might include costs of a production shutdown caused by a supplier's faulty product, disposal/recycling etc.

3.4.2.5 Managing inter-firm relationships

A study of relationship management is complex first given that there is distinct difference between inter- and intra-firm relationship management and also that the concept can be viewed from a variety of perspectives: from the level of the firm, from the level of a particular project or group within and between firms, and lastly at the level of individuals. Hence considerations of inter-firm relationship would subsist at all three levels both within and between firms. The complex nature of managing relationships also echoes on the definition of business relationship which is the start point of effective management. In demonstrating the complexness involved in defining relationships and by implications it management Cousins (2005) reports thus:

> *'At what level (or levels) should the relationship be defined?. . . . . defining the relationship at the level of the firm is impossible as there are so many different experiences and views. I found a total of 1504 [descriptors] of what could be termed relationships . . . . . it would be impossible to say that firm A's relationship with its major supplier was good, bad or indifferent . . . . . A further complication . . . . . is what we might call an asymmetry of understanding . . . Therefore when examining business relationships we must appreciate the views of both buyers and suppliers'.*

The complex nature of the relationships concept and empirical evidences on the varieties of ways it can be described leads Cousins et al. (2008) to rather view it as a process, given that it shares the properties and attributes of a process – it requires input in the form of resources for instance people, technology, time and effort; and it is output focused for instance price or cost reduction, technology sharing, and development, risk sharing etc. As with processes, relationships also need to be viewed in terms of both efficiency – allocation of minimum resource to achieve maximum output, and effectiveness – delivery towards meeting strategic objectives. Hence the nature of the output will determine the nature of the relationship i.e. output that are simple in nature would require a relatively simple level of inputs to achieve it therefore demanding a simple relationship whereas complex output would require complex relationship. Putting all of the above together, Cousins et al. (2008, p. 173) defines inter-firm business relationships as:

> *A set of complex business processes that require resource allocation from the buyer and supplier to achieve a set of complex outputs. These outputs and inputs may be asymmetrical depending on the desired outcomes for the buyer and supplier. In addition, these relationships will be influenced by their respective external environment and constrained by the parties' strategies, goals and power mechanisms.*

Approaches to Relationship Management

Approaches to the management of business relationships are dependent on two factors: the strategy of the organisation and the product sourced. For instance firms that are cost oriented will require Supply to deliver a range of business and marketing benefits that will put the firm into a stronger cost management position (i.e. savings). Firms operating under this approach would not be interested in Supply forming closer working relationships, or implementing complex sourcing strategies nor in short/medium-term direct business benefits. Supply in these organisations will be viewed from a tactical process perspective rather than a strategic one. One the other

hand, firms that are differentiation focused have a more enlightened and long-term view of the business and view Supply as strategic to their business. Differentiated firms compete by using a differentiated approach: improving time-to-market, increase innovation within the firm. And since they see Supply as a strategic activity towards achieving these aims they explore complex collaborative relationships.

Cousins (2005) developed a model that explains how the different strategic focus and business outcome approaches interact to determine the appropriate business relationships management strategy within supply management as shown in Figure 3.11. From the model, a firm with a cost-focused approach has the opportunity to follow two strategic relationship management approaches – operational collaboration or market collaboration. Under this condition, where short-term relationship is requires, the operational collaboration strategy is the best, consisting mainly of activities relating to sharing operations planning information, developing and sharing demand forecasts, and joint capacity planning management systems. In the event that a longer-term relationship is required with suppliers under the cost-focused approach, the best management approach is market collaboration. This is concerned with tactics such as shared merchandising, co-branding, joint selling and management of distribution channels.

Quadrant C of Figure 3.11 shows that firms which are differentiation-focused will tend not to have any short-term strategic foci. They are more concerned at building long-term sustainable business outcomes, based around strategic collaborations. This type of collaboration involves aligning customer requirements with the supplier, the sharing of technological processes and products to enhance offerings that may lead to new product development activities. For these to occur, Supply will be required to align its approaches too.

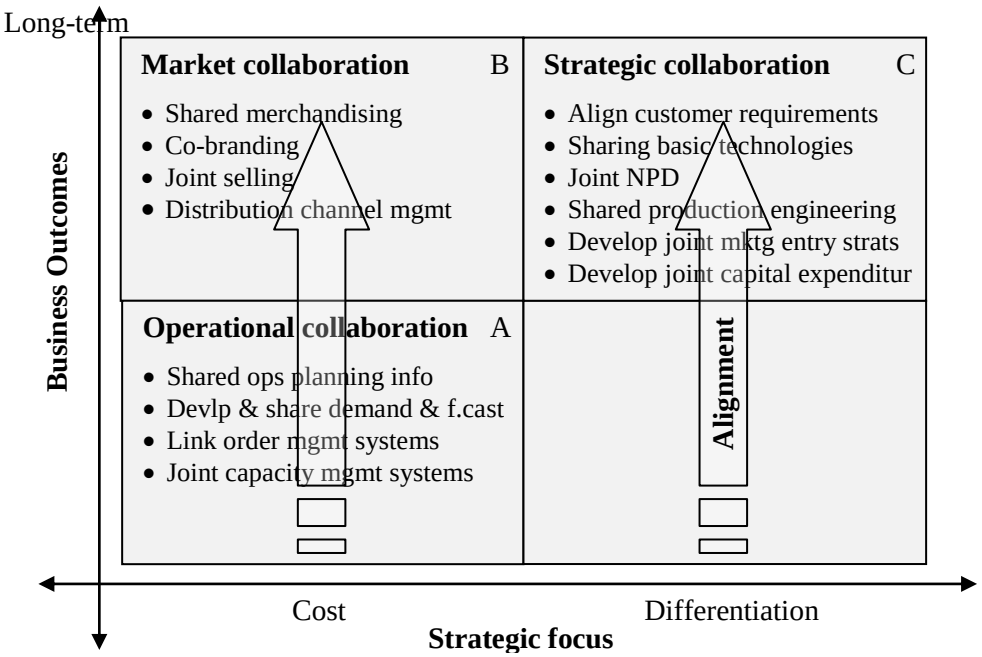


Figure 3.11 – The Strategic Focused Outcomes Model (Cousins 2005)

Model for Relationship Management

With specific reference to managing inter-firm relationship, Cousins et al. (2008) describes two key variables – dependencies and certainty. Dependencies are *'the mechanisms that create a reliance on either the buyer/supplier or both' (p. 179).* In an earlier attempt, Cousins (2002) discovers four key dependencies – historic, economic, technological and political. These dependencies can be identified by both the buyer and supplier firms as a driver for the development and manipulation of the

relationship. Three conditions are possible based on level of dependency with the third highly unlikely to occur: very low level of dependency between the buyer and supplier, either the buyer or supplier creates the dependency for the other and gains substantial advantage, and a situation of mutual dependency or a state of equilibrium where neither party try to gain advantage over the other.

Aside the dependency dimension in explaining the management of inter-firm relationships, the level of certainty is another dimension, defined as the extent to which one party takes advantage of the other. Based on Sako's (1992) work, Cousins et al. (2008) outlines and defines four levels of certainty: contractual, competence, goodwill and political. In balancing out the dependencies and certainties Cousins et al. (2008) identifies four possible relationship management strategies represented in the Strategic Relationship Positioning Model (SRPM) as shown in Figure 3.12. Adversarial strategies refer to arm's length contractual relationship which occurs where firms tend to be independent (low level of dependency) and level of certainty is also low. Opportunism strategies come into play where one of the parties is dependent on the other while level of certainty is low.

Where the level of certainty is high two strategies deal with varying degree of collaboration activities – tactical and strategic collaboration. Tactical collaboration occurs when the level of mutual dependency increases, say due to supply base reduction, and at higher levels of certainty, due to offering of long-term contract for instance. Lastly is the strategic collaboration which occurs when they are high level of dependency and high level of certainty. These collaborative relationships tend to focus both parties on working the relationship for mutual benefits through risks and reward sharing arrangements, co-makership, joint product and technology development teams.

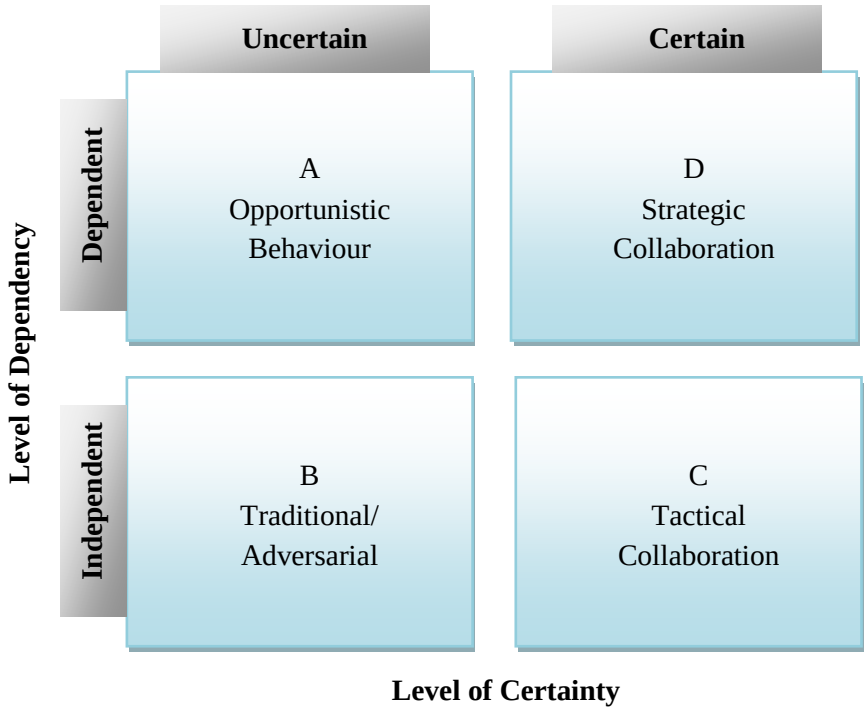


Figure 3.12 – Strategic Relationship Positioning Model (Cousins et al., 2008)

3.4.3 Implications of Supply Chain Management for Construction Projects

3.4.3.1 Client's Role

The agenda for improvement in the construction industry that advocated for the adoption of supply chain management e.g. (Latham, 1994; Egan J. , 1998; Strategic Forum for Construction, 2002; National Audit Office , 2005) looks to the client organisation particularly the public sector client to provide the necessary leadership. For some considerable times this call for leadership by the client organisation enjoyed a sustained support. For instance, Briscoe et al. (2004) and Love et al. (2004) in emphasising the role of client organisations in shaping the characteristics of supply chains indicate that there were four influential variables within client organisation that gives them the edge over assuming this leadership position namely: the volume of demand they place in the construction sector; the previous experience of practitioners'

involvement with the construction sector; the complexity and structure of their organisations and attitude to risk.

In a swift response to the agenda for improvement campaign, Akintoye and Main (2007) report that public sector clients in the UK construction industry adopted innovative procurement methods geared towards improvement in teamwork via demand of higher level of collaboration across clients, suppliers and designers thereby facilitating the use of long-term strategic arrangements. These procurement methods includes: construction partnering (Gruneberg & Hughes, 2004; Green, Fernie, & Weller, 2005), joint venture, public private partnerships, strategic alliance (Meng, Sun, & Jones, 2011) prime contracting, supply chain management and framework agreements (Tennant & Fernie, 2012).

Despite these efforts, the desired outcomes e.g. improvement in productivity, reduction of waste, reduction of delivery time etc were not met as anticipated, though some progress were made (Wolstenholme, 2009; Arantes, Miguel, Ferreira, & Costa, 2015; Behera, Mohanty, & Prakash, 2015). More surprising is that, the extent to which the industry was expected to radically abandon its traditional procurement system which is adversarial in nature as engendered in the agenda for improvement reports, met very steep resistance from the supply side of the supply chain itself (BIS, 2013; Gosling, Naim, & Towell, 2013; Safa, Shahi, Haas, & Hipel, 2014; Pero & Cagolini, 2015). This however is coupled with the attendant fear of adopting newer production systems in a market that is highly volatile and constantly transient in nature (Tennant & Fernie, 2013; Zhang, 2013; Fulford & Standing, 2014; Jonsson & Rudberg, 2014). Clearly, from the aforementioned discussion, the solutions to the successful adoption of supply chain management in the construction industry lies not only with the client

organisation. Changes within the client organisation no doubt are necessary but these by themselves have not and would not galvanise into the anticipated results.

3.4.3.2 Hindrances due to construction industry specific problems

The reports that heralded the agenda for improvement, mentioned above, also did chronicled some major challenges and barriers that must be tackled and resolved before supply chain management can deliver its gains i.e. improved collaboration, integration, evidence of the persistent existence of these challenges and problems long after the client organisation rose to the task of implementing their own side of the improvement agenda, continues to trail the industry (Fearne & Fowler, 2006). Some of these challenges and barriers include (National Audit Office, 2001; National Audit Office , 2005; Briscoe, Dainty, Millett, & Neale, 2004; Wolstenholme, 2009):

a. Inadequate appreciation of the sponsor's role
b. Poor need identification, poor briefing and requirements definition and lack of focus on the business case
c. Use of prescriptive specifications, weaknesses in design, separate early appointment of designers, late variations, too little use of prefabrication and standardisation
d. Little understanding of value management and insufficient appreciation of value engineering or whole life costing
e. Limited project management skills, unclear roles and responsibilities, inadequate quality assurance, and a tendency to transfer risk inappropriately through standard clauses
f. Selecting contractors on the basis of price rather than quality and insufficient incentives for contractors to proposal innovative solutions
g. Lack of post-project appraisals and learning

Based on the findings in their study on supply chains in the construction industry, Segerstedt & Olofsson (2010) concludes as follows, which also resonates with those of Eriksson (2010) and Bankvall, Bygballe, Dubois, & Jahre (2010):

a. Fragmentation in the industry is caused by the volatility of market demand and increased complexity whereby subcontracting and engaging suppliers is a way of risk mitigation for construction company.
b. What distinguish the construction industry from manufacturing are its project-based nature; and discontinuous processes and relationships and that there is a lack of understanding of discontinuous exchanges in project-based industries compared to those which operate continuous exchanges in long-term buyer-supplier relationships.
c. The management of supply chain relationships is problematic in project-based industries due to; the discontinuity of demand for projects, the uniqueness and complexity of each project.

However, more specifically, Bankvall et al. (2010) identifies three types of supply chain dependencies namely pooled, sequential and reciprocal interdependencies and found that given the particular nature of the construction industry, rather than promote supply chain integration for better performance of the industry, better planning, synchronisation and flexibility is more important. This is due to the comprehensive reciprocal interdependencies in the construction industry. Konukcu (2011) advances that due to the frequent reconfiguration of project organisations (a result of the uniqueness and bespoke nature of construction projects), construction supply chains are characterised by highly transient and disjointed relationships – a desperate collection of separate organisations rather than a unified team leading to a lack of integration and consequently a breakdown in the 'knowledge chain'. The main

challenges of supply chain management are contingent on the constituents of the knowledge chain comprising of adaptation to collaborative procurement, downstream-upstream collaboration, interoperability of design tools, structured SCM process, KM applications.

Despite these challenges Tennant & Fernie (2014) described the construction industry as a near perfect model for supply chain management, having so high interdependence amongst an extensive web of specialists, general suppliers and constructors resulting to the commercial exchange of goods and service in the industry typically accounting for approximately 75% - 90% of the total cost project construction cost.

The reason for the slow progress made on the adoption of supply chain management in construction led to an outright challenge of its adoptability and suitability in its original theoretical makeup in terms of concepts, principles, philosophical underpinnings and contexts as applied in the manufacturing and industrial sectors.

3.4.3.3 A Fad in the Construction Industry

Fernie (2005) undertook a comprehensive review of literature relating to supply chain management in construction (Dainty, Briscoe, & Millett, 2001; London & Kenley, 2001; Cox & Ireland, 2002; McGeorge & Palmer, 2002; Briscoe, Dainty, Millett, & Neale, 2004; Love, Irani, & Edwards, 2004) and report that there are quite significant contributions to the industry's understanding but notes that these contributions may not fit within the nature and structure of the construction industry. Fernie (2005) further argues that construction management literature on supply chain management did not 'overtly' explored the interpretation of supply chain management theory per se in order to establish its adoptability within the industry given that it was a concept

borrowed from the industrial sector. This point of argument is antecedent by the following:

i. Supply chain management was considered one of the new and fashionable managerial concepts sponsored by organisations responsible for setting the change agenda in the construction sector.
ii. Its success elsewhere, its promise of productivity improvement and 'best practice' pedigree formed the basis for its adoption in the construction sector.
iii. A number of assumptions underpin these arguments and that they are largely ignored by the promoters of such change and campaigners for its use.

Therefore basing his propositions on an earlier argument i.e. Fernie, Green, Weller and Newcombe (2003) that *'managerial practice is rooted in a context and that it is necessary to engage with practitioners interpretations of both context and practice to fully explain the legitimacy of one practice or strategy over another in desperate contexts'*, Fernie (2005) investigates the sense practitioners in the construction industry makes of supply chain management from a contextual thinking perspectives and comes to the conclusion that the concept as applied does not make sense in the construction sector and that calls for its adoption lacked intellectual rigour and were indeed *'acontextual'*. Further, Fernie & Thorpe (2007) reveals that there are some misconceptions amongst practitioners within construction organisation about supply chain management been synonymous to partnering thereby impeding its adoption and opportunities.

Almost donning a decade after the investigations carried out within the UK construction industry to understand the sense that supply chain management made by comparing theory and practice, and other related researches thereabout and thereby

concluding that supply chain management adoption was *'acontextual'* and wrongly thought of as being same with partnering, Tennant and Fernie (2014) still finds the industry grappling with these same misleading and impoverished viewpoint of supply chain management strategies remaining largely synonymous with initiatives such as partnering, strategic alliance and framework agreement; and also still believing that since it succeeded within the manufacturing sector than its implementation in construction will enhance customer value whilst reducing business cost.

3.5 Input-Process-Output Model

A major outcome of this research is establishing relationships between variables that are classifiable either as independent, mediating or dependent. The I-P-O or the I-P-M-O (as modified to cater for the mediating/intervening variable) model thus provides an integrative approach to study the relationships inherent in achieving value for money in building designs based on client organisation parameters. The research phenomenon can be distinctly conceptualised into three broad interrelated constructs along the I-P-O model namely: client organisation parameters (consisting of three constructs), design process and team functioning.

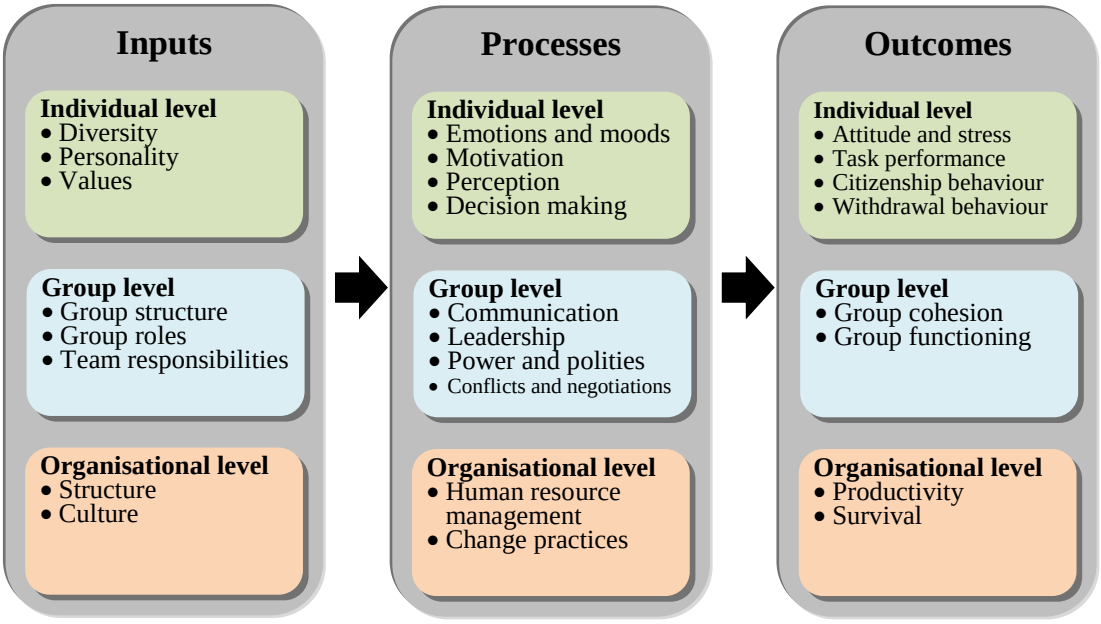


Figure 3.13 – A Basic Organisational Behaviour I-P-O Model (Source: Robbins & Judge, 2013)

Robbins & Judge (2013) provide a simplified yet comprehensive I-P-O model of organisational behaviour outlining the various variables within each of the units of analysis (levels) that typifies all organisations as shown in Figure 3.13. Though the various units – individual, group and organisation, and their interactions are an essential aspect of organisational behaviour, Section 3.6, in line with an aspect of the research i.e. the study of design team as project organisation as foundation for the conceptual framework, explains the IPMO model at the group (team) level of analysis.

Particularly, literature on teams formed the basis of the conceptual framework proposed in Section 3.6 with specific reference to the I-P-O/I-P-M-O/I-M-O-I team framework considerations of Ilgen *et al*. (2005), Barrick *et al*. (2007), and LePine *et al*. (2008). These considerations aided in the adaptation of the Robbins and Judge's model as shown in Figure 3.13 into the modified model discussed in Section 3.6 but also taking into cognisance the episodic and emergent states that characterises teamwork over time as reported by (Cronin, Weingart, & Todorova, 2011; Cooke, Gorman, Myers, & Duran, 2013).

Inputs are identified as variables that set the stage for the eventual behaviours in organisations. They include variables such as personality, values, group structure and organisational culture and are known to affect the aspect of transformation of organisational inputs into organisational output i.e. process. Early attempts at studying I-P-O within teams include the works of Gist, Locke & Taylor (1987) indicating that inputs variables include: group structure (in terms of size, ability, personality, gender and race), group strategies, leadership, and reward allocation. This is consistent with Robbins and Judge's (2013) model but only to the extent that leadership is considered a process variable in the Robbins and Judge model. Many of the variables making up the inputs are pre-determined either as genetic inheritances or environmentally inspired – for instance: diversity, abilities, personality, and gender; or task-related and organisational-based – for instance: strategies, structure, team roles, responsibilities, and reward allocation.

Within the context of organisational behaviour, processes are the actions individuals, groups, and organisations engage in as a consequence of the inputs leading to certain organisational outcomes. Processes can also be referred to as the transformational agents of organisations. They include: at individual level – *emotions, motivation, perception and decision-making;* at group level – *communication, leadership, power and politics, conflicts and negotiations;* while at organisational level – *human resource management and change practices* (Robbins & Judge, 2013). Earlier consideration of group/team researches provides that processes are composed of influence (facilitation, social impact, loafing), development (identification, team development), and decision-making (participation, alternative/information generation, alternative evaluation, consensus building, total process) (Gist, Locke, & Taylor, 1987). Both considerations have similar aspects though ordered differently with that of

Robbins and Judge (2013) simplifying the latter's classification among the three levels of analysis – individual, group and organisation.

Paradigms in organisational behaviour describes outcomes as those variables for which explanations are sought or that need to be predicted, and that are affected by some other variables e.g. input and/or process variables. From the Robbins and Judge model the primary organisational outcomes include: at the individual level – *attitudes and satisfaction, task performance, citizenship behaviour and deviant/withdrawal behaviour*; at group level – *cohesion and functioning*; and at the organisational level – *profitability and survival* (Robbins & Judge, 2013). Specifically, the Gist et al. (1987) I-P-O model considers outcomes (at group level) as group performance (quantity, quality and timeliness), quality of work life for group members, and capability of working independently in the future. This research focuses only on group performance in terms of team functioning as provided by the Robbins & Judge (2013) Model.

3.6 Conceptual Framework for V_fM in Designs based on COP

Recent developments and researches relative to value (for money) conducted within management-based disciplines in the construction industry e.g. project management, construction management, value management, supply chain management etc Kelly (2007), Males, Kelly, Gronqvist, & Graham (2007), Walker (2007), Ashworth (2010) , Thyssen (2011), and Mills (2013) are converging on the consensus that for meaningful success to be made in terms of achieving value (for money), attaining those of the client organisation i.e. the demand side, are of utmost priority. And that with proper *'alignments'* achieving the value prepositions of the other stakeholders i.e. the supply side, will follow suit.

On the other side of the research spectrum, client organisations especially those within the public sector, are considered as having high potency for championing and driving the improvement agenda of the construction industry as specifically called for by the following industry reports: Latham's (1994) Constructing the Team, Egan's (1998) Rethinking Construction and (2002) Accelerating Change, NAO's (2001) Modernising Construction and (2005) Improving Public Services through Better Construction, and Wolstenholme's (2009) Never Waste a Good Crisis. This is a consequence of their high level of active participation and their repeat clientele nature within the industry (Pettit, 2000; Cooper *et al.*, 2005; Booth, 2010; Commission of Architects for the Built Environment, 2010; Prince, 2011; CCG, 2013).

Further also, given the equally important service-based nature of the construction industry (compared to product/goods-based industries), the nature of its products (project-based), and the stage of consideration of the research i.e. design stage, where interaction is mostly between the client organisations and members of the design teams (in the form of consultancies), conditions in the client organisation have been known to affect the outcomes of projects they embark on (Vargo, Maglio, & Akaka, 2008; Leiringer, Green, & Taja, 2009; Lind & Borg, 2010; BIS, 2013). Despite this realisation, the extent of client organisation's influence in achieving value for money do not seem to be the focus of research within construction management. Relatively however, research have focused on: 1) considering how client's strategic decisions (project implementation related) affected their level of satisfaction (Cheng, 2008; Pettit, 2000); 2) understanding and defining their value system (Kelly *et al,*, 2004; Kelly, 2007; Male *et al,*, 2007); 3) through an understanding of their 'values'(Thomson and Austin, 2006; Jay and Bowen, 2009; Mills, 2013; Thomson, *et al.*, 2013).

Due to the paucity of researches relating the influence of client's organisation on design teams performance during the design stages in the construction industry, this research draws heavily upon literature on organisational behaviour as a proxy for the integrative consideration of the supporting theories (discussed in Section 3.2), to develop the research conceptual framework. The proposed conceptual framework elucidates the key variables that were found to significantly explain the variance that occur in organisational performance via teams following the theoretical synthesisation of Farquhar's (2011) review on teams and Chen's (2008) review on organisational performance. Both researches took cognisance of the I-P-M-O model which is adapted for this research based on some modifications to Robbins and Judge's (2013) model.

The modification of the organisation behaviour (IPMO) model as illustrated in literature, particularly that of Robbins and Judge (2009, 2013) discussed in Section 3.5, is due to the fact that these models are most suitable for organisations that are permanent in nature (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Mullins, 2010; Robbins & Judge, 2013). Projects in the construction industry are characterised by their relative temporariness. This temporariness is further complicated by the: (a) shortness of interaction within team members occasioned by the: nature of projects themselves (Walker A. , 2007), (b) presence of inter-organisational teams (Senarantne & Hapuarachchi, 2009), (c) multi-boundary interfaces (Bresnen, 2010; Fellows & Liu, 2012), and (d) high rate of team adjournment and disbandment (Wolstenholme, 2009).

The importance of client organisations achieving successes in their construction projects cannot be overemphasised as demonstrated in the preceding chapters, given their special nature – temporariness. Chapters 2 demonstrates that for value to be achieved, and contextualised for building designs therein, the project 'supply-value' chain must be effectively managed. The chapter also expounded on the ownership of

the supply (design) chain by the client's organisation as a means of not only attaining the required outcomes of their project requirements but also as a means of doing so efficiently. This further reinforces the proposition of client organisations being partly and fundamentally responsible for achieving value (for money) in their building designs, as is already exemplified in the changing roles client organisations are assuming within the industry. Hence, client organisation becomes a parameter of interest in the quest for achieving value in building designs.

Managing value in construction projects, and by implication building designs, has in contemporary times been accepted to be a team-based responsibility due to the divergent-value-views nature of the multi-stakeholders that characterises construction projects as discussed in Chapter 2. Consequently, recent approaches to managing value have seen the introduction of stakeholder management – for instance, client organisation interaction with design team members, and value management – for instance, as ways of doing so effectively and efficiently. To this effect, Section 2.5 brings to fore the interdependency between client's organisation and the design function specifically drawing out the inherent influences client organisations may have on the design process in terms of managing the design team.

Hence, managing the design team from the client's stand point, which introduces an emergent concept in construction management i.e. moving the view point from looking at the project itself to those who manage it as suggested by Radosavljevic & Bennett (2012), is a central focus of the research, particularly given the complex nature of design teams and their unarguable benefits toward achieving value in building designs as discussed in Section 2.5. This emergent concept is in support of the theories governing supply chain management as discussed in Section 3.4. Within the context of the aforementioned therefore, and based on the theories explaining the

concepts of organisational behaviour as discussed in Section 3.3, design teams, in terms of: 1) the client organisation variables that directly has an influence on them – *client organisation roles* and *contextual factors*, 2) those that indirectly influences them – *composition factors*, 3) the processes they undergo – *design process* and, 4) their outcomes – *team functioning*; are the main constructs of the framework developed herein. The conceptual framework is diagrammatised in Figure 3.14 and expatiated upon in Sections 3.6.1 – 3.6.6.

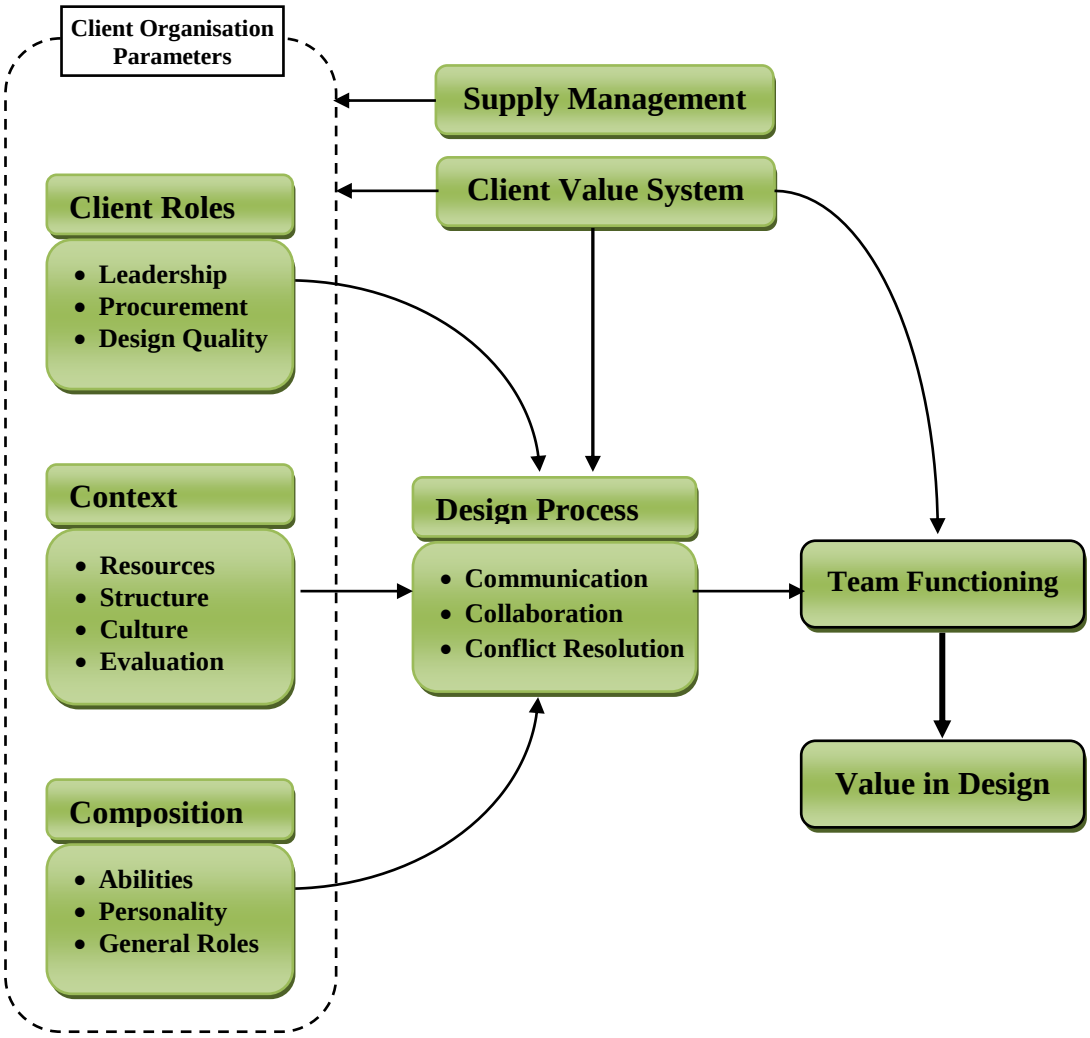


Figure 3.14 – Conceptual Framework for Value Delivery in Building Design

3.6.1 Client Organisation Parameters (COP)

Studies on teams and their emergent theories, concepts, challenges have hitherto focused mainly on those that do their work face-to-face and whose members are mostly co-located (Mathieu *et al*., 2008; National Research Council, 2015). Teams within the construction industry, sparsely meet on a face-to-face basis, particularly more so those of design teams, given the fact that their memberships are pooled from multiple organisations located over geographically disperse locations. These teams are referred to as virtual teams (Robbins & Judge, 2013; National Research Council, 2015). In an earlier attempt, Kanawattanachai and Yoo (2002) estimated that up to 60% of professionals work in virtual teams.

Research shows that face-to-face communication is a valuable contributor to team performance (Pentland, 2012) hence the influences of COP on the design process, undertaken by even a partially enabled virtual team, is expected to have more consequences compared to their effect on those that are face-to-face enabled. The discussions contained herein takes this into cognisance particularly the hypothecation of the conceptual framework while partially complying with Kozlowski (2012) advice that to understand team effectiveness, three levels in an organisation (the project organisation in this case) would need to be conceptually embraced at the minimum, namely: within person over time (not possible to study within the scope of this research since the aim isn't to determine the effectiveness of the teams studied), individuals within team (as conceptualised within the composition construct), and between or contextual effects (conceptualised within both the client roles and contextual factor constructs).

The Robbins and Judge's (2013) team effectiveness framework and IPO model are adapted in developing the conceptual framework as discussed in Section 3.3.5 and 3.5

to cater for the peculiarity of teams within the construction industry compared to those which the generic literature has mainly focused on. Two essential changes introduced to the existing models due to these peculiarities are: client roles to cater for the supply management theoretic perspectives of managing construction projects by a client organisation as justified in Chapter 2; and the consideration of teams from a virtual team view point based on the nature of design teams within the industry. Given, these adaptations, the following sections attempts at conceptualising the three COP constructs within design team considerations by catechising the constituting variables as applied in generic team literature, examining them in detail and drawing parallels within design teams in building projects.

3.6.2 Client Organisation Roles Construct

Tables 2.3 – 2.7 (see Chapter 2) provide a comprehensive outline of roles based on the CCG's (2013) roles framework that client organisations are expected to undertake in order to ensure they achieve value for money in their projects. This section of the research draws from three specific roles outlined in Tables 2.3, 2.4 & 2.7 as the variables of interest within the client roles construct towards developing the conceptual framework as shown in Figure 3.14. The three roles are: 1) Leadership role – consisting of the following responsibilities: provision of the right working environment in terms of policies, structure, resources, information; setting the framework for achieving success in terms of policies, insisting on best practice, demanding appropriate behaviours and effective processes; 2) Procurement and integration role – made up of the following responsibilities: help set exemplar behaviours for procurement partners, set mechanisms for early warming and performance evaluation, establishes and maintains the right relationship with procurement partners; and 3) Design quality role – consisting of responsibilities to:

sets design standard, selection criteria and change process; ensures aligning key drivers with requirements and delivery of required functionality; use of design quality.

The level at which the client organisation interfaces with the design process has been likened to that of a board of directors (defined in the next paragraph) to its corporate organisation (from which this research heavily draws upon its underpinning theories in explaining and categorising roles). For instance, the OGC (2007b) describes client's organisation roles as, amongst others *'decides whether or not a proposed investment in a project should be made ..... be responsible for the approval of the project and therefore maintain the visible and sustained commitment of senior management to its delivery' (p. 11)* These roles are specifically separated from those of project management function which is akin to the management functions in corporate organisation. This indicates that within the construction industry, as is the case in corporate organisations in other industries, there are board-like roles (client organisation roles) and management roles (project management roles) and that these two are distinct and separate roles needed for the attainment of value for money in building designs. This research focuses entirely on the former i.e. client organisation roles.

Drawing from Pryke & Smyth (2006) analogies, by bringing in the other stakeholders into the project environment, the client organisation is placed in the corporate context for the project hence making them the key decision makers or the executives of the project team, in other words – the *'board of directors'*. Board of directors are described (Farquhar, 2011, p. 20) as one of the mechanisms organisations deploy towards the *'determination of the broad uses to which organisational resources will be deployed and the resolution of conflicts among the myriad of participants in organisations'* (Daily, Dalton, & Cannella, 2003) or as the internal mechanism that

'induce the self-interested controller of a company . . . . to make decisions that maximise the value of the company to its owners' (Dennis & McConnell, 2003) . . . . . Researches on boards have variously examined the relationships between board characteristics (structure, roles, processes) and firm performance, finding the existence of significant relationships (Van der Laan, & Postma, 2008; Minichilli, Zattoni, & Zona, 2009; Payne, Benson, & Finegold, 2009; Pugliese, Bezemer, Zattoni, Huse, & Van den Bosch, 2009; Farquhar, 2011)

Specifically, considerations on board roles suggest three primary roles namely (Zahra & Pearce, 1989 cited in Farquhar, 2011): control role, strategy role and service role. Farquhar (2011, p. 110) summarised the Zahra & Pearce (1989) role types thus: control role *"relates to the board evaluating company and CEO performance to ensure company growth and protect stakeholders' interests"*. The service role of board typically *'involves enhancing company reputation, establishing contacts with the external environment and giving advice and counsel to executives*. Strategy role *'relates to the board's involvement in and contribution to the development of the firms mission, and development of the firm's strategy'*. These roles categorisation mirrors those of the client organisations' whereby their leadership, procurement and design quality roles reflect those of boards' strategy, control and service role respectively.

Studies within construction management have attempted at identifying the various types (categories) of client roles. For instance, Pettit (2000, p. 274) describes client's role in the following terms: Base role – *Generate need for project; Communicate need and requirements; Finance the project; Provide the essential pre-requisites; Take ownership of results*. The Added Value role is defined as – *Provision of aims and objectives; Direction of project specific activities; Management of Supplier Base; Management of Project Base; Benefit Maximisation; Induction of Experience*. The

Interfering role is defined as *Change; Restrictions to programme; Provision of Internal Resources; Controls on technical details; Usurping the roles of other participants; Lack of response to other participants*. Again, as was the case with the three basic roles of boards, the Pettit (2000) categorisation of client roles in infrastructure projects to some extent certain mirrors the roles identified for client organisations in meeting their value for money requirements in building designs thus: Leadership role matches the Base role, Procurement and Integration role matches the Added Value role while the Design Quality role matches that of Interfering role.

In their study of roles in construction projects, Hughes and Murdoch (2001) indeed gave a quick understanding of what roles actually means within construction as: *'The relationship between a participant and an operation is known as a role' (p. 25)*. Deriving from a systems point of view, Hughes and Murdoch identified three main distinct categories of roles played by the core participating members of the construction industry namely: Operating role, control role and managing role. These role categories are further distinctively described to contain the following combination of roles (or activities): operating role is made of activities that borders around *operating, co-operating, advising and receiving;* the control role consist of *monitoring, supervising and resourcing;* while the managing role is made up of *co-ordinating, directing, recommending and approving*. A study of the roles contained in Tables 2.3 – 2.7 shows that client organisations undertake each of the role classifications contained within the Hughes and Murdoch role categorisation.

Walker (2007) attempt at describing the construction process in terms of it constitute system draws up two sub-systems: the operating systems – the aspect of the system concerned with undertaking the actual tasks required through which the project is achieved; and the managing system – concerned with carrying out decision-making,

maintenance and regulatory activities require for keeping the operating system operational. For the managing sub-system three basic functions were identified namely: approving and recommendation function; boundary control, monitoring and maintenance function; and general and direct oversight function. Specifically, the approving and recommendation function involves the power of approval at the decision points in making decision, and the authority to make specific recommendations or to present alternatives upon which a decision will be based.

The boundary control, monitoring and maintenance function comprises activities that: *ensures functional compatibility of contributors' work within and between tasks*; involves '*intra-task regulation to check and control prior to output that a task is proceeding in a manner which will achieve its purpose'*; and *'ensures that a task has the capacity to achieve that purpose'*. The general and direct oversight function consists of activities that: *'provides policy guidance for the project'*; and *'directly supervising specific skills used on the project'*. A study of the roles contained in Tables 2.3 – 2.7 shows that client organisations undertake each of the role classifications contained within the Walker role categorisation.

Similarly, the OGC (2007b) did map out three main role categories for client organisation in achieving excellence in their construction projects namely: investment role, ownership role and sponsorship role. The investment role consists of responsibilities to *'approve projects . . . maintain the visible and sustained commitment of senior management . . . define success criteria . . . approve strategic decisions and ensures appropriateness of management structure . . . ensures competencies of persons in client organisation' (p. 11 – 12)*. The ownership role involves *'championing the successful delivery of the project, ensuring that project objectives are realistic, instituting appropriate management structure and allocate*

resources, ensuring stakeholders early involvement and buy in, establish management and conflict resolution systems, give approvals as necessary' (p. 13). The sponsorship role on the other hand consist of *'preparing investment appraisals and appraising options, managing allocated resources, preparing project brief and clarifying design roles, secure professional services for delivery of the project, ensuring effective project delivery and feedbacks' (p. 16)*.

It is also worth noting that based on the descriptions of roles combination within each of the role categories outlined in both the Hughes and Murdoch categories and that of the OGC's, these roles mirrors those of board roles on the one side and those of CCG's (2013) and Pettit's (2000) on the other as shown in Table 3.5.

Table 3.5 – Linking Board Roles to Client Organisation Roles

Board Role	CCG	Pettit	Hughes & Murdoch	OGC
Strategy	Leadership	Base	Managing	Investment
Control	Procurement	Added value	Controlling	Ownership
Service	Design Quality	Interfering	Operating	Sponsorship

Given the various categorisation of roles ascribable to client organisations as discussed above and the paucity of theoretical considerations of roles specific researches within construction management, this section draws upon Farquhar's (2011) study on board roles underpinned by organisation theories (a systems and contingency approach to management) to explain similar client organisation roles categories within the construction industry based on the CCG's (2013) client's responsibilities framework shown in Tables 2.3, 2.4 & 2.7.

3.6.2.1 Leadership Role

The leadership role of client organisations in the construction industry (See Table 2.3) is contextually similar to those of the strategy role of board of directors as identified in

board roles literature. Based on the synthesisation of related literature e.g. Golden & Zajar (2001), Wan & Ong (2005), Ruigrok et al. (2006), Huse (2007), Zona & Zattoni (2007), and Purliese et al. (2009), Farquhar (2011) posits that strategy role is widely recognised as one of the major task of boards of corporate organisations (and by implication the leadership role of client organisations). Though strongly supported by the various organisation theories i.e. agency theory, stewardship theory and stakeholder theory, the exact nature of board's strategy roles differ between these theories. For instance, the agency theorist restricts board's role to that of strategic control (ratification and evaluation) rather than strategic management (formulation and implementation), the latter reserved for those in senior management. While from a stewardship theorist's perspective, board strategy role should be one that encourages collaboration between board and senior management rather than that which emphasises the board having only control function over senior management's activities.

Drawing from the above arguments, similar and parallel conjectures can be inferred for client organisation leadership role within construction projects. Of specific interest is the disagreement between the various theorists on the exact nature of the role i.e. drawing the line between those aspects of leadership role that should be for the client organisations (either control functions, management function or both) and those that should be handled at senior management level different from those for core project management. From Farquhar's (2011) synthesis, agency theorists therefore favours clients to retain only the control aspect of their leadership role while project management focuses on the management aspect as opposed to the stewardship theorists who would prefer that there be some form of collaboration between the client organisation team and the project management team in handling the leadership role.

Evidence within construction management researches also seems to support the disagreement between the various organisation theorists as it exists for board strategy role in corporate organisations. For instance, the OGC (2007b) role category assigns the leadership role to a named position called the Investment Decision Maker (IDM). The IDM is a senior member of the client organisation whose responsibilities is devoid of the daily technical management of the project. The daily management is left to some other senior members of the client organisation and the project manager (or a project management team). Roles within the IDM are solely that of control (ratifying and evaluation) e.g. The IDM should be satisfied that: *there is a need for the project, success criteria have been defined, the business drivers and expected benefits have been established with stakeholders* . . . . . (p. 11). This is in line with the agency and stakeholder theories. The CCG (2013) role also depicts the same pattern with that of the OGC (2007b, 2007c). However, the Hughes and Murdoch (2002) role classification views the leadership role, which they referred to as *'managing role'*, from the stewardship theorist's perspective having both the management and control functions within it but predominately management aspects.

Based on the main point from the discussions above and drawing similar conclusions as Farquhar (2011), it is safe to infer that organisation theorists differ on the exact nature of the leadership role that client organisation assume on their construction project with specific reference to those roles that pertains to achieving value in building designs. One of the implications of the differing perspectives for this research is that the data collected on client's leadership role may be influence to the extent that respondents differ in their perspectives of organisation theory. For instance, respondents with a stewardship theory perspective of organisation may be biased towards the data collection instrument given that they are of the collaborative

approach school to leadership role opposed to the CCG's framework which depicts an agency theory perspective, which formed the basis of data collection. Another implication of the differing perspectives borders on developing the hypothesis concerning relations between leadership roles and the design process.

3.6.2.2 Procurement and Integration Role

Table 2.4 shows the procurement and integration role of client organisations in the construction industry. This role is similar to those of the control role of boards as identified in literature. Based on these literature: Forbes & Milliken (1999), Hillman et al. (2008), Huse (2007), Van den Henvel et al. (2006), and Zona & Zattoni (2007) Farquhar (2011) draws the conclusion that agency theorists suggest that the primary role of board of directors is *'to monitor and control management (agents) for the interest of the owner shareholders (principals)'*. The control role includes decisions regarding managing senior management (hiring, evaluation, compensation, and replacement), approving strategic decisions made at senior management level, and monitoring strategy implementation. Further, there seems to be consensus amongst organisation theorists i.e. agency, stakeholder, resource dependency and stewardship on the exact nature of board's control role. This is unlike that of strategy role where differences in the exact nature of the role exist amongst organisation theorists.

Drawing from the above, similar and parallel conjectures can be inferred to client organisation's procurement and integration role within construction projects. From Farquhar's (2011) synthesis, organisation theorists are in agreement on the exact nature of board control role and evidence within construction management researches seems to support this position. This is particularly true given that 'agents' within the construction industry refers to partners temporarily engaged by the client organisation to manage the project delivery process i.e. members (internal and external) of the

supply chain. For instance, the OGC (2007b) role category likens the procurement and integration role to that of the Senior Representative Owner (SRO) who also is a senior member of the client organisation (and reports directly to the IDM). Roles within the SRO are solely that of control (ratifying and evaluation). Specifically, the SRO responsibilities are to among others (OGC, 2007b): *be the design champion of the project, oversees the preparation of business case and budget, establish an appropriate organisation structure and the necessary communication processes, ensure that user and other stakeholders are involved in and committed to the project, resolve issues with members of the client team and other stakeholders* . . . . . (p. 13). These responsibilities typically depict those described by the organisation theorists as the control role of board of directors for corporate organisations.

Within the CCG (2013) client responsibilities framework, procurement and integration role includes: *set behavioural and performance example, evaluate decisions, insists on early warning culture, establish long-term relationships, understand and align with partners' value system*. The nature of these roles is similar to those of OGC (2007b) as outlined above. A similar nature exist in the Hughes and Murdoch (2002) role classification for procurement and integration role related category, which they referred to as *'controlling role'*.

Therefore, given the aforementioned, and drawing similar conclusions as Farquhar (2011) on board of directors control roles, it is safe to infer that organisation theorists agree on the exact nature of the procurement and integration role that client organisation assume on their construction project with specific reference to those roles that pertains to achieving value in building designs. This is confirmed by the three models studied in this section i.e. the CCG's (2013) client responsibilities framework,

the OGC's (2007b, 2007c) roles and responsibilities model for project organisation, and the Hughes & Murdoch (2002) role categorisation.

3.6.2.3 Design Quality Role

The design quality role of client organisations in the construction industry is shown in Table 2.7. This role is similar to those of the service role of boards as identified in literature. Deriving from the theses of Hillman & Dalziel (2003), Hillman (2005), Huse (2007), Davies et al. (1997) and Boyd (1990), Farquhar (2011) posits that as an alternative to the perspectives of the agency theorists, resource dependency theory suggest that service role is the primary role undertaken by the board of directors. Primarily, this role is to *'provide important resources for a firm by providing a link to external environment and helping the firm manage its uncertainties'*. The service role includes tasks such as: help firm acquire their key resources, provision of advice and counsel to management, legitimising the firm in the environment, networking, and mentoring. However, there seems to be some dissonance amongst organisation theorists i.e. agency, stakeholder, resource dependency and stewardship on the exact nature of board's service role as demonstrated by Farquhar (2011) in the variety of definitions he outlined. This is similar to the strategy role where differences in the exact nature of the service role exist amongst organisation theorists as noted by Van den Henvel et al. (2006).

Drawing from the above arguments, similar and parallel conjectures can be inferred for the client organisation design quality role within construction projects. The difference in definition among the various theorists on the exact nature of the service role would indicate that some aspects of the design quality role of client organisations are co-located within their leadership role. From Farquhar's (2011) synthesis, agency theorists therefore favours clients service role to include control aspect while resource

dependency theorists prefer that the service role are solely those on the provision of required resources and networking – a favour of the stewardship theorists.

Evidence within construction management research supports the disagreement between the various organisation theorists as it exists for board strategy role in corporate organisations. For instance, the OGC (2007c) role category assigns the design quality role to a named position called the project sponsor. The project sponsor is the client representative, acting as a single focal point for the day-to-day management of the client interest in the project. Roles within the project sponsor responsibilities are a combination of managing function e.g. *preparing business case and investment appraisals, managing allocated resources, coordinating and directing user inputs, preparing project briefs, secure professional services, determine procurement route* and *establishing formal reporting arrangement*; and control functions (ratifying and evaluation) e.g. *ensuring that reviews are undertaken, appraising options, controlling changes, ensuring the project is managed in accordance with plans . . . . . (pp. 15 – 16).* The CCG (2013) role also depicts same pattern with that of the OGC (2007c) containing tasks such as: *have clear criteria for selection of design team, ensure a robust change control process, understand the key driver for the design,* and *ensure that the design delivers the required functionality*. . . . . (p.). Similarly, the Hughes and Murdoch (2002) role classification views the design quality role, which they referred to as *'operating role'*, from the stewardship theorist's perspective having both the management and control functions within it but predominately management aspects.

Based on the above perspectives and drawing similar conclusions as Farquhar (2011), it is safe to infer that organisation theorists differ on the exact nature of the design quality role that client organisation assume on their construction project with specific

reference to those roles that pertains to achieving value in building designs. One of the implications of the differing perspectives for this research is that the data collected on client's design quality role may be influence to the extent that respondents differ in their perspectives of organisation theory. For instance, respondents with a stewardship theory perspective of organisation may differ on same role tasks from those having either an agency theory perspective or a resource dependency theory perspective. Another implication of the differing perspectives borders on developing the hypothesis concerning relations between design quality role and the design process.

3.6.3 Organisation Context Construct

To put team in proper perspective, Gully (2000) stated *'that to conduct research on work teams in organisational context, the team has to be treated as the primary level of analysis'* thus illuminating the point that teams operate in contexts that either facilitate or hinders their functioning. Arising thereof, Mathieu et al. (2008, p. 454) define organisational contextual variables as *'sources of influences that are external to the team, yet emanate from the larger organisational system within which they are nested'*. Further to this, distinction was made for sources of influence that emanate from outside the organisation but yet influencing team functioning – called environmental contextual variables.

Within the theory of organisational behaviour, the context within which an organisation operates is considered a main factor that affects the effectiveness of teams within that organisation (Francesco & Gold, 2005; Robbins & Judge, 2013). Amongst the variables considered hereunder are: resources (availability and adequacy), the nature of the organisation structure, culture and reward and evaluation mechanism as shown in Figure 3.5 and briefly discussed in Section 3.3.5. Literature within construction/project management supports the influences of these factors

(Avolio, Luthans, & Walumbwa, 2004; Keegan & Den Hartog, 2004; Keller, 2006; Müller & Turner, 2007; Pheng & Chuan, 2006; Yang, Huang, & Wu, 2011).

A consideration of organisation from a systems perspective recognises five basic sub-systems that interactively contribute to organisational performance i.e. the effective use of input to undertake tasks towards generating required outputs. These sub-systems include tasks, technology, structure, people and management (Mullins, 2010). Mullins (2010, p. 92) describes these sub-systems thus: **task** describes *the goals and objectives of the organisation: the nature of inputs and outputs, and the work activities to be carried out in the transformation or conversion process*; **technology** entails *the manner in which the tasks of the organisation are carried out and the nature of work performance: the materials, systems, and procedures, and equipment used in the transformation or conversion process*.

Other considerations of organisation sub-systems includes: **structure** which depicts the *patterns of organisation, lines of authority, formal relationships and channels of communication among members: the division of work and co-ordination of tasks by which the series of activities is carried out;* **people** describes *the nature of the members undertaking the series of activities: for example their attitudes, skills and attributes; needs and expectations; interpersonal relations and patterns of behaviour; group functioning and behaviour; informal organisation and style of leadership*; and finally **management** which described that part of an organisation responsible for the *co-ordination of task, technology, structure and people, and policies and procedures for the execution of work; corporate strategy, direction of the activities of the organisation as a whole and its interactions with the external environment*.

Organisation theories within construction projects under the systems approach also similarly recognises five basic sub-systems given their unique nature in terms of temporariness, namely: behaviour, techniques and technology, decision making, organisation structure and the project management process (Walker A. , 2007). The **behaviour** factor describes '*the characteristics of the individual members of the organisation reflective of their: motivation, reaction to status and role relationships, and personal goals and values' (p. 12)*; **techniques and technology** dimension defines *'the tools used by the members of the organisation to produce the building or other construction works . . . . . based upon the needs for the organisation to be structured . . . . . to achieving clients' objective' (p. 13).*

The other sub-systems within the Walker model includes: **decision making** encompassing *'the quality . . . . . complexity of . . . series of 'pinch points' through which it [projects] must pass if it is to make progress . . . . . managed by the project management process as a whole . . . . based on output generated by the contributors working within the organisation structure' (p. 15)*; and **organisation structure** describes the *'subset of the project management process. It structures the relationships of the members of the organisation and hence influences their responses to the demands placed on them; establishes the way in which advice is generated for decision making and use of techniques and technology in the process' (p. 15).*

Putting both the Walker's and Mullins' models of organisation context within the context of this research, parallels can be drawn between them relative to that of the Robbins and Judge's (2013) four-variable model. This parallelism is shown in Table 3.6. However, some dimensions of the Walker's and Mullins' models are more suitably mapped to the composition factor (discussed in the next section) rather than to that of organisation context as discussed in this section. For instance, the Mullins'

people dimension and Walker's *behaviour* dimension are dimensions most suitable for the Robbins and Judge's (2013) composition factor that effect team effectiveness. Given the commonalities between the three models considered herein, the Robbins and Judge (2013) four-variable organisation context factor is adopted for the organisation context construct as a building block for the development of the conceptual framework. The variables within the organisation context construct are discussed below.

Table 3.6 – Organisation Context Models

Robbins and Judge (2013)	**Mullins (2010)**	**Walker (2007)**
Available Resources	Technology	Techniques & Technology
Organisation Structure	Structure, task	Organisation Structure, Decision making
Organisation Culture	People	Behaviour
Reward and Evaluation	People	Behaviour

3.6.3.1 Adequate Resources

Teams within the small group and/or team literature are mostly concentrated on organisations that are permanent in nature. In such organisations, teams are domiciled within their parent organisation and its membership drawn from within the organisation either as problem-solving teams, self-managed teams or cross-functional teams (Mathieu and Rapp, 2009; Robbins and Judge, 2013). Hence, resources for such teams are fully the responsibility of the parent organisations most especially in terms of resourcing. However, teams within the construction industry are temporary in nature and their membership drawn from multiple organisations (Walker A. , 2007; BIS, 2013). Therefore resource requirements for temporary organisation would differ from those that are permanent in nature.

Within the framework of supply chain management, which provides a more suitable consideration for teams in temporary organisations, Pryke (2009) sums up the nature of resources client organisations should provide into three in order to make the supply

chain effective, namely: capability, knowledge, and commitments. Rimmer (2009) (Rimmer, 2009) further explains the constituents of each of these resources as follows. Client organisation should be capable of: providing strong leadership, having open management structures, giving recognition, respect for and involvement of the people in the chain; proper information dissemination, and having the required human resources with adequate skills and knowledge both managerial and technical. They should possess knowledge in areas of: product investment, change, performance and their management; business and risk management; design management and improvements initiatives. Finally, client organisations are expected to commitment to adopting practices that are in the best advantage of all members of the supply chain, and show great determination to continuity and success.

Within the team literature, resource related studies have established relationships with performance to varying degrees and looking at a variety of variables. For instance technology certainty and availability both relates significantly with team functioning (Atuahene-Gina and Li, 2005); openness climate that create and promotes an environment which is supportive of employee involvement and teamwork in terms of well developed social structure and socio-political support that enhances participative decision making amongst others, is known to relate positively with team empowerment (Mathieu *et al*., 2006) on the one hand and lower level team process (Mathieu *et al*., 2007) on the other.

3.6.3.2 Organisational Structure

Organisational structure, defined as *'the way in which job tasks are formally divided, grouped, and coordinated'* (Robbins and Judge, 2013, p. 480), have been considered variedly within team studies but particularly at two levels of analysis – team and organisational. Generically, six key elements are taken into consideration when

organisational structure is designed (Robbins and Judge, 2013): work specialisation – degree to which activities are in organisations are subdivided into separate jobs and further into steps each performed by a separate individual; departmentalisation – the basis by which jobs/tasks in an organisation are grouped together for ease of coordination, chain of command – the line of authority showing reporting patterns from top of the organisation to the lowest, span of control – the number of subordinates that a manager can effectively and efficiently direct, centralisation and decentralisation – degree to which decision making is centralised or decentralised, and formalisation – degree to which jobs/tasks within an organisation are standardised..

Still within organisational perspective (compared to that of the team-level), but founded on the principles of supply management, structuring refers to matching an organisational resources and efforts with the requirements of the market. And selecting the right structure involves a combination of three schools of knowledge (Cousins, Lamming, Lawson, & Squire, 2008): strategic supply – in searching for areas of competitive advantages, competition – the driver for strategy and changes in its nature must be considered which may bring about changing skill and competencies, supply sourcing etc; and organisational design – the arranging the intelligent resources of the organisation in such a way that it can engage with the market effectively. Hence, the nature of an organisational structure will influence the teams during the design process, which in turns will affect team functioning.

At team level, structuring can be very important as it serves as a bridge between organisational-level decisions and staffing decisions (Hollenbeck *et al*., 2002 as cited in Mathieu *et al.,* 2008) report that departmentalisation is the most favoured criteria for structuring teams and two of the more widely considered forms are: functional – occur when individual within a team are organised according to the similarity of the

task they will perform; and divisional – occur when individuals within the team are organised based on geographic area served and/or the specific type of product for which they are responsible. Specific areas of research within team structure include composition of team based on type of structure to employ for instance divisional team structure is most effective for teams with high level of cognitive ability (Hollenbeck et al., 2002); influence of structure of information type, wherein divisional team structure allows member share same information thereby improving efficiency (Ellis et al., 2003); effect of changing structure on performance, in which transition from functional to divisional improve performance (Moon et al,. 2004).

3.6.3.3 Leadership and Culture

Leadership defined as the *'ability to influence a group toward the achievement of a vision or a set of goals'* (Robbins & Judge, 2013, p. 368) is receiving considerable significant research patronages within construction management in recent times. This is not unconnected to its influence on project outcomes (Kissi, Dainty, & Tuuli, 2012; Muller, Geraldi, & Turner, 2012; Yang, Huang, & Wu, 2011), particularly given the dynamic nature of the project environment – rapidly evolving, complex and temporariness or work – i.e. the often discontinuous change of work (Hesselbein & Goldsmith, 2006).

Within teams, leadership is considered a critical factor which facilitates effective team performance and more importantly and significantly in project-based, team-oriented tasks and set ups; particularly the transformational leadership (Loosemore, Dainty, & Lingard, 2003; Dionne, Yammarino, Atwater, & Spangler, 2004; Burke, et al., 2006; Zhang, Cao, & Tjosvold, 2011). Tuuli, Rowlinson, Fellows, and Liu, (2012) identified two approaches to leadership – person-orientated and task-orientated. And due to the nature of the construction industry for instance pressures from cost and time

constraints, leadership tend towards greater degree of task-orientation (Andi and Santoso, 2004; Mäkilouko, 2004; Chi and Pan, 2012).

Task-orientated leadership leads to the likely lose of relationship between the leaders and team members. To avoid this lose and its concomitant effect on team performance, Tuuli et al. (2012) advice that effective leadership is contingent on considerations of the project environment and its contextual factors. In an attempt to contribute to understanding of the leadership concept in construction, using some theoretical and empirical evidences Tabassi, Ramli, & Dashti (2014) developed a model proposing that *'team performance is indirectly affected by leadership behaviours via mediating roles of both contextual factors and team behaviours'* (p. 51).

While the proposed model may seem to support Turner and Muller (2005) position that when applied to project environment, leadership has no impact on project success, at least not directly (Müller & Turner, 2007); it however contradicts the existing generic IPO and IMOI team effectiveness models e.g. that of Gist, Locke & Taylor (1987), Ilgen *et al*. (2005), LePine *et al*. (2008), Yang *et al*. (2011) and Robbins and Judge (2013). These models considered leadership either as part of organisational contextual factors in terms of input or as a process variable unlike the Tabassi, Ramli, & Dashti's (2014) model considering contextual factors as moderating between leadership and team behaviour. The conceptual framework developed herein conforms to the generic IPO team effectiveness models which considers leadership as an input variable but also recognises the fact that the nature and culture of client organisations will have an influence on it.

The culture of an organisation has significant impact on shaping its leadership and it is also known that leadership significantly influences the culture in organisations. Hence,

the conceptual framework combines both concepts within a single variable for the purpose of investigation. Mullins (2010) defines culture simply as *'how things are done around here'* and citing Atkinson further explaines that it reflect the underlying assuptions about the way work is performed in terms of what is 'acceptable and not accepted' and what behaviours are encouraged and discouraged. Further, McLean and Marshall (1993) as cited in Mullin (2010) gives a more detailed definition as *'The collection of traditions, values, policies, beliefs, and attitudes that constitute a pervasive context for everything we do and think in an organisation'*. Robbins and Judge (2013) citing Schein (1999) defines cultture as *'a system of shared meaning held by members that distingushed the organisation from other organisation'*.

Linking the culture concept to teamwork and performance, Robbins and Judge (2013, p. 514) explains that: *'organisational culture shows how employees percieve the characteristics of an organisation's culture, not whether they like them. This is important because it differentiates culture from job satisfaction .... Research on organisational culture has sought to measure how employees see their organisation: Does it encourage teamwork? [for instance]....'*. Seven primary characteristics that seems to capture the essence of an organisation's culture are: innovation and risk taking, attention to detail, outcome orientation, people orientation, team orientation, aggressiveness, and stability (Robbins and Judge, 2013). This research focuses on the people and team orientation characteristics. Within supply chain mangement in construction, Fellows (2009) relays that though varieties of cultures exist in all supply chains – due to their multi-organisational configuration – intercultural competence is required so that projects are seen tthrough the eyes of the different stakeholders and to appreciate the performance requirements which each of them place on the project.

Studies on leadership and culture converges on an aspect of the people dimension of organisation particularly at inter-organisational level of analysis – trust (Cheung, Wong, Yiu, & Pang, 2011; Chow, Cheung, & Chan, 2012). Hence, this research used trust as the main concept to operationalise this apect of independent variables i.e. leadership and culture of client organisation for investigation. There seem to be some consensus on the defintion of trust *'a psychological state that enables a party to accept vulnerability based in positive expectations in the intentions or behaviours of other parties'* (Dekker, 2004; Costa & Bijlsma-Frankema, 2007; Davis & Schroorman, 2007; Weibel, 2007). Distinction is made between two types of trusts which play fundamental roles in teams: interpersonal trust or intra-entity trust – involving trust between individuals of contracting organisations formed during interactions, and inter-organisation trust – that which the member of a focal organisation places in a partner organisation (Fang, Palmeaier, Scheer, & Li, 2008; Roehrich & Lewis, 2010; Heavey, Halliday, Gilbert, & Murphy, 2011). This is particularly so in temporary project organisations where highly transient project teams represent their organisation at the project level (Lau & Rowlinson, 2009; Bachmann & Inkpen, 2011; Laan, Noorderhaven, Voordijk, & Dewulf, 2011).

3.6.3.4 Performance Evaluation and Reward

Within generic consideration of organisations, Robbins and Judge (2013) points out that traditionally, organisations assessed only how well tasks are performed based on a job description, but that due to the changing nature of organisation design i.e. less hierarchical and more service oriented, more forms of measurement are emerging, amongst which are: task performance, citizenship and counter-productivity. While these constructs tends to exist at the individual-level of analysis attempts have also been made to evaluate performance at both team and organisational levels (Kirkman &

Rosen, 1999; Kirkman, Rosen, Tesluk, & Gibson, 2004; Chen G. , Kirkman, Kanfer, Allen, & Rosen, 2007; Zellmer-Bruhn & Gibson, 2006).

Outside teams, but within organisation and much less so for teams within the construction industry, performance evaluation serves a number of purposes namely: 1) aid decision making on human resources on matters of promotions, transfers, and termination; 2) identify training and development needs by underpinning skills and competencies for which remedial programs can be developed; 3) provide feedback to employee on how the organisation views their performance which are the basis for reward allocations Robbins and Judge (2013). Mullins (2010) used the term performance management as a more encompassing term to reflect the nature of managing human resource as defined it as

> *'Establishing a culture in which individuals and groups take responsibility for the continuous improvement of business processes and their own skills, behaviours and contributions. It is about sharing expectations. Managers can clarify what they expect individuals and teams to do; likewise individuals and teams can communicate their expectations of how they should be managed and what they need to do their jobs. It follows that performance management is about interrelationships and about improving the quality of relationships between managers and teams, between members of teams and so on, and is therefore a joint process' (p. 510)*.

Mullins' (2010) organisational perspectives on performance evaluation are in sync with considerations within generic supply chain management theory. Performance measurement, another term depicting performance evaluation, is seen as been critical for the successful management of a firm's supply chain and is a key means of monitoring and evaluating the actions of individuals and workgroups within the function. Hence the link between evaluation and performance thus: *'Management use performance measures as a means of signalling and influencing the actions of the people who are responsible for performing tasks, and while they may not necessarily stop at evaluating its suitability, employees take their lead from these measures to*

maximise their own performance' (Reese, 2004; Cousins & Menguc, 2005; Agarwal, 2006; Cousins & Lawson, 2007; Cousins, Lamming, Lawson, & Squire, 2008).

3.6.4 Design Team Composition Construct

Team composition research focuses on the attributes of team members and the impact of the interactive combination of these attribute on team processes, emergent states, and team outcomes. Based on several empirical evidences, the National Research Council (2015) concludes that *'team composition influences team effectiveness, and this relationship depends on the complexity of the task, the degree of interdependence among team members, and how long the team is together' (p. 96)*. Mathieu et al. (2008) asserts that over the years, three main approaches have been the basis of conceptualising and operationalising the team composition construct. These are mean values, diversity indices and complex combinations. Below is a summary of Mathieu's et al. (2008) comprehensive review of compositional factor literature.

1. Under the mean values approach the summary index, which relies on some measure of central tendency of members' attributes, when pooled is indicative of the team's characteristic which indeed affects the team. Members' characteristics that have been studied using this approach is personality with various studies extending it beyond the Big Five to include achievement orientation, dependability, assertiveness and locus of control (LePine J. A., 2003; Boone, Van Olffen, Van Witteloostuijn, & De Brabander, 2004; English, Griffith, & Steelman, 2004; Halfhill, Sundstrom, Lahner, Calderone, & Nielsen, 2005; Pearsall & Ellis, 2006; Bell S. , 2007).
2. Other attributes considered under the mean values approach include: competencies in terms of knowledge, skills and abilities (Cooke, Kiekel, Salas, & Stout, 2003; McClough & Rogelberg, 2003; Hirschfeld, Jordan, Feild, Giles,

& Armenakis, 2005; Morgeson, 2005; Mathieu & Schulze, 2006); goal orientation, teamwork orientation, team learning orientation, member attitude and group value consensus (Bunderson & Sutcliffe, 2003; Chen, Mathieu, & Bliese, 2004; DeShon, Kozlowski, Schmidt, Milner, & Wiechmann, 2004).

3. Diversity factors consider the influences of the heterogeneity of team member characteristics on team mediator/processes and outcome and have been found to be a complex concept in team effectiveness models. This complexity is defined by situational factors and time, thus diversity can and has been reported as being beneficial, detrimental and having no effect on processes and performance (Webber & Donahue, 2001; Jackson, Joshi, & Erhardt, 2003; Chen, Mathieu, & Bliese, 2004). Diversity has been considered in terms of demography, functional background, personality, and attitude/values, as well as complex combinations.
4. While diversity in age and tenure is known to have positive relation with team processes and performance, contrasted by some other studies, race/ethnicity, gender, age, tenure, and education have all shown to be detrimental.

The right team composition and its eventual selection are known to affect the performance of construction projects. Within construction management, composing the team is regarded as the sole responsibility of the client organisation particularly for frequent procuring clients in the public sector (Chan, Scott, & Chan, 2004; Chow & Ng, 2007; Walker A. , 2007; Winch, 2010) as discussed in Chapter 2. Given that composing the team is a client responsibility, clearly the success of the design process – in this case achieving value in building design – relates to a fundamental aspect of the client organisation parameter that influences the effectiveness of teams namely the composition factor as explained by Robbins and Judge (2013).

Composing the design team by the client organisation takes place under a consulting context thus depicting interactions between client organisations and consultants. The active participation of client organisations in consulting engagements engenders the benefits of outsourcing in terms of problem solving, learning and change (Sturdy et al., 2009; Nikolova et al., 2009; Kykyri, Puutio & Wahlstrom, 2007; Clark, Fincham & Sturdy, 2007). Interactions within design teams deploy the concept of knowledge management.

Studies relating management performance to project success abound. For instance, Yang *et al.* (2010) (Yang, Yeung, Chan, Chiang, & Chan, 2010)provide empirical support to the significant impact that the performance of client organisations have on their project success. This therefore suggests that not only is the client organisation responsible for composing the design team but also that of their performance. In other words, how well the client organisation succeeds in getting the right membership composition would impact on the design team succeeding at achieving value in the building they are composed to design. Robbins and Judge (2013) advocate three main factors amongst others, for the successful composition of teams that would impact on their effectiveness namely: abilities, personality and general roles as shown in Figure 3.3 and discussed in Section 3.3.5. Mathieu et al. (2008) confirms the significance and popularity of these three composition characteristics in the team literature. Within the context of systems theory, these three variables defining the composition construct of the conceptual framework depicted in Figure 3.14 are discussed in the following sections.

3.6.4.1 Members Abilities

Among the six variables under the compositional factors considered in the Robbins and Judge's (2013) model member's abilities are the ones closely related to the task

performance which they defines as *"an individual's current capacity to perform the various tasks in a job"* (p. 52). The Nation Research Council (2015) also concurs to this view thus: "*Perhaps the most important individual characteristic to consider when composing a team is scientific, technical, or stakeholder expertise" (p. 82)*. Distinction is made between two types of abilities – intellectual and physical with intellectual abilities which are needed to perform mental activities e.g. thinking, reasoning and problem-solving, being more apt in the consideration of teams. Hence, part of a team's performance depends on the knowledge, skills and abilities of its individual members (Hirschfield, Jordan, Feild, Giles, & Armenakis, 2006; Randall, Resick, & DeChurch, 2011).

It has been established that the performance of a team is not a mere summation of its individual members' abilities nor is it an average of them. These abilities nonetheless set limits as to what team members can be and how effectively they will perform on a team. Specifically, Morgeson, Reider, & Campion (2005) and Hirschfeld et al. (2005) points out that due to the unique demands of working in teams the knowledge, skills and abilities needed for performance differ from those needed by individuals working alone. High diversity of disciplines i.e. composing a team with memberships drawn from a variety of disciplines, enhances their performance (Stvilia, et al., 2010; Cummings, Kiesler, Zadeh, & Balakrishnan, 2013; Mathieu & Schulze, 2006). This is particularly more so for design teams that would require the expertise and knowledge of the diverse professions and specialisations within the construction industry depending on the nature and complexity of the design task.

3.6.4.2 Personality

Personality, defined as *'the dynamic organization within the individual of those psychophysical systems that determine his unique adjustment to his environment"*

which Robbins and Judge (2013) further explains as the sum total of ways in which an individual reacts to and interacts with others. Mullins (2010) also concurs to these descriptions but gives it more insights and depth as consisting of a set of *'stable characteristics'* that explains why a person behaves in a particular way. Two board approaches exist in the study of personality – nomothetic and idiographic approaches (Mullins, 2010). Nomothetic approach assumes a measurable and specific perspective that looks at the identification of traits and personality as a collection of characteristics which are describable, identifiable and measurable and can therefore by subjected to observation and tests. The nomothetic approach views environmental and social influences as minimal and that personality is largely consistent, largely inherited and highly resistant to change. Nomothetic approach aligns itself with the positivist school who believe in the existence of an objective collection of observable data i.e. data that are beyond question, hence its inclination towards the measurability and predictability of the ways in which personality types would behave given certain circumstances.

The idiographic approach on the other hand assumes a holistic and dynamic perspective insisting on taking account of the 'whole' understanding of the individual at work bringing on as it were an understanding of the societal context in which the people live. The idiographic approach is concerned with understanding the uniqueness of individuals, while regarding personality development as a process open to change, and that individuals respond to the environment and people around them dynamically and that this dynamism in interaction plays a critical point in shaping personality. And for this reason the idiographic approach sees the measurement of traits as a means of determining an individual personality as largely inappropriate. The nomothetic approach to personality study in teams particularly the 'Big Five' is the most popular theory (Mathieu, Maynard, Rapp, & Gilson, 2008; Oh, Wang, & Mount, 2011;

Robbins & Judge, 2013; National Research Council, 2015) and hence adopted for this research. While the dimensions in the Big Five measure of personality are not in themselves personality types, they capture the distinct differences between people and *'do a very good job of predicting how people behave in a variety of real-life situations'* (Fleeson & Gallagher, 2009).

Robbins and Judge (2013) explained the following as the Big Five Personality Model:

1. Extraversion – this dimension captures a person's comfort level with relationships. People who score high on the extraversion dimension tend to be gregarious, assertive, and sociable. Introverts on the other hand tend to reserved, timid and quiet.
2. Agreeableness – the agreeableness dimension refers to an individual's propensity to defer to others. Highly agreeable people are cooperative, warm, and trusting. People who score low on agreeableness are cold, disagreeable and antagonistic in nature.
3. Conscientiousness – the conscientiousness dimension is a measure of reliability. A highly conscientious person is responsible, organised, dependable, and persistent. Those who score low on this dimension are easily distracted, disorganised, and unreliable.
4. Emotional stability – this dimension, which is often labelled by its converse – neuroticism, taps a person's ability to withstand stress. People with positive emotional stability tend to be calm, self-confident, and secure. Those with high negative scores on this dimension tend to be nervous, anxious, depressed, and insecure.
5. Openness to experience – the openness to experience dimension addresses range of interests and fascination with novelty. Extremely open people are

creative, curious, and artistically sensitive. Those at the other end of the category are conventional and only find comfort in those things they are familiar with.

3.6.4.3 General Roles

Aside the 'functional' roles team members are engaged to perform based on the specific technical demand of the task assigned them, certain team specific roles must be undertaken by its membership to cater for the differing needs of teams (Humprey, Morgeson, & Mannor, 2009). This is referred to as team roles. Mullins (2010) citing Belbin (1981, 1993) describes team role as a pattern of behaviour, characteristic of the way in which one team member interacts with another whose performance serves to facilitate the progress of the team as a whole' and notes that the most consistently successful groups comprise a range of roles undertaken by various members.

Belbin (1981, 1993) identifies nine team roles described thus: planner – creative, imaginative, unorthodox – solves difficult problems; resource investigator – extrovert, enthusiastic, communicative – explores opportunities and develops contacts; co-ordinator – mature, confident, a good chairperson – clarifies goals, promotes decision-making and delegates well; shaper – challenging, dynamic, thrives on pressure – has the drive and courage to overcome obstacles; monitor-evaluator – sober, strategic and discerning – sees all options and judges accurately; teamworker – co-operative, mild, perceptive and diplomatic – listens, builds and averts friction; implementer – disciplined, reliable, conservative and efficient – turns ideas into practical actions; completer – painstaking, conscientious, and anxious – searches out errors and omissions and deliver on time; and specialist – single-minded, self-sharing, and dedicated – provides knowledge and skills in rare supply.

Similarly, Robbins and Judge (2013) outlines nine key roles of teams and advices that efforts be made at balancing these roles while composing and resourcing the team. These roles include: creator – initiates creative ideas; promoter – champions ideas after they have been initiated; assessor – offers insightful analysis of options; organiser – provides structure to the team's processes; producer – provides direction and follow through; controller – examines details and enforces rules; maintainer – fights external battles; adviser – encourages the search for more information; linker – coordinates and integrate team members.

3.6.5 Design Process Construct

Within the context of this research, design process is a proxy for team process as conceptualised in the generic study of teams. Team processes are described as the *'means by which members marshal and coordinate their individual resources – cognitive (comprising team mental models and transactive memory, cognitive team interaction, team climate, and psychological safety), affective (comprising team cohesion team efficacy and team conflict), and behavioural (comprising team process competencies, and team self-regulation) – to meet task demands necessary for the collective goal accomplishment'* (National Research Council, 2015). And once these resources are appropriately aligned with the task at hand, the team is said to be effective.

Summarising Mathieu et al.'s (2008) synthesisation on team processes, the following points are made:

1. Within team literature, team process variables are referred to as mediating processes and fall into two major categories: processes and emergent states. Team processes plays central role in all team effectiveness models and are further sub-

categorised into three: transition, action and interpersonal. During the transition phase the focus is on activities such as mission analysis, planning, strategic formulation etc, the action phase involves task accomplishment, monitoring progress and system, coordinating members as well as monitoring and backing up fellow members; while the interpersonal phase involves conflict management, motivation and confidence building (Marks, Mathieu, & Zaccaro, 2001)

2. Transition processes are consequential to the other team processes thereby setting the stage for later actions. Specific areas of transition processes that were found to relate positively with performance include: planning and time management, dynamic planning, organising, formulation of strategies etc (Janicik & Bartel, 2003; Hiller, Day, & Vance, 2006; Mathieu & Schulze, 2006). Major aspects of research in action processes have been in communications and coordination (LePine J. , Piccolo, Jackson, Mathieu, & Saul, 2008), members participation (De Dreu & West, 2001), team's reward system (Johnson, et al., 2006) and back up behaviours (Porter C. O., 2005).
3. Interpersonal processes include conflicts, motivation, confidence building and affect with studies on conflict been the most prevalent. Other interpersonal processes that have been found to relate with team performance include: feedback, composite measure and temporal dimension of team (De Dreu & Weingart, 2003; Raver, 2005; Geister, Konradt, & Hertel, 2006; Mathieu & Schulze, 2006; Maynard, Mathieu, Marsh, & Ruddy, 2007). Processes not attributed to any of the three process categories are also found to be studied and popular amongst these is team creativity (Gilson & Shalley, 2004; Gilson, Mathieu, Shalley, & Ruddy, 2005).

Xie (2002) characterised the design process via construction design as *'an increasingly complex synthesis activity for which effective solutions depend upon co-operative participation by a number of people. Thus communication, including the integration of specialised knowledge and negotiation of differences between team members, is a vital process for collaborative design' (p. iii).* From the aforementioned, three variables characterises the design process – cooperative participation, communication, and negotiation of difference. Mills (2013) also emphasised the essence of these variables in the managing multi-stakeholders when interrogating the client value system in order to understand its values and define value. These variables are in line with those in the Robbins and Judge's (2013) model shown in Figure 3.3 and the conceptual framework as shown in Figure 3.14.

Again, due to the paucity of design process specific research within construction management literature, the generic team literature provides the underpinning theoretic considerations to explain the design process as a proxy for team processes. The detailed reviews on team processes by Mathieu et al. (2008), Farquhar (2011) and (National Research Council, 2015) amongst others guided the considerations and discussions in this section as they relate to the three team processes identified for this study – communication, collaboration and conflict resolution

3.6.5.1 Communication

Emmitt and Gorse (2003) notes that defining what is meant by communication can prove difficult given than it is one of those human activities that everyone recognises but few can define satisfactorily. Reporting the finding of a survey conduct far back in 1972 by Dance and Lanson that discovered 126 differing definitions of communication, Emmitt and Gorse (2003) citing Trenholm and Jenson (1995) indicates that over time the number of definition has increased. Given the diversity in

definition, the definition provided by Rogers and Kincaid (1981) is more robust and resonates well with the constituents of the varieties of definitions thus: *"a process in which the participants create and share information with one other in order to reach mutual understanding"* (p. 63 cited in Emmitt and Gorse, 2003, p. 34). Similarly, Robbins and Judge (2013, p. 337) define communication as *"the transfer and understanding of meaning"*.

Citing Tubbs and Moss (1981) Emmitt and Gorse brings out the following as the main components of communication: the creation of meaning between two or more people; the essence of communication being to send, place, exhibit or manifest a message, signal, code, movement or other stimulus which means something to the receiver; information communicated will not mean the same to the sender, but invoke a reaction, manifest a thought that has relevance to both receiver and sender; and that the relevance of the communication need not be the same to the sender and the receiver.

Summarising the National Research Council's (2015) and Farquhar's (2011) synthesisation of communication in team literature the following salient points are evident:

1. Teams actively engage in cognitive processes such as decision making, problem solving, situation assessment, planning, and knowledge sharing (Letsky M. , Warner, Fiore, & Smith, 2008) largely due to the interdependence of team members, and often manifested through communication, the essential building block of team cognition (Fiore, et al., 2010; Cooke, Gorman, Myers, & Duran, 2013).

2. Communication is multidimensional in nature and can broadly be classified into four facets: frequency – the amount of communication between members i.e. exchange of information over a period of time; direction – flow of communication within an organisation upward, downward or lateral; modality – the medium of communication; and content – the detail of the message that is transmitted and extent to which it mediates negative consequence (Mohr et al., 1996; Fisher et al., 1997; Jassawalla & Sashittal, 1998; Massey & Dawas, 2007) . These facets are commonly organised as the dimensions of communication consisting of communication frequency, bi-directional communication and communication quality
3. Communication assumes two forms – collaborative and contentious. Collaborative communication relies on positive attitudes which create an atmosphere of mutual support and respect and is seen as being positive. Contentious communications are seen as being pessimistic and less likely to lead to positive outcomes. An important dimension of communicative communication is the quality of communication and not solely reliance on frequency and bi-directionality (Lovelace *et al*., 2001; Mohr et al., 1996).
4. Communication quality – the extent to which communication supports the accomplishment of task in terms of how credible, understandable, relevant and useful is the information provided – is known to impact positively on team outcomes. But more specifically, this impact relates most highly and significantly on conflict where good quality information promote positive dialogue thereby enhancing functional conflicts (Massey & Dawes, 2007).
5. Generally, team composition, which results from the process of assembling aa combination of team members with the expertise, knowledge and skills necessary for accomplishing team goals and tasks, is seen as an intervention variable at

shaping team processes and particularly more so that of communications (Gorman & Cooke, 2011).

Reporting the outcome of some case studies conducted, Xie (2002) indicates that communications during construction design i.e. design process is influenced by: *procurement methods, communication system, client, contractors and key subcontractors (specialists), resource, social collaboration, technical collaboration, and key personnel* (p. 8). These factors closely replicate those identified as the input variables of this research i.e. client organisation parameters. For instance, procurement method, communication systems and nature of client all fall within the client roles variables as discussed in Section 2.2, while contractor and subcontractor, resource, key personal and collaboration would fall neatly either under the contextual factors or composition factors of the Robbins and Judge (2013) model as discussed in Section 3.3.5 above.

Links between communications and project success abound in construction management literature. For instance, Nzekwe-Excel et al. (2008) (Nzekwe-Excel, Nwagboso, Proverbs, & Georgakis, 2008)investigating satisfaction attributes of construction practitioners, found communications to be their most important attribute out of four clusters of 16 satisfaction attributes. This finding is not surprising given the importance of communications in project organisations. Cheng et al. (2001) and Jonsson and Zinedin (2003) supports this view by indicating that though communication is the binding link between construction practitioners which is the essence of any group interaction, it provides significant benefits in the areas relating to reduced cost, reduced re-work and improved quality.

Studies on the concomitance of poor communication within the construction industry have received significant contributions from researchers and practitioners. Specific areas of interests amongst others includes: effects on project management processes i.e. quality, cost, time and safety (Maslej, 2006); project delays (Jergeas, 2005); productivity, profitability and safety (Dexter, 2005); quality related issues (Collier, 2005; Dunbar, 2006); disputes (Jacklyn, 2011); de-motivated workforce and production problems (Sheetanshu, 2011). Causes for poor communication within the industry have been attributed to the following: temporariness of construction projects (Dainty et al., 2006); lack of common vocabulary across the industry – vertically and horizontally (Kenig, 2005); lack of training to overcome language barriers (Flory, 2001); forms and channels of communication (Mehra, 2009); problems associated with management of the demand-supply chains (Emmit & Gorse, 2007).

Giving specific attention to the design team, den Otter & Emmitt (2007) explored the effectiveness of design team communication based on case study design strategy. Hinging on the understanding that effective team communication is dependent on two inter-related factors: the communication acts of team members (Gorse, 2001) and the ability of mangers to facilitate, simulate and motivate team members (Emmitt & Gorse, 2007), they found a lack of the following: collective framework for team communication, users' understanding of proper use of communication techniques and tools, training and management competences to simulate use of. Based on these, den Otter and Emmitt (2007) advise on the need for there to be *'a better collective understanding of team, which should be supported by with training to develop appropriate skills, both for use of technologies and the use of team rules'* (p. 408). Clearly, these are within the purview of design management as suggested by Emmitt (2007).

Extending the management of designs beyond the scope of design management concept as an outsourced service, and based on den Otter and Emmitt's (2007) findings, a case is made for design management to be a strategic function within supply management – a sole responsibility of the client organisation towards ensuring value for money in building designs. This is in support of the arguments put forward by Cousins, Lamming, Lawson, & Squire (2008); Stevenson (2009); and Booth (2010) adjudicating responsibilities for managing supply chain to the owners i.e. organisations that engages the supplier, particularly where the services outsourced is described as a support function as against their core functions.

A recently found solution to the problems and challenges of communication is effective leadership. Leadership when applied rightly, say transformational as opposed to transactional, is known to enhance the effective distribution of information (Restubog, Hornsey, Bordia, & Esposo, 2008; Yang, Huang, & Wu, 2011). And for tasks requiring high interdependency in more complex environments, organisational productivity can be greatly enhanced with reliable and effective communication and knowledge management systems (Haas & Hansen, 2007).

3.6.5.2 Collaboration/Cohesion

National Research Council (2015) citing Beal et al. (2003) and Kozlowski et al. (2009) among others, summaries the concept of cohesion and its empirical evidences thus:

1. Cohesion is among the most frequently studied team processes, which is multi-dimensional in nature with facets focused on task commitment, social relations and group pride with the latter receiving far less attention.

2. Team cohesion is positively related to team effectiveness and that the relationship is moderated by task interdependence such that cohesion is stronger when team members are more interdependent.
3. Despite the relatively long periods of team cohesion studies, very little research has focused on antecedents to its development or interventions to foster it, theory strongly suggests that team composition factors and developmental efforts by team leaders play important role in its formation and maintenance

Investigating the extent to which teams are integrated within construction projects Baiden, Price, and Dainty (2006) found that while construction project teams exists as individual competent units within their organisationally defined boundaries, they exhibit varying degrees of integration determined by practices adopted by the teams and their congruence with inherent procurement approaches. Another fundamental finding of the research is that teams need not be fully integrated to effectively deliver projects. While this certainly contradicts the stance of generic team effective literature, it may not be surprising given the peculiarity of the construction industry in terms of it temporariness, multi-organisational team structure (Bertelsen, 2003b) and virtuality (Emmitt, 2007; Emmitt & Gorse, 2007; den Otter & Emmitt, 2007).

Integration in construction is used to describe the introduction of working practices, methods and behaviours that create a culture of efficient and effective collaboration by individuals and organisations, thus promoting the free exchange of information between the different participants. (Vyse, 2001; Lennard, et al., 2002). Drawing from some key research studies e.g. DBF (2000); Baiden, Price and Dainty (2003); Bromley, Worthington and Robinson (2003); OGC (2003); Strategic Forum for Construction (2003); Baiden et al. (2006) outlines the following as describing a delivery team in construction project that is “fully integrated”:

a) Has a single focus and objectives for the project;
b) Operates without boundaries among the various organization members;
c) Works towards mutually beneficial outcomes by ensuring that all the members support each other and achievements are shared throughout the team;
d) Is able to predict more accurately, time and cost estimates by fully utilising the collective skills and expertise of all parties;
e) Shares information freely among its members such that access is not restricted to specific professions and organisational units within the team;
f) Has a flexible member composition and therefore able to respond to change over the duration of the project;
g) Has a new identity and is co-located, usually in a given common space;
h) Operates in an atmosphere where relationships are equitable and members are respected; and
i) Has a "no blame" culture.

3.6.5.3 Conflict Resolution

Indicating that there has not been shortage of the definition of conflict and that it is perceptual concept involving opposition or incompatibility and some form of interaction, Robbins and Judge (2013) define conflict as *'a process that begins when one party perceives another party has or is about to negatively affect something the first party cares about'*. Broadly this definition describes: the transition of an interaction into an interparty conflict, the wide range of conflicts people experience in organisations – incompatibility of goals, differences in interpretations etc; and the flexibility in its dimensions. Robbins and Judge (2013) and Mullins (2010) further identify two views of conflict – the traditional and the interactionist. The traditional view saw conflict as bad and should be avoided because it was viewed as been negative. This view depicts conflict as a dysfunctional outcome, referred to as

dysfunctional conflicts. The interactionist view on the other hand proposes that some conflicts are good, referred to as functional conflicts and that these conflicts support goals and improves performance.

Lending voice to the duality of conflict, Mullins (2010) also notes that it is not necessarily a bad thing and can be seen as a 'constructive' force and in some certain circumstances should be welcomed or encouraged . When properly identified and handled, conflict can help to minimise destructive influences of the win-lose situation. Schmidt (1974) as cited in Mullins (2010) outlines the following outcomes of conflicts – for positive outcomes: better ideas produces; people forced to search for new approaches; long-standing problems brought to the surface and resolved; clarification of individual views; stimulation of interest and creativity; and a chance for people to test their capacities. The negative outcomes of conflicts include: some people feeling defeated and demeaned; an increase in the distance between people; development of a climate of mistrust and suspicion; individuals and groups concentrating on their own narrow interests; development of resistance rather than teamwork; and an increase in employee turnover.

Further, Mullins (2010) assert that while giving consideration to conflicts the important point to note is not so much the extent to which it is possible to create a totally harmonious working environment but rather how it is handled and managed when found. This certainly relates with the sources of organisational conflict which include: differences in perception, limited resources, departmentalisation and specialisation, the nature of the work activities, role conflict, inequitable treatment, and violation of territory

Summarising Farquhar's (2011) and the National Research Council's (2015) synthesisation of conflict in team literature the following salient points are evident:

1. Conflict is a multidimensional in nature but broadly classified into three types, task, relationship and process. Task conflict also referred to as cognitive conflict is an awareness of differences in viewpoints on opinions, decisions, ideas pertaining to a group task; relationship conflict referred to as affective conflict is an awareness of interpersonal incompatibility while process conflict is an awareness of controversies about how tasks should be accomplished (Jehn & Mannix; Mannix, 2001; Li & Hambrick; Langfred, 2007). (de Wit, Greer, & Jehn, 2012)de Wit, Greer and Jehn (2012) and Robbins and Judge (2013) strongly supports this conceptualisation of the conflict construct.
2. The impact of conflict on individual- and group-level variables tends to be variable based on the type of conflict i.e. conceptualisation on the one hand and the nature of instrument use for its measurement i.e. dimensionality on the other. For instance, relationship and process conflicts are negatively related to group performance while in some conditions cognitive conflict positively relates with performance, thus indicating the contingent and dynamic nature of conflict (Jenh, 1999; Jehn & Mannix, 2002; Peterson & Behfar, 2003).
3. Despite the seemingly consensus on the variable nature of the effect of conflict on performance, there exists some contradictory studies. For instance, De Dren & Weingart (2003) found that both relationship and task conflict are strongly, negatively associated to performance contrasting task conflict as widely reported in literature, and that in more complex tasks, it had stronger negative relations with performance.

4. Recent research reports that the relationships are more nuanced. For instance, all three types of conflict had deleterious association with a variety of team factors e.g. trust, satisfaction, organisation citizenship, and commitment. Further still, relationship and process conflict had negative associations with cohesion and team performance, the task conflict association was nil. This further suggests that task conflict may not be a negative factor under some circumstance, but that it is a rather complex issue (de Wit, Greer, & Jehn, 2012).
5. Group composition that creates demographic diversity and introduces fault lines or fractures positively associates with team conflict, hence the potency of conflict can be anticipated so that appropriate conflict management strategies – reactive or pre-emptive, can be applied when its manifests as a dysfunctional conflict (Thatcher & Patel, 2011; Kozlowski & Bell, 2013).

While some amount of conflict is considerably inevitable in organisations, there are a number of ways of managing it in order to avoid its harmful effects. Contrary to the generic studies of conflict in teams which conceptualises and measures conflict in terms of the nature of its existence and presence in team, this research conceptualises conflict in terms of team's ability at resolving it, hence importance of conflict management to the study. And closely related to the sources of conflict and its nature, are strategies for its management by focusing on the following aspects (Mullins, 2010, p. 101): clarification of goals and objectives and the continual refinement over time; resource distribution through the use of creative and imaginative allocation and utilisation approaches; implementation of human resource management policies and procedures that are equitable and justifiable; use of non-monetary rewards where financial resources are limited or are non-motivating; development of interpersonal/group process skills, group activities; paying attention to group activities

in terms of composition and factors affecting cohesiveness; leadership and management approaches that are participative and supportive in style should be adopted; paying attention to organisational processes in terms of structuring, work designs, communication processes autonomy and formalisation; and lastly adopting a socio-technical approach towards managing the organisation.

Interfacing Mullins' (2010) strategic model for managing conflict and the processes with teamworks – conflict as is the case here, brings to fore contextual factors that play important roles in conflict management. Looking at the contextual factors of Robbins and Judge's (2013) team effectiveness model, the following categories reduces the incidences of conflict: Resources in terms of clarification of goals and objectives, resource distribution; Leadership and Structure in terms of HRM policies and procedures, leadership and management, and organisational processes; Climate of trust in terms of HRM policies and procedures; Performance and reward system in terms of HRM policies and procedures, and non-monetary rewards. Aspects of Mullins' strategies that organisations must look into in order to reduce the incidence of conflict within the compositional factor of the Robbins and Judge's model are: development of interpersonal/group process skills, and group activities. So, expectedly, when teams demonstrate high levels in both contextual and compositional factors, their level of conflict lessen thus implying higher chances of conflict management to succeed i.e. high performance in conflict resolution.

Managing conflicts within teams in organisations are beginning to focus on devising ways of managing functional conflicts on the one hand while on the other they are focused on minimising to completely eliminating those that are dysfunctional (Mathieu et al., 2008). In managing functional conflicts, Robbins and Judge (2013) points out the following salient issues:

1. One of the keys to minimising counterproductive conflicts is recognizing when there really is a disagreement. Many apparent conflicts are due to people using different language to discuss the same general course of action. This definitely is the case in the design team having diverse discipline-related languages to the extent of professions involved.
2. Successful conflict management recognizes the diversity in possible approaches to problem solving and thus resolve them by encouraging open, frank discussion focused on interests rather than issues.
3. Compromises must be made where opposition tends to be divided along two distinct groups whereby the most important aspects of the solution to the opposing groups are selected and then focus is given to how each side can get its top needs satisfied in a win-win environment.
4. Group that resolve conflicts successfully discuss differences of opinion openly and are prepared to manage conflict when it arises making it easier to develop a shared perception of the problems at hand; also allowing for members to work towards a mutually acceptable solution.
5. Shared interest in solving conflicts must be the emphasis in teams so that members don't become too entrenched in their views to point of taking the conflicts personally. Groups with cooperative conflict styles and a strong underlying identification to the overall group goals are more effective than groups with a competitive style.

3.6.6 Team Functioning Construct

Design team functioning as conceptualised for this research, which is the dependent variable for the purpose of investigating the determinants of value in building designs, is a proxy for team effectiveness as used in generic team literature. Team effectiveness

is defined as an evaluation of outcomes of team processes relative to some set of criteria (Salas et al., 2010; Herre, 2010) and a team is said to be effective if it reaches its set goals in the established timeframe of those it is responsible to i.e. those who would evaluate its outcome (Forsyth, 2010). Within the wider studies of teams, team effectiveness has been conceptualised differently to varying degrees. For instance, Wageman et al. (2005) describes team effectiveness using a three-dimensional conception as follows: 1) The productive output of the team (its product, service, or decision) meets or exceeds the standards of quantity, quality, and timeliness of the team's client; 2) The social processes the team uses in carrying out the work enhance members' capability to work together interdependently in the future; and 3) The group experience contributes positively to the learning and well-being of individual team members, rather than frustrating, alienating, or de-skilling them. In a detailed review of researches on team effectiveness, Mathieu et al. (2008) discovered a barrage of outcomes for measuring team effectiveness, reporting that between the 1980s and 1990s Sundstrom et al. (2000) listed more than 20 outcomes that were studied as team effectiveness measures. And based on Cohen and Bailey (1997) three-dimensional categorisation of team effectiveness measures i.e. performance, attitudes and behaviours, Mathieu et al. (2008) further sub-classified all the effectiveness dimensions within these three categories, whilst discovering that performance is the most widely studied and applied dimension subdividing it into three sub-categories namely: organisational-level performance, team performance behaviours and outcomes, and role-based performance. Within organisation behaviour concepts and theories Robbins and Judge (2013) give two measures of team effectiveness – cohesion defined as the 'extent to which members of a group support and validate one another at work', and team functioning defined as *'the quantity and quality of a group's work output'*.

An attempt at drawing commonalities amongst the three frameworks of measuring team performance effectiveness i.e. Wageman's et al. (2005), Mathieu's et al. (2008) and Robbins and Judge's (2013) based on their descriptive features and properties indicates that, the functioning dimension of Robbins and Judge's (2013) framework adequately represents the productive output dimension of Wageman's et al. (2005) framework and the performance dimension of Mathieu's et al. (2008). Similarly, the cohesion dimension of Robbins and Judge's (2013) framework captures the properties of both the social process and team experience dimensions of the Wageman's framework on the one side and those of the attitude and behaviour dimensions of the Mathieu's framework.

Wageman et al. (2005) critiqued the product or service outcome dimension within their three dimensional conception towards a self-assessment of team effectiveness for the fact that *'a self-report instrument cannot generate trustworthy data about the acceptability of a team's work to its client'*, thereby suggesting either the social process of team experience dimension. However, Mathieu et al. (2008) indicates that performance measure continues to enjoy dominance in terms of popularity of application and specifically advice that the role-based performance measure should also be considered instead of the over-reliance on organisational-level performance measures in terms of achieving greater generalisability of research outcomes on team performance, Furthermore, irrespective of the arguments on the pros and cons of each of the performance measures, Mathieu et al. (2008) suggest that considerations of team performance criteria should amongst others be: a) carefully tied to the function and tasks of the team being studied, and b) differentiated into constituent parts rather than a general all-encompassing composite. Hence, given the commonalities amongst the effectiveness frameworks and the aforementioned arguments, the team functioning

dimension of Robbins and Judge's framework is adopted as measure of team performance i.e. design team functioning. This however, is without prejudice to Wageman's et al. (2008) caution on use of self-assessment instrument as is the case with the questionnaire used in collecting data, given the fact that the client organisation did form part of the team membership as explained within the theories of supply management, and hence expected to provide objective and independent assessment of the functioning of the team.

3.7 Hypothecating the Conceptual Framework

The conceptual framework in the previous section explains the variables that interactively would lead to the achievement of value for money in building designs, based on theoretical and empirical evidences from the review of literature as discussed in Chapter 2. The constructs and variables as contained in the framework were underpinned by theories related to: organisational behaviour – *which are known to influence the outcomes of organisations*; supply management – *which puts client organisation in the core of managing its activities geared towards achieving established organisational goals*; and lastly organisation & management in terms of systems and contingency theories – *which brings together all facets of an organisation i.e. tasks, technology, structure, people, and management; and holistically analyse them within given inherent contexts*.

Based on existing theories underpinning the theoretical framework as discussed herein, this section attempts at suggesting the nature of relationships that is expected to exist between the variables outlined in the conceptual framework and the nature of impact the independent variables i.e. client roles, contextual factors and team composition will have on the design team functioning when mediated by the design process variables i.e. communication, collaboration and conflict resolution. Again,

making such attempts draws heavily from the theories underpinning the development of the conceptual framework. For instance, while organisational behaviour theories will stop at providing evidence of positive relationships between contextual factors (for instance availability of resources, organisational structure etc) and team functioning (which is a proxy for team effectiveness as outlined in Robbins and Judge (2013) team effectiveness model), theories of supply management may further indicate that the nature of roles undertake by the client organisation and their relationships with the members of the supplier chain may impede team functioning given that the contextual factors are excellently catered and adequately provided for. This may be the case where the sourcing strategy is not in line with the nature of services required by the client organisation.

The essence of hypothecating the conceptual framework which was developed from both emergent theoretical and empirical evidences, stems from inherent limitations of existing studies which have largely suggests that teamwork is positively related to team effectiveness. Porter, Gogus, & Yu (2010) identified three important limitations inhibiting the generalisability of the generic team research. These include: 1) the increasing multiplicity and divergences in conceptualising the teamwork construct; 2) uncertainty about teamwork's dimensionality; and 3) lack of consideration of the effects boundary conditions have on the teamwork–team performance relationship. While the first two limitations may not be such a critical issue in the generalisability of research since once adequately conceptualised and operationalised, these measures will guide compatibility analysis and compartmentalisation of studies. The third inhibitor to a large extent is more consequential and fundamental to generalisability given that once the contextual underpinnings of team studies are not know

compatibility is at large. And when generalisations are based on non-contextualised boundaries the sciential nature of knowledge is lost.

Hence, bringing the theories underlying strategic supply management and systems/contingency approaches to organisation management, as a basis of explaining the relationships between team effectiveness variables will take care of the third inhibitor toward the generalisability of team research as mentioned above. To give contextual meaning to the research, first, the case has been made earlier of the nature of the construction industry in terms of its temporariness (Walker A. , 2007; Winch, 2010) and virtual nature of its teams (Emmitt, 2007; Emmitt & Gorse, 2007; National Research Council, 2015) compared to the generic considerations of teams in organisation. Second, given that the research is focused more on the client organisation been the centrepiece of achieving organisational outcomes and their active participation in teams in terms of: the design related roles they assume; setting the right context for teamwork and their ability at composing the design team whose membership are sourced from diverse disciplines and multiple organisations to supply building designs; the principles of supply management provides the most adequate contextual underpinning for such a study (Cousins *et al*., 2008; Pryke, 2009; Stevenson, 2009; Wolstenholme, 2009; Booth, 2010; BIS, 2013). Third, given that team effectiveness is dependent on the nature of task to be under taken by the team and the organisation and management of the team itself (National Research Council, 2015), the contingency theory, an extension of the systems approach to organisation and management which acknowledges the existence of *"possible means of differentiating among alternative forms of organisation structure and systems of management*" (Mullins, 2010, p. 59), suitably underpins the context within which teams operate in construction.

Bringing out the challenges that virtual team face, as mostly is the case for design teams in construction due to its temporariness, multi-organisational and multi-disciplinary participatory nature over geographically dispersed locations, National Research Council (2015) identified the following which would further aid in the hypothecation of the conceptual framework:

1. People working under virtual conditions are both invisible to each other and blind to their actions and situations thereby making members unaware of the detailed context of the work of their colleagues. Though technological solutions are available to the help members collaborate effectively, extra efforts are required to communicate effectively too.
2. Team membership is drawn from cross organisation multi-disciplinary boundaries each having different goals and objectives, organisational culture and structure, and standards and mode of operations, thus making establishment and implementation of common work methods over virtual interactions difficult.
3. Members' personality has been identified to be especially valuable in virtual teams. For instance members with social skills, that are trustworthy with high level of technology readiness, have the openness to explore new ways of working, and the willingness to explicitly make their actions available to other, will no doubt impact positively on the various aspects of team processes.

4. Effective leadership helps teams meet the challenges of collaborating across long distances. For instance, traditional and hierarchical leadership is not significantly related to team performance in virtual team but shared leadership is. Further, under such condition, structural support relates more to team performance than hierarchical leadership.

3.7.1 Design Process and Design Team Functioning

For more than half a century there have been quite a relatively large number of research that have attempted to measure the effectiveness of teams in terms of performance, attitude and behaviour (Kozlowski & Ilgen, 2006; Mathieu *et al*., 2008; Salas, Cooke, & Gorman, 2010; Kozlowski & Bell, 2013). Comparatively, in recent times, only a small number of studies on teams and their effectiveness have been carried out within the construction industry (Cheung, On, Yiu, & Lam, 2013) and none of these studies considered the design team despite the strategic position it holds within the industry (Lawson, 2005) and given the nature of information processing/knowledge driven interactions amongst the supply chain members more so at the design stage (Konukcu, 2011). Drawing from the generic literature, sufficient evidence abound on the influences of team processes dimensions on team performance. For instance, Kennedy, Loughry, Klammer, & Beyerlein (2009) makes the case that it is possible that teams may have unresolved conflicts and a low level of satisfaction among their memberships, making them unwilling or unable to work together in the future, but still do produce adequate results. Evidently, very recent research in team processes is bringing out innovative ways of enhancing and improving team processes. For instance Hu & Liden (2015) reports studies that focused on the influence of prosocial motivation (Grant & Berg, 2011; Li, Kirkman, & Porter, 2014) and team voluntary turnover (Jiang, Liu, McKay, Lee, & Mitchell, 2012; Heavey, Holwerda, & Hausknecht, 2013; Nyberg & Ployhart, 2013; Russell, 2013) on team processes, indicating their importance to teamwork, and indeed provided empirical evidence of the indirect effect prosocial motivation has on team performance. Drawing upon evidences in Section 3.6.5, this section discusses the three team processes that influences team performance and hypothesise the nature of their

effect upon design team functioning with specific reference to supply management principles.

3.7.1.1 Communication

The *'communication'* variable technically described as cognitive team interaction, involves activities which facilitates information and knowledge sharing processes that are foundational to decision-making, problem solving, situation assessment, planning and knowledge sharing (Letsky, Warner, Fiore, & Smith, 2008; Cooke, Gorman, & Kiekel, 2008; Fiore, et al., 2010; Gorman, Amazeen, & Cooke, 2010; Cooke, Gorman, Myers, & Duran, 2013). Communication is conceptualised as a multi-dimensional construct consisting of these dimensions: frequency, bi-directionality, quality, formality and coerciveness of content with quality empirically known to be critical factor to positive outcomes (Huse, 2007; Massey & Dawes, 2007; Cooke, Gorman, & Kiekel, 2008; Bennett & Gadlin, 2014; O'Rourke, Crowley, Eigenbrode, & Wulfhorst, 2014). Salas, Sims and Burke (2005) proposed that the closed-loop communication is an effective way of meeting information requirements in teamwork while McShane and Von Glinow (2010) brought out the benefits of the built in check-mode of this approach due to the dissimilar semantic meanings given to the same message as a results of perceptual mechanisms, biases or personality.

Giving specific considerations to construction project and particular interest in building design, communication has been known to improve project outcomes towards achieving value for money in design in terms of determining client value system, reducing cost and re-work, and improving quality (Cheng, Li, Love, & Irani, 2001; Jonsson & Zineldin, 2003; Nzekwe-Excel, Nwagboso, Proverbs, & Georgakis, 2008). And specific to construction teams Davis (2004) and Leung et al. (2004) asserts that enhanced communication amongst construction participants provides the client with

opportunities of making safer and better decisions and thus improves performance amongst the construction teams.

Within the context of supply management, Nzekwe-Excel (2010) showed that satisfaction (which in itself is a measure of team performance see Wageman, *et al*., 2005; Mathieu *et al.,* 2008) is an issue not just for the client but also for the other members of the project team. And for effectiveness, it is necessary for clients and members to have adequate understanding of each other's satisfaction attributes. Communication was found to be a critical factor for performance and satisfaction within the supply chain (Xie, 2002; Fellows, 2009; Konukcu, 2011). Lastly, evidence from virtual team studies shows that communication is critical in predicting team effectiveness (Kock & Lynn, 2012), specifically indicating that task-oriented communication is most important at early stages of teamwork (Kanawattanachai ^& Yoo, 2007). Based on these arguments and evidences, it is proposed that communication during the design process directly influences design team functioning and hypothesise thus:

H1a: Communication during the design process is positively related to design team functioning.

3.7.1.2 Collaboration/Cohesion

Within generic team literature, Team cohesion is positively related to team effectiveness and that the relationship is moderated by task interdependence such that cohesion is stronger when team members are more interdependent. Mathieu et al. (2008) in their team effectiveness studies catalogued findings on the relationship between cohesion/coordination variable which they referred to as the action processes and team performance as follows: the extent of coordination within team positively

relates to problem management actions (Tesluk and Mathieu, 1999); team members participation increase team innovation De Dreu and West, 2001); backup behaviours which are inherent in collaboration and cohesion, has positive relationship with decision-making performance (Porter, 2005); while Johnson et al. (2006) found that action processes e.g. information sharing, positively mediates between team antecedent e.g. reward system and team performance e.g. shape, speed, and accuracy of decision making.

Design is a knowledge intensive process (Lawson, 2005; Emmitt, 2007). Prior research on new venture formation and/or innovations evidenced that knowledge-intensive outcome such as development of new products, demand intense collaborative efforts, hence requiring team members to exchange information, ideas, and practice (Fleming, Colfer, Marin & McPhie, 2004; Perretti & Negro, 2007; Skilton & Dooley, 2010; Wasserman, 2012 as cited in Boeker, Lahiri & Pahnke, 2014). A fundamental prerequisite to effective team outcome is the team's capability to create synergistic gains where the collective efforts are greater than the simple aggregation of each member's effort (Larson, 2010). To this effect, Grant & Berry (2011) and (Grant, 2013) evidenced that based on the meaningful purpose of helping others and seeking help, team members are willing to share their ideas and may not be afraid to advance opinions that differ from those of other as long as they believe these input positively contributes to the collective goals of the team. Cooperative climate is known to reinforce the mutual support and good working relationship among team members thus spurring members to exert extra effort to collaborate towards improving their collective outcome (Beersma, et al., 2009; Grant & Mayer, 2009; Hausknecht & Trevor, 2011; Morrison, 2011).

Investigating the extent to which collaboration exist within construction projects in terms of integration – a dimension in action process, Baiden, Price, and Dainty (2006) found that while construction project teams exists as individual competent units within their organisationally defined boundaries, they exhibit varying degrees of integration determined by practices adopted by the teams and their congruence with inherent procurement approaches. Another fundamental finding of the research is that teams need not be fully integrated to effectively deliver projects. While this certainly contradicts the stance of generic team effective literature, it may not be surprising given the peculiarity of the construction industry in terms of it temporariness, multi-organisational team structure (Bertelsen, 2003b) and virtuality (Emmitt, 2007; Emmitt & Gorse, 2007; den Otter & Emmitt, 2007).

Views from supply management provides strong evidence for collaboration's positive influence on design team functioning. Earlier industry report promoted the need for collaboration in construction team giving specific reference to partnering as a means to improving the industry performance. Egan (1998) defined the partnering approach as *"involving two or more organisations working together to improve performance through agreeing mutual objectives, devising a way for resolving any disputes and commiting themselves to cotinuous improvement, measuring progress and sharing the gains"*. Sufficiently, this definition provides much more than a anchor for collaboration in teams in construction but also those needed for successful teamwork. Suggesting ways on improving the performance of the UK construction industry based on the present challenges supply chains are faced with, BIS (2013) advises the following amongst others: 1) the early involvement of partners in solution development; 2) greater coordination across the chain posibly based on BIM with specific reference to the construction side of the chain; and 3) improved management

of change by efficient and well coordinated operations, facilitated by an integrated and settled team. These are the basics of effective collaboration toward team effectiveness but this has not been the case within construction supply chains wherein relationships are still adversarial amongst members of the chain, with partnering not achieving its purpose within the construction industry as have been evidenced by Konukcu (2011), Manu (2014), and Manu et al. (2015). Based on these arguments and evidences, it is proposed that collaboration during the design process may not directly influence design team functioning and hypothesise thus:

H1b: Collaboration during the design process is not related to design team functioning.

3.7.1.2 Conflict Resolution

H1c: Conflict resolution during the design process is positively related to design team functioning.

3.7.2 Client Roles and Design Team Functioning

Researches on teams within organisations do not specifically consider roles (and their performance) as contextual variables that affect team effectiveness in terms of functioning. Role is defined as *'a set of expected behaviour patterns attributed to someone occupying a given position in a social unit'* (Robbins & Judge, Organizational Behaviour, 2013, p. 277). In organisations that are permanent in nature where most of the influential studies on teams have been domiciled (Lefton & Buzzotta, 2005; Napier & McDaniel, 2006; Robbins & Judge, Organizational Behaviour, 2013; Wageman, Hackman, & Lehman, 2005), this lack of specific consideration of the organisation roles is understandable – roles within such set up are considered as mediators between process and outcomes, see for instance; Pye &

Pettigrew (2005); Van den Heuvel, Van Gils, & Voordeckers (2006); Huse (2007); Zona & Zattoni (2007); Farquhar (2011).

In comparison however, such understanding cannot be extended to organisations that are temporary in nature, as is the case in construction and/or project organisations, due to factors earlier discussed (BIS, 2013; Fellows & Liu, 2012; Kelly, Male, & Graham, 2004; Lawernce & Scanlan, 2007; Walker A. , 2007). Under such conditions, organisational roles would be considered as input contextual variables rather than mediators as supported by supply management theorists (BIS, 2013; Booth, 2010; Cousins, Lamming, Lawson, & Squire, 2008; Stevenson, 2009; Wolstenholme, 2009). This is succinctly described by Pryke (2009) that supply chain management involves *'intensive management activity'* within client organisation because the nature of *'activities taking place in the supply chain'* would also *'require capacity, knowledge and commitments from them'* to make it effective.

Drawing from the aforementioned, analogies can be made for the purpose of hypothecating the conceptual framework, and to further provide justification for the introduction of client roles in the consideration of team effectiveness for temporary organisations, and its consideration as an input variable (as opposed a mediating one). From Pryke's (2009) submission, reference to *'Intensive management activity'* adequately describes the organisational roles of clients towards achieving value in design e.g. providing the necessary leadership, having the right procurement system etc which would certainly have an impact on the design process; reference to *'activities taking place in the supply chain'* depicts the operations of the actors in the chain inclusive of the client's workforce (also referred to as the internal supplier) which is the core of teamwork i.e. design process; while reference to *'require capacity, knowledge and commitments from them'* fully illustrates the prerequisite

needed by the client organisation to management the supply chain which will further facilitate the performance of their roles.

Given the aforementioned discussions, client roles are considered a part of the parameters that influences the design process. To hypothecate the relationships between client organisational roles and the design process, this aspect of the study draws upon extant team research, theories explaining supply management for reasons advanced in the previous sections, Farquhar's (2011) critical study on board roles and related researches in construction management. The virtual nature of teams within construction project is also taken into cognisance.

3.7.2.1 Leadership Role

Supply management theory recognises the need for client organisations to provide the necessary leadership needed for the success of their supply chains (Cousins *et al.*, 2008; Pryke, 2009; Booth, 2010) which in this case is the design team (chain). This is also strongly backed by the CCG's (2013) roles framework for client organisations. Also in line with Pryke's (2009) assertion on required knowledge and capabilities by client organisation in managing their supply chain, Manley (2006) found that not only are client leadership role important in improving the performance of the industry specifically looking at innovation within the industry, but that they actually do possess relatively higher levels of competence compared to contractors, consultants and suppliers.

Organisation theorists, specifically the agency and stewardship theorists, may however seem to disagree on the exact nature of the leadership role of client organisation particularly in drawing the line between it and those of project management as illustrated by Farquhar (2011) in his review of board of directors' strategy role.

However, Farquhar (2011) could not determine if indeed there is a relationship between board's strategy role (which is similar to the leadership role of client organisation) and the effectiveness of the board in terms of team performance. He found that the variable he constructed to measure strategy role of boards of directors was not reliable. This was due to the fact that all the items under the variable significantly cross-loaded onto more than one factor.

Studies within construction management have shown that there exist significant positive relationship between leadership and team effectiveness (Audi and Santoso, 2004; Keegan & Den Hartog, 2004; Makilouka, 2004; Yang et al., 2011; Kissi *et al*., 2012; Muller *et al*., 2012; Tuuli, *et al*., 2012; Tabassi *et al*., 2014). However, these studies are more focused on those of project management i.e. at team level rather than those of the client organisation or those of the project 'board'. While there are evidences that client organisation are indeed providing the necessary leadership required for achieving success in their projects (Manley, 2006; CABE, 2010; CCG, 2013; Eisma & Volker, 2014) there seems not to be empirical suggestions as to the influence their role have on the design team in terms of the processes they undergo and their functioning. This notwithstanding, generic team literature provides that at the organisational level, leadership style, particularly transformational leadership, leads to better team performance by shaping shared affect within teams (Gooty, Connelly, Griffith, & Gupta, 2010; Menges, Walter, Vogel, & Bruch, 2011; Wang, Oh, Courtright, & Colbert, 2011; Chi & Huang, 2014) irrespective of the nature of role to be performed.

And given the nature of the responsibilities contained in the CCG's (2013) client responsibility framework, which is adopted for this research, the leadership role of client organisation would assist the design teams in understanding how they can

interface with the client organisation, clarifying their tasks and responsibilities, setting standards and establish work procedures, getting the right people on the team, creating atmosphere for building confidence amongst team members, and empowering members generally. Associatively, studies on virtual teams have found that performance is positively influenced by experience of working together and familiarity of team members (Bierly, Stark, & Kessler, 2009), task interdependence (Chi, Chang, & Tsou, 2012), and formalisation of decision making (Bourgault, Drouin, & Hamel, 2008) among others. These attributes are an essence aspect of the leadership role discussed above. Hence given these evidences it can be deduced that client organisation leadership role will impact on the performance of design team and hypothesise thus:

H2a: Leadership role of client organisation is positively related to design team functioning

H2b: This relationship is: (i) mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

3.7.2.2 Procurement and Integration Role

To achieve organisational success, Cousins (2002) framework for strategic supply management outlines the following as very fundamental and essential: Organisational structure, portfolio of relationships, total cost/benefit analysis, skills and competencies, and performance measures. Furthermore, Cousins et al (2008) were also specific of looking at the client organisation as fundament to achieving organisational success in terms of their: strategic consideration, level of maturity i.e. development, make or buy decisions, sourcing strategies, and nature of supply structure. These

variables replicate those contained in the CCG's (2013) Client's procurement and integration responsibilities for delivering efficient projects for better value.

Organisation theorists, i.e. agency, stakeholder, resource dependency, and stewardship theorists, may seem to agree on the exact nature of the procurement and integration role of client organisation particularly in drawing the line between it and those of project management as illustrated by Farquhar (2011) in his review of board of directors' control role. Among his findings, Farquhar (2011) established that board control role (which in this research is similar to procurement and integration role of client organisations) is positively related to board performance in term of their effectiveness (which this case design team functioning towards achieving value in building designs).

Construction management literature has shown that there exist significant positive relationship between client's procurement integration role and project success (Cheng J. , 2008; Al-Tmeemy, Abdul-Rahman, & Harun, 2011; BIS, 2013). However, just as was the case of the leadership role, these studies are more focused on those of project management i.e. looking that what project managers or construction managers do at team level rather than those of what the client organisation does at a more strategic level. While there are evidences that client organisation are indeed providing the necessary leadership required for achieving success in their projects (Manley, 2006; CABE, 2010; CCG, 2013; Eisma & Volker, 2014) there seems not to be empirical suggestions as to the influence their role procurement and integration role have on the design team in terms of the processes they undergo and their functioning.

The nature of the responsibilities contained in the CCG's (2013) client responsibility framework for procurement and integration, which is adopted for this research,

indicates that the client procurement and integration role would definitely have some impact on team performance in meeting organisational goals as shown above but may not necessarily affect the design members during the design process. The role involves: the client organisation setting examples, using appropriate evaluation criteria, and establish long term relationship amongst others. Unlike the Leadership role, the procurement and integration role is more targeted at organisations i.e. organisations partnering with the client organisation rather than the individual members making up the design team. Associatively, studies on virtual teams have found that performance is positively influenced by experience of working together and familiarity of team members (Bierly, Stark, & Kessler, 2009), task interdependence (Chi, Chang, & Tsou, 2012), and formalisation of decision making (Bourgault, Drouin, & Hamel, 2008) among others. Hence given these evidences it is concluded that client organisation leadership role will impact on the performance of design team and hypothesise thus:

H3a: Procurement and integration role of client organisation is positively related to design team functioning

H3b: This relationship is: (i) not mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

3.7.2.3 Design Quality Role

Within supply management theory, client organisation are expected to put strategies for achieving organisational goals, which would influence some other decisions e.g. buy-make decision, sourcing strategy, and the supply structure (Cousins et al., 2008; Booth, 2010). Specifically, Fellows (2009) buttressed the need for strategies and the importance of set out guidance towards achieving them by bringing out the cognitive

dissonance which helps to explain why multi-disciplinary teams of actors perform badly leaving clients frustrated. Bresnen (2009) further posited that this may be due to the mismatch between systems (as required by client organisation for instance their value system) and routines (as perceived by the various participants in the design team) in project environments, frequently leading to the rarity of collaborative relationships cascading below the first tier supplier in the chain, for instance between design organisation and their representatives in design teams. These conflicts arise due to power, status and legitimacy of resources (knowledge-base) that each participant assumes in teams (Chi & Huang, 2014; Eisma & Volker, 2014)

However, organisation theorists, i.e. agency, stakeholder, resource dependency, and stewardship theorists, may seem to disagree on the exact nature of the design quality role of client organisation particularly in drawing the line between managing responsibilities and control responsibilities as illustrated by Farquhar (2011) in his review of board of directors' strategy and control roles respectively. Despite this disagreement, Farquhar (2011) found that board service role (which in this research is similar to design quality role of client organisations) is positively related to board performance in term of their effectiveness (which this case design team functioning towards achieving value in building designs).

Similar, Construction management literature has shown that there exist significant positive relationship between client's design quality role and project success (Cheng, 2008; Al-Tmeemy, Abdul-Rahman, & Harun, 2011; BIS, 2013). However, just as was the case of the leadership role, these studies are more focused on those of project management i.e. looking that what project managers or construction managers do at team level rather than those of what the client organisation does at a more strategic level. And under this condition, conflict arises in discharging it. For Pettit (2000)

indicates that such client roles are known to disrupt work progress in general and hence terms it as 'interfering role'. While there are evidences to suggest that client organisation are providing these design quality role required for achieving success in their projects (Manley, 2006; CABE, 2010; CCG, 2013; Eisma & Volker, 2014) there is no empirical evidence suggesting the influence it has on the design team in terms of the processes they undergo and their functioning.

The nature of the responsibilities contained in the CCG's (2013) client responsibility framework for design quality, which is adopted for this research, indicates that the client design quality role should have some impact on team performance in meeting organisational goals but is not necessarily the case as shown above, and that this role may affect the design members during the design process to some certain degree. The role involves: the client organisation demonstrating understanding the key drivers of the design, ensuring that the design delivers the required functionality, consider WLC principles and use design quality indicators amongst others. Relatively, Studies on virtual teams have found that team performance is negatively influenced by experience of working together and familiarity of team members (Bierly, Stark, & Kessler, 2009), task interdependence (Chi, Chang, & Tsou, 2012), and formalisation of decision making (Bourgault, Drouin, & Hamel, 2008) among others. Hence given these evidences it is deduced that client organisation design quality role will impact on the performance of design team and hypothesise thus:

H4a: Design quality role of client organisation is negatively related to design team functioning

H4b: This relationship is: (i) mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

3.7.3 Organisation Context and Design Team Functioning

Studies within construction management have shown that at team level, there exist significant positive relationship between leadership and team effectiveness (Audi and Santoso, 2004; Keegan & Den Hartog, 2004; Makilouka, 2004; Yang et al., 2011; Kissi *et al*., 2012; Muller *et al*., 2012; Tuuli, *et al*., 2012; Tabassi *et al*., 2014). Specifically, transformational leadership, are known leads to better team performance by shaping shared affect within teams (Gooty, Connelly, Griffith, & Gupta, 2010; Menges, Walter, Vogel, & Bruch, 2011; Wang, Oh, Courtright, & Colbert, 2011; Chi & Huang, 2014).

Trust-communication & project performance (Cheung, On, Yiu, & Lam, 2013) investigates the mediating role of communication in the relationship between trust and project performance via project teams and found it to be a significant mediator in terms of information flow and quality. Looking at inter-organisational trust and project performance particularly investigating the relationships between main contractors and their sub-contractors, it is discovered that influence of trust on performance is dependent of the dimension of trust and the nature of the consequence for instance, functional consequences e.g. reduction in transaction cost are primarily linked to the relational-based dimension and not to the cognition nor system-based trust (Manu, 2014; Manu, Ankrah, Chinyio, & Proverbs, 2015), thus confirming the multi-dimensional nature of trust and its contingent nature in line within (Krishnan, Martin, & Noorderhaven, 2006; Chow, Cheung, & Chan, 2012).

Within the construction industry, with specific reference to design process, Xe (2002) reports that there exist significant positive relationship between some context related factors e.g. procurement methods, communication system, client, key personnel etc

and communication. These elements are the basic constituents in the 'organisational structure' variable of the Contextual factor dimension in the Robbins and Judge's (2013) team effectiveness model. Johnson et al. (2006) (Johnson, et al., 2006)shows that team reward system can influence their level of information sharing and consequently the shape, speed and accuracy of their decision making while Porter (2005) demonstrates that back up behaviours is positively associated with decision-making performance.

Hence given these evidences and those outlined in Section 3.6.3 it is deduced that the following client organisation contextual factors will impact on the performance of design team and hypothesise thus:

H5a: Adequate resource of client organisation is positively related to design team functioning

H5b: This relationship is: (i) mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

H6a: Organisational structure of the client organisation is positively related to design team functioning

H6b: This relationship is: (i) mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

H7a: Organisational culture of the client organisation is positively related to design team functioning

H7b: This relationship is: (i) mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

H8a: Performance evaluation mechanism of the client organisation is positively related to design team functioning

H8b: This relationship is: (i) mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

3.7.4 Team Composition and Design Team Functioning

On the issue of personality, Chi and Huang (2014) advised that during team composition, members' conscientiousness and extraversion should be taken into consideration since they found that positive group affective positively predicts team performance whereas negative group affective tones associates with low levels of team performance. This is also supported by Chi et al. (2011). However, Tsai et al. (2012) advised that organisations should not select members with high levels of negative affectivity due to the fact that members' negative affectivity relates positively to negative group affective tone. Hence given these evidences and those outlined in Section 3.6.4 it is deduced that the following client organisation related team compostion factors will impact on the performance of design team and hypothesise thus:

H9a: Abilities of team members is positively related to design team functioning

H9b: This relationship is: (i) mediated by communications; (ii) mediated by collaboration; and (iii) mediated by conflict management

H10a: Personality of team members is positively related to design team functioning

H10b This relationship is: (i) mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

H11a: General role performed by team members is positively related to design team functioning

H11b: This relationship is: (i) not mediated by communications; (ii) not mediated by collaboration; and (iii) mediated by conflict management

3.8 Chapter Summary

Findings from the reviews conducted in Chapter 2 indicated, amongst others: the lack of consideration of the client organisation in value delivery, most especially their design related roles, during the design stage; and also points to the possible lack of integrative framework for investigating their influence therein. The latter finding is confirmed in Section 3.2 in that researches within construction management have largely been guided by the principle of reductionism rather than that of systems/contingency approach to studying organisations in construction. This is blamed on the complex nature of projects and organisations in the industry. Other revelations from Chapter 2 specifically suggests the following as necessary for successful value delivery by client organisations: organisational management; client value systems, organisational behaviour (particularly established in Chapter 1), and supply management. This Chapter explored the theories and principles of the last two concepts toward firstly evolving the theoretical framework which then aided the development of the conceptual framework and its hypothecation.

3.8.1 Insights from Organisation Behaviour for Construction Management

Organisational behaviour as a field of study provides a very good foundation for studying organisations from systems/contingency perspective, given its consideration

of relating human behaviours within organisational context at individual, group and organisational levels. Recent thinking in construction management are converging on the people dimensions in organisations as been most important to organisational successes as evidenced in current developments for a unified theory of construction management. These thinking revolve around intra- and inter-organisational relationship management, with the most emphasis on the latter which have been identified as the inherently difficult indicators (IdI's) upon which success is dependent in the construction industry given its peculiar nature. Bringing in the principles of organisational behaviours into construction management provides a systematic, defendable and exploratory approach to uncovering important facts and relationships about organisations in construction. This provides a basis for actually predicting behaviours i.e. the determinants of value delivery – client organisation parameters (COPs), design process and team functioning.

Of the three levels of analysis of organisational behaviour – individual, group and organisation – individuals and organisation dominate construction management researches. Groups and/or teams, upon which success is highly dependent upon in construction project organisations is the littlest of these studies while no evidence seem to exist on those combining all the three levels. Linking the reviews of several studies on teams within organisational behaviours and construction management, though indicating three different broad teams namely: client team, project management team and supply team, further reveals that team effectiveness is broadly dependent on organisational context, team composition and team processes. These formed part of the constructs of the conceptual framework for value delivery for a client organisation perspective.

3.8.2 Insights from Supply Management for Construction Management

Despite the exclusion of Client organisation at the core of value delivery during the design process, the reviewed reveals that successful delivery by the design team (a part of the supply team) is highly dependent not only on the involvement of the client organisation but also on the extent to which they own and manage the process. This is in line with the principles of supply management – ensuring that value is created throughout the supply network in line with the requirements of the client value system by managing inter-firm relationships amongst other things. This also falls within the current thinking of construction management – raising the viewpoints from projects themselves to those responsible for managing them i.e. the supply network.

One conclusion, amongst others, that can be drawn from these reviews is the placing of the responsibility for successful value delivery during the design stages of building projects via supply management on the client organisation. This position supports the research gap as identified in Chapter 1 i.e. the lack of consideration of: client organisations in the core value delivery process; and their abilities and capabilities therein. A possible solution from literature to the latter issue is assessing client organisation's capabilities in managing their design partners in terms of the following determinants of effective strategic supply management: 1) development and classification of organisation's supply management; 2) strategic consideration and alignment; 3) competences and skills; 4) performance measurement; 5) total cost/benefit analysis; and 6) relationship management.

Another dimension that the consideration of the principles of strategic supply management brings to the studies of teams within organisation behaviour is the inclusion of client organisation roles alongside organisational context, team composition and team process. This is further corroborated by earlier considerations of

client organisations and their responsibilities in Section 2.3.1. While evidences show that client organisation are keeping with their side of the change agenda driven by the adoption of principles of supply management in the industry i.e. developing their delivery capabilities (mostly evidenced in the UK) and improving upon their procurement approaches, the needed supply side improvements are yet to be met. Though, the reasons for the slowness in anticipated improvement of the industry's performance has been traced to problems predating the adoption of supply management in the industry, for which client organisation roles and their value systems – uniqueness and complexity of client organisations, and temporariness of project organisation – were part of and which still persist, the continued non-consideration of these aspects can only further delay the process of finding solutions to the supply management challenges. This is further worsen by the fact that supply (chain) management is currently viewed by some theorists and practitioners as a 'fad' given that evidences points to the fact that the application of its theory in the construction industry were atypical and 'acontextual'.

3.8.3 Summarising the Conceptual Framework for Value Delivery

Pulling the characteristics of the construction industry together i.e. complexities of both its client organisations and supply (service and production) side, temporariness and uniqueness of its products, 'virtuality' in teamwork etc, and supporting them with the theories of organisational behaviour, supply management client value system and organisational management; and a very heavy reliance on generic teams literature and theory, a six construct framework for value delivery from a client organisation perspective was developed. These are organisational context, team composition, design process, team functioning, value in design, and including the unique contribution of this research – 'client roles'. In line with standard research practice on

teams and based on the I-P-M-O model, client roles, organisational context and team composition served as the antecedents of teamwork, while the design process and team functioning constructs served as teamwork process/mediator and output respectively on the one hand while on the other, supply management and client value system were the antecedents with team functioning and value in design been the process/mediator and output respectively.

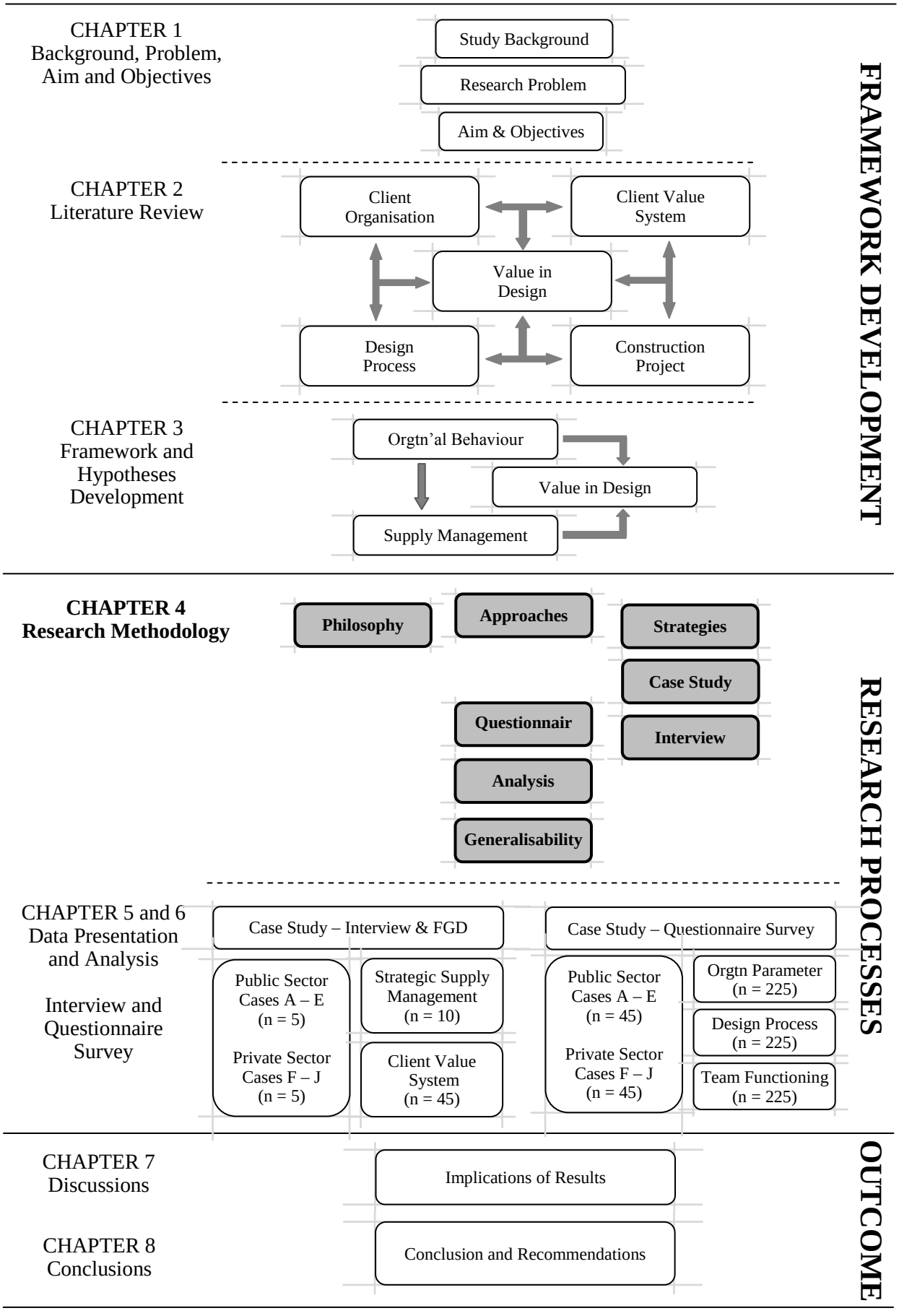
One major contribution of this research to the study of teams especially for those within the construction industry – the client roles – is strongly informed by supply management theory. These roles bring the client organisation with the core process of value delivery given that their performance is believed to have significant influence on the working of the design team, thus placing them as the board of directors (senior executives) of construction project organisations. Drawing from roles and responsibilities literature in construction management and board roles literature, three distinct client roles were identified namely leadership role, procurement role and design quality role. These roles mirrors roles categories in board literature namely strategy role, control role and service role respectively. While organisation theorists differ on the exact nature of strategy role of board and by extension the leadership role of client organisation and on that of service role or design quality role of client organisations, they agree on that of the control role i.e. procurement role of client organisations. These perspectives are expected to have impacts on the data collected and the findings thereof.

Based on the aforementioned theories, considerations of team literature and theories, and giving particular attention to the characteristics of the construction industry, the conceptual framework was hypothecated within the 10 variables of the independent constructs, the 3 variables of the mediating construct and the 2 variables of the

dependent construct. Between design process and design team functioning, 3 hypotheses were formulated thus: that communication and conflict resolution are positively related to team functioning while collaboration is not related. Between client roles and design team functioning, 3 main hypotheses each with 4 sub-hypotheses were formulated thus: leadership role is positively related to team functioning mediated by communication and conflict resolution but not mediated by collaboration; procurement role is positively related to team functioning not mediated by communication and collaboration but mediated by conflict resolution; and that design quality role is negatively related to team functioning mediated by communication and conflict resolution but not by collaboration.

Between organisational context and design team functioning, 4 main hypotheses each with 4 sub-hypotheses were formulated thus: adequate resources, organisational structure, organisational culture and performance evaluation are all positively related to team functioning and that they are all mediated by communication and conflict management and not by collaboration. And between team composition and design team functioning, 3 main hypotheses each with 4 sub-hypotheses were formulated thus: members' abilities, personality and general team roles are all positively related to team functioning and that all these relationships are mediated by communication and conflict management but not by collaboration, except for general roles which is not mediated by communication. Hence, a total of 43 hypotheses are formulated based on the variables contained in the conceptual framework from evidences in literature and theories on teams both generic and within construction management; and supply management.

Chapter 4 – Research Methodology



4.1 Introduction

The need to explore the determinants of V_fM based on client's organisation parameters and their relationships within building designs was clearly demonstrated in Chapter 3, which described and discussed both theoretical and conceptual frameworks of the research. It further proposes that the modelling of these relationships would contribute to a better understanding of the implications of these interactions towards achieving V_fM in building designs for construction clients. This chapter therefore discusses the methodology adopted for this research work bringing out the arguments for and against the various available and adopted strategies, methods and their inherent tools and techniques.

However, debates on research methodology in construction management towards the search for a *'proper methodology'* over the years suggests shifting from the dominant reliance on deductive research methods (Seymour and Ronke, 1995) which are mostly suited for theory testing based upon a scientific process, towards inductive (interpretive) research methods (Romann, 1989; Parke, 1993; Dainty, 2008). The competition for methodological relevance within construction management lead to the consideration of philosophy, defined as the branch of knowledge or academic study devoted to the systematic examination of basic concepts such as truth, existence, reality, causality, and freedom (Encarta Dictionary, 2010). Therefore the chapter begins by discussing philosophy as it shapes research in construction management and then gives the philosophical stand of the current research as a fore-plan towards harnessing the appropriate research methodology. It further highlights on the various research approaches and designs and lastly discusses the appropriate research method that aligns with the nature of the propositions/objectives pursued.

4.2 Philosophical Considerations

Research types comes in a variety of classifications for example (Kothani & Garg, 2014): 1) descriptive – *describing the state of things as they presently exist* vs. analytical – *evaluating the state of things*; 2) applied – *finding solutions to immediate practical problems* vs. fundamental – *mainly concerned with theoretical generalisations*; 3) conceptual – *using abstract ideas or theories to develop new concept or reinterpret existing ones* vs. empirical – *formulating or explaining theories concepts based on experience or observations*. For each type of research there are a number of suitable design strategies which are themselves influenced by the specific research approach and research design adopted. The choice of appropriate methods in conducting a research is highly dependent on the types of research been conducted which in themselves are predicated upon the nature of the research i.e. research philosophy.

It has been argued that it is unwise to embark on a research endeavour without giving serious thought and having awareness of the philosophical stance of the study area under study. The philosophy adopted is an indication of the way they view world phenomenon containing assumptions that will underpin the eventual research strategy and methods chosen (Smith, 2002; Saunders et al., 2007). Research theorists e.g. Creswell (2009), Bryman (2004), Crotty (2007) have explained that philosophical stances in research comprises of the two basic perspectives namely: the nature of what is known i.e. what knowledge exist – ontology; and the development of knowledge i.e. how we know what we know – epistemology. These two considerations not only provides insights to the research approaches and methods but that they also have significant influence on the whole research process. Hence, researchers have been

admonished to base their consideration of selecting appropriate research design on both the ontological and epistemological assumptions of their research.

4.2.1 Ontological Considerations

Fellows and Liu (2008) describes ontology as the theory of entities concerned with the assumptions in conceptual reality and the question of existence separated from the specific objects and events describing such reality. Ontology seeks to describe the basic relationships existing between entities and to attempt at categorising what an entity is on the most fundamental level of existence answering such questions as "what is the nature of what we know?" or "what is the nature of being?" (Walliman, 2006). Bryman (2004, 2008) suggested two main ontological stances in the social sciences – objectivism and constructivism.

Objectivism defines the belief that social phenomena and their meanings have an existence that is not dependent on social actors since they are facts that have an independent existence e.g. the notion of the existence of objective, absolute and unconditional truths. Constructivism on the other hand is the belief that social phenomena are in a constant state of change because they are totally dependent on the dynamism of social interactions as they take place. Researchers with biases toward constructivism mostly address the process of interaction among individuals and also focus on the specific contexts in which people live and work in other to understand the contextual background of the participants (Creswell, 2009; Walliman, 2006; Bryman, 2008).

Given the nature of the research problem – lack of knowledge of client organisation influence in value delivery during the design stage of building projects based on managing their supply chain, their value systems and their interactions with design

teams – which is suggestive of the fluid nature of social interactions taking place within design process and in the managing of the supply chain, the constructivism approach suffices. However, looking at the nature of some of the objectives for instance the appraisal of the determinants of value in design, which assumes that the existence of these determinants are independent of the respondents and a seen as objective unconditional realities, suggests that objectivism approach also suffices. Thus, due to the nature of the research problem and its associated objectives, the research navigates between both the objectivism and constructivism ontological perspectives.

4.2.2 Epistemological Considerations

Epistemology is concerned with the theory of knowledge in relation to its methods, validation, the possible and accepted ways of acquiring knowledge of social reality, and the relation between humans and their knowledge (Coghlan and Brannick, 2005; Fellows and Liu, 2008). It is concerned about questioning "what is or should be regarded as acceptable knowledge in a discipline?" or questioning within justifiable reasons "whether social realities can be and should be studied?", or "what is the truth?" (Walliman, 2006; Bryman, 2008). Four epistemological perspectives are identified between social sciences and management research – positivism, realism, interpretivism and pragmatism.

Positivism described the position that adopts the philosophical stance of natural sciences to the study of social reality i.e. it derives from scientific thinking within this perspective, it is possible to capture 'reality' through the use of research instruments such are questionnaires and experiments (Blaxter, 2001; Bryman and Bell, 2007). Realism is acknowledged as another epistemological position that relates to natural scientific enquiry. The underlying philosophy of realism is that there is a reality quite

independent of the mind (Saunders et al., 2007). Researchers adopting realism assume a scientific approach to develop knowledge.

Interpretivism is a term contrasting epistemology to positivism and it subsumes the views of writers who have been critical of the application of the scientific model to the study of the social world and who have been influenced by different intellectual traditions (Bryman, 2004). It embodies the recognition that subjective meanings play a crucial role in social actions", which aims to reveal interpretations and meaning (Walliman, 2006). The interpretivist approach is also sometimes referred to as the hermeneutic, phenomenology, constructivist, postmodern interpretivism relativist approach (Coghlan and Brannick, 2005). It emphasises the differences between people and the objects of study in natural and physical sciences and therefore requires the social scientist to grasp the subjective meaning of the observed social action (Bryman and Bell, 2003; Saunders et al., 2007).

Researchers using interpretivisam describe, interpret, and understand a situation from the perspective of the scientist (Creswell, 2007). Pragmatism is a belief that claims of knowledge arise out of actions, situations, and consequences rather than antecedents (Creswell, 2009) and it is concerned with applications (what works) and solutions to problems (Patton, 2002; Saunders et al., 2007). Researchers applying a pragmatism epistemology into their research have a freedom to choose the methods, techniques, and procedures of research that best meet their needs and purpose (Creswell, 2009).

4.3 Research Approaches

Generally, research approach can be classified as quantitative, qualitative, or a combination of the two, which is called triangulation (Fellows and Liu, 2008; Creswell, 2009; Silverman, 2010; Neuman, 2011; Kathoni and Garg, 2014).

Quantitative research refers to explaining a phenomenon by collecting numerical data that is analysed using mathematical methods, in particular statistics (Aliaga and Gunderson, 2002). Qualitative research is designed to explore the human elements of a given topic, where specific methods are used to examine how individuals see and experience the world (Given, 2008). Triangulation is a combination of the two research approaches. Quantitative research is a scientific approach and is useful for research that demands a quantitative answer or concentrates on numerical changes (Fellows and Liu, 2008).

The quantitative approach is also applied to test hypotheses. A hypothesis is a tentative explanation that accounts for a set of facts and can be tested by further investigation (Muijs, 2011). Quantitative research is often used to test a hypothesis through the collection of the relevant quantitative data and the use of statistical analysis techniques. In the contrast to the above, the qualitative approach is more concerned with the beliefs, understandings, opinions and views of people than with numbers and facts (Fellows and Liu, 2008). It is a situated activity that locates the observer in the world and consists of a set of interpretive, material practices that make the world visible.

The qualitative approach is useful for complex, in-depth investigation of peculiar issue. Unlike the quantitative approach, the qualitative approach can be applied to the development of a hypothesis. Triangulated studies employ both the qualitative and quantitative approaches to reduce or eliminate the disadvantages of each individual approach while gaining the advantages of both. This approach has become more common, and much research practice lies somewhere on a continuum between the quantitative and qualitative (Fellows and Liu, 2008; Creswell, 2009). It is the nature and objectives of a research project as well as the employed data collection and

analysis techniques which determine whether the research can be classified as qualitative, quantitative or both.

4.4 Research Strategy

Research strategy comprises an all-encompassing method with the logic of design incorporating specific approaches to data collection and to data analysis (Yin, 2009). Cooper and Schindler (2009) define research strategic as *'the plan and structure of the investigation so conceived as to obtain answers to research questions. The plan is the overall scheme or program of the research. It includes an outline of what the investigator will do from writing hypotheses and their operational implications to the final analysis of data' (p. 140).* Bell and Opie (2002) suggested five types of research strategies: 1) action, 2) ethnographic, 3) surveys, 4) case study, and 5) experimental. Saunders et al. (2007) added one more research strategy: grounded theory. Every strategy can be used for exploratory, descriptive and explanatory research (Yin, 2009). For example, there may be exploratory case studies, descriptive case studies, or explanatory case studies; there may be exploratory experiments, descriptive experiments, or explanatory experiments. Furthermore, even though each strategy has its distinctive characteristics, there are large areas of overlap among them (Sieber, 1973).

Yin (2009) suggested three conditions to distinguish the different strategies: 1) the type of research question posed, 2) the extent of control an investigator has over actual behavioural events, and 3) the degree of focus on contemporary as opposed to historical events. Saunders et al. (2007) reviewed the different research strategies and stated that the choice of research strategy is guided by the research question(s) and objectives, the extent of existing knowledge, the amount of time and other resources

the researchers have available, and the philosophical underpinnings. Each of these research strategies is briefly defined and their main elements highlighted.

4.4.1 Action Research

In action research, the researcher actively participates in the process in order to identify and evaluate problems and potential solutions. Action research suggests and tests solutions to particular problems. Change/innovation is the main focus of the research and coordination is essential between researcher and participants (Fellows and Liu, 2003; Coombes, 2001). According to Gittins (2007), researchers should try out their theories with industry practitioners and organizations. Blaxter et al. (2001) defined the aim of action research as the continuous improvement of real practice.

Coombes (2001) defined action research as an investigation focused on a particular issue of current concern with the aim of implementing a change in a specific situation. Therefore the disadvantage of this method is its high level of dependency on a single organisation. The advantage in this method is being based on practice and using the validity criteria and validation processes based on involvement in the practices (Wisker, 2001). Wisker (2001) defined the steps in action research as follows: focus on the problem, produce a general plan of action, action step, monitoring step, collect the data, evaluate the results, and then reformulate the plans.

4.4.2 Ethnographic Research

McNeill (1990) defined `ethnography` as `writing about a way of life`. Ethnographic research has replaced studies using participant observation since the early 1980s (Flick, 2006). It is concerned with the study of people and cultures and has its foundation in anthropology. In this type of research, a group of researchers observe subjects in detail in order to gain insights into how, what and why people‟s behaviours

occur. McNeill (1990) defined the purpose of ethnographic research as being *"to describe the culture and life style of the group of people being studied in a way that is as faithful as possible to the way they see it themselves."*

The essential elements of ethnography are interviews, observations and examination to gain understanding of the respondents` perspective (Fellows and Liu, 2003). The strengths of ethnographic research methodology come from creating new ideas and insights and its weakness comes from the subjective nature of the process (Ganah, 2003). The disadvantages of this style of research include being very laborious and time-consuming due to the involvement of the researcher full-time for extended periods without doing any other work (McNeill, 1990).

4.4.3 Survey Research

Blaxter et al. (2001) defined survey research as the method of collecting information by asking a number of predefined questions in sequence in a structured questionnaire to a sample of respondents selected to be representative of a specific population. The aim of surveys is to collect information from sampling frames, which include a number of respondents, to identify more specific characteristics among groups. Surveys are based on probabilistic or non-probabilistic sampling and vary from the use of questionnaires to structured interviews. In probability sampling, each element has an equal probability of being included in the sample and the inclusion of each element is an independent decision, on the other hand, non-probabilistic sampling uses best judgement to decide which elements are the best representative of the population (Judd et al., 1991).

4.4.4 Case Studies

This type of research facilitates deeper investigation of particular areas within the research subject and employs various data collection methods (Fellows and Liu, 2003). Blaxter et al. (2001) define a case study as the method of choice when the subject under research is not readily distinguishable from its context. Heath (1998) defines a case study as *"an account or description of a situation, or sequence of events, which raises issues or problems for analysis and solution."* Gillham (2000) defines a case study as *"an investigation of specific research questions and a range of different kinds of evidence, evidence which is there in the case setting, and which has to be abstracted and collated to get the possible answers to the research questions".* Case studies are the preferred strategy when "how" or "why" questions are being asked, when the researcher has less control over events and when the focus is on a real-life context (Yin, 2009). Case study development can be divided into the following steps:

- Data Collection- interviews, observation;
- Restructuring data - deciding the structure, writing and editing.
- Case enhancement- supplementary word, audio, and video material.

Case studies employ various methods including interviews, participant observation, and field studies (Hamel et al., 1993). Case study data comes from different sources such as interviews, observations, company reports, and the writer‟s own experience (Heath, 1998; Yin, 2009). Interviews and observations are undertaken when the researcher wishes to record what is actually happening within the organization and the views about the organization's present and past situation (Heath, 1998). In case studies, it is important that researchers should know what they want to do and how to do (Heath, 1998). The most important form of interviewing in case study research is

the semi-structured interview, which is the richest single source of data due to being very flexible and natural (Gillham, 2000).

Observation can be a rich source of information for case study research and enables the researcher to capture what people actually do (Wisker, 2001). Observation is the most basic method for obtaining information and a selective way of watching and listening to an interaction (Kumar, 2011). The idea of observation underlies all the methods used by researchers in their data collection (Chadwick et al., 1984). When the researcher participates in the activities of the group as a member, it is called *participant observation*.

When the researcher is not involved in the activities of the group and just observes the situations, this is called *non-participant observation* (Kumar, 2011). Case study research does not only include qualitative methods and data; quantitative data and its analysis can add to the overall picture (Gillham, 2000). The data are to be collected from people and organizations; therefore, in a case study the researcher should understand how to integrate real-world events with the needs of the data collection plan (Yin, 2009). Having all these in mind, the major tasks to collect data for the research are as follows (Yin, 2009):

- Gaining access to key organizations or interviewees;
- Having sufficient resources in the field (for example computer, recorder, etc.);
- Making a clear schedule of the data collection activities which are planned to be completed within a specific period of time;
- Being ready for the changes in the availability of interviewees.

The reporting phase of the case study is one of the most difficult parts to carry out and the best way is to combine the portions of the case study early rather than waiting until the end of the data analysis process (Yin, 2009). The last step for the research is the evaluation of the work done within the case studies and general research context. Weiss (1998) defined evaluation as "*systematic assessment of the operation and/or the outcomes of a program or policy, compared to a set of explicit or implicit standards, as a means of contributing to the improvement of the program or policy."*

Weiss (1972) defined the purpose of evaluation research as "*to measure the effects of a program against the goals it set out to accomplish as a means of contributing to subsequent decision making about the program and improving future programming."* The five key elements for evaluation in these definitions are systematic assessment, the operation and outcomes of the program, standards for comparison and contribution to improvement. The evaluator‟s responsibility is to create an evaluation format that fits the questions to be asked and evaluation design should indicate which people or units will be selected, what kind of comparisons will be drawn and the timing of the investigation (Weiss, 1998). An easy way of collecting data for the evaluation stage is to develop a survey form that asks structured and unstructured questions about the research study (Weiss, 1998).

Bryman (2008) highlights that advantage of the case study research due to usage of both quantitative and qualitative methods in the analysis. This is advantageous as it enables a researcher to evaluate different sources of data to test a particular theory or concept on the basis that a consensus of the findings will yield more robust results (Proverbs and Gameson, 2008). One of the biggest disadvantages to using the case study method has to do with external vs. internal validity. Using the case study method, the PhD researcher often does not have control over certain variables and

events and, therefore, cannot control them as the researcher could in a lab experiment. Consequently, the researcher using the case study method must be content that his/her findings may only be applicable to similar cases (Guba and Lincoln, 1993). Beyond the disadvantages, the case study can achieve many of the same goals as other methods. For example, the case study can be exploratory (create new knowledge), constructive (solve some problem), or confirmatory (test a hypothesis with empirical evidence).

4.4.5 Experimental Research

This type of research is best suited to `bounded` problems or issues in which the variables involved are known or hypothesized. Generally, experiments are carried out in laboratories and aim to test relationships between the defined variables (Fellows and Liu, 2008). However, randomized experiments can also be conducted in real-life environments (Judd et al., 1991). Experimental designs and procedures maximize the internal validity of research and, unlike field experiments, laboratory experiments are poor representations of natural processes (Judd et al., 1991).

Moreover, there is no way to control all the possible independent variables in field experiments (McNeill, 1990). An important criticism about experimental research is that experiments do not provide useful descriptive data like survey research. Although surveys provide descriptive data about the population, experiments provide information about causes and effects and do not provide descriptive data about percentages of people in the population (Judd et al., 1991).

4.5 Review of Research Methods

Kumar (2011) summarised the basic research methods currently available as: observations, questionnaires and interviews. These are described briefly below.

4.5.1 Observation

Observation is a purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place (Kumar, 2011). Observation is useful in the study of social behaviour. Participants sometimes are observed for a predetermined period of time using a common set of rules. These rules are referred as observation schedules. Based on the use of an observation schedule, Bryman (2004) classified observation as either structured or unstructured. Structured observation is a technique in which the researcher employs explicitly formulated rules for the observation and recording of behaviour.

In contrast to this, unstructured observation records the behaviour as long as possible to develop a narrative account of that behaviour, and does not entail the use of an observation schedule for the recording of behaviour. The choice of a particular observation method is dependent upon the purpose of the observation, the complexity of the interaction and the type of population being observed (Kumar, 2011). Structured observation is an alternative to interviewing or a questionnaire, and tends to be employed in certain specific research environments, such as the behaviour of teachers and pupils and interaction between them (Bryman, 2004). Unstructured observation is more common in research of general human behaviour.

4.5.2 Interviewing

"An interview is a verbal interchange, often face to face, though the telephone or other instrument may be used, in which an interviewer tries to elicit information, beliefs or opinions from another person" (Burns and Burns, 2008). Interviewing is a widely employed method of data collection. Interviewing allows a researcher to investigate and prompt information that cannot be directly observed, such as thoughts, values, prejudices, perceptions, views, feelings and perspectives (Wellington, 2000).

Interviews are classified into different categories according to the degree of flexibility and specificity. Categories include unstructured interviews, semi-structured interviews and structured interviews.

In an unstructured interview, the interviewer typically only has a list of topics or issues (called an interview guide), and furthermore, the style of questioning is usually informal, and the phrasing and sequencing of questions vary from interview to interview. In other words, the interview structure, contents and questions are all flexible. Semi-structured interviews cover a wide range of instances, and typically refer to a context in which the interviewer has a series of questions that are in general form of an interview schedule but is able to vary the sequence of questions or has some latitude to ask further questions in response to what are seen as significant relies (Bryman, 2004).

In a structured interview, the interviewer asks a predetermined set of questions, using the same wording and order of questions as specified in the interview schedule (a written question list prepared for use by an interviewer in a person-to-person interaction). The choice of interviewing style is associated with the researcher's main concern and the focus of the research objective. Unstructured interviews offer flexibility in structure, contents and questions, but require a high level of interviewer expertise and an in-depth understanding of the research objectives (Parsons, 1984). Structured interviews maximise the reliability and validity of measurement of key concepts, but are little more than a face-to-face questionnaire (Bryman, 2004). The semi-structured interview is more valuable because it avoids the inflexibility of structured interview and overcomes the problems inherent in the unstructured interview (Wellington, 2000).

4.5.3 Questionnaire

A questionnaire is a written list of questions, the answers to which are recorded by respondents (Kumar, 2011). A questionnaire works best with standardised questions that are interpreted the same way by all respondents (Robson, 2011). Questionnaires can be classified as self-administered or interview-administered. Internet mediated questionnaires, postal questionnaires, and delivery and collection questionnaires are all self-administered and usually completed by the respondents. Interview-administered questionnaires are completed or recorded by the interviewers based on the respondents' answer. Examples include interview by telephone and face-to-face interview. Each type of the questionnaire has its advantage and disadvantages.

For example, the benefits of Internet mediated questionnaires are low cost, high speed, high confidence to reach the right target respondent, automated data for future analysis and a potentially large sample size, but the response rate is typically lower than the other types of questionnaires (Witmer et al., 1999: Dillman, 2000; Hewson et al., 2003; Saunders et al., 2007). Face-to-face interview questionnaires afford interviewers the opportunity to solicit clarification, or use follow-up or branched questions, and tend to result in high rates of response, however, the data collection process usually requires travel, clerical support and large amount of time (Forza, 2002).

Decisions about which type of questionnaire is best are based on the needs of the specific survey as well as time, cost and human resource constraints. According to Saunders et al. (2007), the factors that should be considered in choosing the appropriate type of questionnaire include: 1) characteristics of the respondents; 2) importance of reaching a particular person as respondent; 3) importance of respondents' answers not being contaminated or distorted; 4) size of sample required for the analysis, taking into account the likely response rate; 5) type of question that

must to be asked in order to collect the required data; and 6) the number of required questions.

4.5.4 Mono-method, Multi-methods and Mixed-methods

The choices of research methods in a research study include mono-method, multiple-methods, and mixed-methods. Mono-method refers to using a single data collection technique and corresponding analysis procedure. Multiple-methods refer to using more than one data collection technique with associated analysis technique, but all the adopted methods are restricted within either the quantitative or qualitative category. Mixed-methods refer to using both quantitative and qualitative data collection techniques and data analysis procedures in a research design (Saunders et al., 2007).

In the mono-method design, only one analytic interest is pursued, while in the multiple-method or mixed-method design, two or more analytic interests are investigated. Multi-method designs are generally intended to supplement one information source with another, or 'triangulate' on an issue by using different data sources to approach a research problem from different points of view (PREST, 2004). In other words, multiple-methods can add insight and meaning that might be missing in a singular method (mono-method) design, and uses the strengths of one research method to overcome weaknesses of another. However, the mixed-method designs are conceptually more complex.

Mixed-method designs may provide a basis for triangulation but, more often, become the source of different ways of conceptualising the problem, such as different instrument design for data collection (qualitatively and quantitatively), and various methods of data analysis and inference (statistically and qualitatively) (Tashakkori and Teddlie, 2003; Creswell, 2009). Therefore, besides the strengths of complementarity

and triangulation, the mixed-method designs have other advantages, such as providing both narrative and numeric data, interpreting a broader and more complete range of questions, increasing generalisability of results, and producing more complete knowledge to inform practice (Traynor, 2004). The weaknesses of mixed-methods are mainly in relation to the complexity of data collection and analysis (Saunders et al., 2007).

4.6 Methodological considerations of Current Study

4.6.1 Approach Considerations

Research methods focus on the techniques that are available and those that are actually employed for data collection and analysis in a research project (Fellows and Liu, 2008). The current research employed approaches that demanded quantitative responses (i.e. with number and facts) as in the approaches used to achieve Objectives Three i.e. appraising client organisation practices in terms of supply management and managing their value systems, Objective Four i.e. appraising the determinants of value in building designs and Objective Five i.e. determining the effects of the determinants. Additionally, the current research also employed approaches that were mainly concerned with the beliefs, understandings, opinions and views of people. For example, the approaches used to mainly achieve Objective Three i.e. appraising client organisation practices in terms of supply management and managing their value systems.

Hence, triangulated approaches were applied to the current study to acquire the richness of knowledge of supply management and managing client value systems. Quantitative data collection methods and statistical analysis were used to establish the appraise the determinants of value for money in building designs while qualitative data collection methods and documents analysis were employed to identify gaps and

essential improvements for supply management and determination of client value systems. Both qualitative and quantitative approaches were used to develop and evaluate the conceptual framework for value delivery.

4.6.2 Strategy Consideration

Achieving the primary aim of this research i.e. to determine the influence of client organisation on achieving value for money in building designs would require enquiries on the issues influencing the managing of building designs and understanding of the context within which they occur, so that related issues are unearthed within their proper context. One way of achieving this is by accessing the 'perception' of various members of the construction sector who have some effect on designs as a way of understanding the client organisations impacts on designs.

For this purpose, the line of inquiry should include "what, how, why, and when", in order to develop a broad contextual understanding of issues surrounding building designs in terms of supply management, value system management and design team functioning. Furthermore, to strengthen this knowledge and develop a deeper understanding of specific design related issues, it is equally important to investigate the actual practices in supply management and value system determination within some selected client organisations.

Here, the questions for investigation include "how and why". No single strategy will meet the requirements for both the breadth (the thinking of practitioners within the industry) and depth (actual practices within selected organisations) of the research. Two or more strategies must be applied to execute the research. Therefore, a multi-methodology research strategy is chosen for this research. The use of a survey is chosen to access the perceptions of design team members about the determinants of

value in designs, and a case study approach is employed to investigate the actual practices of in client organisations.

4.6.3 The Research Design

Research design is the general plan that describes a researcher's attempt to answer research questions (Saunders et al., 2007). In the current study, a multi-methodological research strategy is applied to take account the organisational context and investigate client organisation interface with the design process in the construction industry both in breadth and depth. A pragmatic mixed-methods design, combining both quantitative and qualitative approaches for data collection and analysis, has been justified as the most suitable approach for the current research. The research design is diagrammatised in Figure 4.1.

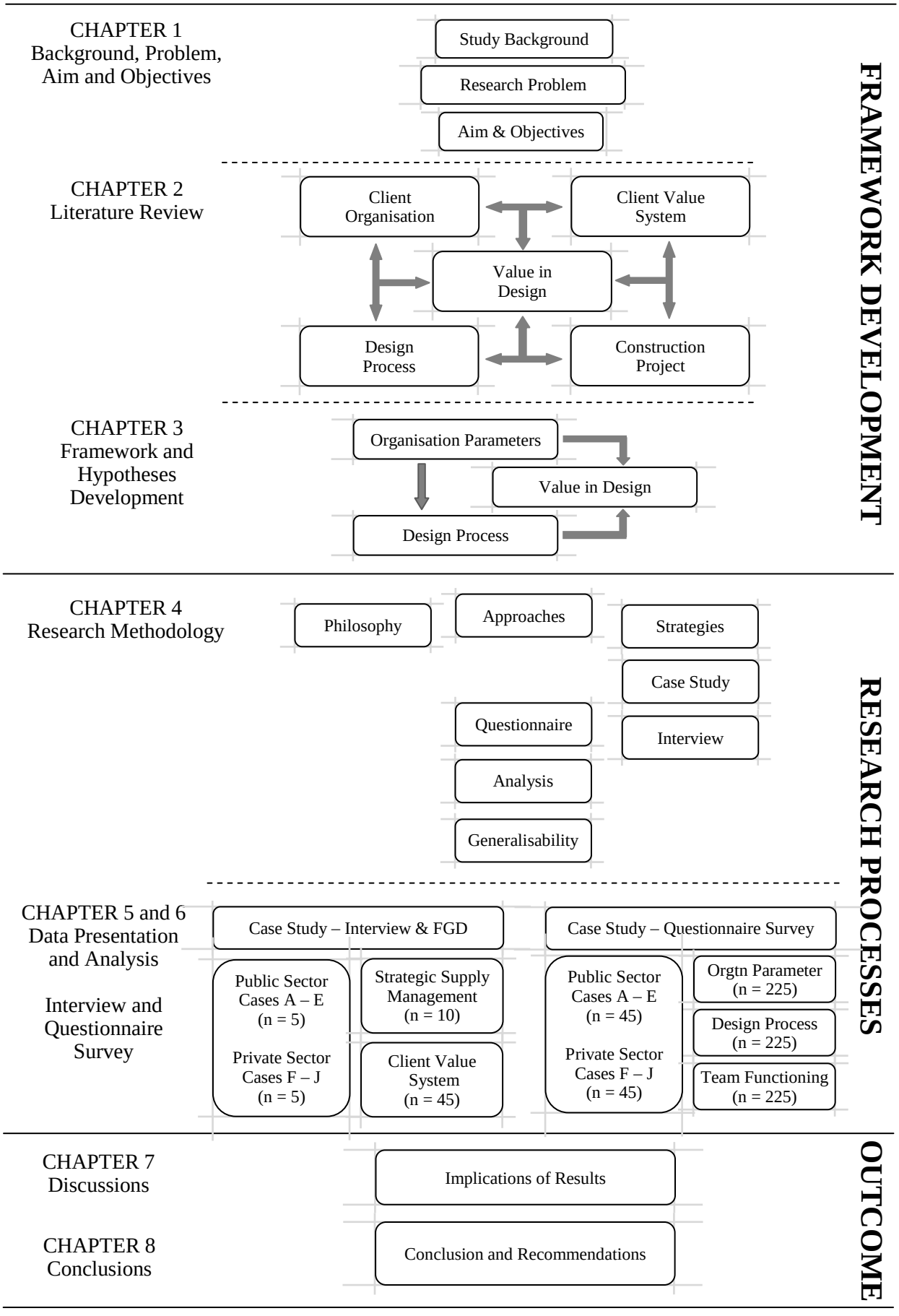


Figure 4.1 – Overview of the Research Design

4.7 Research Methods Adopted in Current Study

4.7.1 Theory Exploration and Literature Review

Research is highly based on existing concepts which are predicated upon the body of knowledge surrounding them in form of theories, principles, laws, and literatures, within which lays their structural dimensions. The exploration of theories and search for literature basically served the purpose of achieving the first and second objectives of the research i.e. to explore the VfM concept and its associated factors influencing its achievement for client organisations in construction; and to establish theoretical and conceptual frameworks for value delivery based on client organisations parameters respectively.

In researching this work, sourcing of literary materials is of paramount importance to this section. Amongst the available means, libraries (both physical and electronic) shall form the major source of materials. For the physical libraries, the academia served as the primary sources particularly main libraries and departmental libraries of tertiary institutions, public and private agencies. Types of materials sourced included: research papers from peer viewed journals, articles from professional journals and magazines, research reports from accredited research institutions, technical reports and government publications, relevant and related textbooks, encyclopaedia, stored in either hard copies and/or electronic form.

In line with the scope, areas for which theories and literature were researched from include: *'theory of value'* within the fields of economics and construction, '*concept of value for money'* in procurement of public sector construction project and other related industries with success stories e.g. the manufacturing/production industry, and '*design methodologies and approaches'* particularly at the design stage. Other aspects include '*Supply management'* from a general perspective and within the context of building

design, and lastly, *teams and organisational outcomes* within the fields of *Organisational behaviour*.

4.7.2 Case Studies: Client Organisation Management Practices

The third objective of this research is to appraise client organisation practices in terms of their supply management and managing their value systems in procuring building designs. To achieve this objective, a case study strategy was applied. Multiple-case studies were accomplished by going through three steps. The three steps for conducting the multiple-case studies include:

- *Defining and designing*: identifying the case study aim, the rationale for choosing the target organisations, and the methods for carrying out the case studies;
- *Preparing and collecting*: preparing for conducting the case studies, conducting the first case study and writing the individual case report, and then carrying on the same process on the next three cases; and
- *Analysing and concluding*: analysing the initial results, drawing cross-case conclusions, and writing cross-case report.

Step One: Defining and Designing of the Multiple-case Studies

The main purpose of the case studies was to investigate the actual supply management and value system determination practices of client organisations. Six specific objectives associated with supply management and three aspects associated with managing client value systems were established in order to achieve the main purpose of the case studies. These are discussed in Chapters 2 and 3 and outlined in Chapter 5. The rationale for selecting the case study organisations was based on their uniqueness as clients of the construction industry – their high and consistent volume of procurement within the periods 2011 – 2015. The public sector client organisations

were specifically targeted due to their continued and sustained access to intervention funds for public institutions in Nigeria i.e. TETFund Intervention Programmes.

In the current research, semi-structured interviews were conducted with each of the directors of the client organisations studied all of whom are experienced in and responsible for the management of their supply chains and their value systems. The list of questions used in the semi-structured interviews and the checklist protocol can be found in Appendix A. Also, focus group discussions were conducted with five members each of the Units responsible for managing construction procurement in the cases studied. Ten client organisations were selected for the case studies (details are shown in Chapter Five). The case studies were carried out through investigating two levels of the selected organisations: 1) at the organisational level; and 2) at the project level. At the organisational level, investigation was focused on exploring the strategic practices of managing design partners in the target organisations. While at the project level, investigation was concentrated on exploring how client organisations manage the project value systems. Both types of investigation were accomplished via two main methods: 1) semi-structured interviews with checklists, and 2) focus group discussions using Focus Group Discussion Protocol (see Appendix B) and the Value Assessment Matrix (see Appendix C)..

Step Two: Preparing and Collecting of the Multiple-case Studies

This step involves preparing the data collection protocols, carrying out the case studies, and producing initial reports for each case. To carry out the case studies at both the organisational and project levels, two data collection protocols were prepared. The interview and checklist protocol was for the Directors while the focus group discussion protocols were for the management cadre professionals working in client organisation. The interview and checklist protocol for the Directors was focused on:

1) determining the supply management development stage of the target organisations, 2) understanding client organisation strategic considerations, 3) competences and skills, 4) performance measurement, 5) consideration of cost/benefit analysis, and 6) managing their inter-firm relationships

The focus group discussion protocol and value assessment matrix was centred on: 1) examining the practices of value definition and determination in client organisations; 2) understanding how stakeholders and managed during design process; and 3) exploring the value dialogue and judgement practices of client organisations. Face-to-face interviews were undertaken with the Directors from the ten target organisations. Either before the start or at the end of each interview, the Directors indentified five senior management staff in their respective organisation who partook in the focus group discussion for each target case. All the interview and discussion conversations were recorded either by hand or with the aid of a recording device. Some interviewees and discussants did not want their sessions recorded using a recording device.

Step Three: Analysing and Concluding of the Multiple-case Studies

The case studies were analysed with thematic analysis. In thematic analysis the task of the researcher is to identify a limited number of themes which adequately reflect their textual data (Howitt and Cramer, 2007). To reflect the required level of analysis adequately, the texts (transcribed from the interview conversations, where recorded), documentation and outcome of the FGD (collected from the discussants) were read through and attempted to generalise the main themes revealed. Themes that emerge are pieced together to form a comprehensive picture of their collective experience (Aronson, 1994; Guest, et al., 2012). The results and findings of the multiple-case study are presented in Chapter Five.

4.7.3 Survey: Value in Design Determinants & their Influence

The fourth objective of this research is to appraise the determinants of VfM in building designs in terms of client organisation parameters, design process and team behaviour. The fifth objective is to determine the influence of the determinants on value delivery in building designs. To achieve the goals of these two Objectives, an industry survey was selected as the appropriate research strategy. Amongst the advantages of survey research are: it can collect a great deal of data about an individual respondent at one time at low cost; and the survey research method is versatile enough to be used in virtually any setting (Cooper and Schindler, 2008; Creswell, 2009)

Survey research is characterised by a structured or systematic set of data. Information is gathered about the same variables or characteristics from at least two (normally far more) cases and ends up with a data matrix. There are three major methods to elicit information from respondents: the personal interview, the mail questionnaire, and the telephone survey. A survey research should possess the following characteristics (Smith & Dainty, 1991; Creswell, 2009; Kathori and Garg 2014):

- Survey research is a quantitative method, requiring standardised information from and/or about the subjects being studied.
- The main data collection method is by asking people structured and predefined questions. Their answers, which might refer to themselves or to some other unit of analysis, constitute the data to be analysed.
- Information is generally collected about a fraction of the studied population, but it is collected in such a way as to be able to generalise the findings to the population. The sample should be large enough to allow extensive statistical analysis.

Oppenheim (2000) distinguishes two types of survey research: descriptive survey and analytical survey.

- Descriptive survey is aimed largely at fact-finding in nature, or making predictions. Its purpose is to count, and chiefly tell us how many (what proportion of) members of a population have a certain opinion or characteristics or how often certain events occur together. They are not designed to explain anything or to show causal relationships between one variable and another.
- Analytical survey is aimed at exploring causal relationships between variables, and often undertaken to test specific propositions or hypotheses. It answers the question of 'why' rather than 'how many' or 'how often'.

Based on the above literature of survey research, while this research is laced with traces of descriptive survey, it uses analytical survey as the dominant component, given that the objectives of this aspect of the research are firstly, to appraise the determinants of value in design in terms or client organisation parameters, design process and design team functioning; and secondly, to determine the effects of these determinants on value delivery. Hypotheses of relationships between these variables are formulated through literature review and will be analysed using quantitative data collected via survey research. The survey was accomplished by going through the following steps.

Step One: Defining the Study Population, Sample and Potential Respondents

The investigation of value in design determinants relative to client organisations in this research mainly concentrates on design teams as been part of the larger project organisations. This will include firstly, identifying specific projects within client

organisations, and then identifying members of the design teams composed for the design responsibility of the project. Hence, two units of analysis are present for this aspect of the research namely: client organisation and design team members. Since, 'project' tends to adequately subsume the two units of analysis, construction projects becomes the unified unit of analysis for the research. This includes other construction projects e.g. civil engineering, heavy engineering industrial engineering, renovation and repair works among others.

Based on the research scope, the population of the current study should be comprised of building projects within institutions of higher learning owned by either public or private organisations in Nigeria. In order to define an appropriate sample and its size, various sampling methods was reviewed. Sampling allows researchers to draw conclusions about the population by selecting units that are representative of the population (Maylor & Blackmon, 2005). There are two approaches to sampling: probability and non-probability sampling (Maylor & Blackmon, 2005; Blumberg et al, 2008; Kathori and Garg, 2014).

There are several types of random sampling, such as simple random sampling, stratified random sampling, cluster sampling, and stage sampling (Blumberg et al., 2008; Bryman and Bell, 2007). Simple random sampling involves taking a random sample directly from the population. However, it is limited by the availability of a complete list of the population, one that could be very large and not feasible or even possible to obtain. Stratified random sampling consists of taking random samples from various strata, which are different sub-populations within a larger population. By defining strata, the researcher can identify more relevant ones that are worth investigating. Cluster sampling randomly selects clusters of subjects, thus avoids the difficulty of sampling from a large population. Stage sampling is an extension of

cluster sampling and involves successive random selections from each previously selected cluster.

Non-random sampling provides less justifiably representative samples, but is used for the sake of cost efficiency and convenience. Typical techniques that have been applied in previous research are: purposive sampling, quota sampling, convenience, accidental or volunteer sampling, and snowball sampling (Blumberg et al., 2008; Bryman & Bell, 2007). Purposive sampling is achieved by the researcher through hand-picking subjects on the basis of traits to give what is felt or believed to be a representative sample. This requires all the relevant variables or traits to be identified so the sample would include a cross-section of persons possessing these.

Quota sampling involves the researcher non-randomly selects subjects from identified strata until desired numbers are reached. Such an approach ensures that each group is of the same size, which can be important for some inferential statistical tests. The disadvantage is that the numbers may not reflect the true proportions of sub-populations in the whole population. Snowball sampling involves the researcher identifies a small number of subjects with the required characteristics, who in turn identify others etc. This is of value when a researcher has little idea of the size or extent of a population, or there simply may be no records of population size. The disadvantage is that it is difficult to defend the representativeness of the sample.

Indeed, there is widespread recognition among organisational researchers that investigations using sample survey are rarely based on probability samples. Instead, convenience samples tend to prevail which was the sampling method of choice for this research. Bryman and Bell (2007) offer an explanation as to why non-probability sampling is widespread:

- Practical reasons such as increased difficulty in gaining access to firms for survey research.
- Strategic reasons, in other words a non-random sampling may be deemed better than a random one, or a random sample may not be a feasible plan of action. Random sampling is unlikely to be feasible in the event that there is no frame or when the frame would be absurdly expensive or even impossible construct

For this research, and due to the nature of the research scope and duality in the unit of analysis, initial efforts were made during the early stages of the research to determine the sampling frame toward determining the research population. And given that the results of the case studies conducted cross-references those of the survey, the context for both data collection had be to given considerable thought while determining the population, population element and sampling frame. This initial effort assisted in arriving at the fact that to qualify as a population element, some criteria must be met – which aligns with the non-random sampling approach of convenience sampling. These criteria include:

- The designs of the candidate project must have been completed within a minimum and maximum of 3 and 15 months respectively before the survey. The collection of data was staggered over a period of 3 years i.e. .between 2012 – 2015.
- The state of the candidate project must either be on-going or completed. Projects that have been suspended or abandoned shall not qualify.
- The composition of the design team must be made up of at least four design related professionals – architect, M & E Engineer, Structural Engineer and Quantity Surveyor and a client representative.

- All the design team members of the candidate project are available and willing to participate in the survey.

Applying these inclusion criteria, six projects could be conveniently surveyed from each of the five public institutions while three projects could be easily sourced from each of the five private institutions. Based on this possibility, 45 projects were conveniently selected from the target population, encompassing various building projects that met the inclusion criteria. For each of these projects, the members of the design team i.e. 5 in each formed the respondents for the survey.

Step Two: Considering the Survey Measurement and Scale

Survey instrument development is an important phase of this research, as it is the main process through which the validity and reliability of the measurements, as discussed previously in this chapter, is achieved. Measurement is one of the most fundamental elements in research. It is a problem shared by researchers in all disciplines where an attempt is made to quantify observations (Blumberg et al., 2008; Bryman and Bell, 2007; Maylor and Blackmon, 2005). According to Blumberg et al., (2008) in measuring, first a mapping rule is devised, then the observation of property indicants is translated using this rule. The rules that we use to assign numbers to observations result in various levels of measurement. Several types of data are possibly dependent on the assumptions about the mapping rules. In addition, each data type has its own set of underlying assumptions about how numerical symbols correspond to real world observations (Blumberg et al., 2008). There are four levels of measurement with different properties involved, namely nominal, ordinal, interval and ratio scales (Blumberg et al., 2008)

- A nominal scale is one in which numbers are assigned to individuals or phenomena. Their purpose is merely to give a label to a class or category.

Nominal characteristics do not show any order of distinctions. Using nominal data, very little statistical analysis can be carried out. Only percentages, frequencies, and the mode can be calculated, and limited statistical techniques such as Chi-square can be used to determine significant differences between categories.

- Ordinal level data are numbers that are assigned to data on the basis of some order, i.e. the data is in an order that ranges from the bottom to the top. However, it is not possible to quantify precisely how much difference there is between the categories.
- Interval level data represent numbers used to rank items such that numerically equal distance on the scale represents equal distance in the property being measured. This is, in addition to classification and order, we have equal units of measurement. There are precisely defined intervals between and among observations. What is lacking with an interval scale is a stable starting point (an absolute zero), and consequently, the scales cannot be interpreted in any absolute sense. However, we can perform a large number of mathematical operations with interval data, which are not possible with nominal and ordinal data.
- A ratio scale is a type of scale that uses numbers that rank items in order that the intervals are equal in measurement and have an absolute zero point. With ratio data, all descriptive as well as inferential statistics are applicable.

In social science research, many attitude scales are presumed to be interval (Blumber et al., 2008, Bryman & Bell, 2007). For example, the Likert scale that requires respondents to state their degree of agreement or disagreement to a given statement. Blumber et al., (2008) emphasise that it is obvious that the interval between each of these degrees of agreement or disagreement is not exactly equal, but more researchers

treat these data as if the intervals are equal. This is because the result of most statistical techniques is not seriously affected by this minor non-compliance to the interval scale requirements.

In this research questionnaire, data were assessed by Likert scales, which are treated as an interval scale. A five point scale was used because as Blumberg et al., (2008) point out many researchers contend that the greater the number of points on a rating scale, the greater the sensitivity of measurement and extraction of variance. The reasons for using a Likert scale are: (1) These scales have been found to communicate interval properties to the respondent, and therefore produce data that can be assumed to be intervally scaled (Bryman & Bell, 2007; Maylor & Blackmon, 2005); (2) In team literature, Likert scales are normally treated as interval scales. This enables the research to describe the nature of research subjects, as well as to explain the relationships between variables by employing inferential statistics.

Step Three: Considering the Research Design's Validity and Reliability

The quality and impact of management research depends upon the appropriateness and rigour of the research methods chosen. Issues on design choices such as instrumentation, data analysis, and construct validation, etc. affect research findings and conclusions. This leads to the continuous focus on reliability and validity of research methods. Many authors have addressed the issues from different aspects, resulting in a wide range of labels that are used to describe reliability and validity of measures in the methodological literature (Blumberg et al., 2008; Yin, 2009). The following section identifies the methods undertaken within this research to ensure validity and reliability.

Validity

Validity refers to the extent to which a test measures what is wanted to be measured. It is generally agreed that no one research strategy can adequately cover all aspects of validity. Researchers need to adopt different strategies to maximize different kinds of validity. Triangulation is suggested as an effective strategy to achieve more valid and reliable research results. However, due to limitations of research resources, the nature of research projects, and the skills of the researcher, triangulation is not always possible. In the particular case of this research, the prime task is to identify the relationships between variables. Quantitative methods are more effective in solving the concerned issues.

The content validity is optimised though extensive literature reviews. The operationalisation of each measurement is checked against the relevant content domain for the construct. Efforts have been made to use the measures that have been previously tested. In some instances, modifications were made and new measures were created. These will be listed in the following sections. New items used in the survey questionnaire and hypotheses development followed from a critical review of theories and previous research findings.

External validity of this research is achieved through adopting a quantitative research strategy, followed by critical review of all relevant research fields in terms of identifying theoretical foundations and cross-comparison with previous research findings. Survey research is adopted and aims to achieve generalisable findings. Details of questionnaire administration are reported in the later section of this chapter.

Reliability

Reliability demonstrates that the operations of a study can be repeated with the same results. The reliability of this research is achieved through the following measures:

- Minimising the source of unreliability, multi-item indicators, and the use of questions from reputable studies.
- Minimising source of unreliability: Various researchers argue that a question may be unreliable due to bad wording: people may understand a question differently on different occasions (Blumberg et al., 2008; Yin, 2009). Another source of error is when people have no opinion or have insufficient information. In the survey, bad wording is minimised by extensive review of past literature, critical discussion with the supervisor, expert review of the questionnaire Difficult questions were reworded, and ambiguous questions were amended or deleted.
- Multi-item measure: Yin (2009) argues that multi-item indicators are the best way to create reliability, as well as offering an easier method of assessing their reliabilities. Moreover, single-item measures are said to have almost certainly a strong yes-saying bias, while multi-item measures eliminate this. This study used multi-item measures for all constructs with items ranging from 4 statements to 10 statements for each construct.
- Use of questions from reputable study: Effort has been made to use the measures from previous studies, but in some instances, modifications were made and new measures were created, using the steps specified above. Reliability of the measurement instruments was checked and achieved by using Cronbach's alpha coefficient.
- Cronbach's Alpha test of reliability: This is a model of internal consistency, based on the average inter-item correlation. Cronbach's Alpha was calculated for each construct in the study and the results are reported in the following chapter.

The importance of validity and reliability of research in generalising research findings is discussed above. Black (1993, p55) notes "without generalizability of results, social science research in general will tend to limp along, not benefiting from the efforts of others, collecting results on a piecemeal basis." The more generalisable the results are, the greater the possibility that one can begin to resolve conflicting hypotheses. By following the identified methods, this research is aimed to achieve optimised validity and reliability.

Step Four: Designing the Structured Questionnaire

Questionnaire design is a very important part of this research. As previously mentioned, measurements are carefully selected from existing research when available. In cases when existing measurement scales are not available, questions were drawn from strong theoretical background. The questionnaire uses a 5-point Likert scale, usually ranging from 1=strongly disagree, 2=disagree, 3=Neutral, 4=agree, 5=strongly agree; 1=Not important, 2=less important, 3=important, 4=very important, 5=extremely important; and 1=very low, 2=low, 3=average, 4=high, 5=very high.

Format of Questionnaire

The format of the questionnaire is a most important criterion that determines response rate (Blumberg et al., 2008; Bryman & Bell, 2007). The appearance of the questionnaire and how the questions are structured within it can influence a respondent's co-operation, as well as the quality of data collected (Blumberg et al., 2008; Bryman & Bell, 2007, Maylor & Blackmon, 2005). Blumberg et al., (2008) specify that in a mail survey, both the layout and appearance of the questionnaire are crucial, because they are the only elements that will entice respondents to cooperate.

Questions were deliberately grouped into sections and sub-sections using sub-numbering systems to enhance the format of the questionnaire. Instead of ending up with over hundred of individual questions, questions were grouped into sections.

Based on the aforementioned a structured questionnaire was devised on the aim and objectives of the survey. Altogether, the questionnaire included 60 statements covering six sections (see Appendix D). All the statements were designed as closed questions. The first Section considered the background information of the survey respondents. The background information was designed for analysing the survey results later, specifically for revealing the distribution of survey responses and identifying the trends value in design determinants based on different categories (i.e. experience, professions and position). The second Section considered the client organisation roles within design delivery. The third Section appraises the team composition determinants in value delivery. The fourth Section investigated the team functioning determinants. The fifth Section investigated the organisational context and their influence on value delivery. Lastly, the sixth Section considered the design process determinants of value in design.

Step Five: Analysing the Survey Findings and Presenting the Results

Various analytical tools were employed pursuant to achieving each of the study objectives. To determine the various factors relative to the processes of determining and measuring value in building design, two tools were be adopted – descriptive statistics and factor analysis. The former aided in arriving at central tendencies for the factors, for example, mean values, standard deviations, aggregated perceived level of importance and severity of performance, while the latter i.e. factor analysis addressed the existing multi-co linearity that maybe be evident in the factors, hence reducing them into sizeable and manageable clusters or components. The reduced factors

formed the basis for developing factor-based models to predict the likely value performance of building designs in terms of achieving V_fM.

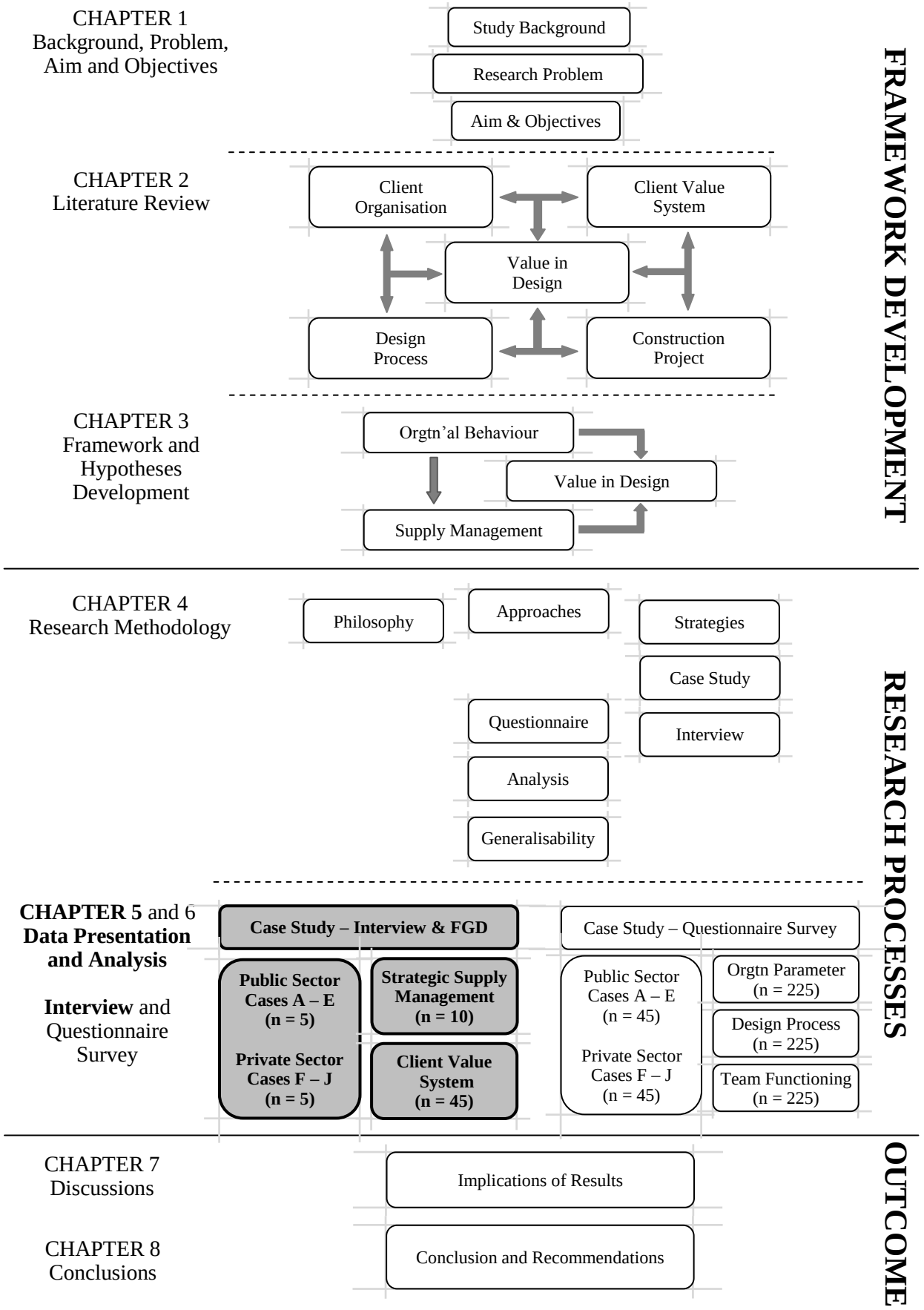
The establishment of relationships amongst the study variables was be achieved by performing correlation analysis using the Pearson's correlation coefficient and the Spearman rank correlation coefficient. Further analyses were performed to determine the effect/influence of these variables on response variables using multiple regression techniques. Aside from been used as explanatory model, the multiple regression technique was also employed in the research as predictive model to forecast the likely outcome of the response variable.

Regression analysis is a more sophisticated way of examining the relationship between two or more variables that is correlation (Barrow, 2006). The major difference them been that with regression, a direction of causality is asserted, from the explanatory variable(s) to the dependent variable; the influence of each explanatory variable upon the dependent is measured, and the significant each can be ascertained. Regression analysis describes the causal relationship by fitting straight line (lines) in the case of multiple regression) drawn through the data which, best describes them. This line is called the 'line of best fit', found by the 'ordinary least square' method. Measuring the goodness of fit of the data to the line gives an indication of whether the regression is a good or bad one. This is determined by the coefficient of determination of the regression analysis model developed denoted as R^2.

The value of R^2 must lie between 0 and 1 i.e. $0 \leq R^2 \leq 1$, a value of 1 indicating that all the sample observations lie exactly on the regress line (a perfect correlation) while a value of 0 indicates that the explanatory variable does not linearly influence the dependent variable. In such a case the regression line is of no use for prediction. When multiplied by 100 i.e. converted to percentage, the R^2 indicated the extent of variation

in the dependent variable explained by the independent variable(s). The unexplained variations may be due to other variables not considered in the analysis or due to pure random variation. High values of R^2 suggests that the regression seem to make a worthwhile contribution to explaining why the observations in the dependent variable differs within the sample. The quality of a regression model is not only based on the R^2 but also the significance of the regression coefficient as shown by the ANOVA table, for instance. The sample R^2 is known to optimistically estimate how well the model developed fits the population. The model usually does not fit the population as well as it fits the sample from which it is derived. Hence, the Adjusted R^2 attempts to correct R^2 to more closely reflect the goodness of fit of the model in the population (SPSS).

Chapter 5 – Case Study Analysis & Results: Client Organisation Practices



5.1 Introduction

Chapters 1 and 2 outlined arguments that client organisations are not only required to provide the necessary leadership needed to improve the performance of their projects in particular and that the construction industry in general, but that their involvement in projects has significant impact on the level of satisfaction they derive there from. The point was also made that to extend the frontiers of project performance beyond that presently attained, client organisations should own and effectively manage their supply chain. Importantly also, and in keeping with the requirements of strategic supply management, Chapter 2 detailed the principles of client value system wherein effective value delivery is engendered. To these ends, Chapter 3 outlined the principles and theories of strategic supply management, leveraging on how client organisations can achieve value for money objectives when engaging their supply partners. This Chapter describes the analysis and results of case studies conducted to appraise client organisations in terms of managing their supply chains and their value systems in pursuant of Objective 3.

Evidences from Section 3.4 indicate that effective strategic supply management which is more apt for investigating client organisation in the public sector compared to operational supply management, is predicated on consideration of the following aspects: classification of the supply function and its strategic considerations in terms of nature and alignment; competencies and skills based of its personnel; performance management; total cost benefit analysis; and managing inter-firm relationships. The instrument for data collection – both the semi-structured interview and checklist protocols were formatted in accordance with these aspects, hence, each of the cases studied are analysed in similar manner for the first part of the case study analysis. This part of the investigation was targeted at those in charge of the Supply management

units of the universities studied. Details of the respondents and specific projects which formed part of the investigation are given in the appropriate section describing the general information of, and details of projects considered for each case study

The second part the case study analysis focused on appraising the value systems in client organisations. And based on the discussions outlined in Section 2.2.3 which gives details of the concept of client value systems, three main aspects lend themselves for investigating value systems within client organisations, namely: stakeholders' management, value dialogues and judgements, and value assessment. Focus group was the approach adopted for data collection process of this part of the research. Specifically, for the practical determination of value for projects, the pro-forma shown in Appendix C was used for data elicitation from the members of the focus group discussion (FGD), while for the other aspects i.e. stakeholders' management, value judgement and assessment; group consensus was the means adopted based on the FGD Data Collection Protocol. The FGD Data Collection Protocol was formatted in line with the main aspects of this section as outline above which also forms the basis of analysing the cases studied for the second part of the investigation.

Two sets of analyses are performed for the cases studied – the stand-alone case analysis involving within-case analysis as appropriate, and the cross-case analysis. For the former, each case is individually assessed on the various aspects outlined above for the two main parts of this section while for the latter all the cases were assessed to give a global description of client organisations in terms of their supply management practices and management of their value systems based on the aforementioned aspects.

5.2 Stand-alone Analysis of Cases Studied

5.2.1 Case Study A

5.2.1.1 General Background Information

Case Study A is based on the investigation conducted with a public university established more than 40 year having a Procurement and Works Maintenance Unit which became operational since inception of the institution. Between the periods of 2008 – 2015 the University spent well over N12.7b on construction works 72% of which was committed to procuring new buildings. Up to N9b of this fund was provided by TETFUND while the balance was from the school's internally generated revenue (IGR). Interview was held with the person in charge of the University's Procurement and Works Maintenance Unit (PWMU) while the FGD session had five personnel drawn from within PWMU. PWMU is responsible for construction procurement. Table 5.1 show the particulars of the personnel.

Table 5.1 – Case Study A Participants Information

ID[1]	Designation	Qualifications	Exp[2]	Prof	Participation
A1	Director	MSc, MBA, FNIQS	33	QS	Interview
A2	Chief Architect	MSc, FNIA	35	Architect	FGD
A3	Chief QS	BSc, FNIQS	18	QS	FGD
A4	Senior Engineer	MSc, MNSE, MNIOB	21	M & E	FGD
A5	Senior Engineer	BSc, MNSE	22	Struct & Civil	FGD
A6	Principal Officer I	BSc, MNIOB	10	Builder	FGD
A7	Chief Technician	HND, FNSE	20	FM	FGD

[1] *Respondent's ID;* [2] *Working Experience*

The interview was conducted with A1, the Director of the PWMU. Table 5.1 shows that 'A1' has worked with Case 'A' for more than 25 years with 6 years in his current capacity as Director, spending his entire working carrier within the PWMU. He possesses a Masters Degree in Quantity Surveying, an MBA and is a Fellow with the Nigerian Institute of Quantity Surveyors and a cumulative working experience of 33 years. The members making up the FGD session for Case 'A' are a representation of the main professionals within the built environment comprising of Architect, Builder,

Facilities Manager, M & E, Quantity Surveyor and Structural Engineer. Case 'A' FGD members occupy both top and middle level management of the PWMU, having work experiences ranging between 10 – 35 years (average working experience = 23 years). All the FGD members have a minimum of a Bachelor's Degree except the Facilities Manager who possesses a HND, with two of them having Masters Degree. All the members belong to the professional bodies regulating their respective profession with half of them being 'Fellows' of their Institutes. A unique addition to Case 'A' FGD membership (compared to the remaining cases except Case 'G') was the inclusion of the Facilities Manager. This personnel represents a particular user Department for which a Twin Lecture theatre and an Auditorium was been constructed at the time the investigation was conducted. Based on the aforementioned it can safely be concluded that data elicitation for Case 'A' comes from members with high academic qualifications, satisfactory professional standing with very high level of experience and considerable wealth of knowledge about the construction industry in general, and the PWMU and projects they undertake in particular.

5.2.1.2 Case 'A' Supply Management Practice

1. Classification of PWMU

The current mandate of the PWMU is to *'oversee the procurement of built assets in terms of buildings and their related infrastructures, civil works and other related as so defined, and the maintenance of all built asset of the University'* (A1). While this is the current mandate of the Unit, there have been some changes over the years of its existence, given that the Unit was originally set up to have maintenance services to the existing building stocks. At the time of establishment, procurement for the University was undertaken by external consultants. When asked about the main goal of the Unit, A1 states that:

> *'In keeping with its mandate the PWMU is guided by the overall University's strategy and acquisition of built assets .... we are fully driven and guided by the principles of the University's objectives. However, in some instance, given that I am a member of the University Management, our Unit participates in the discussions on University's goals and strategies. In one instances, we were able to help direct the formulation of strategies on goals relating to students accommodation for the University*'.

When asked to give a brief description of what they do as the University's Supply Management Unit A1 informed that:

> *'... constantly departments make requests for spaces ..... and when funds are available [say TETFUND], PWMU packages the procurement plans on behalf of the university and makes submission to the funding agencies for approval. The selection of projects for onward submission to the Funding Agency are based on prioritisation of needs by a committee of which I am the Chairman drawing membership from major Departments and a member from the University's Management in charge of Need's Assessment ... We package our plans based on the funds (budget) available and once approval is given following the recommended process engage consultants and contractors on behalf of the University and manage their activities towards ensuring value for money for the School.*

Further enquiry on classifying PWMU probed on the theory supporting it make-buy decision. However, been a public institution, it was known beforehand that procuring design services (and construction) is through some form of competition (as stipulated by the Public Procurement Act of 2007, regulating public procurement in Nigeria). Hence, design services in Case 'A' are bought rather than made by law. This position was confirmed to be the case by A1 for PWMU. However, the theory supporting the choice is equally important toward investigating their supply management practice.

When asked what parameters they consider when procuring design services, A1 indicates that cost minimisation was the main consideration towards cost savings for the University. He further explains thus: *'the competitive tendering process for consultants introduced by the PPA is a very good instrument in ensuring cost minimisation by ensuring that public projects are bid for on a value for money basis'*.

Summing the outcome of the interview with A1 towards characterising Case 'A' based on its classification and strategic consideration, the following summarily describes it: PWMU is of the 1st generation, viewing itself as a manager of resources, adopting an implementing strategy at the passive stage of its development that harnesses the neoclassical economy theory in its decision to procure design service.

2. Strategic Considerations and Alignment

The strategy PWMU adopts in sourcing its design partners was investigated. When asked what variables instigate their choice of supply strategy, A1 said that fundamental to PWMU are the '*importance of the design service'* to the procurement of the building and the '*competitiveness of the market in terms of demand and supply'*. Further, A1 was asked to describe the nature of design services normally procured by the University with the view of identifying the most appropriate sourcing strategy based on the Kraljic positioning matrix (See Figure 3.6). His response is thus: *'I'll describe the nature of design services procured for construction projects in terms of impact on the University's activities as high since the quality of building affects learning, in terms of supply market complexity as low since there are many design professionals in the market'*. Further probe on the how the PWMU interact with their design suppliers,, it was clear that the 'routine: efficiency' strategy was the popular sourcing strategy. This is contrary to the requirements of the Kraljic positioning matrix which stipulates the 'leverage: best deal' strategy.

Based on the nature of design services procured by the PWMU in terms of its impact on Case 'A' built asset and the supply market risk or complexity as described by A1, the delegated sourcing and parallel sourcing were the most appropriate sourcing structure based on the Cousins et al. (2008) framework (See Figure 3.7). This is contrary to what obtains in Case 'A' which adopts the single sourcing and multiple

sourcing structure which are in accordance to that suitable for the 'routine: efficiency' strategy as practiced by PWMU albeit wrongly based on the Kraljic Positioning Matrix and the Cousins et al. (2008) sourcing strategy – sourcing structure mapping.

On the issue of strategic alignment, A1 indicates that Case 'A' has in place corporate level strategies that a related to built assets citing the following excerpt of a Management meeting and captured under its Statutes, as an example *'In order to put the funds from TETFUND to the maximum benefit of achieving its students centred programs in terms of accommodation, the University Management commits to utilising 50% of all its allocations between the 2013 – 2017 intervention period towards the provision of befitting 2 – 3 star rated hostel facilities …'*. A1 describes three competitive priorities of Case 'A' which forms the basis of their corporate strategies for built assets and which also plays pivotal roles in the selection of design partners namely cost, quality and delivery. On one instance, innovation was a matter of priority over cost. This however was for a project which was funded from Case's 'A' IGR. A1 informed that it was rather difficult insisting on innovative designs when the funding was anchored by a public agency due to economised principles of spending public funds.

Lastly, under this aspect of the investigation, A1 was asked if the PWMU has its own strategies and how these strategies (both corporate and functional) are developed. Case 'A' formulates its own strategies but this is done rather informally since no written documentations is available except when captured in minutes of meetings. A1 explained that strategy development adopts a top-down approach Supply (Purchasing) strategies are informed by corporate strategies but that corporate strategies are development gets the participation of the PWMU. Therefore there is evidence to support the fact that there is some level of strategic alignment in Case 'A' though no

indication of any contribution from the Departments who mostly are the beneficiaries of the building designed.

3. Competencies and Skills Base

Talking freely on the level of competencies and skills of the personnel of the PWMU, A1 expressed satisfaction with the level but quickly indicated that there remain room for improvement in the area of team building skills and strategic planning which is an area that he passionately wants to explore before leaving office as Director of the Unit. Table 5.2 show the outcome of the ranking of the competencies and skills base of the PWMU by A1 which was aided by explanations of what each aspect entailed from the researcher where such explanations was needed and where it was felt such explanations will improve on the objectiveness of the assessment by A1. Two different assessments were required – the ranking of the current levels and what A1 thought was an ideal ranking for a contemporary Supply Management Unit. These outcomes are shown in Table 5.2.

Table 5.2 – Case A Competencies and Skills Ranking

Competencies/Skills	Ranking		Competencies/Skills	Ranking	
	Cu	Id		Cu	Id
Assertiveness	1	4	Inventory Management	2	5
Aggregate needs	1	3	Negotiations skills	2	2
Communicative skills	4	1	Numeracy	1	4
Competitiveness	2	3	Product/Service knowledge	3	5
Computer literacy	3	5	Relationship Mgt Skills	4	1
Cross-functional working	5	4	Risk assessment skills	5	2
Forecasting ability	4	2	Strategic thinking	5	1
Volume/cost analysis	2	5	Supply industry knowledge	4	3
Profitability analysis	3	4			

Cu – Current status, Id – Ideal situation

From the Table, Case 'A's main strength in competencies and skills include: assertiveness, aggregate needs, and numeracy; followed by competitiveness, volume/cost analysis, inventory management, and negotiation skills; and lastly computer literacy, profitability analysis, and product/service knowledge. These

rankings clearly places Case 'A' within the tactical acquisition and tactical profit quadrant of the Cousins et al. (2008) strategic supply competency table. Analysing A1's ideal situation for a contemporary Supply Management Unit, a more strategic approach is envisaged comprising of the following highest ranked competencies and skills: relationship management skills, strategic thinking, and communicative skills followed closely by negotiation skills, risk assessment skills, and forecasting ability. These rankings places A1's ideal situation for contemporary Supply Management Unit within the strategic security and strategic critical quadrant.

Connected to the regular competencies and skills base of the PWMU, specialised supply management skills were also investigated. The outcome is shown in Table 5.3.

Table 5.3 – Case 'A' Adequacy of Specialised Procurement Skills

Adequacy	**Skills**
None	Goal-setter, Influencer
Not Adequate	Planner, completer, public speaking, listening, making a business case, leader and decision maker
Adequate	Presenting, writing, cost accounting, economics, computer literacy, mathematic, process development,

Table 5.3 shows that Case A lacks the following personnel for these specialised procurement skills: strategic planning skills i.e. goal-setter and planner; Communication i.e. public-speaking, and listener; Financial skill i.e. making a business case, and team building skill i.e. leader, decision maker and influencer. However, they have adequate personnel in the following specialised procurement skills communication i.e. presenting and writing; Financial skills i.e. cost accounting, and economics; and technical skills i.e. computer literacy, mathematics and process development. This reveals that the PWMU lacks adequate personnel in two specialised procurement skills areas namely: strategic planning and team building. This finding

corroborates the earlier findings on the core competencies and skills base of PWMU as shown in Table 5.2.

4. Performance Measurement

The PWMU of Case 'A' undertakes performance measurement on at both project and organisational levels albeit in a semi formal matter. A1 posits that:

> *'Performance is a key consideration for the University because even the University's Management always registers its dismay with the PWMU whenever contractors are not meeting up the aspirations of the University or when buildings are thought of as poorly designed .... the PWMU also ensures that designers and contractors maintain some certain level of performance ... However, there isn't any written guide to assess performance per se, during project meetings criteria are agreed upon and used as basis to assess performance. Though, this is not usually the case for design performance. Reference buildings are used as basis for assessing the design outcomes'*.

Though not a formalised and highly structure system, the measurement of design performance undertaken by the PWMU is essentially to monitor and evaluate the activities of design partners towards controlling the outcome of the design process mainly by calling upon persons in charge of the designs as required and appropriate. When asked on the extent to which the activities of the PWMU is measured in terms of performance, A1 observed thus: *'well everybody within the PWMU are highly committed and know exactly what is required of them in terms of their responsibilities to project and for this reason there wasn't so much emphasis on measuring performance as you would expect us to do for the suppliers [design partners]'*.

From the submission of A1 as contained above, that the measures considered in the metrics used by PWMU are the effectiveness and efficiency measures while these are specifically targeted at suppliers performance only. PWMU performance measurement is not targeted at the user departments, the internal processes at PWMU nor at opportunities for innovation and learning. Judging from the responses on the main features of the performance measurement system adopted by PWMU the main features

indicates that there is some form of linkage between the metrics for measurement and the corporate objectives of Case 'A' measuring performance on a one-dimensional scale but incorporating both effectiveness and efficiency measures and focused on qualitative aspect only, with the absence of standard guidelines exposing it to the possibilities of manipulation. The system is lacking in the following areas: ability to combine different measures, identification of trade-offs, mixing of leading/lagging indicators, potentials of systemic data collection and analysis, inability to differentiate between measures and non-consideration of cross-functional working i.e. intra and inter units.

5. Total Cost/Benefit Analysis

Discussing their approach to cost consideration, A1 reiterated the provisions of the Manual of the Public Procurement Act 2007 and the provisions of the Standard bidding Document for Consultancies in Nigeria. Specifically, the documents points to the *'most economically advantageous tender'* as the most preferred bidder to engage for public project further giving credence to selecting the lowest bid upon evidence of succeeding in qualify performance evaluations (the documents above actually recognises Quality-cost-based assessment as the preferred criteria for awarding public projects). The point of this from A1's explanation was that apart from looking at initial cost, no guide refers to how public agencies can treat cost on a whole life basis in the procurement of built assets. Hence, guided by this principle, PWMU considers only initial price in terms of service fees paid for design services rendered.

Design fees are only considered within the principles of the approved scale of fees operational in Nigeria, published by the Federal Ministry of Works in 1996. However, A1 noted that several scales exists, prepared by the various professional Institution regulating most professions of the built environment, most public funding agencies

stipulates the use of approved National Scale of Fees for the industry. Common to most of the scales, three stages of payment are recognised, Stage I, II and III, covering the entire design stages to completion of the construction. Hence, as exemplified by law, the PWMU considers only the initial acquisition costs and reception/handover costs for design services since these are what funding agencies are willing to pay for. When asked for eventual redesign cost of the building when in-use A1 states that *'.... maintenance cost usually is a consideration during the procurement stage of building. Irrespective of who is funding, whether from IGR or public funding agencies, maintenance cost are left until when they do arise .... how can you now treat design in such manner? .... and besides such redesign are not let out on a consultancy basis. They are undertaken by the PWMU'*.

Enquiring on the levels at which cost are aggregated and considered by the PWMU, A1 indicates that *'Being a public institution, and a unit funded by the University, of course through the Federal Government cost to the Unit in terms of administrating contracts, say for design for instance, is not a major consideration, since we work on the basis of a fixed budgetary allocation for administrative duties'*. Probing further on how they manage such allocations towards contract administration A1 informed that:

> *'... and since such [budgetary] provisions are really meagre, we try not to incur more than we are allocated. However little we can allocate to managing the relationship e.g. inspecting consultants' offices to ascertain quality of staff and equipment, etc, we allocate. Though we face a lot of constraints in this area because they form a huge part of the cost incurred when managing a supplier [design organisation], some aspect of it is included in staff emoluments.... The other costs aspects are largely taken care of in staff emoluments really e.g. involving and payments certifications etc'.*

The aforementioned reveals that though some levels of considerations are given to cost of managing relationship with their design partners, the PWMU only gives specific considerations to supplier level costs and that this is done superficially due to financial constraints and for the fact that staff emoluments substantially covers the

others i.e. order-level cost and unit-level cost, serious considerations are not given to these aspects.

6. Managing Inter-firm Relationships

A first aspect of understanding for this section of the investigating is having an understanding of how the PWMU defines and sees the concept of relationship. A1 defines and describes relationship as understood within the PWMU as *'The mutual contract between the University and a consultant for the provision of the stipulated service'*. Expatiating further on this definition, as result of probing what the constituents of the definition are, with specific relationship to processes, A1 further provides that

> *'Issues of processes are entirely left to the design professional to deal with. The PWMU does not interfere with design processes for instance. That's what we pay the consultants for and so expects them to provide processes that are suitable for the project. Beside they are in the best position to know which process works well under what conditions'.*

Clearly from the above, the PWMU does not see relationship as constituting a set of complex business processes as defined by Cousins et al. (2008) which this research adopts but rather as the agreement entered into by the PWMU on behalf of Case 'A' and the design firm which basically stipulates amongst others: what is required, the offer by the consultant and acceptance by the PWMU; all contained in an 'Engagement of Services' form signed by both parties. An inspection of a sample form revealed that there was no indication as to the nature of the inputs required, processes to be undertaken or output specifics, except stating what should be designed.

On the issue of whether the PWMU considers intra-firm relationship management as much as it does inter-firm, A1 provides the following as the practice of Case 'A':

> *'There are about 6 Faculties and 10 Institutes and Directorates in this University. The Faculties put together have about 23 Departments. Each of these functional units of the University has some form of building needs at some point in time. Apart from engaging with the Committee on Asset Management, each unit is also engaged by the PWMU to participate as the User Department mainly for the purpose of capturing their needs and also in monitoring the progress of works going on. For design works the user departments are only engaged in capturing their needs and requirements, which is one of PWMU's responsibilities'.*

Further probing was necessary to specifically determine if there was any form of relationship between these Units and the PWMU apart from merely been involved as described above. There was no evidence that any formal relationship exist. Even within the definition of relationship by the PWMU, no form of formal 'contract' exist between the PWMU and User Department on the procurement of buildings in Case 'A'. Nor could any form of 'complex business processes' be seen to exist between them. Hence, from the aforementioned, Case 'A' does not consider intra-firm relationships.

The Interview segment requires that aspects on relationship management strategies adopted by Case 'A' be investigated (also refer to Checklist Protocol at Appendix A). This remaining aspect of this investigation could not be conducted since the PWMU had no specific strategy to management inter-firm relationship. The Engagement of Service Agreement is the sole basis of managing relationships with consultants engaged for design works particularly given that the PWMU minimally gets involve with the design process per se.

5.2.1.3 Case 'A' Value System Management Practice

1. Value (for Money) Definition and Determination by PWMU

When asked what value meant to the PWMU members of the FGD took quite some time at agreeing on common definition of value as perceived by the Unit. They eventually agreed that value is *'achieving the cost and quality target of a project as*

stipulated by the PWMU on behalf of Case 'A' which is constructed within the agreed time'. This seem a generic definition hence further probing was done to get Case 'A's definition of value relative to building designs. The PWMU FGD reframed the definition thus: '*the ability of the design to demonstrate that the cost and quality targets of the client can be achieved when it is constructed and within the time envisaged'*.

From the aforementioned it seems that value is considered on a project to project basis, further probing on this issue (see Question 2 of the FGD Protocol) indicate that in most instances specific determination of value is not done on project basis since only two or three criteria are mainly considered i.e. cost, quality and time – the traditional iron triangle in construction. An instance was given of a particular project whereby the User Department insisted that what is of value to them is not the consideration of any of these three criteria, though important in themselves, but that innovation was the main criteria. This was possible given that the funding came directly to the Department from an International Funding Agencies and for a specified purpose – *'building a sizeable laboratory that minimizes energy consumption and water utilisation that reflects the principles of sustainable construction'*. However, this project did not form part of those considered in this section. At the time of collecting data, commencement of design had just been approved. Hence no design team had been assembled by the PWMU.

When asked how value is determined by the PWMU, participants of the FGD were initially divided on the specifics of the process but agreed unanimously that a process exists. Upon intensive deliberations it was evidence that a unified value system is in existence in Case 'A' – consisting of a generic set of criteria which is agreed upon by stakeholders engaged at colloquiums organised by the PWMU at different times (such

colloquiums were organised thrice over a 15 year period the latest been in 2012). In such gatherings consensus is reached amongst the stakeholders on what should constitute value for the University buildings based on importance – the iron triangle is heavily relied upon.

2. Stakeholder Management by PWMU

On the issue of managing stakeholders, representatives are drawn from all relevant units of the University to participate in the colloquium but where there is special requirements outside those of the generic criteria making up Case 'A' value System, the User Department are specifically asked of these requirements for inclusion in the brief which the design team uses. Irrespective of specialness of the projects, within the User Departments, the Head of Department or any other assigned person interacts with representatives of the PWMU, normally Architects to basically arrive at the specific requirements of the Department or Unit in terms of functional and space requirements. Matters of cost and quality are not normally issues to discuss in such interactions since budgets would have been prepared for each project particularly for Intervention Projects (i.e. Project funded by Public Funding Agencies etc TETFUND).

After settling on the client's requirements, the PWMU prepares the brief for the on behalf of the User Department and gets their endorsement of the document before they become official design documents for the design team when they are constituted. The User Department's further involvement in the project is at pre-construction stage where the final working drawings are presented to the PWMU and at such presentations the User Department is invited to participate. However, preliminary designs are communicated to the PWMU but only seldom, for instance, where the design of a complex nature and the design team feels that the budgetary provisions may not be adequate. During construction and at handover, User Departments are

invited to attend site meetings and handing over meetings whereby their observations are made on design matters as well as on construction issues. During these meetings, it was gathered that User Departments rarely critique design outcomes but rather constantly seek clarifications and occasionally reports of design related issues are communicated to the PWMU when buildings are in use.

3. Value Dialogues and Value Judgement

While it is recognised that a process for determining value exist in Case 'A', such a process is not applied to all projects. The opportunity to engage in value dialogues and make value judgement exists in Case 'A' during colloquiums organised by the PWMU on behalf of the University as discussed earlier. This is done to agree on the set of criteria that expresses value for the University. The outcome of the FGD describes the dialogue and judgement process thus:

> *'Membership of the colloquium is drawn from all Departments, Institutes and Directorates of the University and members of the PWMU chaired by the Director of the PWMU. Suitably persons from each of the Unit are chosen by and represent each Unit in the Colloquium. Members are briefed on projects undertaken within the periods between the last colloquium and the one been held, and those that are currently underway. Members are called upon to make observations and give constructive criticisms on matters that bother on the performance of the project, mostly on quality and usage, in the form of lessons learnt for project underway. User Department/Functional Units of the University are mostly not conversant with the matters of cost. The PWMU provides these issues and more often than not, observations and criticisms made are either withdrawn or watered down because cost constrains the implementations of most of the observations made. Hence, focus is given to quality in terms of specifications where finishes e.g. floor and walls predominates such discussions'.*

From the aforementioned, there isn't any evidence of a value dialogue ensuing during colloquiums held by Case 'A' given that members are not free to communicate their understanding of and aspirations of value in terms of value criteria as is recommended in the Thomson and Austin (2006) VALiD Framework. What obtains is a selection from a predetermined value criteria set in line with the Kelly and Male (2006) Client

Value System Matrix (CVSM), albeit on a reduced scale. The CVSM has 8 Value criteria against Case A's three criteria. Case 'A' FGD team was further quizzed on how these criteria are agreed upon during the colloquiums. The outcome of their discussion is captured thus:

> *'During deliberations, records are made of what was agreed upon and at the end each deliberation – matter by matter – the agreement are read out to which members would either consent to (indicating that as the true position of members on that matter) or rejected conversely. In the event that members disagree, the matter in put to vote. For instance, where a certain type of floor finish is recommended for the University's buildings – say classrooms, and there seems to be disagreement amongst members, the outcome of the voting exercise will determined the decision to take'.*

While it is evident that members do not engage in value dialogues during the colloquiums, value judgements are made based on consensus and in the event that this is not reached, voting will determine the decision on value judgements.

4. Practical Value Determination of Selected Projects

This aspect of the investigation requires the FGD team to determine the value criteria for five projects selected specifically for the purpose of this research work in line with the criteria and methods discussed in Chapter 4. The members that participated in this aspect of the investigation and their qualifications is shown in Table 5.1 identified as A2 .... A7. The team comprises of architect, builder, Facilities Manager, M & E Engineer, Quantity Surveyor, and Structural Engineer, having a total working experience of 126 years amongst them, at an average of 21 years. All the participants were involved in the five selected projects investigated for Case 'A'. The particulars of these projects are shown in Table 5.4.

Table 5.4 – Project Information for Case Study A

ProjID	Project Description	Size (m^2)	Cost (₦m)	Status
Pj1	Assembly/Sport Hall	1,700	312	2012
Pj2	Auditorium for Social Science	1,250	285	2013
Pj3	Blocks of Classroom, School of Engg	2,800	392	On-going
Pj4	Language Laboratory for Arts Faculty	1,000	175	On-going
Pj5	Office Complex, Dept of Library Sci	1,500	200	2012

All cost exclude external works and Furnishing but includes Preliminaries and contingency sums

The specific projects investigated for Case 'A' comprise a range of project types but all fall within projects classified under academic buildings, ranging between N175m – N395m, with two of them on-going at the time of carrying out the investigation and three of them completed within 2012 – 2013. All the projects were funded by TETFUND. Discussed below are the outcomes of Case 'A' FGD team's determination of value criteria which informed the brief that was given to the design team as a basis for their design. Each outcome was based on the extensive deliberations of members of the FGD team and their eventual agreement on the criteria.

i. Value Determination for Case 'A' Pj1

Figure 5.1 shows the value criteria of the Assembly/Sport hall constructed and completed in 2012 at a sum of ₦312m.

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
5	**1**	**3**	**2**	**0**	**7**	**3**	**5**

A. Capital Cost - CAPEX
B. Operating Cost – OPEX
C. Time
D. Environment
E. Esteem
F. Flexibility
G. Comfort
H. Community/ Accessibility

Total

Figure 5.1 – Case A Value System Matrix for Assembly/Sport Hall

Figure 5.1 reflects Case 'A' desire for an Assembly/Sport Hall which is flexible to change, reasonably constructed within approved budget, and easily accessible to members of the community within which the University is domiciled. Surprisingly, the basic constituent of the brief, as shown by the Value System Matrix, mirrors the famous iron triangle which Case 'A' applies as a generic model for value determination of their projects. The Matrix identifies the following three criteria as most important: Flexibility, a measure of quality, CAPEX, a measure of initial cost, and Community accessibility, also a measure of quality. Time and comfort (a measure of quality) were both next in importance. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.1.3 (5).

ii. Value Determination for Case 'A' Pj2

Figure 5.2 shows the value criteria for the Auditorium for The Faculty of Social Sciences constructed and completed in 2013 at a sum of ₦285m. Though, it was gathered that the contract sum was revised from ₦235 during the construction phase of the project due changing client requirements.

A. Capital Cost - CAPEX							
B	**B. Operating Cost – OPEX**						
A	**B**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**F**	**F**	**F. Flexibility**		
G	**G**	**G**	**D**	**G**	**G**	**G. Comfort**	
H	**H**	**H**	**H**	**H**	**F**	**H**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
4	**4**	**3**	**2**	**0**	**3**	**5**	**6**	**Total**

Figure 5.2 – Case A Value System Matrix for Auditorium for Social Sci.

Figure 5.2 reflects Case 'A' desire for an Auditorium which is easily accessible to members of the community within which the University is domiciled, comfortable for use for staff, students and members of the community, reasonably constructed within approved budget, and given equal considerations to the cost of operating the Auditorium. Surprisingly, the basic constituent of the brief, as shown by the Value System Matrix, mirrors the famous iron triangle which Case 'A' applies as a generic model for value determination of their projects. The Matrix identifies the following four criteria as most important: Community accessibility, a measure of quality, users' comfort, also a measure of quality, CAPEX, a measure of initial cost, and lastly OPEX a measure of operating cost. Time and flexibility (a measure of quality) were both next in importance, with 'Environment' and 'Esteem' been the least important. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.1.3 (5).

iii. Value Determination for Case 'A' Pj3

Figure 5.3 shows the value criteria for the Blocks of Classrooms for School of Engineering, started in 2013 at a sum of ₦392m.

A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**D**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**F**	**C**	**D**	**F**	**F. Flexibility**		
A	**G**	**G**	**D**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**H**	**F**	**G**	**H. Community/ Accessibility**

A. Capital Cost - CAPEX

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**2**	**4**	**4**	**0**	**2**	**5**	**1**	**Total**

Figure 5.3 – Case A Value System Matrix for Blocks of Classrooms

Figure 5.3 reflects Case 'A' desire for Blocks of Classrooms which is strictly constructed within approved budget, comfortable for use by both staff and students, ease to maintain and operate and should be constructed within stipulated time. The basic constituent of the brief, as shown by the Value System Matrix, also largely mirrors the famous iron triangle which Case 'A' applies as a generic model for value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; comfort, a measure of quality; OPEX, a measure of operating cost and Time. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.1.3 (5).

iv. Value Determination for Case 'A' Pj4

Figure 5.4 shows the value criteria for the Language Laboratory for Faculty of Arts, started in 2013 at a sum of ₦175m. The project was scheduled to be completed in 2014 but experienced some contractor-related delays.

A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**D**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**F**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**H**	**F**	**G**	**H. Community/ Accessibility**

A. Capital Cost - CAPEX

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**3**	**4**	**2**	**0**	**2**	**6**	**1**	**Total**

Figure 5.4 – Case A Value System Matrix for Language Laboratory

Figure 5.4 reflects Case 'A' need for a Language Laboratory which is strictly constructed within approved budget, comfortable for use by both staff and students, constructed within stipulated time and easy to maintain and operate. The basic constituent of the brief, as shown by the Value System Matrix, also largely mirrors the famous iron triangle which Case 'A' applies as a generic model for value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; comfort, a measure of quality; Time; and OPEX, a measure of operating cost. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.1.3 (5).

v. Value Determination for Case 'A' Pj5

Figure 5.5 shows the value criteria for Office Complex belonging to the Department of Library and Information Science, completed in 2012 at a sum of ₦200m.

A. Capital Cost - CAPEX							
A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**D**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**F**	**C**	**D**	**F**	**F. Flexibility**		
A	**G**	**G**	**D**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**H**	**F**	**G**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**2**	**4**	**4**	**0**	**2**	**5**	**1**	**Total**

Figure 5.5 – Case A Value System Matrix for Office Complex

Figure 5.5 reflects Case 'A' need for an office complex, strictly constructed within approved budget, comfortable for staff, easy to maintain and operate and should be constructed within stipulated time. The basic constituent of the brief, as shown by the

Value System Matrix, also largely mirrors the famous iron triangle which Case 'A' applies as a generic model for value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; comfort, a measure of quality; OPEX, a measure of operating cost and Time. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.1.3 (5).

5. Assessment of Value Delivery in Designs of the Selected Projects

Based on the method discussed in Chapter 4, participants of Case 'A' FGD were requested to assess the performance of the design team at achieving the various value criteria within the designs they produced using the value assessment form (See Appendix C). Table 5.5 shows the outcome of analysing the scoring of the Assembly/Sport Hall design.

Table 5.5 - Value Assessment of Assembly/Sport Hall for Case A

Value Criteria	**FGD Members' Scores (Max Score = 10)**					**Average Scores**	**Weight**	**Weighted Scores**
	A2	**A3**	**A4**	**A5**	**A6**	**a**	**b**	**c = a * b**
A. CAPEX	8	7	8	7	6	7	5	36
B. OPEX	7	7	5	6	7	6	1	6
C. Time	6	7	7	8	7	7	3	21
D. Environment	5	7	7	8	6	7	2	13
E. Esteem	5	6	7	8	6	6	0	0
F. Flexibility	7	8	7	8	7	7	7	52
G. Comfort	7	8	7	8	7	7	3	22
H. Accessibility	7	7	7	8	7	7	5	36
						Aggregated Average Score i.e. ∑c/∑b		**7.18**

Weight is the value contained in the CVSM as shown in Figure 5.1

Table 5.5 shows the individual scores given by members of Case 'A' PWMU that participated in the part of the investigation. Using the formula discussed in Chapter 4, the aggregate average design performance score of each building was computed. As shown in Table 5.5, on the average, the participants scored the designers' performance for the Assembly/Sports Hall design above average having 7.18 out of 10. The same

procedure was adopted for assessing the remaining four projects of Case 'A' whose summaries are shown in Table 5.6. Details of the scoring and computation of the average score for each project is shown in Appendix E. These scores represent the measure of Value in Design for projects undertaken by Case A (as depicted in the Conceptual Framework), a proxy for design outcomes.

Table 5.6 – Average Performance of Design Teams for Case 'A'

ProjID	Project Description	Performance (=10)		Status
		Range	Average	
Pj1	Assembly/Sport Hall	5 – 8	7.18	
Pj2	Auditorium for Social Science	6 – 8	7.21	
Pj3	Blocks of Classroom, School of Engg	5 – 8	6.64	
Pj4	Language Laboratory for Arts Faculty	5 – 8	7.13	
Pj5	Office Complex, Dept of Library Sci	5 – 8	7.06	

5.2.2 Case Study B

5.2.2.1 General Background Information

Case Study B is based on the investigation conducted with a public university established more than 45 year having a Directorate of Physical Planning, Procurement and Maintenance Works. The DPPPMW became operational 5 years after inception of the University. Between the periods of 2008 – 2015 the University spent well over N20.0b on construction works all of which were committed to procuring new buildings. Up to N15b of this fund was provided by TETFUND while the balance was from the school's internally generated revenue (IGR). Interview was held with the person in charge of the University's DPPMW while the FGD session was held with five personnel drawn from within the DPPPMW, which is responsible for construction procurement. Table 5.7 show the particulars of the personnel.

Table 5.7 – Case Study B Participants Information

ID[1]	Designation	Qualifications	Exp[2]	Prof	Participation
B1	Director	MSc, MLA, FNIA	30	Architecture	Interview
B2	Chief Architect	MSc, FNIA	30	Architecture	FGD
B3	Chief QS	BSc, MNIQS	25	QS	FGD
B4	Chief Engineer	MSc, FNSE	22	M & E	FGD
B5	Senior Engineer	BSc, MNSE	22	Struct & Civil	FGD
B6	Principal Officer I	BSc, MNIOB	20	Builder	FGD

[1] *Respondent's ID;* [2] *Working Experience*

Interview was conducted with B1, the Director of the DPPPMW who has worked with Case 'B' for more than 30 years. He possesses Master Degrees in Architect and Landscape Architecture, and a Fellow with the Nigerian Institute of Architects and a cumulative working experience of 33 years. The members making up the FGD session for Case 'B' are a representation of the main professionals within the built environment comprising of Architect, Builder, M & E, Quantity Surveyor and Structural Engineer. Case '**B**' FGD members occupy both top and middle level management of the DPPPMW, having work experiences ranging between 20 – 35 years (average working experience = 25 years). All the FGD members have a minimum of a Bachelor's Degree, with three of them having Masters Degree. All the members belong to the professional bodies regulating their respective profession with half of them being 'Fellows' of their professional Institutes. Hence, data elicitation for Case 'B' comes from members with high academic qualifications, satisfactory professional standing with very high level of experience and considerable wealth of knowledge about the construction industry in general, and the DPPPMW and projects they undertake in particular.

5.2.2.2 Case 'B' Supply Management Practice

1. Classification of PWMU

B1 reiterate the overall task of the DPPPMW as *'to engage with partners in the provision of services related to the built environment within and outside the University*

towards improving learning and knowledge dissemination in terms of building (academic, residential and the likes, and their accompanying civil and infrastructural works during their whole life cycle'. While this is the current mandate of the Unit, there hasn't been much changes over the years of its existence, given that the Unit was originally set up to cater for provision of new building and provide maintenance services to the existing building stocks right from its inception. When asked about the main goal of the Unit, B1 reiterated its main task as stated above. When asked to give a brief description of what they do as the University's Supply Management Unit B1 informed that:

> *'The DPPPMW engages with all arms [functional units] of the University to address their demand for space and the management of such spaces when provided. The Unit is responsible for preparing procurement plans for the University toward accessing funding for Public funding agencies. In the case of project funded from IGR, business case which in most cases is a feasibility study, is submitted to the University's Management for approval. For projects that are externally funded by public agencies, submissions are made in compliance with the regulations of the Bureau for Public Procurement in order to get Certificate of No Objection. These are for projects which are selected for funding based on the assessment of the University's priorities which is handled by the DPPPMW in conjunction with other stakeholders.*

To further assist on classifying the DPPPMW, B1 was probed on the theory supporting its make-buy decision. As observed earlier, being a public institution, it was known beforehand that procuring design services (and construction) is through some form of competition (as stipulated by the Public Procurement Act of 2007, regulating public procurement in Nigeria). Hence, design services in Case 'B' are bought rather than made by law. This position was further confirmed by B1. However, the theory supporting the choice is equally important toward investigating their supply management practice.

When asked what parameters they consider when procuring design services, B1 indicates that cost savings was the main consideration towards achieving value for

money for the University. He further explains thus: *'when consultants are selected, keen competition during the procurement process introduces very good mechanisms for achieving value for money in terms of selecting consultants on least cost particularly given that their level of services are relatively comparable. However, for designs of buildings funded by IGR the DPPPMW engages its staff where we believe we have the capability to undertake such designs. This way we not only save money but also design to our taste'.*

Summing the outcome of the interview with B1 towards characterising Case 'B' based on its classification and strategic consideration, the following summarily describes it, similar to that of Case 'A' thus: DPPPMW is of the 1st generation, viewing itself as a manager of resources, adopting an implementing strategy at the passive stage of its development and harnessing the resource-based view theory in its decision to procure design service in some instances.

2. Strategic Considerations and Alignment

The strategy the DPPPMW adopts in sourcing its design partners was investigated. When asked what variables instigate their choice of supply strategy, B1 said that fundamental to the DPPPMW are the '*the complexity of the design task'* and the '*competitiveness of the market in terms of demand and supply'*. Further, B1 was asked to describe the nature of design services normally procured by the University with the view of identifying the most appropriate sourcing strategy based on the Kraljic positioning matrix (See Figure 3.6). His response is thus: *'In terms of the impact [the design services procurement has on the University] I'd say that it is high. This is due to the fact that the nature of buildings affects the activities carried out therein. In term of supply market complexity, I'd say average because sometimes the nature of the design may require specialists design skill which may be in short supply at that given*

moment and sometimes again simple design will have many available designers'. Further probe on the how the DPPPMW interact with their design suppliers, it was gathered that the 'routine: efficiency' strategy was the popular sourcing strategy. This is partially in accordance with the Kraljic positioning matrix (no average point exist on the matrix) which stipulates either the 'leverage: best deal' strategy or the 'routine efficiency' strategy.

Based on the nature of design services procured by the DPPPMW in terms of its impact on Case 'B' built asset, the complexity of the design and the supply market risk or complexity as described by B1, the delegated sourcing and parallel sourcing were the most appropriate sourcing structure based on the Cousins et al. (2008) Framework (See Figure 3.7). This is contrary to what obtains in Case '**B**' which adopts the single sourcing and multiple sourcing structure which is in accordance to that suitable for the 'routine: efficiency' strategy as practiced by DPPPMW albeit wrongly based on the Kraljic positioning matrix and Cousins et al. (2008) sourcing strategy – sourcing structure mapping.

On the issue of strategic alignment, B1 indicates that Case 'B' has in place corporate level strategies related to the built environment. B1 describes three competitive priorities of Case 'B' which forms the basis of their corporate strategies for built assets and which also plays pivotal roles in the selection of design partners namely cost, quality and delivery.

Lastly, under this aspect of the investigation, B1 was asked if the DPPPMW has its own strategies and how these strategies (both corporate and functional) are developed. B1 explained that Case 'B' formulates its own procurement-related strategies and this is done in a rather semi formal way, in that committees are set up to come up with

such strategies which then forms part of the University's Statutes when rectified by the University's Management. B1 explained that strategy development adopts a top-down approach Supply (Purchasing) strategies are informed by corporate strategies and that in some instances, corporate strategies development gets the participation of the DPPPMW. Therefore there is evidence to support the fact that there is some level of strategic alignment in Case 'B' though no indication of any contribution from the Departments who mostly are the beneficiaries of the building designed.

3. Competencies and Skills Base

Talking freely on the level of competencies and skills of the personnel of the DPPPMW, B1 expressed satisfaction with the level and also indicated that there remain room for improvement in the area of team building skills and strategic planning. Table 5.8 show the outcome of the ranking of the competencies and skills base of the DPPPMW by B1 which was aided by explanations of what each aspect entailed from the researcher where such explanations was needed and where it was felt such explanations will improve on the objectiveness of the assessment by B1. Two different assessments were required – the ranking of the current levels and what B1 thought was an ideal ranking for a contemporary Supply Management Unit.

Table 5.8 – Case B Competencies and Skills Ranking

Competencies/Skills	**Ranking**		**Competencies/Skills**	**Ranking**	
	Cu	**Id**		**Cu**	**Id**
Assertiveness	2	4	Inventory Management	1	5
Aggregate needs	1	3	Negotiations skills	2	1
Communicative skills	4	2	Numeracy	1	4
Competitiveness	1	3	Product/Service knowledge	3	5
Computer literacy	3	3	Relationship Mgt Skills	4	1
Cross-functional working	5	4	Risk assessment skills	5	2
Forecasting ability	2	2	Strategic thinking	5	1
Volume/cost analysis	2	5	Supply industry knowledge	4	1
Profitability analysis	3	4			

Cu – Current status, Id – Ideal situation

From the Table, Case 'B's main strength in competencies and skills include: aggregate needs, competitiveness, inventory management and numeracy; followed by assertiveness, forecasting ability, volume/cost analysis, and negotiation skills; and lastly computer literacy, profitability analysis, and product/service knowledge. These rankings clearly places Case 'B' within the tactical acquisition and tactical profit quadrant of the Cousins et al. (2008) Strategic Supply Competency Table (See Figure 3.10). Analysing B1's ideal situation for a contemporary Supply Management Unit, a more strategic approach is envisaged comprising of the following highest ranked competencies and skills: negotiation skill, relationship management skills, strategic thinking, and supply industry knowledge. This is followed closely by communicative skills, forecasting ability, and risk assessment skills. These rankings places B1's ideal situation for contemporary Supply Management Unit within the strategic security and strategic critical quadrant.

In addition to the regular competencies and skills base of the DPPPMW, specialised supply management skills were also investigated. The outcome is shown in Table 5.9.

Table 5.9 – Case 'B' Adequacy of Specialised Procurement Competencies

Adequacy	**Skills**
None	Nil
Not Adequate	Planner, goal-setter, completer, listening, making a business case, process development, leader, decision maker, influencer.
Adequate	Presenting, public speaking, writing, cost accounting, economics, computer literacy, mathematics

Table 5.9 shows that Case 'B' does not lack personnel in any of the specialised procurement competencies but is inadequate in the following: strategic planning skills i.e. planner, goal-setter and completer; Communication i.e. listening; Financial skill i.e. making a business case; technical skills i.e. process development; and team building skill i.e. leader, decision maker and influencer. They however have adequate

personnel with the following specialised procurement competencies: communication i.e. presenting, public speaking and writing; Financial skills i.e. cost accounting, and economics; and technical skills i.e. computer literacy, and mathematics. This reveals that the DPPPMW lacks adequate personnel in two specialised procurement skills areas namely: strategic planning and team building. This finding corroborates the earlier findings on the core competencies and skills base of DPPPMW as shown in Table 5.8.

4. Performance Measurement

The DPPPMW of Case 'B' demonstrates that performance measurement is undertaken at both project and organisational levels in a formalised matter. B1 posits that:

> *'At the commencement of every project, key performance indicators are agreed upon amongst members of the DPPPMW, User Department and the design consultants engaged for the project. Basically, the KPIs agreed upon fall within the generic measurement guide produced by the DPPPMW specifically for assessing the performance of the University's projects. The measurement instrument is developed with participation from the University's Management, User Departments and the DPPPMW and contains metrics targeted at each of these three aspects of the University incorporating metrics to measure suppliers' performance too. This way all stakeholders involved in the delivery of construction projects are assessed in terms of their performances. While the KPIs may be more suitable to measure construction projects per se, we are looking at adapting the design quality indicators as a more suitable tool for measuring design performance '.*

Operating a formalised and structured system (though no mention was made on whether suppliers' assessments of the University was part of the performance measurement exercise), the measurement of design performance undertaken by the DPPPMW is essentially to monitor and evaluate the activities of design partners towards controlling the outcome of the design process and aiding the identification of criteria success areas. When asked on the extent to which the activities of the DPPPMW is measured in terms of performance, B1 observed that: *'Four aspects forms the principal focus of measuring the activities of the DPPPMW, namely the*

University's Management, User Departments, suppliers [design consultants], and the DPPPMW's activities. And because the measurement permeates al the levels, both financial and non-financial measures are adopted '.

From the submission of B1 as contained above, that the measures considered in the metrics used by the DPPPMW comprises of the following measures, effectiveness, efficiency, financial and non-financial targeted at all the stakeholders involved in the delivery of value in design. Hence, the DPPPMW performance measurement is targeted at: the user departments, the DPPPMW's internal processes, and the design consultants, thus providing opportunities for innovation and learning. Judging from the responses on the main features of the performance measurement system adopted by the DPPPMW, the main features indicates that there is some form of linkage between the metrics for measurement and the corporate objectives of Case 'B' measuring performance on a multi-dimensional scale and incorporating effectiveness, efficiency, financial and non-financial measures; balancing between qualitative and quantitative approaches; and demonstrates the incapability of been manipulated given the existence of a pro forma for measuring performance. The system is lacking in the following areas: identification of trade-offs, mixing of leading/lagging indicators, and the potentials of systemic data collection and analysis.

5. Total Cost/Benefit Analysis

Discussing their approach to cost consideration, B1 referred to the restrictions within the provisions of the regulations guiding Public procurement in Nigeria i.e. the Public Procurement Act 2007 and the Standard bidding Document for Consultancies in Nigeria. B1 believes that the approaches and methods stipulated in these documents make it difficult to consider cost beyond the initial, since they require that the *'most economically advantageous tender'* is the most preferred bidder to engage for public

project. This further gives credence to selecting the lowest bid upon evidence of succeeding in quality-based performance evaluations (the documents above actually recognise Quality-cost-based assessment as the preferred criteria for awarding public projects). The point of this from B1's explanation was that apart from looking at initial cost, no guide refers to how public agencies can treat cost on a whole life basis in the procurement of built assets. Hence, guided by these principles, DPPPMW considers only initial price in terms of service fees paid for design services rendered.

B1 further explained that design fees are paid based on the approved scale of fees operational in Nigeria, published by the Federal Ministry of Works in 1996. However, also noting that several scales exists, prepared by the various professional Institution regulating most professions of the built environment, B1 indicated that though most public funding agencies stipulates the use of approved National Scale of Fees for the industry, the DPPPMW has attempted making cases for the adoption of scales other than that of published by the Federal Government for payment of consultancy fees, particularly given that they are similar in term of the stages of payment, covering the entire design stages to completion of the construction. Therefore, as exemplified by law, the DPPPMW considers only the initial acquisition costs and reception/handover costs for design services since these are what funding agencies are willing to pay for. This also applies to the IGRs. Though there were some cases (3 specific projects over the life of the DPPPMW), where payment of consultancy fees were not based on scale of fees but rather on a retainer agreement basis. Under this arrangement, the designer's fees included payment for services that covered the full spectrum of the project i.e. from inception to a period covering the limitation of the design contract, which was 20 years for both projects. When asked how design related costs are managed for the other projects after construction B1 states that:

> *'Cost associated design during the use phase are usually not included in the budget at the planning stages though these cost are considered during the designing of the building to help determine the most advantageous and efficient design in terms of energy saving and maintainability of materials used. Where designs are required at the operational phase of buildings, the DPPPMW undertake these designs mainly because such designs are funded from the IGRs. Interventions from the Federal Government do not consider funding for rehabilitation and refurbishment'.*

Enquiring on the levels at which costs are aggregated and considered by the DPPPMW in managing procurement of designs, B1 indicates that *'The Unit is funded wholly by the University and procurement activities of the Unit are paid for through staff remunerations and allocations (normal and special) given to the Unit to undertake some of its non-routinized functions'*. Probing further on how Case 'B' manages such allocations towards contract administration, B1 informed that:

> *'We operate on fixed budgets from the monthly allocations we receive from the University. This is the routine but when the situation so demands, special allocations can be requested based on the specifics of the project or project portfolio at hand. These allocations (normal and special) are utilised in managing aspects of the procurement that are non-routine (we make sure routine activities e.g. preparation payments, invoicing, taking deliveries etc are catered for by monthly salaries), for instance logistics required to investigate potential design consultants during prequalification process, undertaking a detailed needs assessment with User departments, specialised staff training etc. We sometimes cater for and organise training for staff members of User Departments to acquaint them with latest developments in procurement so as to enable them participate effectively during stakeholder conferences and the likes'.*

The aforementioned reveals that Case 'B' gives due considerations to total cost of managing relationship with their design partners covering up to four stages of the procurement value chain including: initial acquisition, reception, possession and utilisation. Looking at levels at which total cost is aggregated within organisations, the DPPPMW gives specific consideration to the three levels when procuring design services. For instance, at the supplier-level the DPPPMW considers cost of prequalification of suppliers, at the order-level cost of auditing designs using external

designers in the case of complex projects; and at the unit-level the Unit considers cost of redesign during the operational phases of buildings.

6. Managing Inter-firm Relationships

This aspect investigates the understanding of how the DPPPMW defines and sees the concept of relationship, which gives a direction to how relationships are managed. B1 defines and describes relationship as understood within the DPPPMW in particular and Case 'B' in general as '*The agreement entered into between the University and design consultants for design services contained in the memorandum of agreement under the conditions stated therein*'. Expatiating further on this definition, by probing on what the constituents of the definition are, with specific relationship to processes, B1 further provides that

> *'In order not to be seen as infringing on the responsibilities of the design consultants, the design process is largely left to the design team of manage. Design management is not a core matter for the Unit but rather outcomes are the main concern. However, we ensure that we have a member of the DPPPMW in every design team. That way the there will be synergy between the Unit and the designers towards achieving organisational gaols. Even with this arrangement, most times conflicts arise between our representatives on design teams and the other members on issue regarding managing the design process. Under sure situations we caution our staff on not aggravating matters since the responsible for delivering the design is entirely that of the consulting designers ... that's what they are been paid for* .

From the aforementioned, the DPPPMW does not see relationship solely as constituting a set of complex business processes as defined by Cousins et al. (2008) which this research adopts but rather as the agreement entered into by the DPPPMW on behalf of Case 'B' and the design firm which basically stipulates amongst others: what is required, the offer by the consultant and acceptance by the DPPPMW; all contained in an 'Engagement of Services' form signed by both parties. An inspection of a sample form revealed that there was no indication as to the nature of the inputs required, processes to be undertaken or output specifics, except stating what should be

designed. However, B1 provided reasons for not insisting on inputs and outputs within the agreement as a means of managing relationships with design partner thus: 'During prequalification and tender/bid evaluation, design firms are required to state their methodology for undertaking the design task. Within this, the necessary inputs required and the processes to be undertaken are detailed by the design firms in competition, upon which the suitable firm is selected to provide the required design service. So for this reason, these requirements do not form part of the agreement.

On the issue of whether the DPPPMW considers intra-firm relationship management as much as it does inter-firm, B1 provides the following as the practice of Case 'B':

> *'The DPPPMW is responsible for ensuring that all functional Units of the University gets value for money for every construction project embarked on their behalf. To do this effectively, the DPPPMW partners with User Departments right from the inception of the project to its end and during the operational phase of the building. Through these cycle, User Departments are participate in identifying user needs, contributing to design decisions and participating in design reviews after they are completed. To make it easy for User Departments to participate and do so effectively, some meetings are held at the User's premises where it is possible. This way the User Department can own some of the processes engaged in during the design stage of projects'.*

While it is evident from the above that some form of relationship exist between the DPPPMW and User Departments in their University, it was necessary to determine if there was any formal 'contract' and 'complex business processes' between them. There was evidence that formal contracts exist. When projects are initiated, written agreements are entered into between the DPPPMW and the User Department detailing the processes entailed and the responsibilities of each of the parties within the processes. Hence, from the aforementioned, Case 'B' does consider intra-firm relationships particularly given that the expected outputs from such relationship are deliberated upon and agreed on by both the DPPPMW and User Departments before design consultants are brought in. However, it would have been so much beneficial if

design consultants can be brought in much sooner. This way they can contribute to and be part of the problem forming aspect of the project.

The Interview segment also requires that aspects on relationship management strategies adopted by Case 'B' be investigated (also refer to Checklist Protocol at Appendix A). Reacting to the question on what does the DPPPMW considers when determining the appropriate strategy to manage inter-firm relationships B1 offered that: *'How relationships are managed basically revolves around the agreement that exist between us and the design consultants. These agreements generally gives indications to what the design is all about stipulating the functions required of the design consultants. Standard forms are used for the basis of entering into agreement. So relationship management is highly formalised'*.

Further enquiries were made to find out how either organisational strategy or nature of product influence the strategy for managing inter-firm relationship, it was gathered that though these criteria may not be consciously thought of when managing relationships by the DPPPMW, in terms of business outcomes with design partners, Case 'B' strategy are those of the short-term, particularly due to the nature of public procurement. And in term of strategic focus, the University is mainly cost-focused rather than differentiation-focused given that public procurement emphasizes 'value for money' in terms of effectiveness and efficiency, both of which are more of cost management and essentially cost savings. Relating these to the Cousins' (2005) Strategic Focused Outcome Model, Case 'B' adopts the 'operational collaboration' strategy in managing its inter-firm relationships.

Under the operational collaboration strategy, it is expected that the DPPPMW and the design firms (the suppliers) do the following: share operations planning information,

develop and share demand forecasts, link their order management systems together, and have joint capacity planning management systems in order to align operational flows. When the extent to which these actions are practiced within Case 'B' was enquired, it was found that of the four activities only one was done but to a very minimal extent i.e. sharing operations planning information. B1 explains that both the DPPPMW and the Design Consultants would jointly develop and agree on the plan of work that the design process with adopt and from the explanation, it wasn't likely that organisational planning from both the DPPPMW and Design firm i.e. organisational planning (compared to project or design planning) is a matter in the process, which indeed is an essential element of this relationship management strategy.

The other aspect in relationship management considers the levels of dependency and certainty as a means of determining how relationships can be managed. This aspect was also investigated within Case 'B'. B1 explained that *'the nature of public procurement warrants that the DPPPMW is highly dependent on design consultants to get building designs done irrespective of their in-house capabilities, as such, we are dependent on the design consultants but they work independently of the DPPPMW'*. One the extent of certainty, B1 demonstrates that: *'One of the things we do especially with designers we've never had prior work experience, is build on our level of trust. That way higher level of certainty should be guaranteed but this is hardly the case due to the industry's cultural issues, designers see themselves independent of the client*'. From the aforementioned therefore, and based on the Cousins' Strategic Relationship Positioning Model (See Figure 3.12), Case 'B' is positioned within the traditional/adversarial strategy to relationship management and that the nature of their relationship design consultants is in the short-term, influenced by the PPA (2007).

5.2.2.3 Case 'B' Value System Management Practice

1. Value (for Money) Definition and Determination by DPPPMW

Members of Case 'B' FGD were asked what value meant to the DPPPMW and their University in general, and upon a moment of agreeable discussions they reached a consensus and agreed that value is *'those aspects of a building that gives the users of the building satisfaction and for which they are willing and able to pay for'*. While this definition seem acceptable, it is somewhat generic for the study, hence further probing was done to get Case 'B's definition of value relative to building designs. The DPPPMW's FGD reframed the definition thus: '*capturing those aspects that give users the greatest satisfaction in the design within budgetary provisions and in line with the provisions of the client brief'*.

From the aforementioned it seems that value is considered on a project to project basis, further probing on this issue (see Question 2 of the FGD Protocol) indicate that in most instances specific determination of value is not done on project basis since only two or three criteria are mainly considered i.e. cost, quality and time – the traditional iron triangle in construction. This somewhat contradicts the DPPPMW's definition and description of value which suggests that rather than concentrate on cost, quality and time (which is the traditional approach to determining project performance as against value), the users of buildings would be responsible for determining the aspects of the building that would give them the greatest satisfaction. Hence, what is known of value in building designs within the DPPPMW on behalf of Case 'B' are not what is contained in the designs nor are they the criteria used in assessing designs.

When asked how value is determined by the DPPPMW, participants of the FGD were initially divided on the specifics of the process but later agreed that a process exists. Upon a slightly lengthy deliberation it was evidence that a value system is in existence

in Case 'B' – consisting of a generic set of criteria which is agreed upon by members of the User Departments and the DPPPMW at the commence of projects. In such gatherings consensus is reached amongst the members, though heavily influenced by the DPPPMW, on what should constitute value for the building under consideration based on importance and availability of funds – again the iron triangle is heavily relied upon in such deliberations.

2. Stakeholder Management by DPPPMW

On the issue of managing stakeholders in Case 'B', the FGD indicates that representatives are sent from the User Department to participate in the determination of value and that where there is special requirements outside those of the generic criteria making up Case 'B' value System, the User Department are specifically asked of these requirements for inclusion in the brief which the design team uses. Irrespective of specialness of the projects, within the User Departments, the Head of Department or any other assigned person interacts with representatives of the DPPPMW, to arrive at the specific requirements in terms of functional and space requirements. Matters of cost are not normally issues to discuss in such interactions since budgets would have been prepared for each project particularly for Intervention Projects (i.e. Project funded by Public Funding Agencies etc TETFUND). However, quality dominates these discussions and User Departments are allowed to make their preference in terms of quality known to the DPPPMW and where such falls within the budgetary provisions for the project, they are accommodated. Hence, flexibility in determination of aspects of quality exists in Case 'B'.

Continuing with the process of determining value, Case 'B' FGD indicates that after settling on the client's requirements, the DPPPMW prepares the brief for the project on behalf of the User Department and gets their endorsement of the document before

they become official design documents for the design team when they are constituted. The User Department actively participate during the design stage given that Case 'B' allows interactions between the User Department and the design consultants. This wasn't the case in Case 'A'. Traditionally, design consultants work solely with the briefs handed to them by the client organisation. The User Department also participate when the final working drawings are presented to the DPPPMW and at such presentations the User Department to make their contributions. However, preliminary designs are communicated to the DPPPMW but only seldom, for instance, where the design of a complex nature and the design team feels that the budgetary provisions may not be adequate. During construction and at handover, User Departments are invited to attend site meetings and handing over meetings whereby their observations are further made on design matters as well as on construction issues. During these meetings, it was gathered that User Departments actively critique design outcomes. It was gathered that the functional Units of the University are organised in 'Complexes' and every complex has Facilities Officers attached to it, who themselves also form part of the representation of every User Department.

3. Value Dialogues and Value Judgement

From the aforementioned, it is clear that a process exist in the determination of value in Case 'B' and, the opportunity to engage in value dialogues and make value judgement is also evident during interactions organised by the DPPPMW between it and the User Departments as discussed earlier. This is done to agree on the set of criteria that expresses value for the University in general and for the User Department specifically. Deliberation during the FGD captures and describes the dialogue and judgement process thus:

> *'Determining value for each project is done by the DPPPMW and the User Departments hence, the memberships are drawn from these two Units. From*

> *the User Department this is normally made up of the Head of the Unit, the Complex Facilities Officer, and any other three members two of whom must be the direct end-users, for instance, students, where classrooms, are involved. The team from the DPPPMW will mostly comprise of all the relevant members of the built environment relative to building works, chaired by the Director of the DPPPMW. Members are briefed on performance of recent projects undertaken by the University, bringing out the positive sides of each and the challenges they face in terms of cost, quality, and time. The performances of completed projects are discussed. During these interactions, the User Department is allowed to come up with what aspect to consider while the DPPPMW makes contributions in terms of sufficiency of cost, quality and time to meet up the user value specific requirements. However, many an instance, the outcome of such interactions brings some innovative ideas; they are stifled with conflicts between the User Department and the DPPPMW'.*

From the aforementioned, there is ample evidence of a value dialogue ensuing during value determination interactions in Case 'B' whereby User Departments are free to communicate their value criteria as is recommended in the Thomson and Austin (2006) VALiD Framework. However, due to the absence of a system to manage these dialogues, for instance, use of the VALiD toolkit, User Departments are forced to limit their value criteria from a predetermined set in line with the Kelly and Male (2006) Client Value System Matrix (CVSM). The CVSM has 8 Value criteria against Case B's three to five criteria. Case 'B' FGD team was further quizzed on how these criteria are agreed upon. The outcome of their discussion is captured thus:

> *'When value criteria selected by User Departments are outside the three main ones i.e. cost, quality and time, but understood by the DPPPMW and seen to reasonably be within budget provision and in line with the University strategy, they become acceptable for that project. Since the User Department is mainly responsible for determining what is value to them only aided by the DPPPMW when necessary, disagreements seldom occurs. However, when specifications issues are determined, usually the responsibility of the DPPPMW, conflict may arise with the User Departments. Under such situations, the design team will help out to determine which is best given the requirement of the brief'.*

From the exposition above, complementing the value dialogues for projects in Case 'B', value judgements are made based on consensus. In the event that this is not reached in terms of specifications (and not value criteria), further efforts are made on

agreeing by allowing the design team lend their expertise to arriving at the most advantageous specification within the project constraints.

4. Practical Value Determination of Selected Projects

This aspect of the investigation requires the FGD team to determine the value criteria for five projects selected specifically for the purpose of this research work in line with the criteria and methods discussed in Chapter 4. The members that participated in this aspect of the investigation and their qualifications is shown in Table 5.7 identified as B2 .... B6. The team comprises of architect, builder, M & E Engineer, Quantity Surveyor, and Structural Engineer, having a total working experience of 119 years amongst them, at an average of 24 years. All the participants were involved in the five selected projects investigated for Case 'B'. The particulars of these projects are shown in Table 5.10.

Table 5.10 – Project Information for Case Study B

ProjID	Project Description	Size (m^2)	Cost (₦m)	Status
Pj1	Medical Lab/Facilities Building	4,200	680	2014
Pj2	Twin Lecture Theatre	1,950	320	2013
Pj3	Museum, School of Arts & Lang	1,500	288	2014
Pj4	Library Complex	3,500	525	On-going
Pj5	Office Complex for Social Science	1,500	220	2014

All cost exclude external works and Furnishing but includes Preliminaries and contingency sums

The specific projects investigated for Case 'B' comprise a range of project types but all fall within projects classified under academic buildings, ranging between N220m – N680m, with one of them on-going at the time of carrying out the investigation and four of them completed within 2013 – 2014. All the projects were funded by TETFUND. Discussed below are the outcomes of Case 'B' FGD team's determination of value criteria which informed the brief that was given to the design team as a basis for their design. Each outcome was based on the extensive deliberations of members of the FGD team and their eventual agreement on the criteria.

i. Value Determination for Case 'B' Pj1

Figure 5.6 shows the value criteria of the Medical Lab/Facilities Building constructed and completed in 2014 at a sum of ₦580m.

A	**B. Operating Cost – OPEX**						
A	**B**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**F**	**F**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**H**	**H**	**F**	**G**	**H. Community/ accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**5**	**3**	**1**	**0**	**4**	**6**	**2**	**Total**

Figure 5.6 – Case B Value System Matrix for Medical Lab/Facilities Building

Figure 5.6 reflects Case 'B' desire for a Medical Lab/Facilities Building which is constructed strictly within approved budget, flexible to change, and cost effective to maintain and operate. The basic constituent of the brief, as shown by the Value System Matrix, slightly differs from the famous iron triangle which reflects Case 'B' flexibility in value determination of their projects. The Matrix identifies the following three criteria as most important: CAPEX (a measure of initial cost), Comfort (a measure of quality) and OPEX (a measure of operating cost). Flexibility (a measure of quality) and time were both next in importance. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.2.3 (5).

ii. Value Determination for Case 'B' Pj2

Figure 5.7 shows the value criteria for the Twin Lecture Theatre constructed and completed in 2013 at a sum of ₦320m..

A. Capital Cost - CAPEX							
A	**B. Operating Cost – OPEX**						
A	**B**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**F**	**F**	**F. Flexibility**		
G	**G**	**G**	**D**	**G**	**G**	**G. Comfort**	
H	**H**	**H**	**H**	**H**	**F**	**H**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
5	**4**	**3**	**2**	**0**	**3**	**5**	**6**	**Total**

Figure 5.7 – Case B Value System Matrix for Twin Lecture Theatre.

Figure 5.7 reflects Case 'B' desire for a Twin Lecture Theatre which is easily accessible to members of the community within which the University is domiciled, comfortable for use for staff, students and members of the community, reasonably constructed within approved budget, and given equal considerations to the cost of operating the Auditorium. The basic constituent of the brief, as shown by the Value System Matrix, mirrors the flexibility in Case 'B' considerations of the famous iron triangle towards value determination of their projects. The Matrix identifies the following four criteria as most important: Community accessibility, a measure of quality; users' comfort, also a measure of quality; CAPEX, a measure of initial cost, and lastly OPEX a measure of operating cost. Time and flexibility (a measure of quality) were both next in importance, with 'Environment' and 'Esteem' been the least important. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.2.3 (5).

iii. Value Determination for Case 'B' Pj3

Figure 5.8 shows the value criteria for the Museum for School of Arts and Languages, constructed and completed in 2014 at a sum of ₦288m.

A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**F**	**D**	**F**	**F. Flexibility**		
A	**G**	**G**	**D**	**G**	**G**	**G. Comfort**	
A	**B**	**H**	**D**	**H**	**F**	**G**	**H. Community/ accessibility**

A. Capital Cost - CAPEX

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**4**	**3**	**4**	**0**	**2**	**5**	**2**	**Total**

Figure 5.8 – Case B Value System Matrix for Museum for School of Arts

Figure 5.8 reflects Case 'B' desire for a Museum for its School of Arts and Languages which is strictly constructed within approved budget, comfortable for use by both staff and students, ease to maintain and operate and should have respect for the environment. The basic constituent of the brief, as depicted by the Value System Matrix, largely mirrors the flexible system of the famous iron triangle which Case 'B' applies during value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; Comfort, a measure of quality; OPEX, a measure of operating cost and Environment, a measure of building impact on its surrounding. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.2.3 (5).

iv. Value Determination for Case 'B' Pj4

Figure 5.9 shows the value criteria for the Library Complex, started in 2013 at a sum of ₦525m. The project was scheduled to be completed in 2015 and work has reached advanced stage on site.

A. Capital Cost - CAPEX							
A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**F**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**H**	**F**	**G**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**4**	**5**	**2**	**0**	**3**	**6**	**1**	**Total**

Figure 5.9 – Case B Value System Matrix for Library Complex

Figure 5.9 reflects Case 'B' need for a Library Complex which is strictly constructed within approved budget, comfortable for use by both staff, students and other users, constructed within stipulated time and easy to maintain and operate. The basic constituent of the brief, as shown by the Value System Matrix, also largely mirrors the famous iron triangle which Case 'B' is open to modifying during value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; Comfort, a measure of quality; Time; and OPEX, a measure of operating cost. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.2.3 (5).

v. Value Determination for Case 'B' Pj5

Figure 5.10 shows the value criteria for Office Complex belonging to the School of Social Sciences, started in 2012 and completed in 2014 at a sum of ₦220m.

A. Capital Cost – CAPEX							
A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**D**	**D**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**D**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**H**	**F**	**G**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**3**	**4**	**5**	**0**	**2**	**6**	**1**	**Total**

Figure 5.10 – Case B Value System Matrix for Office Complex

Figure 5.10 reflects Case 'B' need for an office complex, strictly constructed within approved budget, comfortable for staff, sited in harmony to the environment, and should be constructed within stipulated time. The basic constituent of the brief, as depicted by the Value System Matrix, largely mirrors the flexible system of the famous iron triangle which Case 'B' applies during value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; Comfort, a measure of quality; Environment, a measure of building impact on its surrounding; and Time. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.2.3 (5).

5. Assessment of Value Delivery in Designs of the Selected Projects

Based on the method discussed in Chapter 4, participants of Case 'B' FGD were requested to assess the performance of the design team at achieving the various value

criteria within the designs they produced using the value assessment form (See Appendix C). Table 5.11 show the outcome of analysing the scoring of the Medical Laboratory/Facilities Building design.

Table 5.11 - Value Assessment of Medical Lab Building for Case B

Value Criteria	**FGD Members' Scores (Max Score = 10)**					**Average Scores**	**Weight**	**Weighted Scores**
	B2	**B3**	**B4**	**B5**	**B6**	**A**	**B**	**c = a * b**
A. CAPEX	8	8	9	9	9	9	7	60
B. OPEX	8	7	8	7	8	8	5	38
C. Time	8	8	9	8	8	8	3	25
D. Environment	8	7	8	8	8	8	1	8
E. Esteem	8	7	9	9	7	8	0	0
F. Flexibility	8	8	8	8	8	8	4	32
G. Comfort	8	8	8	8	8	8	6	48
H. Accessibility	8	7	8	7	8	8	2	15
						Aggregated Average Score i.e. ∑c/∑b		**8.06**

Weight is the value contained in the CVSM as shown in Figure 5.6

Table 5.11 show the individual scores given by members of Case 'B' DPPPMW that participated in this part of the investigation. Using the formula discussed in Chapter 4, the aggregate average design performance score of each building was computed. As shown in Table 5.11, on the average, the participants scored the design team's performance for the Medical Laboratory/Facilities Building design above average having 8.06 out of 10 points. The same procedure was adopted for assessing the remaining four projects of Case 'B' whose summaries are shown in Table 5.12. Details of the scoring and computation of the average score of each project is shown in Appendix E. These scores represent the measure of Value in Design for projects undertaken by Case B (as depicted in the Conceptual Framework), a proxy for design outcomes.

Table 5.12 – Average Performance of Design Team for Case B

ProjID	Project Description	Performance (=10)		Status
		Range	Average	
Pj1	Medical Lab/Facilities Building	7 – 9	8.06	
Pj2	Twin Lecture Theatre	6 – 8	7.44	
Pj3	Museum, School of Arts & Lang	7 – 8	7.68	
Pj4	Library Complex	7 – 9	7.66	
Pj5	Office Complex for Social Science	7 – 9	7.91	

5.2.3 Case Study E

5.2.3.1 General Background Information

Case Study E is based on the investigation conducted with a public university established more than 30 years ago, having a Physical Planning & Procurement Department (PPPD) which became operational some 10 years after the inception of the Institution. The Unit in charge of maintaining the University's built asset is separate from the PPPD. Between the periods of 2009 – 2015 the University spent well over N10b on construction works 50% of which was committed to procuring new buildings. Up to N7b of this fund was provided by TETFUND while the balance was from the school's internally generated revenue (IGR) and other external sources (non-public). Interview was held with the person in charge of the PPPD while the FGD session had five personnel drawn from within PPPD. Table 5.13 show the particulars of the personnel.

Table 5.13 – Case Study E Participants Information

ID[1]	**Designation**	**Qualifications**	**Exp[2]**	**Profession**	**Participation**
E1	Director	LLB, MSc, FNIA	28	Architecture	Interview
E2	Chief Architect	MSc, FNIA	32	Architecture	FGD
E3	Chief QS	BSc, FNIQS	20	QS	FGD
E4	Chief Engineer	MSc, MNSE, MNIOB	23	Services Engg	FGD
E5	Senior Engineer	BSc, MNSE	15	Struct & Civil	FGD
E6	Principal Officer I	BSc, MNIOB	10	Builder	FGD

[1] Respondent's ID; [2] Working Experience

The interview was conducted with E1, the Director of the PPPD. Table 5.13 shows that 'E1' has works experience of 28 years with Case 'E' with 3 years in his current

capacity as Director, spending most of his working carrier within the PPPD. He possesses a Law degree, a Masters Degree in Architecture, and is a Fellow with the Nigerian Institute of Architects. The members making up the FGD session for Case 'E' are a representation of the main professionals within the built environment comprising of Architect, Builder, M & E, Quantity Surveyor and Structural Engineer. Case 'B' FGD members occupy both top and middle level management of the PPPD, having work experiences ranging between 10 – 32 years (average working experience = 20 years). All the FGD members have a minimum of a Bachelor's Degree, with three of them having Masters Degree. All the members belong to the professional bodies regulating their respective profession with one of them a 'Fellow'. Based on the aforementioned it can safely be concluded that data elicitation for Case 'E' comes from members with high academic qualifications, satisfactory professional standing with very high level of experience and considerable wealth of knowledge about the construction industry in general, and the PPPD and projects they undertake in particular.

5.2.3.2 Case 'E' Supply Management Practice

1. Classification of PPPD

Commenting on the function of the PPPD, E1 states that *'The overall function of the PPPD is to oversee the procurement of construction works and other related works as deem necessary by the University, by delivering and sustaining comfort built environment built towards supporting the University's service delivery system'*. While this is the current mandate of the Unit, there have been some changes over the years of its existence, given that the Unit was reorganised and craved out from the Works and Maintenance Division which was originally set up to provide maintenance services to the existing building stocks. When asked about the main goal of the PPPD, E1 states that:

> *'The main goal of the PPPD is to provide the right atmosphere for delivering the University's educational services and in so doing, we work in accordance with the University's goals [strategies] on procurement of construction works and other related works. The PPPD is fully represented in the University's Management Board by the Office of the Director (my office) and most times we participate in the processes of arriving at the strategies which the University establishes as those for its built environment. And at the most, the Executives of the University including the members of Council draws a lot from the PPPD in guiding decisions with regards to strategic goals and objectives of the University with regards procurement of construction works particularly those that relate to academic buildings*'.

When asked to give a brief description of what they do as the University's Supply Management Unit E1 informed that:

> *'Every two years, the University undertakes a needs analysis of its built environment and its requirements for space. The outcome of these assessments provides the buildings to be procured in line with the School's programme. For a while now, the University's projects have been funded by the ETF/TETFUND Interventions Funds to Universities. So in accordance with the provisions of these funding agencies, the PPPD prepares the procurement plans on behalf of the University to seek approval from the funding agency. When approval is received the PPPD kick starts the procurement process first with that of selecting the design consultants which is strictly in accordance with the provisions of the BPP's procedures for engaging consultancy services in Nigeria towards achieving value for money for public projects'.*

Further enquiry to aid in classifying PPPD probed on the theory supporting its 'make-buy' decision. However, been a public institution, it was known beforehand that procuring design services (and construction) is through some form of competition (as stipulated by the Public Procurement Act of 2007, regulating public procurement in Nigeria). Hence, design services in Case 'E' are bought rather than made by law. This position was confirmed to be the case by E1 for PPPD. However, the theory supporting the choice is equally important toward investigating their supply management practice.

When asked what parameters they consider when procuring design services, E1 indicates that cost minimisation was the main consideration towards cost savings for the University. He further explains that: *'the recent introduction of competition*

amongst consultants by the Federal Government is a way of procuring design services with the intent of achieving value of money through getting the best services at the lowest possible and acceptable fees'.

Summing the outcome of the interview with E1 towards characterising Case 'E' based on its classification and strategic consideration, the following summarily describes it: Case 'E' through the PPPD is of the 1st generation, viewing itself as a manager of resources, adopting an implementing strategy at the passive stage of its development that harnesses the neoclassical economy theory in its decision to procure design service.

2. Strategic Considerations and Alignment

The strategy Case 'E' adopts in sourcing its design partners was investigated. When asked what variables instigate their choice of supply strategy, E1 said that fundamental to PPPD are the '*importance of the design service'* to the procurement of the building and the '*competitiveness of the market in terms of demand and supply'*. Further, E1 was asked to describe the nature of design services normally procured by the University with the view of identifying the most appropriate sourcing strategy based on the Kraljic Positioning Matrix (See Figure 3.6) and he responded that: *'In terms of impact on University's programme, I'd describe the nature of design services procured for construction projects as high and in terms of supply market complexity, I'd describe the nature of design services procured for construction projects as low'*. Further probe on how the PPPD interact with its design suppliers, it was clear that the 'routine: efficiency' strategy was the popular sourcing strategy. This is contrary to the requirements of the Kraljic positioning matrix which stipulates the 'leverage: best deal' strategy. This was the case with Case 'A'.

Based on the nature of design services procured by the PPPD in terms of its impact on Case 'E' built asset and the supply market risk or complexity as described by E1, the delegated sourcing and parallel sourcing were the most appropriate sourcing structure based on the Cousins et al. (2008) framework (See Figure 3.7). This is contrary to what obtains in Case 'E' which adopts the single sourcing and multiple sourcing structure which is accordance to that suitable for the 'routine: efficiency' strategy as practiced by PPPD albeit wrongly based on the Kraljic Positioning Matrix and Cousins et al. (2008) sourcing strategy – sourcing structure mapping.

On the issue of strategic alignment, E1 indicates that Case 'E' has in place corporate level strategies that relates to built assets citing the following excerpt of a Management meeting and captured under its Statutes, as an example *'To explore ways of reducing energy consumption and promote energy efficient buildings, innovative design solutions must be sought to reduce energy use of buildings by 10 - 20% while providing buildings that promotes and enhance service delivery, which are attractive and provide comfort to users'*. E1 describes three competitive priorities of Case 'E' which forms the basis of their corporate strategies for built assets and which also plays pivotal roles in the selection of design partners namely cost, quality and delivery.

Lastly, under this aspect of the investigation, E1 was asked if the PPPD has its own strategies and how these strategies (both corporate and functional) are developed. Case 'E' formulates its own strategies but this is done rather informally since no written documentation is available except when captured in minutes of meetings. E1 explained that strategy development adopts a top-down approach. Supply (Purchasing) strategies are mainly informed by corporate strategies and that at times corporate strategies are development based on inputs from the PPPD. Therefore there is evidence to support the fact that there is some level of strategic alignment in Case 'E'

though no indication of any contribution from the Departments who mostly are the beneficiaries of the building designed.

3. Competencies and Skills Base

Discussing on the level of competencies and skills of the personnel of the PPPD, E1 expressed satisfaction with the present level of competencies and skills of the Unit but noted that there is still room for improvement in the area of team building skills and strategic planning which are areas he believe contemporary Supply Management Units should possess and excel in to be effective and efficient. Table 5.14 show the outcome of the ranking of the competencies and skills based of the PPPD by E1 which was aided by explanations of what each aspect entailed from the researcher where such explanations was needed and where it was felt such explanations will improve on the objectiveness of the assessment by E1. Two different assessments were required – firstly, the ranking of the current levels and secondly, what E1 thought was an ideal ranking for a contemporary Supply Management Unit. Both outcomes are shown in Table 5.14.

Table 5.14 – Case E Competencies and Skills Ranking

Competencies/Skills	**Ranking**		**Competencies/Skills**	**Ranking**	
	Cu	**Id**		**Cu**	**Id**
Assertiveness	2	4	Inventory Management	1	5
Aggregate needs	1	3	Negotiations skills	3	5
Communicative skills	2	1	Numeracy	1	4
Competitiveness	2	4	Product/Service knowledge	2	2
Computer literacy	3	3	Relationship Mgt Skills	4	1
Cross-functional working	4	2	Risk assessment skills	4	3
Forecasting ability	3	1	Strategic thinking	5	2
Volume/cost analysis	4	5	Supply industry knowledge	5	2
Profitability analysis	5	1			

Cu – Current status, Id – Ideal situation

From the Table, Case 'E's main strength in competencies and skills include: aggregate needs, inventory management and numeracy; followed by assertiveness, communicative skills, competitiveness and product/service knowledge; and lastly

computer literacy, forecasting ability, and negotiation skills. These rankings clearly places Case 'E' predominately within the tactical acquisition and tactical profit quadrant and sparingly within the strategic critical quadrant of the Cousins et al. (2008) Strategic Supply Competency Table (See Figure 3.10). Analysing E1's ideal situation for a contemporary Supply Management Unit, a more strategic approach is envisaged comprising of the following highest ranked competencies and skills: communicative skills, forecasting ability and profit analysis followed closely by cross-functional working, product/service knowledge, strategic thinking and supply industry knowledge. These rankings places E1's ideal situation for contemporary Supply Management Unit within the strategic security and strategic critical quadrant.

Connected to the regular competencies and skills base of the PPPD, specialised supply management skills were also investigated. The outcome of this is shown in Table 5.15.

Table 5.15 – Case 'E' Adequacy of Specialised Procurement Skills

Adequacy	**Skills**
None	Goal-setter, process development, Influencer
Not Adequate	completer, public speaking, listening, making a business case, leader and decision maker
Adequate	Planner, presenting, writing, cost accounting, economics, computer literacy, mathematic,

Table 5.15 shows that Case E either lacks or does not have adequate personnel for these specialised procurement skills: strategic planning skills i.e. goal-setter; team building skills i.e. influencer; Communication i.e. public-speaking, and listener; Financial skill i.e. making a business case, technical skills i.e. process development and team building skill i.e. leader, decision maker and influencer. However, they have adequate personnel in the following specialised procurement skills: Strategic planning i.e. planner; Communication i.e. presenting and writing; Financial skills i.e. cost accounting, and economics; and Technical skills i.e. computer literacy and

mathematics. This reveals that the PPPD mainly lacks adequate personnel in two specialised procurement skills areas namely: strategic planning and team building. This finding fairly corroborates the earlier findings on the core competencies and skills base of PPPD as shown in Table 5.14.

4. Performance Measurement

The PPPD of Case 'E' undertakes performance measurement at both project and organisational levels albeit in a semi formal matter. E1 posits that:

> *'By measuring performance we are able to assess how well the designers did at meeting the brief requirement, which is a fundamental requirement of the University's procurement strategy. Though there isn't any formalised and structured guideline in measuring designers' performance, the PPPD ensures that metrics for assessing performance are agreed during meetings with design consultants based on the value criteria determined by the User Departments. The University takes the matter of performance very seriously, by instituting a mechanism for blacklisting firms that exhibits poor performance. This it does to prevent the incidence of poor designs during the design stages of building projects'.*

Though not a formalised and highly structure system, the measurement of design performance undertaken by the PPPD is essentially to monitor and evaluate the activities of design partners towards controlling the outcome of the design process mainly by calling upon persons in charge of the designs as required and appropriate. When asked on the extent to which the activities of the PPPD are measured in terms of performance, E1 observed thus: *'The Unit has dedicated and very hard working personnel, each with specific and clearly understood responsibilities, duties and work schedules. And given that we are interested in the performances of design consultants, measuring that of the PPPD will not have an effect on that of the design consultants'.*

From the submission of E1 above, that the measures considered in the metrics used by PPPD are the effectiveness and efficiency measures while these are specifically targeted at suppliers' performance only. The PPPD's performance measurement is not

targeted at the user departments, the internal processes at PPPD nor at opportunities for innovation and learning. Judging from the responses on the main features of the performance measurement system adopted by PPPD the main features indicates that there is some form of linkage between the metrics for measurement and the corporate objectives of Case 'E' measuring performance on a one-dimensional scale but incorporating both effectiveness and efficiency measures and focused on qualitative aspect only, with the absence of standard guidelines exposing it to the possibilities of manipulation. The system is lacking in the following areas: ability to combine different measures, identification of trade-offs, mixing of leading/lagging indicators, potentials of systemic data collection and analysis, inability to differentiate between measures and non-consideration of cross-functional working i.e. intra and inter units.

5. Total Cost/Benefit Analysis

Discussing their approach to cost consideration, E1 likewise, reiterated the provisions of the Manual of the Public Procurement Act 2007 and the provisions of the Standard bidding Document for Consultancies in Nigeria. Specifically, the documents points to the *'most economically advantageous tender'* as the most preferred bidder to engage for public project further giving credence to selecting the lowest bid upon evidence of succeeding in qualify performance evaluations (the documents above actually recognises Quality-cost-based assessment as the preferred criteria for awarding public projects). The point of this from E1's explanation was that apart from looking at initial cost, no guide refers to how public agencies can treat cost on a whole life basis in the procurement of built assets. Hence, guided by this principle, PPPD considers only initial price in terms of service fees paid for design services rendered.

Design fees are only considered within the principles of the approved scale of fees operational in Nigeria, published by the Federal Ministry of Works in 1996. However,

E1 also noted that several scales exists, prepared by the various professional Institution regulating most professions of the built environment, most public funding agencies stipulates the use of approved National Scale of Fees for the industry. Common to most of the scales, three stages of payment are recognised, Stage I, II and III, covering the entire design stages to completion of the construction. Hence, as exemplified by law, the PPPD considers only the initial acquisition costs and reception/handover costs for design services since these are what funding agencies are willing to pay for. When asked for eventual redesign cost of the building when in-use E1 states that *'.... consideration is given to maintenance cost during the early design stages of construction projects and designer consultants are encouraged to incorporate such thinking in their designs. While such cost are considered during the design stages implementing them during the in-use phase is a different ball game entirely'*.

Enquiring on the levels at which cost are aggregated and considered by the PPPD, E1 indicates that *'A major part of the cost incurred by the PPPD are paid through staff salaries which are the funding from the Federal Government's allocation to the University. Other administrative costs are funded by monthly allocations provided by the University and due to its insufficiency these aspect of design cost are not given the much needed consideration per se'*. Probing further on how they manage such allocations towards contract administration E1 informed that:

> *'We receive two types of allocations from the University to fund the other administrative cost associated with managing the supply chain – normal and special. The normal is what is given monthly and is relatively fixed and largely insufficient to cover these costs, but this is normal. The special allocations come when we make special request to cover for activities that are not performed on a regular basis e.g. travels to inspect design consultants offices, confirmation of information provided by bidders at pre-qualification etc. Aside these costs, the normal and everyday activities are covered by staff salaries which we also use to cushion the insufficiency of the project specific activities'*.

The aforementioned reveals that though some levels of considerations are given to cost of managing relationship with their design partners, the PPPD only gives specific considerations to supplier level costs and that this is done superficially due to financial constraints and for the fact that staff emoluments substantially covers the others i.e. order-level cost and unit-level cost, serious considerations are not given to these aspects.

6. Managing Inter-firm Relationships

A first aspect of understanding for this section of the investigating is having an understanding of how the PPPD defines and sees the concept of relationship. E1 defines and describes relationship as understood within the PPPD as *'The agreement between the University and a consultant for the provision of the stipulated service'*. Expatiating further on this definition, as result of probing what the constituents of the definition are, with specific relationship to processes, E1 further provides that

> *'The culture in the construction industry is such that when matters of design process is undertaken by any other but the design team members grudges becomes the order of the day. Consultants do not like such as they term them as unhealthy interferences. And truly we are very happy not to interfere because the consultants have a job to do and they are paid to do just it. So we do not bother so much with the processes the design team embarks upon, we assess their performance'*.

Clearly from the above, the PPPD does not see relationship as constituting a set of complex business processes as defined by Cousins et al. (2008) which this research adopts but rather as the agreement entered into by it on behalf of Case 'A' and the design firm which basically stipulates amongst others: what is required, the offer by the consultant and acceptance by the PPPD; all contained in an 'Engagement of Services' form signed by both parties. An inspection of a sample form revealed that there was no indication as to the nature of the inputs required, processes to be undertaken or output specifics, except stating what should be designed.

On the issue of whether the PPPD considers intra-firm relationship management as much as it does inter-firm, E1 provides the following as the practice of Case 'E':

> *'The University has several functional units and each having specific and special space needs and requirements. In order to understand their specific needs, the PPPD engages with each of the Functional Units to determine needs and requirement which we translate into a brief with which the design team produces the designs. Apart from engaging with the Departments/Units of the University, the PPPD engages with the Central Committee on Built Asset which is responsible for managing existing assets in junction with the Maintenance Unit. At times, University-wide meetings are organised to discuss procurement matters'.*

Further probing was necessary to specifically determine if there was any form of relationship between these Units and the PPPD apart from merely been involved as described above. There was no evidence that any formal relationship exist. Even within the definition of relationship by the PPPD, no form of formal 'contract' exist between the PPPD and User Department on the procurement of buildings in Case 'E'. Nor could any form of 'complex business processes' be seen to exist between them. Hence, from the aforementioned, Case 'E' does not consider intra-firm relationships.

The Interview segment requires that aspects on relationship management strategies adopted by Case 'E' be investigated (also refer to Checklist Protocol at Appendix A). As was the case with Case Study 'A', this aspect of the investigation could not be conducted since the PPPD had no specific strategy to management inter-firm relationship. The Engagement of Service Agreement is the sole basis of managing relationships with consultants engaged for design works particularly given that the PPPD minimally gets involve with the design process per se.

5.2.3.3 Case 'E' Value System Management Practice

1. Value (for Money) Definition and Determination by PPPD

When asked what value meant to the PPPD members of the FGD and upon a moment of agreeable discussions they reached a consensus and agreed that value is *'those*

aspects that exist in the building which the client wants in order to achieve its organisational goals for the amount of money that they have. While this definition may seem acceptable, it is somewhat generic for the study, hence further probing was done to get Case 'E's definition of value relative to building designs. The PPPD's FGD reframed the definition thus: '*the ability of the design team to incorporate those aspects in the design that makes clients achieves their need for building towards meeting their organisational goals'*.

From the aforementioned it seems that value is considered on a project to project basis, further probing on this issue (see Question 2 of the FGD Protocol) indicate that in most instances specific determination of value is not done on project basis since only two or three criteria are mainly considered i.e. cost, quality and time – the traditional iron triangle in construction. This somewhat contradicts the PPPD's definition and description of value which suggests that rather than concentrate on cost, quality and time (which is the traditional approach to determining project performance as against value), the client (maybe on behalf of the users) of buildings would be responsible for determining the aspects of the building that would give them the greatest satisfaction. Hence, what is known of value in building designs within the PPPD on behalf of Case 'E' are not what is contained in the designs nor are they the criteria used in assessing designs.

When asked how value is determined by the PPPD, participants of the FGD were initially divided on the specifics of the process but agreed unanimously that a process exists. Upon intensive deliberations it was evident that a unified value system is in existence in Case 'E' – consisting of a generic set of criteria which is agreed upon by stakeholders engaged at University-wide meetings organised by the PPPD at different times. In such gatherings consensus is reached amongst the stakeholders on what

should constitute value for the University buildings based on importance – the iron triangle is heavily relied upon.

2. Stakeholder Management by PPPD

On the issue of managing stakeholders, representatives are drawn from all relevant units of the University to participate in the University-wide meetings but where there is special requirements outside those of the generic criteria making up Case 'E' value System, the User Department are specifically asked of these requirements for inclusion in the brief which the design team uses. Irrespective of specialness of the projects, within the User Departments, the Head of Department or any other assigned person interacts with representatives of the PPPD, normally Architects to basically arrive at the specific requirements of the Department or Unit in terms of functional and space requirements. Matters of cost and quality are not normally issues to discuss in such interactions since budgets would have been prepared for each project particularly for Intervention Projects (i.e. Project funded by Public Funding Agencies etc TETFUND).

After settling on the client's requirements, the PPPD prepares the brief for the on behalf of the User Department and gets their endorsement of the document before they become official design documents for the design team when they are constituted. The User Department's further involvement in the project is at pre-construction stage where the final working drawings are presented to the PPPD and at such presentations the User Department is invited to participate. However, preliminary designs are communicated to the PPPD but only seldom, for instance, where the design of a complex nature and the design team feels that the budgetary provisions may not be adequate. During construction and at handover, User Departments are invited to attend site meetings and handing over meetings whereby their observations are made on

design matters as well as on construction issues. During these meetings, it was gathered that User Departments rarely critique design outcomes but rather constantly seek clarifications and occasionally reports of design related issues are communicated to the PPPD when buildings are in use.

3. Value Dialogues and Value Judgement

While it is recognised that a process for determining value exist in Case 'E', such a process is not applied to all projects. The opportunity to engage in value dialogues and make value judgement exists in Case 'E' during colloquiums organised by the PPPD on behalf of the University as discussed earlier. This is done to agree on the set of criteria that expresses value for the University. The outcome of the FGD describes the dialogue and judgement process thus:

> *'The members of the University-wide meetings are drawn from all Departments, Institutes and Directorates of the University and members of the PPPD chaired by its Director or the Chairman of the Central Committee on Built Assets. Participants from each of the Units are chosen by and represent each Unit in the meetings. Members are briefed on projects undertaken within the periods between the last colloquium and the one been held, and those that are currently underway. Members are called upon to make observations and give constructive criticisms on matters that bother on the performance of the project, mostly on quality and usage, in the form of lessons learnt for project underway. User Department/Functional Units of the University are mostly not conversant with the matters of cost. The PPPD provides these issues and more often than not, observations and criticisms made are either withdrawn or watered down because cost constrains the implementations of most of the observations made. Hence, focus is given to quality in terms of specifications where finishes e.g. floor and walls predominates such discussions'.*

From the aforementioned, there isn't any evidence of a value dialogue ensuing during University-wide meetings held by Case 'E' given that members are not free to communicate their understanding of and aspirations of value in terms of value criteria as is recommended in the Thomson and Austin (2006) VALiD Framework. What obtains is a selection from a predetermined value criteria set in line with the Kelly and Male (2006) Client Value System Matrix (CVSM), albeit on a reduced scale. The

CVSM has 8 Value criteria against Case E's three criteria. Case 'E' FGD team was further quizzed on how these criteria are agreed upon during the University-wide meetings. The outcome of their discussion is captured thus:

> *'During deliberations, records are made of what was agreed upon and at the end each deliberation – matter by matter – the agreement are read out to which members would either consent to (indicating that as the true position of members on that matter) or rejected conversely. In the event that members disagree, the matter is put to vote. For instance, where a certain type of floor finish is recommended for the University's buildings – say classrooms, and there seems to be disagreement amongst members, the outcome of the voting exercise will determined the decision to take'.*

While it is evident that members do not engage in value dialogues during the University-wide meetings, value judgements are made based on consensus and in the event that this is not reached, voting will determine the decision on value judgements.

4. Practical Value Determination of Selected Projects

This aspect of the investigation requires the FGD team to determine the value criteria for five projects selected specifically for the purpose of this research work in line with the criteria and methods discussed in Chapter 4. The members that participated in this aspect of the investigation and their qualifications is shown in Table 5.13 identified as E2 .... E6. The team comprises of architect, builder, M & E Engineer, Quantity Surveyor, and Structural Engineer, having a total working experience of 100 years amongst them, at an average of 20 years. All the participants were involved in the five selected projects investigated for Case 'E'. The particulars of these projects are shown in Table 5.16.

Table 5.16 – Project Information for Case Study E

ProjID	Project Description	Size (m^2)	Cost (₦m)	Status
Pj1	Community Health Centre	2,530	400	2014
Pj2	Twin Lecture Theatre	1,750	355	2013
Pj3	Classroom & Office Complex	4,850	756	2014
Pj4	Centre for Entrepreneurship	2,250	396	2014
Pj5	Science Laboratory & Offices	1,500	350	2014

All cost exclude external works and Furnishing but includes Preliminaries and contingency sums

The specific projects investigated for Case 'E' comprise a range of project types some falling within projects classified under academic buildings, ranging between N350m – N756m, all of them completed within 2013 – 2014. All the projects were funded through Special Interventions by TETFUND and had to go through Ministerial approvals since they were above the University's Spend Threshold. Discussed below are the outcomes of Case 'E' FGD team's determination of value criteria which informed the brief that was given to the design team as a basis for their design. Each outcome was based on the extensive deliberations of members of the FGD team and their eventual agreement on the criteria.

i. Value Determination of Pj1 for Case 'E'

Figure 5.11 shows the value criteria of the Community Health Centre constructed and completed in 2014 at a sum of ₦400m.

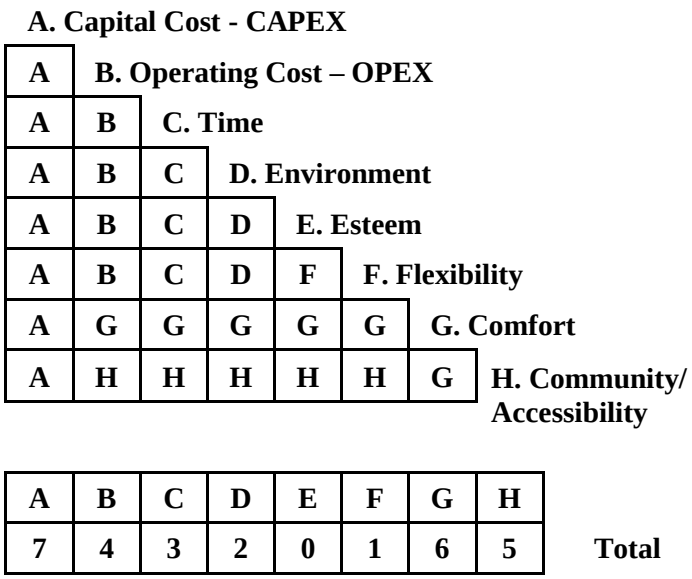


Figure 5.11 – Case E Value System Matrix for Community Health Centre

Figure 5.11 reflects Case 'E' desire for a Community Health Centre which is strictly constructed within approved budget, comfortable to users, and easily accessible to members of the community within which the University is domiciled. The basic constituent of the brief, as depicted by the Value System Matrix, reflects Case 'E's

flexibility with the famous iron triangle towards value determination of their projects. The Matrix identifies the following three criteria as most important: CAPEX, a measure of initial cost, Comfort, a measure of quality; and Community accessibility, also a measure of quality. OPEX (a measure of quality) and Time were both next in importance. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.3.3 (5).

ii. Value Determination of Pj2 for Case 'E'

Figure 5.12 shows the value criteria for the Twin Lecture Theatre constructed and completed in 2013 at a sum of ₦355m. Though, it was gathered that the contract sum was revised from ₦324 during the construction phase of the project due to changing client requirements.

A. Capital Cost - CAPEX

A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**F**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**H**	**H**	**F**	**G**	**H. Community/ accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**4**	**5**	**1**	**0**	**3**	**6**	**2**	**Total**

Figure 5.12 – Case E Value System Matrix for Twin Lecture Theatre

Figure 5.12 reflects Case 'E' desire for a Twin Lecture Theatre which is strictly constructed within budget provisions, comfortable for use, and constructed within the stipulated time frame. The basic constituent of the brief, as depicted in the Value System Matrix, reflects Case 'E's flexibility with the famous iron triangle towards value determination of their projects. The Matrix identifies the following three criteria

as most important: CAPEX, a measure of initial cost, Comfort, a measure of quality; and Time. OPEX (a measure of quality) and Flexibility, a measure of quality were both next in importance. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.3.3 (5).

iii. Value Determination of Pj3 for Case 'E'

Figure 5.13 shows the value criteria for the Classroom and Office Complex, completed in 2014 at a sum of ₦756m.

A. Capital Cost - CAPEX							
A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**D**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**H**	**H**	**G**	**H. Community/ accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**4**	**5**	**3**	**0**	**1**	**5**	**2**	**Total**

Figure 5.13 – Case E Value System Matrix for Classroom/Office Complex

Figure 5.13 reflects Case 'E' desire for Classroom and Office Complex which is strictly constructed within approved budget, comfortable for use by both staff and students, ease to maintain and operate and should be constructed within stipulated time. The basic constituent of the brief, as shown by the Value System Matrix, also largely mirrors the famous iron triangle which Case 'E' applies as a generic model for value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; comfort, a measure of quality; Time, and OPEX, a measure of operating cost. The values in the Matrix are used to

assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.3.3 (5).

iv. Value Determination of Pj4 for Case 'E'

Figure 5.14 shows the value criteria for the Centre for Entrepreneurship, completed in 2014 at a sum of ₦395m. The project was scheduled to be completed in 2013 but experienced some client-related delays.

A. Capital Cost - CAPEX							
A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**D**	**D**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**D**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**H**	**F**	**G**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**3**	**4**	**5**	**0**	**2**	**6**	**1**	**Total**

Figure 5.14 – Case E Value System Matrix for Centre for Entrepreneurship

Figure 5.14 reflects Case 'E' need for a Centre for Entrepreneurship which is strictly constructed within approved budget, comfortable for use by all users, and constructed to have the great impact on its surroundings. The basic constituent of the brief, as shown by the Value System Matrix, also largely mirrors the famous iron triangle which Case 'E' applies as a generic model for value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; Comfort, a measure of quality; Environment, a measure of building impact on its surrounding; and Time. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.3.3 (5).

v. Value Determination of Pj5 for Case 'E'

Figure 5.15 shows the value criteria for Science Laboratory and Office Complex, completed in 2014 at a sum of ₦350m.

A. Capital Cost - CAPEX							
A	**B. Operating Cost – OPEX**						
A	**B**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**D**	**F**	**F. Flexibility**		
A	**B**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**H**	**F**	**G**	**H. Community/ accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**6**	**4**	**3**	**0**	**2**	**5**	**1**	**Total**

Figure 5.15 – Case E Value System Matrix for Science Lab/Office Complex

Figure 5.15 reflects Case 'E' need for a Science Laboratory and office complex, strictly constructed within approved budget, easy to maintain and operate, comfortable for staff and students use, and should be constructed within stipulated time. The basic constituent of the brief, as shown by the Value System Matrix, slightly differs from the famous iron triangle which reflects Case 'E' flexibility in value determination of their projects. The Matrix identifies the following three criteria as most important: CAPEX (a measure of initial cost), OPEX (a measure of operating cost) and Comfort (a measure of quality). Time and Environment were both next in importance. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.3.3 (5).

5. Assessment of Value Delivery in Designs of the Selected Projects

Based on the method discussed in Chapter 4, participants of Case 'E' FGD were requested to assess the performance of the design team at achieving the various value

criteria within the designs they produced using the value assessment form (See Appendix C). Table 5.17 shows the outcome of analysing the scoring of the Community Health Centre design.

Table 5.17 - Value Assessment of Community Health Centre for Case E

Value Criteria	**FGD Members' Scores (Max Score = 10)**					**Average Scores**	**Weight**	**Weighted Scores**
	B2	**B3**	**B4**	**B5**	**B6**	**a**	**b**	**c = a * b**
A. CAPEX	7	7	7	8	7	7	7	50
B. OPEX	7	7	8	8	7	7	4	30
C. Time	7	7	7	8	7	7	3	22
D. Environment	7	7	7	8	7	7	2	14
E. Esteem	6	7	7	8	7	7	0	0
F. Flexibility	6	7	6	8	7	7	1	7
G. Comfort	6	7	7	8	7	7	6	42
H. Accessibility	6	7	7	8	7	7	5	35
						Aggregated Average Score i.e. ∑c/∑b		**7.14**

Weight is the value contained in the CVSM as shown in Figure 5.11

Table 5.17 shows the individual scores given by members of Case 'E' PPPD that participated in this part of the investigation. Using the formula discussed in Chapter 4, the aggregate average design performance score of each building was computed. As shown in Table 5.!7, on the average, the participants scored the designer team's performance for the Community Health Centre design above average with 7.14 out of 10. The same procedure was adopted for assessing the remaining four projects of Case 'B' whose summaries are shown in Table 5.18. Details of the scoring and computation of the average score of the other projects are shown in Appendix E. These scores represent the measure of Value in Design for projects undertaken by Case E (as depicted in the Conceptual Framework), a proxy for design outcomes.

Table 5.18 – Average Performance of Design Teams for Case 'E'

ProjID	Project Description	Performance (=10)		Status
		Range	Average	
Pj1	Community Health Centre	6 – 8	7.14	
Pj2	Twin Lecture Theatre	5 – 8	7.28	
Pj3	Classroom & Office Complex	6 – 8	7.50	
Pj4	Centre for Entrepreneurship	7 – 8	7.75	
Pj5	Science Laboratory & Offices	6 – 8	7.23	

5.2.4 Case Study G

5.2.4.1 General Background Information

Case Study G is based on the investigation conducted with a private university established less than 15 years ago having a Department of Procurement and Facilities Management which became operational since inception of the institution. Between the periods of 2008 – 2015 the University spent well over N15.0b on construction works up to 50% of which was committed to the procurement of building works. 70% of these funds were externally sourced mainly from borrowing and grants while the balance was from the school's internally generated revenue (IGR). Interview was held with the person in charge of the University's DPFM while the FGD session was held with five personnel drawn from within the DPFM, which is responsible for construction procurement. Table 5.19 show the particulars of the personnel.

Table 5.19 – Case Study G Participants Information

ID[1]	Designation	Qualifications	Exp[2]	Profession	Participation
G1	Director	MSc, MLA, FNIA	18	Architecture	Interview
G2	Chief Architect	MSc, FNIA	18	Architecture	FGD
G3	Chief QS	BSc, MNIQS	15	QS	FGD
G4	Chief Engineer	MSc, FNSE	20	Struct & Civil	FGD
G5	Facilities Manager	BSc, MSc, MFM	15	Facilities Mgr	FGD
G6	Engineer I	BSc, MNSE	6	Service Engg	FGD
G7	Principal Officer I	BSc, MNIOB	6	Builder	FGD

[1] *Respondent's ID;* [2] *Cummulative Working Experience*

Interview was conducted with G1, the Director of the DPFM who has worked with Case 'G' for more than 10 years. He possesses Master Degrees in Architect and Landscape Architecture, and a Fellow with the Nigerian Institute of Architects and a cumulative working experience of 18 years. The members making up the FGD session for Case 'G' are a representation of the main professionals within the built environment comprising of Architect, Builder, M & E, Quantity Surveyor and Structural Engineer. Case '**G**' FGD members occupy both top and middle level management of the DPFM, having work experiences ranging between 6 – 20 years

(average working experience = 13 years). All the FGD members have a minimum of a Bachelor's Degree, with four of them having Masters Degree. All the members belong to the professional bodies regulating their respective profession and two of them being 'Fellows' of their professional Institutes. Hence, data elicitation for Case 'G' comes from members with high academic qualifications, satisfactory professional standing with very high level of experience and considerable wealth of knowledge about the construction industry in general, and the DPFM and projects they undertake in particular.

5.2.4.2 Case 'G' Supply Management Practice

1. Classification of the DPFM

G1 reiterate the overall task of the DPFM as *'to select and engage with design partners in the provision of a built environment that enhances learning and provides an atmosphere that is conducive to work in and that simulates and encourages interactions amongst its users, and ensuring that the environment is constantly meeting up its present and future demands'*. While this is the current mandate of the Unit, there hasn't been much changes over the years of its existence, given that the Unit was originally set up to cater for provision of new building and provide maintenance services to the existing building stocks right from its inception. When asked to give a brief description of what they do as the University's Supply Management Unit G1 informed that:

> *'The DPFM engages with all the Units of the University to address their demand for space and the management of such spaces when provided. The Unit is responsible for preparing Business Cases presented to the University' Management toward securing funding approvals particularly for project funded from IGR. For funding that are externally sourced, the DPFM prepares and makes, submissions in compliance with the regulations of the Funding Agencies or Organisation on behalf of the University. These are for projects which are selected for funding based on the assessment of the University's priorities which is handled by the DPFM in conjunction with other stakeholders.*

To further assist on classifying the DPFM, G1 was probed on the theory supporting its make-buy decision. Unlike the earlier Case Studies, being a private institution, it was expected that procuring design services (and construction) maybe done through other means aside through some form of competition (as stipulated by the Public Procurement Act of 2007, regulating public procurement in Nigeria). Interestingly, G1 informed that design services in Case 'G' are sometimes made and sometimes bought rather than the 'make' only approach promoted by Public Procurement law. Hence, the importance of investigating the theory supporting Case 'G' 'make – buy' choice.

When asked what parameters they consider when procuring design services, G1 indicates that while cost savings was an important factor, transaction cost and the capabilities of the DPFM plays very significant roles toward delivering value for money for the University. He further explains thus:

> *'Where in opinion of the DPFM the design can be procured in-house based on its resource capabilities, the decision to make rather than buy is made only where it can be proven that the DPFM will outperform design solutions that can be given by design consultants. This way we not only save money but also design in accordance to the corporate goals and strategies of the University'.*

Summing the outcome of the interview with G1 towards characterising Case 'G' based on its classification and strategic consideration, the following summarily describes it, similar to that of Case 'B' thus: DPFM is of the 1st generation, viewing itself as a manager of resources, adopting an supporting strategy at the independent stage of its development and harnessing the resource-based view theory in its decision to procure design service in some instances.

2. Strategic Considerations and Alignment

The strategy the DPFM adopts in sourcing its design partners was investigated. When asked what variables instigate their choice of supply strategy, G1 said that fundamental to the DPRM are '*the complexity of the design task'* and the

'*competitiveness of the market in terms of demand and supply'*. Further, G1 was asked to describe the nature of design services normally procured by the University with the view of identifying the most appropriate sourcing strategy based on the Kraljic positioning matrix (See Figure 3.6). His response was:

> *'In terms of the impact [the design services procurement has on the University] I'd say that it is high. This is due to the fact that the nature of buildings affects the activities carried out therein. In term of supply market complexity, I'd say average because sometimes the nature of the design may require specialists design skill which may be in short supply at that given moment and sometimes again simple design will have many available designers'.*

Further probe on the how the DPFM interact with their design suppliers, it was gathered that the 'leverage: best deal' strategy was the popular sourcing strategy adopted by Case 'G'. This is partially in accordance with the Kraljic positioning matrix (no average point exist on the matrix) which stipulates either the 'leverage: best deal' strategy or the 'critical: cooperation' strategy.

Based on the nature of design services procured by the DPFM in terms of its impact on Case 'G' built asset, the complexity of the design and the supply market risk or complexity as described by G1, the delegated sourcing and parallel sourcing were the most appropriate sourcing structure based on the Cousins et al. (2008) framework (See Figure 3.7). This is in conformity to what obtains in Case '**G**' which adopts the single sourcing and parallel sourcing structure which is in accordance to that suitable for the 'leverage: best deal' strategy as practiced by DPFM based on the Kraljic Positioning Matrix and Cousins et al. (2008) Sourcing Strategy – Sourcing Structure Mapping.

On the issue of strategic alignment, G1 indicates that Case 'G' has in place corporate level strategies related to the built environment. G1 describes four competitive priorities of Case 'G' which forms the basis of their corporate strategies for built

assets and which also plays pivotal roles in the selection of design partners namely quality, delivery and innovation.

Lastly, under this aspect of the investigation, G1 was asked if the DPFM has its own strategies and how these strategies (both corporate and functional) are developed. G1 explained that Case 'G' formulates its own procurement-related strategies and this is done in a rather semi formal way, in that committees are set up to come up with such strategies which then forms part of the University's Statutes when rectified by the University's Management. G1 explained that strategy development adopts a top-down approach. Supply (Purchasing) strategies are informed by corporate strategies and that in some instances, corporate strategies development gets the participation of the DPFM. Therefore there is evidence to support the fact that there is some level of strategic alignment in Case 'G' though no indication of any contribution from the Departments who mostly are the beneficiaries of the building designed.

3. Competencies and Skills Base

Talking freely on the level of competencies and skills of the personnel of the DPFM, G1 expressed satisfaction with the level and also indicated that there is room for improvement particularly in the area of team building skills and strategic planning. Table 5.20 show the outcome of the ranking of the competencies and skills based of the DPFM by G1 which was aided by explanations of what each aspect entailed from the researcher where such explanations was needed and where it was felt such explanations will improve on the objectiveness of the assessment by G1. Two different assessments were required – the ranking of the current levels and what G1 thought was an ideal ranking for a contemporary Supply Management Unit.

Table 5.20 – Case G Competencies and Skills Ranking

Competencies/Skills	Ranking		Competencies/Skills	Ranking	
	Cu	Id		Cu	Id
Assertiveness	3	4	Inventory Management	1	3
Aggregate needs	3	5	Negotiations skills	1	1
Communicative skills	4	2	Numeracy	2	4
Competitiveness	1	3	Product/Service knowledge	4	2
Computer literacy	2	3	Relationship Mgt Skills	5	1
Cross-functional working	5	4	Risk assessment skills	5	2
Forecasting ability	3	5	Strategic thinking	4	1
Volume/cost analysis	2	5	Supply industry knowledge	4	1
Profitability analysis	3	4			

Cu – Current status, Id – Ideal situation

From the Table, Case 'G's main strength in competencies and skills include: competitiveness, inventory management and negotiations skills; followed by computer literacy, volume/cost analysis, and numeracy; and lastly assertiveness, aggregate needs, forecasting ability and profitability analysis. These rankings clearly places Case 'G' within the tactical acquisition and tactical profit quadrant of the Cousins et al. (2008) Strategic Supply Competency Table (See Figure 3.10). Analysing G1's ideal situation for a contemporary Supply Management Unit, a more strategic approach is envisaged comprising of the following highest ranked competencies and skills: negotiation skill, relationship management skills, strategic thinking, and supply industry knowledge. This is followed closely by communicative skills, product/service knowledge, and risk assessment skills. These rankings places G1's ideal situation for contemporary Supply Management Unit within the strategic security and strategic critical quadrant.

In addition to the regular competencies and skills base of the DPFM, specialised supply management skills were investigated. The outcome is shown in Table 5.21.

Table 5.21 – Case 'G' Adequacy of Specialised Procurement Competencies

Adequacy	Skills
None	Nil
Not Adequate	Completer, listening, making a business case, process development, leader, influencer.
Adequate	Planner, goal-setter, presenting, public speaking, writing, cost accounting, economics, computer literacy, mathematics, decision maker,

Table 5.21 shows that Case 'G' does not lack personnel in any of the specialised procurement competencies but is inadequate in the following: strategic planning skills i.e. completer; Communication i.e. listening; Financial skill i.e. making a business case; technical skills i.e. process development; and team building skill i.e. leader, and influencer. They however have adequate personnel with the following specialised procurement competencies: strategic planning skills i.e. planner and goal-setter; Communication i.e. presenting, public speaking and writing; Financial skills i.e. cost accounting, and economics; and technical skills i.e. computer literacy, and mathematics; and Team building i.e. decision-maker This reveals that the DPFM lacks adequate personnel in two specialised procurement skills areas namely: strategic planning and team building. This finding corroborates the earlier findings on the core competencies and skills base of DPFM as shown in Table 5.20.

4. Performance Measurement

The DPFM of Case 'G' demonstrates that performance measurement is undertaken at both project and organisational levels in a formalised matter. G1 posits that:

> *'Though we have standardised format for assessing performance, at the start of every project, key performance indicators are agreed upon amongst members of the DPFM, User Department and the design consultants engaged for the project. Basically, the KPIs agreed upon fall within the generic measurement guide produced by the DPFM specifically for assessing the performance of the University's projects in line with the requirements of the Balanced Score Card metric. The measurement instrument is developed with participation from the University's Management, User Departments and the DPFM and contains metrics targeted at each of these three aspects of the University incorporating metrics to measure suppliers' performance too. This*

way all stakeholders involved in the delivery of construction projects are assessed in terms of their performances'.

Operating a formalised and structured system, with specific mention of suppliers' assessments of the University been part of the performance measurement exercise, the measurement of design performance undertaken by the DPFM is essentially to monitor and evaluate the activities of design partners towards controlling the outcome of the design process, and aiding the identification of criteria success areas. When asked on the extent to which the activities of the DPFM is measured in terms of performance, G1 observed that: *'Four aspects forms the principal focus of measuring the activities of the DPFMW, namely the University's Management, User Departments, suppliers [design consultants], and the DPFM's activities. And because the measurement permeates al the levels, both financial and non-financial measures are adopted, aside measuring efficiency and effectiveness '.*

From the submission of G1 as contained above, that the measures considered in the metrics used by the DPFM comprises of the following measures, effectiveness, efficiency, financial and non-financial targeted at all the stakeholders involved in the delivery of value in design. Hence, the DPFM performance measurement is targeted at: the user departments, the DPFM's internal processes, and the design consultants, thus providing opportunities for innovation and learning. Judging from the responses on the main features of the performance measurement system adopted by the DPFM, the main features indicate that there is some form of linkage between the metrics for measurement and the corporate objectives of Case 'G' measuring performance on a multi-dimensional scale and incorporating effectiveness, efficiency, financial and non-financial measures; balancing between qualitative and quantitative approaches; and demonstrates the incapability of been manipulated given the existence of a pro forma

for measuring performance. However, the system is lacking in the following areas: identification of trade-offs, and the potentials of systemic data collection and analysis.

5. Total Cost/Benefit Analysis

Discussing their approach to cost consideration, G1, recognising the restrictions within the provisions of the regulations guiding Public procurement in Nigeria i.e. the Public Procurement Act 2007 and the Standard bidding Document for Consultancies in Nigeria, explained that the total cost management approach is adopted with the design consultants playing very important roles in effectively managing these cost . This is possible due to the nature of engaging consultants within Case 'G', mostly based on negotiations and retainers. G1 explained that this approach to considering total cost allows for all aspect of cost to be considered early and with certainty, given that the firm manages a relatively fixed number of design firms compared to that obtained in public procurement, where every consultants that meets the criteria for participation, can submits bids for consideration. The point of this from G1's explanation was that apart from looking at initial cost, other costs associated with procurement of designs are considered on a whole life basis and that with the long-term relationships entered with design consultants, they also get heavily involve in managing such costs.

G1 further explained that design fees are paid based on negotiation with the design consultants. At some point the approved scale of fees operational in Nigeria, published by the Federal Ministry of Works in 1996 formed the basis of sure negotiations. But recent, scales prepared by the various professional Institution regulating most professions of the built environment, are becoming very prominent. G1 further indicated that though several scales of fees exists for use in the industry, the DPFM has make attempts at unifying the various scales and came up with a harmonised scale of fees for engaging design consultants for its construction projects. Therefore, as

exemplified by the harmonised scale of fees, the DPFM considers the initial acquisition costs, reception/handover costs and in-use cost for design services due to the long-term nature of relationship they have with the design consultants. This is confirmed by G1 thus:

> *'The modalities for managing design related charges after completion i.e. in-use costs are agreed earlier in the project planning stage, with the design consultants, who are paid on a retainer basis. But where the extent of redesign is small in scope, the DPFM may decide to undertake the design activities at no extra cost to the University since this would have been included in payments made as staff remunerations. And besides, in the event that the extent of redesign is large in scope and the DPFM is embarking on it, funds from the IGR are allocated for rehabilitation and refurbishment works'.*

Enquiring on the levels at which costs are aggregated and considered by the DPFM in managing procurement of designs, G1 indicates that *'The DPFM is funded wholly by the University but opportunities are given to it to generation funds through engaging in consultancies. The activities of the DPFM are paid for through staff remunerations, with allocations [normal and special] given to undertake some functions'*. Probing further on how Case 'G' manages such allocations towards contract administration, G1 informed that:

> *'The largest proportion of supply management cost is paid for through staff remuneration, for the normal duties e.g. managing consultant orders, invoicing and payments etc, while the others are mainly on fixed budgets from the monthly allocations provided by the University e.g. vetting design firms, training cost, transportation cost etc. Where situations so demands, special allocations are requested for and where possible funds are drawn from the PDFM's purse to manage some aspect of the design service related costs.*

The aforementioned reveals that Case 'G' gives due considerations to total cost of managing relationship with their design partners covering up to four stages of the procurement value chain including: initial acquisition, reception, possession and utilisation. Looking at levels at which total cost is aggregated within organisations, the DPFM gives specific consideration to the three levels when procuring design services. For instance, at the supplier-level the DPFM considers cost of prequalification of

suppliers, at the order-level cost of auditing designs using external designers in the case of complex projects; and at the unit-level the Unit considers cost of redesign during the operational phases of buildings.

6. Managing Inter-firm Relationships

This aspect investigates the understanding of how the DPFM defines and sees the concept of relationship, which gives a direction to how relationships are managed. G1 defines and describes relationship as understood within the DPFM in particular and Case 'G' in general as '*The coming together of the University represented by the DPFM and design consultants for the provision of design services under a formalised agreement entered by both parties*'. Expatiating on the specific constituents of this definition in relations to processes, G1 further provides that

> *'The relationships we've develop with the design firms that work for us is very cordial and during design processes they see us as part of the design team rather than mere clients. The DPFM plays very important role in identifying the processes involved for every design task and share in the design management function since we have a senior member from the DPFM responsible for the delivery of the design service and who holders and plays key roles in the design team, in fact he ceremonially heads the team. So there is synergy between University and its design consultants. This is due to the importance placed on the processes – the success of the design task depends to a large extent on how its processes were managed. And for this reason we get deeply involved in managing this'.*

From the aforementioned, the DPFM does considers relationship as constituting a set of (complex business) processes as defined by Cousins et al. (2008) but rather manages it albeit partially, based on the agreement entered into by the DPFM on behalf of Case 'G' and the design firm which basically stipulates amongst others: what is required, the offer by the consultant and acceptance by the DPFM; all contained in an 'Engagement of Services' form signed by both parties. An inspection of a sample form revealed that there was no indication as to the nature of the inputs required, processes to be undertaken or output specifics, except stating what should be designed.

On the issue of whether the DPFM considers intra-firm relationship management as much as it does inter-firm, G1 provides the following as the practice of Case 'G':

> *'Getting the right built solution for the University is what the DPFM is responsible for. To be able to satisfy the various Units of the University we must have some form of relationship with them. By this I mean that there must be some sort of arrangements where responsibilities are understood between all the stakeholders. For instance, what we do is that we first identify the responsibilities of a Unit to the DPFM and educate them on our responsibilities to them. Based on understanding of these, we i.e. the DPFM and the Unit enter into an agreement which forms the basis of managing the relationship.'.*

It is evident from the above that some form of relationship exist between the DPFM and the functional Departments in Case 'G', it was necessary to determine if there was any formal 'contract' and 'complex business processes' between them. There was evidence that formal contracts exist. When projects are initiated, written agreements are entered into between the DPFM and the recipient Units detailing the processes entailed and the responsibilities of each of the parties within the processes. Hence, from the aforementioned, Case 'G' does consider intra-firm relationships particularly given that the expected outputs from such relationship are deliberated upon and agreed on by both parties before design consultants are brought in. Case 'G' is a peculiar case compared to the others considered so far, in that design consultants are already engaged even before the initiation of projects. Hence, early involvement of the design consultants assists in identifying problem and solving problem at points where the greatest benefits are derived.

The Interview segment also requires that aspects on relationship management strategies adopted by Case 'G' be investigated (also refer to Checklist Protocol at Appendix A). Reacting to the question on what the DPFM considers when determining the appropriate strategy to manage inter-firm relationships G1 offered that: *'Relationships are managed based on the agreement between the University and*

the design firms. Generic roles and responsibilities of both parties are spelt out in the memorandum of agreement. And then we also have the Standard Conditions which further steers the management of relationships.

Further enquiries were made to find out how either organisational strategy or nature of product influence the strategy for managing inter-firm relationship, it was gathered that though these criteria may not be consciously thought of when managing relationships by the DPFM, in terms of business outcomes with design partners, Case 'G' strategy are those of the long-term, particularly given that consultancy services are based on retainers. And in term of strategic focus, the University is mainly differentiation-focused rather than cost-focused given that their emphasis on 'value for money' revolves around building long-term sustainable business outcomes based on strategic collaborations towards meeting the needs of both its staff and students. Relating these to the Cousins' (2005) Strategic Focused Outcome Model, Case 'G' adopts the 'strategic collaboration' strategy in managing its inter-firm relationships.

Under the strategic collaboration strategy, it is expected that the DPFM and the design firms (the suppliers) do the following: align customer requirements, share basic technology, develop joint capital expenditure and have shared production engineering. When the extent to which these activities are practiced between Case 'G' and their design consultants was enquired, it was found that to some certain extent all the four activities were undertaken but to varying degrees.

The other aspect in relationship management considers the levels of dependency and certainty as a means of determining how relationships can be managed. This aspect was also investigated within Case 'G'. G1 explained that *'Due to the nature of the relationship we have with our design consultants, the DPFM is highly dependent on*

them to get building designs done irrespective of our in-house capabilities, but only where we have made the decision not to "make" but rather to "buy" the design'. One the extent of certainty, G1 explains that: *'Given the level of trust that exist between the DPFM and the design consultants as a result of the long-term relationships established, there is a high level of certainty which reduces the incidence of opportunism where the design consultant may want to take advantage of us*'. From the aforementioned therefore, and based on the Cousins' Strategic Relationship Positioning Model (See Figure 3.12), Case 'G' is positioned within the Strategic collaboration strategy to relationship management and that the nature of their relationship design consultants is in the long-term.

5.2.4.3 Case 'G' Value System Management Practice

1. Value (for Money) Definition and Determination by DPFM

Members of Case 'G' FGD were asked what value meant to the DPFM and their University in general, and upon a moment of agreeable discussions they reached a consensus and agreed that value is *'the characteristics of a building that defines the extent to which it can satisfy its users and for which they can pay for or rather based on the money they have'*. While this definition seem acceptable, it is somewhat generic for the study, hence further probing was done to get Case 'G's definition of value relative to building designs. The DPFM's FGD team reframed the definition thus: '*the ability of the design in capturing those aspects that will provide users satisfaction in the operational phase of the building taking into cognisance the amount of money that is budgeted for the building'*.

From the aforementioned it seems that value is considered on a project to project basis, further probe on this issue (see Question 2 of the FGD Protocol) indicate that in all instance determination of value is done on project basis using a wider variety of

criteria beyond that of the traditional iron triangle are i.e. cost, quality and time. This is in line with the DPFM's definition and description of value which suggests that rather than concentrate on cost, quality and time (which is the traditional approach to determining project performance as against value), the users of buildings would be responsible for determining the aspects of the building that would give them the greatest satisfaction. Hence, what is known of value in building designs in Case 'G' are what is contained in the designs and also are the criteria used in assessing designs.

When asked how value is determined by the DPFM, participants of the FGD were almost instantly agreed on the specifics of the process thus also signifying that a process exists. Upon deliberations amongst the FGD team it was evidence that a value system is in existence in Case 'G' – consisting of a generic set of criteria which is agreed upon by members of the Units (including representations from the direct users), representations from the University Management and the DPFM after project initiation – during stakeholders' meetings. In such meeting consensus is reached amongst the members. Consensus is reached using a scoring system which recognises the importance of each value criteria to the building project which are arrived at through stakeholders' engagement and participation.

2. Stakeholder Management by DPFM

On the issue of managing stakeholders in Case 'G', the FGD team indicates that representatives are sent from the beneficiary Unit and University Management to participate in the determination of value with the generic criteria making up Case 'G' value System. Irrespective of that specialness of projects, the Head of Department or any other assigned person of each Unit interacts with representatives of the DPFM and University's Management, to arrive at the specific requirements in terms of space, functional and technical requirements. Matters of cost are not normally issues to

discuss in such interactions since budgets would have been prepared for each project but which are subject to adjustment as appropriate. During these interactions the beneficiary units are allowed to make their preference in terms of the criteria known to the DPFM and where such falls within the budgetary provisions for the project, they are accommodated within the design. Hence, flexibility in determination of aspects of quality exists in Case 'G'.

Continuing with the process of determining value, Case 'G' FGD team indicates that after settling on the user's requirements, the DPFM prepares the brief for the project in conjunction with the design consultants on behalf of the User Department and gets their endorsement of the document before they become official design documents for the design team to develop their design. The User Department actively participate during the design stage given that Case 'G' allows interactions between the User Department and the design consultants. This wasn't the case in Case 'A'. Apart from these early participation, the beneficiary unit also participate when the final working drawings are presented to the DPFM where they make their contributions. During construction and at handover, beneficiary units are invited to attend site meetings and handing over meetings whereby observations are further made on design matters as well as on construction issues. During these meetings, it was gathered that User actively critique design outcomes. It was gathered that the functional Units of the University are organised in 'Complexes' and every complex has Facilities Officers attached to it, who themselves also form part of the representation of every beneficiary unit as was the case with Case 'B'.

3. Value Dialogues and Value Judgement

From the aforementioned, it is clear that a process exist in the determination of value in Case 'G' and, the opportunity to engage in value dialogues and make value

judgement is also evident during interactions organised by the DPFM between it and the beneficiary units as discussed earlier. This is done to agree on the set of criteria that expresses value for the University in general and for the User Department specifically. Deliberation during the FGD captures and describes the dialogue and judgement process thus:

> *'Determining value for each project is done by interaction between the beneficiary unit, DPFM and the University Management. Hence, the members are drawn from these three Units. The beneficiary unit is normally made up of the Head of the Unit, the Complex Facilities Officer, and any other three members two of whom must be the direct end-users, for instance, students, where classrooms, are involved. The team from the DPFM will mostly comprise of all the relevant members of the built environment relative to building works, chaired by the Director of the DPFM while two members represent the School's management. Basically, members are briefed on performance of recent projects undertaken by the University, bringing out the positive sides of each and the challenges they face in terms of the generic value criteria. During these interactions, the beneficiary unit in conjunction with other members is allowed to come up with weighting and scoring of the value criteria while the DPFM makes contributions in terms of sufficiency of cost, quality and time to meet up the user value specific requirements'.*

From the aforementioned, there is ample evidence of a value dialogue ensuing during value determination interactions in Case 'G' whereby beneficiary units are free to communicate their value criteria as is recommended in the Thomson and Austin (2006) VALiD Framework and using a measuring toolkit similar to AEDET design quality indicator toolkit. Case 'G' does not employ the Kelly and Male (2006) Client Value System Matrix (CVSM). Case 'G' FGD team was further quizzed on how the value criteria are agreed upon. The outcome of their discussion is captured thus:

> *'Members are provided with the assessment pro forma which consist of three main aspects for assessing building design namely functionality, impact and access. Each of these sections have several items describing the building upon members are required to weight each and score them based on how each stakeholder perceive its importance towards the performance of the building. At the end of the scoring exercise, the aggregated weighted score of each is computed which becomes the adjudged importance of the stakeholders judgement. And when these value criteria judgements are seen to reasonably be within budget provision and in line with the University strategy, they become acceptable for that project. Since the beneficiary units are mainly responsible for determining what is value to them and the scoring system*

adopted disagreements seldom occurs. However, when specifications issues are determined, the responsibility of the DPFM, conflict may arise with the beneficiary units. Under such situations, the design team will help out to determine which is best given the requirement of the brief'.

From the exposition above, complementing the value dialogues for projects in Case 'G', value judgements are made based on a weighting and scoring system. In the event that consensus is not reached in terms of specifications (and not value criteria), further efforts are made on agreeing by allowing the design team lend their expertise to arriving at the most advantageous specification within the project constraints.

4. Practical Value Determination of Selected Projects

This aspect of the investigation requires the FGD team to determine the value criteria for five projects selected specifically for the purpose of this research work in line with the criteria and methods discussed in Chapter 4. The members that participated in this aspect of the investigation and their qualifications is shown in Table 5.22 identified as G2 .... G6. The team comprises of architect, builder, M & E Engineer, Quantity Surveyor, and Structural Engineer, having a total working experience of 80 years amongst them, at an average of 16 years. All the participants were involved in the five selected projects investigated for Case 'G'. The particulars of these projects are shown in Table 5.22.

Table 5.22 – Project Information for Case Study G

ProjID	Project Description	Size (m^2)	Cost (₦m)	Status
Pj1	Students Residential Building	5,000	830	2013
Pj2	Block of Classrooms	2,450	386	2013
Pj3	Science Complex	3,000	535	2014
Pj4	Library Complex	3,500	625	2014
Pj5	Administrative Block	3,750	700	2012

All cost exclude external works and Furnishing but includes Preliminaries and contingency sums

The specific projects investigated for Case 'G' comprise a range of project types classified under academic buildings, and residential buildings ranging between N386m – N830m, all of which were completed within 2012 – 2014. All the projects were

funded by Case ‘G’ from internal and external sources. Discussed below are the outcomes of Case ‘G’ FGD team’s determination of value criteria based on the Kelly and Male (2006) Client Value System Matrix, which informed the brief that was given to the design team as a basis for their design. Each outcome was based on the deliberations of the FGD team and their eventual agreement on the criteria.

i. Value Determination of Pj1 for Case ‘G’

Figure 5.16 shows the value criteria of the Students Residential Building constructed and completed in 2013 at the sum of ₦830m.

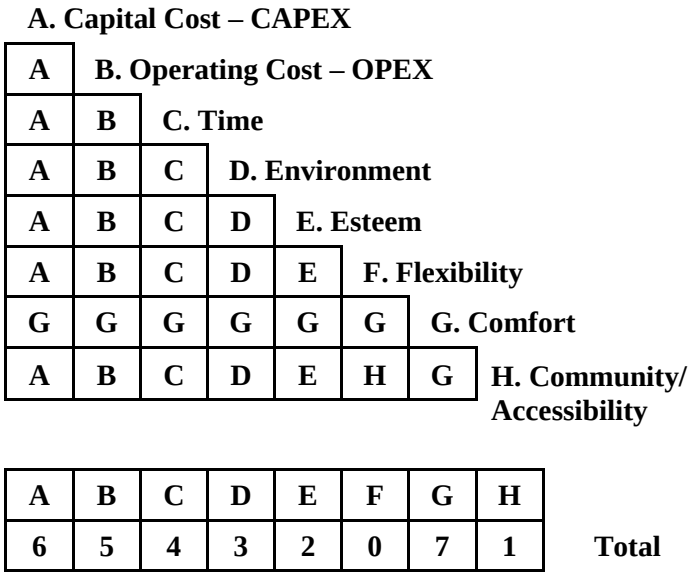


Figure 5.16 – Case G Value System Matrix for Students Residence

Figure 5.16 reflects Case ‘G’ desire for a Students Residential Building which is constructed to provide comfort for students’ use, strictly within approved budget, and cost effective to maintain and operate. The basic constituent of the brief, as shown by the Value System Matrix, slightly differs from the famous iron triangle which reflects Case ‘G’ flexibility in value determination of their projects. The Matrix identifies the following three criteria as most important: Comfort (a measure of quality), CAPEX (a measure of initial cost), and OPEX (a measure of operating cost). Environment (a measure of quality) and time were both next in importance. The values in the Matrix

are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.4.3 (5).

ii. Value Determination of Pj2 for Case 'G'

Figure 5.17 shows the value criteria for the Block of Classrooms constructed and completed in 2013 at a sum of ₦386m..

A. Capital Cost - CAPEX							
A	**B. Operating Cost – OPEX**						
A	**B**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**D**	**E**	**F. Flexibility**		
G	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**C**	**D**	**E**	**F**	**G**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
6	**5**	**4**	**3**	**2**	**1**	**7**	**0**	**Total**

Figure 5.17 – Case G Value System Matrix for Block of Classrooms.

Figure 5.17 reflects Case 'G' desire for a Block of Classrooms which is comfortable for use for staff and students, reasonably constructed within approved budget, and easy to maintain and operate. The basic constituent of the brief, as shown by the Value System Matrix, mirrors the flexibility in Case 'G' considerations of the famous iron triangle towards value determination of their projects. The Matrix identifies the following three criteria as most important: users' comfort, a measure of quality; CAPEX, a measure of initial cost, and lastly OPEX a measure of operating cost. Time and Environment (a measure of quality) were both next in importance, with 'Flexibility' and 'Community/accessibility' been the least important. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.4.3 (5).

iii. Value Determination of Pj3 for Case 'G'

Figure 5.18 shows the value criteria for the Science Complex, constructed and completed in 2014 at a sum of ₦535m.

A	**B. Operating Cost – OPEX**						
A	**B**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**D**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**H**	**D**	**H**	**F**	**G**	**H. Community/ accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**5**	**4**	**3**	**0**	**2**	**6**	**2**	**Total**

Figure 5.18 – Case G Value System Matrix for Science Complex

Figure 5.18 reflects Case 'G' desire for a Science Complex which is strictly constructed within approved budget, comfortable for use by both staff and students, ease to maintain and operate and should have respect for the environment. The basic constituent of the brief, as depicted by the Value System Matrix, largely mirrors the flexible system of the famous iron triangle which Case 'G' applies during value determination of their projects. The Matrix identifies the following four criteria as most important: CAPEX, a measure of initial cost; Comfort, a measure of quality; OPEX, a measure of operating cost and Environment, a measure of building impact on its surrounding. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.4.3 (5).

iv. Value Determination of Pj4 for Case 'G'

Figure 5.19 shows the value criteria for the Library Complex, completed in 2014 at a sum of ₦625m.

A. Capital Cost - CAPEX							
A	**B. Operating Cost – OPEX**						
A	**C**	**C. Time**					
A	**B**	**C**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**F**	**F**	**F. Flexibility**		
A	**G**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**H**	**H**	**H**	**H**	**H**	**H**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
7	**3**	**4**	**1**	**0**	**2**	**5**	**6**	**Total**

Figure 5.19 – Case G Value System Matrix for Library Complex

Figure 5.19 reflects Case 'G' need for a Library Complex which is strictly constructed within approved budget, ease of access for community use, and comfortable for use by both staff, students and other users. The basic constituent of the brief, as shown by the Value System Matrix, also largely mirrors the famous iron triangle which Case 'G' is open to modifying during value determination of their projects. The Matrix identifies the following three criteria as most important: CAPEX, a measure of initial cost; Community/accessibility, a measure of quality; and Comfort, a measure of quality. This is followed by Time; and OPEX, a measure of operating cost. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.4.3 (5).

v. Value Determination of Pj5 for Case 'G'

Figure 5.20 shows the value criteria for Administrative Block, completed in 2012 at the sum of ₦700m.

A. Capital Cost – CAPEX

B	**B. Operating Cost – OPEX**						
A	**B**	**C. Time**					
A	**B**	**D**	**D. Environment**				
A	**B**	**C**	**D**	**E. Esteem**			
A	**B**	**C**	**D**	**F**	**F. Flexibility**		
G	**B**	**G**	**G**	**G**	**G**	**G. Comfort**	
A	**B**	**H**	**H**	**H**	**H**	**G**	**H. Community/ Accessibility**

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	
5	**7**	**2**	**3**	**0**	**1**	**6**	**4**	**Total**

Figure 5.20 – Case G Value System Matrix for Administrative Block

Figure 5.20 reflects Case 'G' need for an Administrative Block, constructed within full consideration of its whole life cycle, comfortable for staff, completed within approved budget, and provide easy access to users and visitors. The basic constituent of the brief, as depicted by the Value System Matrix, largely mirrors the flexible system of the famous iron triangle which Case 'G' applies during value determination of their projects. The Matrix identifies the following four criteria as most important: OPEX, a measure of in-use cost; Comfort, a measure of quality; CAPEX, a measure of initial cost; and Community/accessibility, a measure of quality. The values in the Matrix are used to assess the performance of the design team in terms of team functioning. This is discussed in Section 5.2.4.3 (5).

5. Assessment of Value Delivery in Designs of the Selected Projects

Based on the method discussed in Chapter 4, participants of Case 'G' FGD were requested to assess the performance of the design team at achieving the various value criteria within the designs they produced using the value assessment form (See Appendix C).Table 5.23 show the outcome of analysing the scoring of the Students Residential Building design.

Table 5.23 - Value Assessment of Students Residence for Case G

Value Criteria	FGD Members' Scores (Max Score = 10)					Average Scores	Weight	Weighted Scores
	G2	G3	G4	G5	G6	a	b	c = a * b
A. CAPEX	8	8	9	7	9	8	6	49
B. OPEX	8	8	8	8	9	8	5	41
C. Time	8	8	8	8	8	8	4	32
D. Environment	8	8	8	8	8	8	3	24
E. Esteem	8	8	8	8	8	8	2	16
F. Flexibility	8	8	8	8	8	8	0	0
G. Comfort	9	8	9	8	9	9	7	60
H. Accessibility	8	8	8	8	8	8	1	8
						Aggregated Average Score i.e. ∑c/∑b		**8.23**

Weight is the value contained in the CVSM as shown in Figure 5.16

Table 5.23 show the individual scores given by members of Case 'G' DPFM that participated in this part of the investigation. Using the formula discussed in Chapter 4, the aggregate average design performance score of each building was computed. As shown in Table 5.23, on the average, the participants scored the design team's performance for the Students Residential Building design above average i.e. 8.23 out of 10 points. The same procedure was adopted for assessing the remaining four projects of Case 'G' whose summaries are shown in Table 5.24. Details of the scoring and computation of the average score of each project is shown in Appendix E. These scores represent the measure of Value in Design for projects undertaken by Case G (as depicted in the Conceptual Framework), a proxy for design outcomes.

Table 5.24 – Average Performance of Design Team for Case G

ProjID	Project Description	Performance (=10)		Status
		Range	Average	
Pj1	Students Residential Building	7 – 9	8.25	
Pj2	Block of Classrooms	7 – 9	8.59	
Pj3	Science Complex	8 – 9	8.61	
Pj4	Library Complex	8 – 9	8.91	
Pj5	Administrative Block	8 – 9	8.71	

All cost exclude external works and Furnishing but includes Preliminaries and contingency sums

5.3 Cross Case Analysis: Supply Management Practice

Section 5.2 provide a detailed analysis of four of the ten Universities (client organisations) cased for this section of the research i.e. Case A, Case B, Case E and Case G, the first three been public universities and the last a private university. These stand-alone analyses brought out the peculiarity of each client organisation, specifically showing the extent to which client organisations are similar or differ in the various aspects of both their supply management practices and value system management. To add latitude to the investigation of client organisations, this section and Section 5.3 discusses the cases from an aggregated perspective.

In this section, the cross case analysis of the ten client organisations investigated is with the view to providing a generic understanding of client organisations in the construction industry in terms of their supply management practices. The ten case studies considered are labelled Case A – Case J with Case A – Case E representing public sector client organisations while Case F – Case J represents client organisations in the private sector. The main aspects considered under this section include: classification of Client Organisations in terms of their Supply Management function, strategic considerations of their Supply Management Units, competencies and skills base, performance management, total cost/benefit analysis, and managing inter-firm relationships.

5.3.1 Classification of Client Organisation's Supply Management

The type of supply strategy adopted by a client organisation and its development stage determines the maturity of that organisation and this can be an indication of the effectiveness of the organisation in strategically managing its supply chain (Cousins et al, 2008; Pryke, 2009; Booth, 2010). Almost all i.e. 8 out of 10, of the client

organisations investigated were of the 1st generation, while half of them adopt an implementing strategy, at the best, to supply management and are either at the passive or independent stage of their development.

Cases A, B, D, F and Case H all exhibit these characteristics. Interviews with their respective Directors reveal thus *'We tend to key into the University's strategy and help in achieving them by effectively managing the design consultants engaged'* This is typical of the traditional consideration of the importance of supply function to an organisation i.e. focusing on managing inputs. Two client organisations Case G and Case I both demonstrated that rather than concentrate on managing input they constantly seek collaborative relationship with their design consultant on a long-term basis *'The type of relationship we entered into with the design consultants are long-term and on a retainer basis which enables the building of trust over a period of time to allow for high levels of dependence and certainty'*. Hence Case G and Case I are classified as 2nd Generation Supply Management Unit

None of the client organisations fall under the 3rd generation category due to their inability to view their function as strategic towards achieving their organisational goals and objectives. 3rd generation Supply Management Units manages the supply chains by developing relationships to strategically position them within a market. Some interviewees provided likely reasons for this: *'It is not reasonable to consider Supply Management Units as strategic in Organisation clients that completely outsource the procurement of construction given that sure organisation are not in the construction market and wouldn't compete therein*'.

Three types of strategies have been identified for Supply function of client organisation namely: implementing strategy, supporting strategy and driving strategy.

Five of the Cases studied adopt the implementing strategy while three of them adopt the supporting strategy. Cases A, B, D, F and Case H fall under the former, the reason been that these organisations mainly manages requisition and logistics issues to ensure effective deliveries and are not actively involved in formulation of organisational strategy.

Three of the cases studied are characterised as being at either the independent or supportive stage in term of their development. These are Case E, Case G and Case I. Interviewees from these cases explained that *'.... and despite the fact that we based our strategies on those of the University we tend to maintain some extent of independence in our strategic direction'* Case I; and *'the strategy we operate are derived from the University's organisational strategy and tends to support and strengthen its implementation'* Case E and Case G. In the former Cases i.e. Independent Stage – the organisation basically concentrates on cost reduction and efficiency based performance measures, top management within these client organisations recognises the importance of professional development and opportunities to profitability. While in the latter Cases i.e. Supportive stage – these client organisations involves their design consultants in their core operations within supply management activities, considering consultants and people as valuable resources and they continuously monitor and analyse design markets amongst others.

On their decision to 'make – buy' all the public client organisations and three of the private client organisation align with the buy decision due to the nature of how they manage their inter-firm relationship. For the public clients, they are guided by the Public Procurement Act 2007 and they are limited by it while the private client organisation totally outsources the design function. One of the private client organisations i.e. Case J engages an all-in consultancy firms to handle its Supply

Management function instead of operating theirs as all the others do. The other client organisations i.e. Case G and Case H sometimes buy by engaging design consultants and sometimes undertake the designs using their in-house staff. Three of the client organisations i.e. Case F and Case I provide the design services using their in-house staff and they also offer design consultancies as a Unit outside their Universities.

5.3.2 Strategic Considerations and Alignment

Within supply management, consideration for sourcing strategies is dependent on the competitiveness of the supply market and the technical complexity of the product or the service. These aspects were investigated amongst the cases studied. All the client organisations indicated that to a certain extent they consider both factors when adopting a sourcing strategy. However, there exist differences in how they perceive these factors within the construction market. When asked to describe the impact of designs and/or the design services on the operations of their respective Universities, 8 interviewees i.e. A1, B1, D1, E1, F1, G1, H1, and J1 indicates them as having high impact, explaining thus: *'the quality of output of the occupants of a building is dependent on the quality of the building to some certain extent and this again is dependent on the design itself. One way of improving productive is to improve on the quality of the design. A poorly designed building does not motivate its occupants'*. The two interviewees who indicate that design have low impact on their organisation's operations i.e. C1 and I1 gave this for their choice *'except in very rare occasions, where the design are very complex, the value of design to the University's operation is low though the cost of construction is high it will be difficult to describe the design service as high'*. On the issue of describing the complexity of the design market, 3 interviewees believe that the complexity is high (C1, F1, J1) while 5 interviewees indicate that it is low (A1, D1, E1, H1, I1). Two of the interviewees indicate that the

complexity is *'dependent on the need for specialist design skills but that otherwise it is neither low nor high but rather average' (B1, G1)*.

Investigating the sourcing strategies adopted by the client organisations based on their understanding of the two factors affecting this choice discussed above, it was discovered that some client organisations adopt sourcing strategies contrary to the Kraljic Positioning Matrix (See Figure 3.6). Two of the Client Organisations who indicated both impact of design and complexity of supply market as high adopts either the routine: efficiency strategy (Case C) or the bottleneck: supply continuity strategy (Case F), against the critical: cooperation strategic as depicted in the Kraljic Positioning Matrix. Four of the client organisations that indicated impact of design as high and market complexity as low adopts either the routine: efficiency strategy (Case A, Case D and Case E), or the bottleneck: supply continuity strategy (Case I), against the leverage: best deal strategy suggested by the Kraljic Positioning Matrix. Four client organisations are either fully (Case H & Case J) or partially (Case B & Case G) in conformity with the Kraljic Positioning Matrix on sourcing strategy. Arising from this finding, for the public sector client organisation, the 'leverage: best deal' strategy is the best sourcing strategy to adopt towards enhancing value in design while the 'critical: cooperation' strategy is the best for private sector client organisations. This is in contrast to the current practice of the Nigerian construction industry which is dominated by the routine: efficiency sourcing strategy.

Sourcing strategy affects the sourcing structure adopted by organisations (Cousins, et al., 2008). Hence, the appropriateness of sourcing structure adopted by client organisations was also investigated. All the five public sector client organisations investigated adopts the single sourcing and/or multiple sourcing structures i.e. Case A, Case B, Case C, Case D and Case E. This is against the delegated sourcing and

parallel sourcing suggested by the Cousins et al. (2008) Framework. Three private sector client organisations i.e. Case F, Case G and Case J adopt one or two of the following: single sourcing, parallel sourcing and delegated sourcing. These sourcing structures are in conformity with the Cousins' et al. (2008) Framework which suggest the delegated sourcing and parallel sourcing as the most appropriate structure for the nature of sourcing strategy adopted by these organisations. Case H and Case I adopt the single sourcing and/or parallel sourcing, which are partially in conformity with the Cousins' et al. (2008) Framework.

In terms of alignment of strategies between those of Supply Management Units and those of their organisation, firstly, all the Cases studied demonstrated the existence of corporate-level strategies for construction procurement. For example, one of Case A's strategy states thus: *'In order to put the funds from TETFUND to the maximum benefit of achieving its students' centred programs in terms of accommodation, the University Management commits to utilising 50% of all its allocations between the 2013 – 2017 intervention period towards the provision of befitting 2 – 3 star rated hostel facilities ...'*. For some client organisations, their corporate strategies are design specific, for instance that of Case E *'To explore ways of reducing energy consumption and promote energy efficient buildings, innovative design solutions must be sought to reduce energy use of buildings by 10 - 20% while providing buildings that promotes and enhance service delivery, which are attractive and provide comfort to users'*.

Secondly, within the generic theories of supply management, five factors determine competitive priorities for firms and organisations namely cost, quality, delivery, flexibility and innovation. The outcome of investigating these factors showed that while a combination of all these factors formed the basis of developing corporate strategies for the private sector client organisations only a combination of three of

them i.e. cost, quality and delivery, formed the basis for those of the public sector client organisations. However in Case A, a public sector client organisation, innovation and flexibility inspired the strategy they adopted for a project they undertook in 2013. A1 explained the reason for this *'we had a grant from an International agency to jointly undertake a specialised programme which required a specialised building. To do this and get it right first time, we had to think outside the box'*.

Thirdly, all the five private sector client organisations demonstrated that they indeed have specific strategies, and for two of them, their strategies are independent to those of their organisation i.e. Case F and Case G. They explained that: *'we are the powerhouse of the University's quality assurance programme. The buildings we procure for the University are a statement of our strategies which we believe places the University in good standing and favourable competitiveness in the market'*. There is evidence of alignment in all the private sector client organisations. For the public sector client organisation however, three organisations have specific supply management strategies i.e. Case A, Case B, and Case E but are rather developed informally i.e. the structure for developing and aligning strategies as suggest by Cousins et al. (2008) is not adhered to in toto. In all the instances where supply management specific strategies exist, it was discovered that they were aligned with corporate strategies.

Finally, on the issue on how corporate and supply management strategies are formed, it was evidenced that in majority of the cases studied, the development of corporate strategies are mainly informed by participation of supply management units, and that supply management strategies are developed based on corporate strategies. However, in two of the cases investigated i.e. Case F and Case G, the development of corporate

strategies are championed by the supply management strategies. None of the cases gave an indication or demonstrated that supply management strategies were developed based on inputs from the functional units of their Universities except for Case J. This may seem an impossible task for client organisations: *'Given the largeness of my University, having well over 37 diverse functional units, formulating strategies that will cater for all their differing needs will be extremely difficult to achieve' (Case A)*.

Apart from the largeness in functional units, functional units within Universities, particularly the core functional units (which constitute the largest functional units therein), all key into their respective University's strategic plans (though with inputs from them), for their core function which in this case is *'teaching and research'*. Therefore, for construction-related matters, functional units would not have strategies in this direction as was noted by some of the interviewees e.g. *'It is very rare for us to, and unlikely that we ask for functional unit's input in the development of our strategies since these unit rely on us to provide them the building they need which our strategies shapen and not the other way round' Case B*.

5.3.3 Competencies and Skills

Traditional supply chain management typifies operational supply against strategic supply (Rimmer, 2009, Booth, 2010) and consideration of supply chain management in construction has hitherto been the traditional approach (Prkye, 2009). For this reason therefore, two aspects of competencies and skills requirements for supply management were investigated for this research i.e. the present competencies/skills base of the supply management units of each client organisation and perceptions of the ideal competencies/skills base for strategic supply management.

In terms of the existing competencies and skills base of client organisations and using Cousins' et al. (2008) Strategic Supply Competency Table, 7 out of the 10 Cases studied exhibited competencies and skills in two areas – tactical acquisition and tactical profit i.e. Case A, Case B, Case C, Case D, Case G, Case F and Case I. The specific competencies and skills of these client organisations include: for tactical acquisition – computer literacy, negotiation skills, assertiveness, impact on price margin or profitability analysis; and for tactical profit – numeracy, ability to aggregate needs, impact of volume on cost and profit, negotiation and competitiveness. Of the remaining three client organisations, Case E showed some level of competencies and skills in strategic critical area, while the dominant competencies and skills of Case H and Case J falls within the tactical profit and strategic security areas. The strategic security area is made of these competencies and skills: relationship management skills, inventory management skills, forecasting ability, risk assessment and supply industry knowledge.

Looking at perceptions of the ideal competencies and skills required for contemporary strategic management, interviewees all the client organisations investigated agreed on two areas i.e. the strategic critical and strategic security and as such clearly indicates the deficiency of the current competencies and skills within client organisation pursuant to strategic supply management. However, interviewees C1 and D1 indicated that competencies and skills are needed in the tactical profit area for contemporary supply management. The competencies and skills required for these areas include: for strategic critical – relationship management skills, product/service knowledge, risk assessment, strategic thinking, cross-functional working, and communication skills while those for strategic security are listed above.

Apart from the normal competencies and skills set needed for supply management, specialised skills are also required and these were investigated. Form the interactions with the interviewees, two main areas were identified as lacking in terms of non-existence and inadequacy in client organisations. These are strategic planning competencies and skills and team building competencies and skills. Competencies and skills required for strategic planning include – planning, goal-setting, and completing skills while those required for team building include leadership, decision making and influencing skills. Evidently, all the client organisations investigated have personnel who possess competencies and skills in the following: communication in terms of presenting, public speaking, listening and writing; technical skills in terms of computer literacy, mathematics, and process development; and financial skill in terms of cost accounting, making business case and economics.

5.3.4 Performance Management

Performance management is undertaken by all the client organisations investigate but to differing nature and extent. Of the 10 cases studies only three client organisations are reported to having a formalised system for measuring performance i.e. Case B, Case G and Case H, and in two of these organisations i.e. Case B and Case H, sample forms were actually presented during the interview sessions. For the remaining 7 cases, no formalised system exists for measuring performance thus: '.... *the PWMU also ensures that designers and contractors maintain some certain level of performance ... However, there isn't any written guide to assess performance per se ...' Interviewee A1* or in another instance: *Though there isn't any formalised and structured guideline in measuring designers' performance, the PPPD ensures that metrics for assessing performance are agreed during meetings' Interviewee E1* and yet in another instance *'We really don't need to formalise the performance*

management process. Our designers are the regulars we engage in all our procurement programmes.... they have been with us for a very long time.... our relationships are cordial' Interviewee J1.

When asked the main reason(s) of undertaking performance management, all the interviewees indicated the following: to aid strategic implementation, monitoring and evaluating activities and signalling the actions of people. A third of the respondents i.e. Interviewees A1, E1, and H1 indicated that the reasons also included influencing the actions of people while only two of them i.e. E1 and G1 indicated controlling purchasing activities and identifying critical success factors as reasons. On the issue of the measures considered for performance measurement, for all the client organisations that did not have a formalised system in place i.e. Case A, Case C, Case D, Case E, Case F, Case I, and Case J, their main measures are efficiency and financial. While for Case B, Case G and Case H, all four measures i.e. efficiency, effectiveness, financial and non-financial are considered in the performance measurement metrics they use in their organisations. Interactions with these three organisations gave insights to the reasons they engage the four measures in their metrics for measuring performance. For instance:

> *'While we take very seriously to cost and delivery performances and getting it right time, we also take into cognisance our financial performances and those of our design consultants; also consider performances in terms of development of our designers, intra and inter-firm relationship. This way we can go 360^0 in ensuring that all aspects of our activities are put under the searchlight' Interviewee H1*.

The aspects that the performance measurement is targeted at were also investigated. Literature identifies five aspects namely financial perspectives, customer focus, internal business process, innovation and learning, and supplier performance. All the client organisations target financial perspective and supplier performance, 6 of them target customer focus i.e. Case B, Case C, Case D, Case F, Case G, and Case J; 5 of

the client organisations target innovation and learning i.e. Case B, Case G, Case H, Case I and Case J; while only 2 of them target internal business process i.e. Case B and Case G. Only 2 of the 10 client organisations investigated indicated that all the five aspects of performance measurement were targeted by them i.e. Case B and Case G, only 1 of them i.e. Case J, had a combination of four aspects they targeted, 5 of them i.e. Case C, Case D, Case F, Case H, and Case I, had a combination of three aspects targeted, 2 of them i.e. Case A, And Case E, targeted two aspects. Thus, having only 3 of the client organisations studied i.e. Case A, Case G, and Case J, targeting up to four aspects of performance measurement while the others have three of less, is a rather poor representation at the overall goals of performance measurement for effective supply management.

Investigating the essential features of the performance measurement systems in client organisations revealed that most of the Cases studied demonstrated the ability of the system to: link to corporate objectives, combines different measures, capture both efficiency and effectiveness, balance of qualitative and quantitative and differentiates between measures and objectives. Most of the system are completely lacking in the following aspects and needs to be incorporated: identification of trade-offs; incapable of manipulation; systemic collection and analysis of data; and allowing cross-functional working, while in most of the client organisations improvements are required in the systems' ability to: combine different measures, balance between qualitative and quantitative, and the mix of leading/lagging indicators.

5.3.5 Total Cost/Benefit Analysis

In order to be effective in its supply management functions, client organisations must not only be contributing towards the development and support of the design of their building project but also measure the cost of doing so too. This aspect of the

investigation explores the practices of client organisation in this direction. In almost all the client organisations, except for two private client organisations i.e. Case G and Case J, their approach to cost management is largely dictated by the provisions of the PPA (2007) which does not give any indication as to how costs other than initial costs should be considered by public agencies in their procurement of consultancy services. Actually two private client organisations i.e. Case H and Case I adopts the PPA (2007) as their procurement guideline particularly on matters of costs. Based on this, all the public client organisations, Case H and Case I consider only the initial costs and reception/handover costs as typified by Case A thus: *'.... maintenance cost usually is a consideration during the procurement stage of building. Irrespective of who is funding, whether from IGR or public funding agencies, maintenance cost are left until when they do arise .... how can you now treat design in such manner? .... and besides such redesign are not let out on a consultancy basis'*. Hence, most client organisations are into management of price rather than total cost management.

However Case B gave instances when they considered cost differently whereby cost consideration was not predicated on the limitations of the PPA (2007). In these procurements, the Organisation considered cost covering up to stages of procurement namely initial acquisition, reception, possession and utilisation. This was also the practice in Case G and Case J. Below are excerpts from Case B and Case G that explains the client organisations that considers costs beyond the initial and reception stages:

> *'Cost associated design during the use phase are usually not included in the budget at the planning stages though these cost are considered during the designing of the building to help determine the most advantageous and efficient design in terms of energy saving and maintainability of materials used. Where designs are required at the operational phase of buildings, the DPPPMW undertake these designs mainly because such designs are funded from the IGRs. Interventions from the Federal Government do not consider funding for rehabilitation and refurbishment' [Case B]*.

> *'The modalities for managing design related charges after completion i.e. in-use costs are agreed earlier in the project planning stage, with the design consultants, who are paid on a retainer basis. But where the extent of redesign is small in scope, the DPFM may decide to undertake the design activities at no extra cost to the University since this would have been included in payments made as staff remunerations. And besides, in the event that the extent of redesign is large in scope and the DPFM is embarking on it, funds from the IGR are allocated for rehabilitation and refurbishment works' [Case G]*.

On the levels at which costs associated with building designs are aggregated in client organisations, within the public organisations i.e. Case A, Case C, Case D and Case E, cost aggregation at the supplier level is the most popular consideration. This they indicated was due to the paucity of funds available for procuring public projects, which at present is achieved through Interventions from the FGN.

> *'... and since such [budgetary] provisions are really meagre, we try not to incur more than we are allocated. However little we can allocate to managing the relationship e.g. inspecting consultants' offices to ascertain quality of staff and equipment, etc, we allocate. Though we face a lot of constraints in this area because they form a huge part of the cost incurred when managing a supplier [design organisation], some aspect of it is included in staff emoluments.... The other costs aspects are largely taken care of in staff emoluments really e.g. involving and payments certifications etc' [Case A]*.

For Case B and all the private client organisations i.e. Case F, Case G, Case H, Case I and Case J, design related costs are aggregated at three levels namely supplier, order and unit as typified by Case G:

> *'The largest proportion of supply management cost is paid for through staff remuneration, for the normal duties e.g. managing consultant orders, invoicing and payments etc, while the others are mainly on fixed budgets from the monthly allocations provided by the University e.g. vetting design firms, training cost, transportation cost etc. Where situations so demands, special allocations are requested for and where possible funds are drawn from the PDFM's purse to manage some aspect of the design service related costs.*

5.3.6 Inter-firm Relationship Management

The success of supply management greatly depends on the success of managing the relationships that exists both intra- and inter-firms with the emphasis been more on the later. One of the starting points of achieving success in relationship management by client organisation is in their understanding of the concept itself. Various definitions

were provided by the client organisations. However, there is a common ground for comparing and classifying the varieties of definitions. First, all the definitions clearly provided that there was something that drives the engagement – focus; second, reference to an expectation – outcome; third, reference to some agreement – contract, and four, the main participants – actors.

Some definitions that were provided by some of the Directors are as follows: *The mutual contract between the University and a consultant for the provision of the stipulated service' (Case A);* '*The agreement entered into between the University and design consultants for design services contained in the memorandum of agreement under the conditions stated therein' (Case B); 'The agreement between the University and a consultant for the provision of the stipulated service' (Case E).* Case G's Director defines relationship as '*The coming together of the University represented by the DPFM and design consultants for the provision of design services under a formalised agreement entered by both parties*'.

In all the Cases, a focus and some outcomes were stated in the definition provided, in four Cases i.e. Case A, Case E, Case F and Case H contract was mentioned alongside focus and outcome, while in four Cases studied mentioned was made of all four attributes i.e. Case B, Case D, Case G and Case J. Hence Case C and Case I only mentioned focus and outcome in her definition of relationship. Whilst there is a popularity of three attributes in the definition by client organisation the nature of and context to which these attributes feature in the definition differs. This difference may account for ineffective practices in relationship management. In most of the definitions, the agreement existing between the actors in a relationship was mentioned as the focus. Only in Case F and Case G was 'managing the processes . . . ', and 'the coming together of . . . .' mentioned as the focus respective.

The non-consideration of the specific processes and inputs involved in managing the design by both the client organisation and their design consultants i.e. the actors, by most of the client organisation is indeed atypical to effective relationship management. The reason for the non-consideration of the business processes as the focus of relationships by client organisations may not be unrelated to the general perception within these organisations that managing the design process is the full responsibility of the design team and not that of the client organisation. This is clearly demonstrated by interviewee A1, the Director of Case A thus:

> *'Issues of processes are entirely left to the design professional to deal with. The PWMU does not interfere with design processes for instance. That's what we pay the consultants for and so expects them to provide processes that are suitable for the project. Beside they are in the best position to know which process works well under what conditions'.*

While the existence of managing inter-firm relationships is very clear within client organisations despite the fault in their focus of relationship managing, there isn't such clarity in the existence of managing intra-firm relationships. With the exception of Case B, Case G and Case J, client organisations do not have a formal system in place to manage inter-firm relationships. This corroborates their position of viewing the functional units as not having so much of an influence the design considerations other than participating in value determination, where this was even practiced. In firms that engage in intra-firm relationship management, formal agreement is entered into by the User Departments and their Supply Management Units specifying the inputs required of each party, the processes to be managed and the expected outcomes. Interviewee G1 explanations on how Case G manages its intra-firm relationships typifies does of Case B and Case J thus:

> *'Getting the right built solution for the University is what the DPFM is responsible for. To be able to satisfy the various Units of the University we must have some form of relationship with them. By this I mean that there must be some sort of arrangements where responsibilities are understood between all the stakeholders. For instance, what we do is that we first identify the responsibilities of a Unit to the DPFM and educate them on our*

responsibilities to them. Based on understanding of these, we i.e. the DPFM and the Unit enter into an agreement which forms the basis of managing the relationship'.

In these client organisations, interviewees B, G, and J while noting the added values achieved by managing intra-firm relationship alongside those of inter-firms, advised that further improvements can be achieved when design consultants can be engaged much more earlier in the procurement process so that their expertise are also explored during value determination stage in managing client value systems.

Selecting the appropriate inter-firm relationship management strategies is dependent on some organisational specific factors – organisation's strategy, the nature of service sourced and approach. Investigating these aspects in client organisations reveals that most do not have any mechanism in place for selecting appropriate relationship management strategies. These client organisations include Case A, Case C, Case D, Case E, Case F, Case H and Case I. Hence, it would be difficult generalising the relationship management practices of client organisation other than to conclude that no system exists. But in three of client organisations, there exist a semi-conscious system for managing inter-firm relationships namely Case B, Case G and Case J which has become a pattern in the form of Supply Management practices.

The practices in these organisations entail unconscious consideration of organisational strategy and nature of the design service required when selecting appropriate management strategies and that both that cost and differentiation approaches are adopted in these organisations, the former mostly practiced in the public sector client organisation. Public sector client organisations are constraint to adopt short-term relationships with their design partners while those in the private sector embrace long-term relationships. Given these outcomes, and using the Cousins' (2005) Strategic Focused Outcome Model, the operational collaboration and strategic collaboration

strategies are adopted in managing inter-firm relationships. However, the requirements of these strategies based on the SFOM are not fully complied with by these client organisations.

Dependency and certainty are two factors used in positioning organisations based on the nature of their strategic relationship with their supplier partners. Public sector client organisation tend to be less dependent on their design consultants and are less certain about their expectations from the relationship they engage in with their design consultants. The opposite actually occurs in the private sector client organisations. Based on these outcomes, the nature of the public sector client organisations relationships with their design consultants is describable as traditional/adversarial while that of the private sector client organisations is describable as strategic collaboration.

5.4 Cross Case Analysis: Client Value System Management

Section 5.3 discussed the cross cased analysis of the 10 Case Study conducted to investigate the supply management practices of client organisation in the delivery of value in building designs in terms of: classifying them based on the stage of development, understanding their strategic considerations and alignments, investigating their competencies and skills to undertake strategic supply management as opposed to operational supply management, their performance measurement system, how they undertake total cost management and lastly, an appraisal of their relationship management practices. This section discusses the outcome of analysis carried on how client organisations manage their value systems. Three main aspects are investigated, namely: value definition and determination, stakeholders' management, and value dialogues and value judgements. Data for this aspect of the investigation were collected through FGD in each of the Cases studied.

5.4.1 Value (for money) Definition and Determination

Members of the FGD team were asked to define what value meant their respective organisations. Quite a number of differing definitions were given. Generically, for example the following resulted: *'Achieving the cost and quality target of a project as stipulated by the PWMU on behalf of Case 'A' which is constructed within the agreed time'* ***Case A***. *'Those aspects of a building that gives the users of the building satisfaction and for which they are willing and able to pay for'* ***Case B***. *'Those aspects that exist in the building which the client wants in order to achieve its organisational goals for the amount of money that they have'* ***Case E***. *'the characteristics of a building that defines the extent to which it can satisfy its users and for which they can pay for or rather based on the money they have'* ***Case G***.

These definitions typified the responses for the other client organisations, showing that while client may look at value from different perspectives, they all, to some certain extent present some commonalities. For example, while in some instance, value is considered as been provided for the user by the client organisations (through their Supply Management Units) as is the case in Case A, Case B, Case C, Case E and Case J, in some it is viewed from the perspectives of the users rather than the client (for University buildings/construction projects, the client is different from the users). Clearly therefore, the former definition provided by half of the client organisations investigated indicates the need for improvement in their understanding of value (for money).

When the various FGD teams were asked to relate their definitions of value to building designs a similar response pattern emerged thus: '*the ability of the design to demonstrate that the cost and quality targets of the client can be achieved when it is constructed and within the time envisaged'* ***Case A***. '*capturing those aspects that give*

users the greatest satisfaction in the design within budgetary provisions and in line with the provisions of the client brief' ***Case B***. '*the ability of the design team to incorporate those aspects in the design that makes clients achieves their need for building towards meeting their organisational goals'* ***Case E***. '*the ability of the design in capturing those aspects that will provide users satisfaction in the operational phase of the building taking into cognisance the amount of money that is budgeted for the building'* ***Case G***. Another aspect of these definitions that makes them less suitable as the definition of value is the insistence of the three iron triangle in construction – cost, quality and time – in some of client organisations e.g. Case A, Case C, Case F, and Case I.

On the existence of value systems in client organisations, investigations revealed that there exists a client value system in each of the Cases studied but to differing degrees of implementation and effectiveness. It was also discovered that in some client organisations, determination of value is not done a project basis, but rather at an institutional level or university-wide level e.g. Case A, Case C, Case E, Case F, and Case I. In these Universities, value determination is reliant on the agreed University-wide value criteria which are agreed upon at meetings organised to establish such criteria which are usually from a set of predetermined criteria still within the iron triangle i.e. cost, time and quality. The only exception to this rule is when there is a special building required and for which the preset criteria cannot satisfy/ Generally, determination of value is achieved in any of four approaches – 1) university-wide colloquiums organised periodically to either confirm the predetermined value criteria or update them (which is hardly the case) as practiced in Case A, Case C, Case E, Case F and Case I; 2) interactions between User Department and their Supply Management Units (without or without representation from University's Management)

organised at the commencement of each project to agree on a set of predetermined value criteria, as practiced in Case B, Case D; and lastly, 3) interactions between User Department and their Supply Management Units (without or without representation from University's Management) organised at the commencement of each project to agree on new set of value criteria, defined mainly by the User Departments, as practiced in Case G, Case H, Case J.

5.4.2 Stakeholder Management

Managing stakeholders in term of value determination and value dialogue is dependent on the approaches outlined in Section 5.4.1. Where University-wide colloquia are organised, representatives are drawn from all relevant units of the University to participate in the colloquium to. Thereafter and at the start of projects, the Head of Department/Unit or any other assigned person from the User Department interacts with representatives of their Supply Management Unit (SMU), normally Architects to basically arrive at the specific requirements of the Department or Unit in terms of functional and space requirements. Matters of cost and quality are not normally issues to discuss in such interactions since budgets would have been prepared for each project After settling on the client's requirements, the SMU prepares the brief for and on behalf of the User Department and gets their endorsement of the document before they become official design documents for the design team when they are constituted. The User Department's further involvement in the project is at pre-construction stage where the final working drawings are presented to the SMU and at such presentations the User Department is invited to participate. During construction and at handover, User Departments are invited to attend site meetings and handing over meetings whereby their observations are made on design matters as well as on construction issues.

Where the approach requires that interactions between User Departments and their Supply Management Units (without or without representation from University's Management) on a set of predetermined value criteria takes place, representatives are sent from the User Department to participate in the determination of value and that where there is special requirements outside those of the generic criteria the value System, the User Departments are specifically asked of these requirements for inclusion in the brief which the design team uses. Just as with the previous approach, the Head of Department or any other assigned person interacts with representatives of the SMU, to arrive at the specific requirements in terms of functional and space requirements.

However, quality dominates these discussions and User Departments are allowed to make their preference in terms of quality known to the SMU and where such falls within the budgetary provisions for the project, they are accommodated. In this approach, the User Department actively participate during the design stage given that interactions between the User Department and the design consultants are allow under this approach. The User Department also participate when the final working drawings are presented to the SMUs and at such presentations the User Department to make their contributions. During construction and at handover, User Departments are invited to attend site meetings and handing over meetings whereby their observations are further made on design matters as well as on construction issues. During these meetings, it was gathered that User Departments actively critique design outcomes.

In the event that the approach to value determination adopted requires that interactions between User Departments, their Supply Management Units and representation from University's Management, based on a new set of value criteria, takes place, representatives are sent from the beneficiary Unit and University Management to

participate in the determination of value within the generic value criteria framework. The Head of Department or any other assigned person of each Unit interacts with representatives of the SMUs and their University's Management, to arrive at the specific requirements in terms of space, functional and technical requirements. Matters of cost are not normally issues to discuss in such interactions since budgets would have been prepared for each project but which are subject to adjustment as appropriate. During these interactions the beneficiary units are allowed to make their preference in terms of the criteria known to the SMUs and where such falls within the budgetary provisions for the project, they are accommodated within the design. Thereafter, the SMUs prepares the brief for the project in conjunction with the design consultants on behalf of the User Department who actively participate during the design stage given interactions between the User Department and the design consultants is allowed.. During construction and at handover, beneficiary units are invited to attend site meetings and handing over meetings whereby observations are further made on design matters as well as on construction issues. During these meetings, it was gathered that User actively critique design outcomes.

5.4.3 Value Dialogues and Value Judgements

Given that there exist a value system in all the 10 Cases studied, opportunities for value dialogues and value judgements also exists in each of them. However, investigations showed that these opportunities did not exist where value determination approach is the University-wide colloquium style as practiced in Case A, Case C, Case E, Case F, and Case I. This is evidenced thus:

> *Members are called upon to make observations and give constructive criticisms on matters that bother on the performance of the project, mostly on quality and usage, in the form of lessons learnt for project underway... and more often than not, observations and criticisms made are either withdrawn or watered down because cost constrains the implementations of most of the observations made. Hence, focus is given to quality in terms of specifications*

where finishes e.g. floor and walls predominates such discussions' (Case A and Case E).

However, despite the lack of value dialogues in this approach to value determination, value judgements are been made based on consensus and where this is not immediately possible voting takes place e.g. '*the agreement are read out to which members would either consent to (indicating it as the true position of members on that matter) or rejected conversely. In the event that members disagree, the matter is put to vote' Case E.*

Under the approach where interaction takes place between the User Departments and their SMUs on a predetermined value criteria set, some form of value dialogue ensues between the members that make up the interactive sessions to determine value for each project underway. During these sessions members particularly the User Departments are free to communicate their value criteria as recommended in the Thomson and Austin (2006) VALiD Framework. For instance, some of the FGD teams explained that:

> *'During these interactions, the User Department is allowed to come up with what aspect to consider while the DPPPMW makes contributions in terms of sufficiency of cost, quality and time to meet up the user value specific requirements. However, many an instance, the outcome of such interactions brings some innovative ideas; they are stifled with conflicts between the User Department and the SMUs'.*

However, due to the absence of a system to manage these dialogues, for instance, use of the VALiD toolkit, User Departments in these client organisations are forced to limit their value criteria from a predetermined set in line with the Kelly and Male (2006) Client Value System Matrix (CVSM). The CVSM has 8 Value criteria against the three to five criteria which are mostly used in these organisations. As was the case with the approach discussed above, in the approach, value judgements are made based on consensus during value determination sessions within these client organisations. In

the event that this is not reached in terms of specifications (and not value criteria), further efforts are made on agreeing by allowing the design team lend their expertise to arriving at the most advantageous specification within the project constraints.

Under the approach where interaction takes place between the User Departments and their SMUs on a new set of value criteria, value dialogue ensues between the members that make up the interactive sessions to determine value for each project underway. There is ample evidence to conclude that the client organisations that adopts this approach engage in value dialogues during value determination interactions whereby beneficiary units are free to communicate their value criteria as recommended in the Thomson and Austin (2006) VALiD Framework and using a measuring toolkit similar to AEDET design quality indicator toolkit. These client organisations do not employ the Kelly and Male (2006) Client Value System Matrix (CVSM).

> *'Determining value for each project is done by interaction between the beneficiary units, SMUs and the University's Management... During these interactions, the beneficiary unit in conjunction with other members is allowed to come up with weighting and scoring of the value criteria while the SMUs makes contributions in terms of sufficiency of cost, quality and time to meet up the user value specific requirements'.*

For this category of client organisation, value judgements are made based on a weighting and scoring system. In the event that consensus is not reached in terms of specifications (and not on value criteria), further efforts are made on agreeing by allowing the design team lend their expertise to arriving at the most advantageous specification within the project constraints as evidenced by the FGD teams that belong to the client organisations that adopt this approach to value determination i.e. Case G, Case H, Case J:

> *'Members are provided with the assessment pro forma which consist of three main aspects for assessing building design namely functionality, impact and access. Each of these sections have several items describing the building upon members are required to weight each and score them based on how each stakeholder perceive its importance... Since the beneficiary units are mainly*

responsible for determining what is value to them and the scoring system adopted disagreements seldom occurs'.

5.5 Summary of Case Study

This chapter reports the analyses and findings of the case studies conducted. The study was targeted at exploring the supply management practices of client organisations and how they manage their value system with the view to contributing to understanding of the specific contributions these concepts make towards design outcomes. This is in line with achieving Objective 3 i.e. appraise client organisation practices in terms of supply management and their value systems in procuring building designs. The outcome of the investigation also help confirms the validity of both supply management and value system in the conceptual framework developed in Chapter 3.

5.5.1 Supply Management Practices

The study found that while client organisations are relatively at their infancy stage in term of development of their supply management practices, they are driven by strategies particularly at the corporate level and operational level. Strategies at the functional level at not very popular in these organisations. This projects the supply management practice of client organisations solely as one that pursues cost minimisation as the main purpose of engaging with the supply chain. In half of the cases studied, supply management units are merely implementers of corporate strategy rather than one that harnesses either a supporting strategy or driving strategy. However, there are very few client organisations that have advanced on their development stage – been either at the independent or supportive stage.

While client organisations may seem to be doing well in terms of aligning their strategies within their organisations i.e. intra-firm strategic alignment there seems to exist disagreement on how they view the determinants of strategic sourcing and that

they exhibit mismatches in their consideration of the supply market. For instance, their sourcing strategies and sourcing structures are at variance with the recommended practice from effective supply management, adopting the routine: efficiency sourcing strategy instead of the critical: cooperation strategy. Very few client organisations adopt the appropriate strategy as recommended. A fundamental outcome from this research in terms of sourcing and structuring the sourcing of design services, aside the revelation of the inappropriate practice engaged by client organisations, is that contrary to the recognised sourcing strategy practice of routine: efficiency, the 'leverage: best deal' strategy is the most appropriate to adopt by the public sector client organisation while the delegated sourcing and parallel sourcing structures should be adopted rather than the current practice of using the single sourcing and/or multiple sourcing structure.

Competitive priorities framing corporate strategy tends to be commonly defined by three factors in the public client organisations – cost, quality and delivery; while in addition to these, flexibility and innovation frames that of the private sector client organisations. The incidences of having specific supply management strategies is low in the private section client organisations and even lower in the public sector where in the even they exist are informally managed. Where separate strategies exist at the three levels of organisation, there is more alignment in the private sector organisation than is the case in the public. Development of supply management strategies is particularly challenged by the thinking behind the need and the processes engaged. This may be predicated on the competences and skills areas predominant in client organisations i.e. tactical acquisition and tactical profit. There is a lack of competences and skills in both the strategic critical and strategic security areas. Also lacking in

client organisations are two critical supply management specific skills sets namely strategic planning and team building.

Performance management practice is diverse amongst client organisations with only a few operating a formalised system. The main reason client organisations undertake performance measurement is evaluative rather than strategic. Most of the public sector client organisations mostly rely on efficiency and financial measures as basis for measuring performance. The main targets of performance measurement are financial, customer, and innovation and learning (mostly by the private sector client organisation). Very few client organisations considers all the five targets hence the practice is uncommon amongst them. Though the performance measurement systems operated in client organisations i.e. where they exist excels in its tactical aspect. Its strategic aspect need to be improved on.

5.5.2 Value System Management Practices

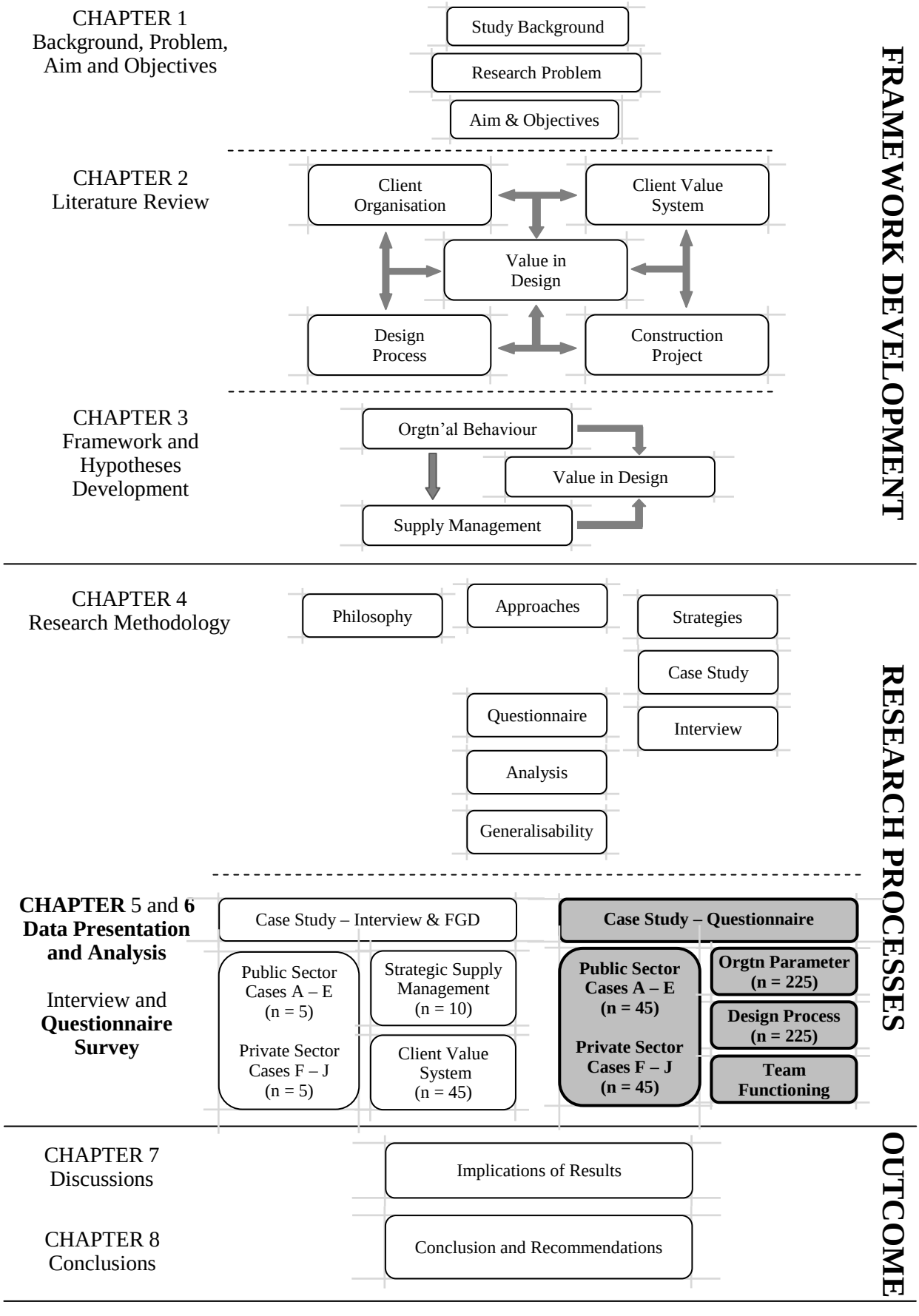
Value definition and determination is the foundation upon which value delivery rest. Client organisations offers divergent understanding of value as it relate to their buildings and views it determination from varied perspectives – client organisation determines value for the user or the user determines value themselves. In the former instance, the iron triangle in construction still dominates the definition of value. This is in spite of the existence of value systems in all the client organisations. In terms of value determination, the systems recognise two approaches institutional-wide approach and project-wide approach. Between these approaches are four methods three of which are not applicable to the university-wide approach.

Managing stakeholders by client organisations somewhat follows a textbook approach – identification, engagement and monitoring. Though, the importance of considering

stakeholders is higher when the value system is project-wise rather than organisation-wise. Under project-based value systems, user departments in most client organisations (public particularly) are not typically involved during the core design process – it suffices for them to participate in defining and determining value and thereafter participate in site meetings during the construction phase. And, since user department's influences are rather subsumed in those of the Supply Management Units in most client organisations, they are not seen as the most important stakeholders in terms of building designs. This is in spite of their involvement in value determination – value dialoguing.

Value dialoguing is not practiced under the institution-wide approach to value determination – the case in half the client organisations investigated. Where they do occur, no system is in place to manage the dialoguing process, thereby losing its essence. This notwithstanding, two approaches to value dialoguing exist in client organisations – restrictive and flexible. Under the former approach, value judgements are minimally done and are mostly by consensus – majority while in the latter some weighting and scoring systems are adopted.

Chapter 6 – Survey Analysis & Results: Determinants of Value in Design



6.1 Introduction

This section discusses the descriptive analysis based on descriptive statistics performed on the data collected. The essence of this analysis is to provide a basis for arriving at an aggregated general description of the underlying patterns derived from the data collected. An understanding of this generalised pattern will greatly assist with the subsequent analyses that are performed to establish relationships that exist within the patterns derived hereunder. The section discusses these patterns using frequency analysis, measures of central tendencies and tests of differences in responses based on respondents' demography.

6.2 Frequency Analysis

6.2.1 Respondents Demography

The first section of the survey questionnaire solicits specific information about the respondents. This information is meant to give a brief picture of the nature of respondents' characteristics that may potentially affect interpretation of the analysis conducted on the data collected. These characteristics have been known to significantly affect responses gathered through surveys conducted using questionnaires (Appendix A). And where they exhibit such effect they serve as control variables in the establishment of influence between the variables under study. Table 6.1 summaries the respondents' specific information and forms the basis for the descriptions below.

Table 6.1 – Respondent's Demographic Information

Demographic Characteristics	Frequency	Per cent
Educational Sector		
Public	150	66.7
Private	75	33.3
Profession/Representation		
Client Organisation	45	20.0
Architecture	45	20.0
Building Services Engineering	45	20.0
Structural Engineering	45	20.0
Quantity Surveying	45	20.0
Years of Experience		
1 - 5 yrs	12	5.3
6 - 10 yrs	37	16.4
11 - 15 yrs	118	52.4
16 - 20 yrs	33	14.7
Greater 20 yrs	25	11.2
Years in Current Institution		
1 - 5 yrs	20	8.9
6 - 10 yrs	72	32.0
11 - 15 yrs	90	40.0
16 - 20 yrs	30	13.3
Greater 20 yrs	13	5.8
Position in Organisation		
Lower Management	22	9.8
Middle Management	59	26.2
Upper Management	144	64.0

Sample size = 225

Data were solicited from a high proportion of respondents in public educational sector (66.7%) while the remaining 33.3% came from those in the private sector. The reason for the high solicitations from the public sector is due to the existence of an operational procurement act regulating the conduct of public procurement in Nigeria – the Public Procurement Act 2007. Given this therefore, practices and procedures within the public sector is expected to be highly standardised. This is in addition to the reasons advanced for the selection of tertiary institutions as cases from educational sector to study in Chapter 4 and further supported by the revelation of the non-existence of a common unified standard or operational guide applicable to private universities as discovered in Chapter 5.

Despite the existence of a procurement act regulating public universities, their approaches to managing value in design is expected to differ. This expectation is founded on the absence of frameworks within the public sector guiding and directing on how value in design should be managed by each procuring entity. Hence, the aforementioned preposition is suggestive that due to the absence of a guide on achieving value in building designs, both public and private universities rely on practices that are specific to them and that any noticeable difference in their value systems is due to organisation specific parameters. Differences in client value systems across the various universities are adequately explained within the subjective view of assessing value in construction considered from the perspectives of stakeholders value judgement based on personal values (Thomson, Austin, Mills, & Devine-Wright, 2003; Thomson & Austin, 2006; Mills, 2013).

The even distribution of respondents across profession (i.e. 20% for each) was achieved by design as explained in Chapter 4. An outcome of analysing the cases studied during the interview and focus group discussion sessions reveals that in all the universities cased and the projects which formed the basis of this aspect of the research, five distinct professions/representations participates in the design phase of the projects. And since the unit of analysis for this section of the research is the design team, all the members that participated in the 45 projects studied fully participated in this survey. Hence, in each of the 45 projects, one representative from the client organisation, architectural firm, building services firm, structural engineering and quantity surveying firms participated depicting a 20% representation for each. This equal proportioning eliminates designed biases which may occur due to unbalanced or loaded proportioning across professions/representatives. The membership of the design teams surveyed is in line with definitions and descriptions of construction

teams in general and design team in particular as given by Chan, Ho, & Tam (2001), Winch (2002) and Commission of Architects for the Built Environment (2010).

Experience has been mentioned severally in literature as fundamental to effective teamwork and even more so in the dialogue for value judgement that takes place at the design process (Kelly, Male, & Graham, 2004; Murray & Moses, 2005; Male, Kelly, Gronqvist, & Graham, 2007)(Kelly, Male, & Graham, 2004; Murray & Moses, 2005; Male, Kelly, Gronqvist, & Graham, 2007). In line with this therefore, respondents were asked information about their years of experience in the industry and years in their current employment. Approximately 22% of the respondents have up to 10 years working experience, 52.4% have worked between 11 to 15 years while approximately 26% of them have worked for greater than 16 years. A slightly different response pattern was depicted in the years the respondents have worked in their current employment: approximately 40% of the respondent have either worked for up to 10 years or 11 – 15 years in their current institutions while about 20% have been in their current employment for more that 16 years. This findings implies that responses were gathered from a well experienced pool given that a greater proportion of the respondents (78.2%) possessed more than 11 years working experience with more than half of them having worked for more than 11 years at their current institutions.

Buttressing the respondents' level of experience is the position they occupy. Almost all the respondents are at or above middle management (90.2%) with those at top management accounting for about two third of them (64%). Aside coming from an experienced pool, the data collected also came from a pool that is largely homogenous and not over-diversified in terms of team membership composition. Team membership diversify factors – age, experience and position do have an impact on team's effectiveness (Mullins, 2010; Robbins & Judge, 2013). Further, given these

characteristics of the respondents, there is a high level of confidence to conclude that the responses given by the respondents are credible, factual and that they do accurately describe the phenomenon of interest.

6.2.2 Main Research Variables

To achieve objectives 3 and 4, five main constructs – generated from the review of literature and further articulated within the conceptual framework i.e. Chapter 3, formed the basis of investigation. This includes three constructs representing the independent variables – *client's roles, contextual factors* and *composition factors*; one construct defining the mediating variable – *design process*; and lastly another construct defining the response variable – *design team functioning*. These constructs were operationalised within 14 variables, consisting of 10 independent variables and 3 mediating variables. These variables, together with the response variable are investigated using a five-point measuring scale. To aid discussions in this section and ease comparison between responses based on the scales used, the scales are aggregated to either a two-point scale or a three-point scale as appropriate. For instance, the measure of importance and performance of client roles is aggregated to a two-point scale discriminating against 'low importance – high importance' and 'low performance – high performance' respectively. A detailed result of the analysis based on the original five-point scale used to arrive at the aggregated scales presented in this section is shown in Appendix F.

6.2.3 Independent Variables – Client's Roles, Context and Composition

6.2.3.1 Client Roles

For the three distinct client roles investigated, respondents were asked to rate how: 1) important they are in ensuring a successful design process and outcome towards achieving value for money in building designs – i.e. Importance; and 2) the client

organisation performed or discharged the function – i.e. Performance. The reason for investigating the importance is to get an understanding of the extent to which members of the design team believe that these roles are important in aiding them during the design process and if indeed client organisations should consider performing them. Performance was measured based on what each member perceives as outcomes during their interaction within the design teams they participated in. Table 6.2 gives an aggregated pattern of the responses detailing outcomes for both *Importance* and *Performance.*

Table 6.2 - Frequency Distribution of Importance/Performance of Client's Roles

Client's Roles and Responsibilities	**Importance**		**Performance**	
	LI	**HI**	**Low**	**High**
Leadership				
Clearly identify client structure and responsibilities	7.6	92.4	39.2	60.9
Provide resource for continuity and leadership	0.4	99.5	24.4	75.5
Develop and share brief prior to the design stage	30.2	69.7	29.8	70.2
Ensure compliance to standards/best practice	0.9	99.1	26.8	73.3
Getting the right people for the right job at right time	0.0	100.0	37.4	62.7
Drive collaborative and flexible procurement policy	0.0	100.0	61.8	38.2
Demand effective quality management processes	0.4	99.6	20.9	79.1
Insist on adoptions of collaborative behaviours.	0.0	100.0	50.6	49.3
Procurement and Integration				
Set behavioural and performance example	5.8	94.2	61.8	38.2
Evaluate decisions using criteria agreed upon	14.2	85.8	74.7	25.4
Insist on ‘early-warning culture’ from all involved	14.2	85.8	32.4	67.6
Establish long term relationships with partners/firms	5.8	94.2	68.1	32.0
Understand and align with partners value system	14.7	85.3	68.9	31.1
Design Quality				
Have clear criteria for selecting design team	1.8	98.2	64.5	35.5
Ensures robust change control process	7.1	92.9	58.7	41.3
Understand the key drivers for the design	14.6	85.4	57.4	42.6
Ensures that design delivers required function	2.6	97.4	57.8	42.2
Considers whole life cycle principles	12.4	87.6	97.8	2.2
Use of modern technologies	14.6	85.4	58.7	41.4
Use of design quality indicators	20.4	79.5	53.8	46.2

LI – Less Importance. HI – High Importance

Table 6.2 shows that client roles are generally accepted to be of 'high importance' indicating that the respondents judged them either as 'highly important' or 'extremely important'. The Table on 'Importance' of Client Role in Appendix 'F' further shows that none of the roles is judged 'Not Important' while only a few are judged as 'Less Important'. Those that were judged 'Less Important' were done by a very small proportion of the respondents (0.4 – 11.1%).

Specifically, 'Leadership' role did have the highest incidence of 'high importance' ranging from 92.4% to 100% except for 'develop and share brief prior to the design stage' which 30.2% of the respondents believe to be of 'low importance'. While these roles are believed to be of 'high importance', performing them by the client organisations are not in sync with the level of importance attached to them. For instance, 38.2% to 79.1% of the respondents believed that the client's organisation performance of the 'Leadership' role is 'high' i.e. they rated them as either 'very high' or 'extremely high'. Four role attributes are rated as 'low' by a significant proportion of the respondents namely: 'clearly identify client structure and responsibilities' (39.2%), 'getting the right people for the right job at right the time' (37.4%), 'drive collaborative and flexible procurement policy' (61.8%) and 'insist on adoptions of collaborative behaviours' (50.6%).

Majority of the respondents (85.3 – 94.2%) indicate that both the 'Procurement and Integration' role and the 'Design Quality' role are of 'high importance'. However, an appreciable proportion (between 12.4 – 20.4%) believes them to be of 'low importance'. While it may be understandable why this is so for the 'Procurement and Integration' role (which may be due to difficulty of directly connecting these roles to design outcomes), it is somewhat difficult explaining why this is so for the 'Design Quality' role given that this role do have direct impact on deign outcomes. However,

one possible explanation may be that these members may believe that client organisations should not be bothered about matters on design quality but should rather be those of the designers. The outcome of the interviews conducted and interactions during the focus group discussions sessions supports this assertion – members of the client organisations (made up of design professional) concurred that design matters – particularly quality related - are better left to the design consultants to solve. There isn't any recognisable formal mechanism in place to manage design quality within client organisation.

On the issue of performance, the 'Procurement and Integration' role and 'Design Quality' role both have a relatively high incidence of 'low' performance, again not in sync with the level of importance attached by respondents. For all the attributes in these two role categories, more than half the respondents (ranging between 53.8 – 97.8%) indicate that client's performance is 'low' that is ranging between 'very low' (3.6 – 16%), low (1 – 27%) and moderate (24 – 62.2%) (as shown in Appendix F). Role attributes for which respondents rated the client organisation with the lowest performances include (in descending order): 'considers whole life cycle principles' (97.8%), 'evaluate decisions using criteria agreed upon by all parties' (74.7%), 'understand and align with partners value systems' (68.9), 'establish long term relationships with design partners' (68.1%), 'having clear criteria for selecting design team' (64.5%), and 'set behavioural and performance example' (61.8%).

6.2.3.2 Context-based Factors

Contextual factors relates to those operational attributes expected of client's organisation which are known to affect design teams effectiveness. Respondents were asked to indicate their level of disagreement/agreement to the extent to which client organisations exhibited these attributes during the course of the specific design

process they participated in. For this aspect the five-point measuring scale is aggregated to a three-point scale – Disagree (combining 'Strongly Disagree' and 'Disagree' from the original scaling used in the questionnaire), Neutral (same as the original scale), and Agree (combining 'Strongly Agree' and 'Agree' from the original scaling used in the questionnaire). Table 6.3 presents the outcome of the frequency analysis. Majority of the respondents (62.3 – 70.7%) generally 'agree' that client organisations provide the necessary resources required during the design stage and that these resources are adequate.

Table 6.3 - Frequency Distribution of Extent of Contextual Factors

Contextual Factors Affecting Design Teams	Disagree	Neutral	Agree
Adequate Resources from Client Organisation			
Provided timely information	4.9	24.4	70.7
Proper equipment and adequate staffing	8.9	24.0	67.2
Necessary support and encouragement	4.4	27.6	68.0
Adequate administrative assistance	8.0	29.8	62.3
Organisational Structure of Client Organisation			
Clear definition of each member's role	9.3	24.4	66.3
Agreeing on specifics of work with members	12.0	24.4	63.6
Integrating and fitting individual members skills	12.4	24.0	63.6
Responsibility for teams performance	15.6	30.7	53.8
Clear channel of communication	16.0	28.0	56.0
Empower member by delegating responsibility	12.4	24.0	63.6
Leadership by and Culture of Client Organisation			
Leadership focus on work not persons	17.8	30.7	51.6
Ensure shared leadership	8.8	27.6	63.6
Promotes trust among team members	13.8	7.1	79.2
Encourages trust for team leadership	15.1	14.2	70.7
Willingness of members to take risks	8.4	6.2	85.4
Willingness to expose team's vulnerabilities	29.8	12.9	57.4
Performance Evaluation & Reward by Client			
Evaluates team rather than individuals	55.6	12.0	32.5
Encourages joint accountability	56.9	12.0	31.1
Group-based appraisals	33.8	35.2	31.0
Profit/gains sharing incentives	40.0	28.8	31.2

However, an appreciable proportion of the respondents (24.0 – 29.8%) remain 'neutral' on this aspect indicating that for these respondents, the client organisations they consulted for sometimes exhibits these attributes and in equal proportion, they do not exhibit them. Resources have the lowest incidence of 'disagree' from the respondents ranging from 4.4% to 8.9%.

'Organisational Structure of Client's organisation' is seen to be adequate given that majority of the respondents (53.8 – 66.3%) 'agree' that members roles are clearly defined, work specifics collectively agreed upon, client being responsible for teams performance, and there exist clear channels of communications. This response patterns is also almost replicated for 'Leadership by and Culture of Client Organisation'. Majority of the respondents (51.6 – 85.4%) 'agree' that the client organisation provides the needed leadership within the design teams, promotes trusts among members, allow members to wilfully commit and conduct themselves. However, a significant proportion of the respondents 'disagree' on these two aspects – Organisational structure (9/3 – 16.0%) and Leadership and Culture (8.4 – 29.8%). Of particular mention is 'willingness to expose team's vulnerabilities' making 29.8% of the respondents 'disagree' that the leadership style and culture of the client organisation allows for full disclosure of problems faced by the teams during design processes.

As is the case with 'Resources', an appreciable proportion of the respondents remain 'neutral' indicating that both 'Organisational Structure' (24.0 – 30.7%) and 'Leadership and Organisational Culture' (6.2 – 30.7%) are sometimes adequate toward enhancing the design process and in some instances they are not adequate. Specific attributes with high incidences of respondents been 'neutral' are: 'responsibility for

teams performance' (30.7%), 'clear channels of communication' (28.0%), 'leadership focus on work not persons' (30.7%), and 'ensure shared leadership' (27.6%).

While respondents generally 'agree' that client's organisation provides the necessary and adequate resources, and that they have both structure and culture that enhances the design process, they tend to 'disagree' more on the aspect that relate to 'Performance Evaluation and Reward by Client'. A third to half the respondents (33.8 – 56.9%) 'disagree' that client organisation have measures in place to enhance design output in terms of evaluating teams performance, encouraging collaborative accountability and profit sharing incentives. Only a third of the respondents (31.0 – 32.5%) 'agree' to the client organisation exhibiting these attributes during the design stage. High incidences of respondents 'neutrality' are noticed in: 'group-based appraisals' (35.2%), and 'profit/gains sharing incentives' (28.8%).

6.2.3.3 Composition Factors

The composition of design team members plays a significant role in the effectiveness of the team. To this end therefore, respondents were requested to provide information on the extent to which they felt members of their team exhibited the characteristics under investigation. The initial five-point scale used is aggregated to a three-point scale for the purpose of this section thus: Low (combining 'Very Low' and 'Low' from the original scale used in the questionnaire), Average (reflecting 'Moderate' in the original scale) and High (combining 'Very High' and 'High' from the original scale used in the questionnaire). The outcome is shown on Table 6.4 and discussed below. However, it is worth noting that none of the attributes investigated herein was rated as 'Very Low' by the respondents (See Appendix F).

Table 6.4 - Frequency Distribution of Performance of Composition Factors

Composition Factors Affecting Design Teams	Low	Average	High
Members Abilities			
Technical knowledge and expertise	1.3	45.3	53.4
Problem-solving skills	1.3	50.2	48.5
Decision-making skills	1.3	32.0	66.7
Interpersonal skills	1.3	15.1	83.6
Personality of Members			
Appreciably relating well with others	1.3	30.7	68.0
Cooperation and trust for others	1.3	22.2	76.4
Responsibleness and dependability	0.9	23.1	76.0
Highly organised and persistence	0.9	32.4	66.7
Emotional stability	0.9	16.9	82.2
Openness, creativity and sensitivity	0.9	13.8	85.3
General Roles			
Coordinating and integrating efforts	0.9	28.4	70.7
Initiates creative ideas	0.9	56.0	43.1
Champions ideas after been created	0.9	36.9	62.2
Offers insightful analysis of opinions	0.9	55.6	43.6
Provides directions and follow through	0.9	55.1	44.0
Examines details and enforces laws	1.8	44.9	53.3
Fight external influences to team	1.8	45.8	52.4
Encourages search for more information	3.1	44.9	52.0

Regarding the composition of design teams, respondents tend to be unanimous that the extent to which team members exhibited the attributes relating to members' abilities, their personalities and the general roles they each play within the design process is anything but 'low'. For instance, for 'Members Abilities' only 1.3% of the respondents rated them as such, 0.9 – 1.3% for 'Personality of Members, and 0.9 – 3.1% for 'General Roles'. Generally, respondents expressed that the design teams they were a part of performed slightly higher in terms of 'Personality of Members' (66.7 – 85.3%) compared to 'Members Abilities' (48.5 – 83.6%). Regarding the 'General Roles' of design team members, there is a mix in the consistency of patterns which have played out in the other variables so far considered – wherein attributes within variables are rated similarly by the respondents particularly for scales at extremities. For this aspect i.e. 'General Roles', there are some attributes that less than 50% of the

respondent rated as 'high', for example 'initiates creative ideas', 'offers insightful analysis of opinions' etc; while for some more than 50% rated them as such e.g. 'coordinating and integrating team members efforts', 'champions ideas after been created' etc.

A considerable proportion of the respondents indicate that the teams they participated in exhibited the composition attributes to an 'average' level for the 'Members Abilities' (15.1 – 50.2% of the respondents) and the 'General Roles' (28.4 – 56.9% of the respondents) variables. An 'average' level suggests that for these two aspects, there is a relatively high incidence of having only half the membership of the design teams exhibiting these attributes during the design process with the other half not exhibiting them. The 'Personality of Members' variable showed a relatively lower incidence of 'average' (13.8 – 32.4%) compared with those of the 'Members Abilities' and 'General Roles' variables as shown above.

6.2.4 Mediating Variable – Design Process

Design Process was conceptualised as a mediating variable based on evidences from the review of literature in Chapter 2 and Section 3.1, and the development of the conceptual framework in Section 3.2. This aspect of the research is a major contribution to studies relating to team performances in the construction industry in terms of considering mediators between factors affecting team effectiveness and team performance. Three variables which are known to significantly impact on team processes in general, were investigated namely: communications, collaboration and conflict resolution. To each of them, respondents were requested to provide the level of their disagreement/agreement to the extent to which the various attributes were exhibited/demonstrated by the team during the design process for each of the project they participated in. The scales discussed here have been aggregated from a five-point

scale to a three-point scale measuring disagreement/agreement in terms of 'Disagree' (combining 'Strongly Disagree' and 'Disagree' as used in the questionnaire), 'Neutral' (same as scale in questionnaire), and 'Agree' (combining 'Strongly Agree' and 'Agree' as used in the questionnaire). Table 6.5 depicts the result. It is worth mentioning however, that only very few of the attributed were rated as either 'Strongly Disagree' or 'Disagree' and where they are, only few respondents did (1.3 – 12.0%) as shown in Appendix F.

Communications within the design teams is seen to be just barely adequate given that only about half the respondents (42.2 – 58.7%) 'agree' that project briefs and design information are available, adequate time is given, and team members are given authority to modify briefs if there was any need for it. An appreciable proportion of the respondents (37.8 – 43.6%) indicate that they are 'neutral' to the design team members exhibiting or demonstrating these attributes. Very few totally 'disagree' on the 'availability of project briefs/client requirements' (16%) and 'authority to modify brief/requirement if need be' (14.2%).

Table 6.5 - Frequency Distribution of Design Process Performance

Design Process Related Factors	Disagree	Neutral	Agree
Communications			
Availability of project brief/client requirements	16.0	37.8	46.2
Adequate time for deliberations on brief	0.0	41.3	58.7
Availability of design related information	0.0	41.8	58.2
Authority to modify brief/requirement if need be	14.2	43.6	42.2
Collaboration			
Translate client's objective to team goals	0.0	30.7	69.4
Interdependence of members on each other	7.1	42.2	50.7
Confidence and trust amongst members	0.9	34.2	64.9
Members' total sense of commitment to the team	0.0	30.7	69.4
Conflict Resolution			
Common problem solving approach	4.9	58.2	36.9
Common understanding of the design problem	0.0	66.2	33.8
Existence of interpersonal incompatibility	0.0	67.6	32.4
Conflicts on task to be performed	0.0	68.0	32.0

Design teams exhibits some appreciable levels of collaborations amongst their members. This is supported by having above half the respondents 'agree' that the team translates client's objectives to team specific goals (69.4%), team members are interdependent on each other (50.7%), there is confidence and trust among team members (64.9%), and that each member is totally committed to the team (69.4%). About a third of the respondents maintain a 'neutral' position on these attributes suggesting that sometimes these attributes are demonstrated by team members and sometimes they are not.

Conflict resolution during design process did not enjoy the level of agreement enjoyed by collaboration among team members. Majority of the respondents (58.2 – 68.0%) are 'neutral' in agreeing on the existence of a common problem solving approach, common understanding of the design problem, and the existence of interpersonal incompatibility amongst members of their design teams. Only a third 'agree' on this attributes.

6.2.5 Response Variable – Design Team Functioning

The outcome of the design process is the design solution (output). However, the relationship between these two variables – design process and design solution is rather one of an indirect nature. This relationship is further mediated by the design team functioning. For the purpose of this chapter and in line with achieving objectives 3 & 4, design team functioning is considered a response variable to client's organisation parameters (independent variables) mediated by the design process. To this end therefore, respondents were requested to provide information about the extent to which their team functioned toward achieving value for money in the designs they developed. The scales discussed here have been aggregated from a five-point scale to a three-point scale measuring disagreement/agreement in terms of 'Disagree'

(combining ‘Strongly Disagree’ and ‘Disagree’ as used in the questionnaire), ‘Neutral’ (same as scale in questionnaire), and ‘Agree’ (combining ‘Strongly Agree’ and ‘Agree’ as used in the questionnaire). Table 6.6 outlines the frequency distribution. There are some attributes that respondents ‘Strongly Disagree’ with but only by a negligible few (0.4 – 1.8%) while only a few of them ‘Strongly Agree’ (0.4 – 5.8%) as shown in Appendix F.

Table 6.6 - Frequency Distribution of Team Functioning

Team Functioning Related Factors	Disagree	Neutral	Agree
'Value' was explicitly defined for the design	12.0	35.1	52.9
Brief contained function-quality-cost requirements	6.2	43.6	50.2
Client's 'Value' requirement understood by team	6.2	43.6	50.2
Functions and quality met client's expectations	8.9	42.7	48.4
Cost objectives were met and/or exceeded	10.7	46.2	43.1
WLC formed the basis for design decisions	16.0	41.8	42.2
Efforts made to balance function-quality-cost	13.8	40.4	45.8
Budgets were adjustable to meet function/quality	3.6	50.7	45.8
Achieving client's value was the primary driver	7.5	37.3	55.1
There exist a recognisable client value system	10.7	39.6	49.8

Team functioning i.e. performance, is at an average level given that only about half the respondents (48.4 – 52.9%) ‘agree’ that their teams met the functioning parameters. For instance, the team had and did worked with an explicit definition of ‘value’; that the brief they used contained specific requirements for function, cost and quality; the value requirements of client was fully understood by the design team; the team was able to meet or exceed the design objectives in terms of function and quality. Team performance in terms of functioning is below average in some instances – ‘Cost objectives were met and/or exceeded’ (43.1%), ‘WLC formed the basis for design decision’ (42.2%), ‘Efforts made to balance function-quality-cost’ (45.8%) and ‘budgets were adjustable to meet function/quality’ (45.8%).

A significant proportion of the respondents (35.1 – 50.7%) are 'neutral' on the extent to which their teams functioned (performed). These set of respondents are of the opinion that the functioning attributes were sometimes exhibited or demonstrated in their teams and sometimes they are not i.e. while undertaking their design responsibilities for a particular project, *sometimes the team functions as expected (based on the attributes investigated herein) and sometime they don't*. While it may be slightly difficult understanding why respondents will not distinctly agree or disagree on these attributes, a possible explanation for this may be the nature of the value system of the client organisation as revealed during the interviews and focus group discussions contained in chapter 6. It was found that while the term 'value' is still understood to literally mean *'quality'* (i.e. specification) and *'cost'* (not exceeding budget) considered in isolation within client organisations (function is perceived therein to be usually implied), it is believed that value considerations are only within the responsibility of architects and quantity surveyors. Briefs are normally only discussed with the architect. Hence, it is expected that a large proportion of the 'neutral' response should come from the other professionals.

To investigate this proposition and corroborate the interview findings (or otherwise) on the client value systems, a cross tabulation analysis was carried out to identify the pattern of responses to these attributes categorised by respondents' profession. The result of the cross tabulation showing only the 'neutral' response is depicted in Table 5.7. There is some appreciable level of consistency – in term of 'neutral' response across professions within the design teams and a noticeable neutralising effort from the pattern generated. For instance, while a profession e.g. Client may be having high proportions in some of the attributes (e.g. value explicitly defined – 15, understanding client's value – 18, meeting client's cost objectives – 18) and low in others (e.g. brief

contain requirements – 19, budget adjustability – 15), another profession e.g. Struct would inverse its pattern i.e. having low (value explicitly defined – 14, understanding client's value – 13, meeting client's function requirement – 17) and high (e.g. brief contain requirements – 22, budget adjustability – 18) respectively for similar attributes.

Table 6.7 - Distribution of 'Neutral' Response to Team Functioning by Profession

Team Functioning Related Factors	Client	Arch	M & E	Struct	QS	Mean
'Value' was explicitly defined for the design	15	16	21	14	13	**16**
Brief contained function-quality-cost requirements	19	18	23	22	16	**20**
Client's 'Value' requirement understood by team	18	20	22	13	25	**20**
Functions and quality met client's expectations	17	20	17	17	25	**19**
Cost objectives were met and/or exceeded	18	18	31	15	22	**21**
WLC formed the basis for design decisions	15	17	23	14	25	**19**
Efforts made to balance function-quality-cost	16	19	24	14	18	**18**
Budgets were adjustable to meet function/quality	15	24	34	18	23	**23**
Achieving client's value was the primary driver	15	22	16	16	15	**17**
There exist a recognisable client value system	19	21	15	17	17	**18**

Figures expresses number of respondents

Further, there isn't any noticeable profession that proportionally outweighed the others, except for some isolated incidences (in comparison to the mean values), and where they occur, they weren't consistent to any one or group of profession(s). An exception however, is the building engineering services profession showing proportions that are consistently above the mean values. Hence, the proposition that *value issue are matters solely for architects and quantity surveyors to solve* as found while investigating client value system is not supported by the questionnaire survey finding, given that both the architects and quantity surveyors responded similarly to the other professions.

A possible reason for the differing perceptions in both the interview and survey findings on whose responsibility it is to manage value at the design stage may be due to the difference in target respondents. While the interviews and focus groups drew

participation from client organisations only, the survey drew from design consultancies i.e. architecture, building services engineering, structural engineering and quantity surveying. The latter, whose unit of analysis is design team involving representatives of the client organisations as members of the teams, presents a fair, balance, objective and more justifiable response. This been true, it can be inferred that client organisations unknowingly shy away from their responsibilities of managing value in building design, by emphasising that these roles are solely those of the design professionals.

6.3 Measures of Central Tendency of the Determinants

Getting an overall picture and pattern of the several variables in a dataset (for the purpose of aggregate analysis – which serves the need of achieving Objective 3) would require measuring the central tendency of each variable/observation or a combination of them as may be required. Amongst the main measures of central tendencies – mode, median and mean, the mean is the most robust given its unique properties and being the basis for undertaking inferential and statistical tests (Barrow, 2006). This section presents the mean values and standard deviations statistics describing the attributes making up the various research variables and associated statistical test that support employing mean statistics to describe the dataset.

6.3.1 Test for Normality

The appropriateness of the mean statistics as a measure of central tendencies holds only when the variables under consideration approximate to a normal distribution (Barrow, 2006). Available test of normality for dataset containing variables that are continuous and quantitative in nature are numerous. The following were used: numeric shape estimators/descriptors – trimmed mean, skewness, kurtosis, normal Q-Q plots. The Kolmogorov-Smirnov test was further applied to test the significance of the fit.

This method overlay a normal curve on the actual data and assesses the fit; a significant test i.e. having p – value less than 0.05 indicates poor fit (Norusis, 2004; Tabachnick & Fedell, 2001; Tashakkori & Teddlie, 2003). Table 6.8 shows essential statistics describing the distribution shape of observations for importance of client's roles while Figure 6.1 further provides visual perspectives and associated statistics for those of performance of client's roles different from those shown in Table 6.8.

Table 6.8 - Test of Normality for Importance of Client Roles

Client's Roles/Responsibilities	Mean	5% Trim Mean	Median	Std Dev	Skewness	Kurtosis
Clearly identify client structure and responsibilities	4.30	4.33	4.00	0.602	-0.235	-0.602
Provide adequate resource to maintain leadership	4.48	4.48	4.00	0.510	-0.022	-1.757
Develop/share detailed brief prior to the design stage	3.98	4.03	4.00	0.060	-0.411	-0.764
Ensure compliance to standards and best practice	4.49	4.50	4.00	0.519	-0.149	-1.530
Getting the right people for the right job at right time	4.52	4.52	5.00	0.501	-0.081	-2.011
Drive collaborative and flexible procurement policy	4.49	4.49	4.00	0.501	0.045	-2.016
Demand effective quality management processes	4.45	4.45	4.00	0.034	0.085	-1.746
Insist on adoptions of collaborative behaviours.	4.58	4.59	5.00	0.494	-0.336	-1.904
Set behavioural and performance example	4.40	4.45	4.00	0.598	-0.446	-0.660
Evaluate decisions using evaluation agreed criteria	4.24	4.26	4.00	0.683	-0.336	-0.851
Insist on 'early-warning culture' from all involved	4.22	4.24	4.00	0.676	-0.294	-0.822
Establish long term relationships with partners/firms	4.37	4.41	4.00	0.593	-0.342	-0.680
Understand/align with other partners value system	4.21	4.24	4.00	0.681	-0.294	-0.844
Have clear criteria for selecting design team	4.36	4.36	4.00	0.516	0.209	-1.083
Ensures robust change control process	4.28	4.31	4.00	0.588	-0.154	-0.542
Understand the key drivers for the design	4.08	4.10	4.00	0.625	-0.171	-0.017
Ensures that design delivers required function	4.36	4.37	4.00	0.549	-0.222	0.226
Considers whole life cycle principles	4.26	4.29	4.00	0.678	-0.455	-0.431
Use of modern technologies	4.09	4.15	4.00	0.887	-1.066	0.696
Use of design quality indicators	4.02	4.08	4.00	0.935	-0.861	-0.003

An inspection of the shape descriptors reveals that the observations mirror normal distribution given that the values of their mean, trimmed mean and median (when mean values are converted to whole numbers) are not too different from each other. In fact in all cases, the trimmed mean is the greater where not same. The skewness values

are on the average generally closer to zero except for few having values above 0.300 and particularly ‘Use of modern technologies’ having a skewness value of -1.066.

However, the presence of skewness (either a positive or negative) in all the observations is an indication of a less than perfect normal distribution fit. Table 6.9 presents the fitness test performed indicating that all the attributes do not significantly fit a normal distribution, given that their p – values are all less than 0.05. However, looking at the Q-Q Plots of these observations, shown in Figure 6.2 and based on the low values of skewness and standard deviations (non have value greater than 1.000), the mean values are indeed a representation of measures of central tendencies and that they adequately describe the distribution of the attributes under investigation.

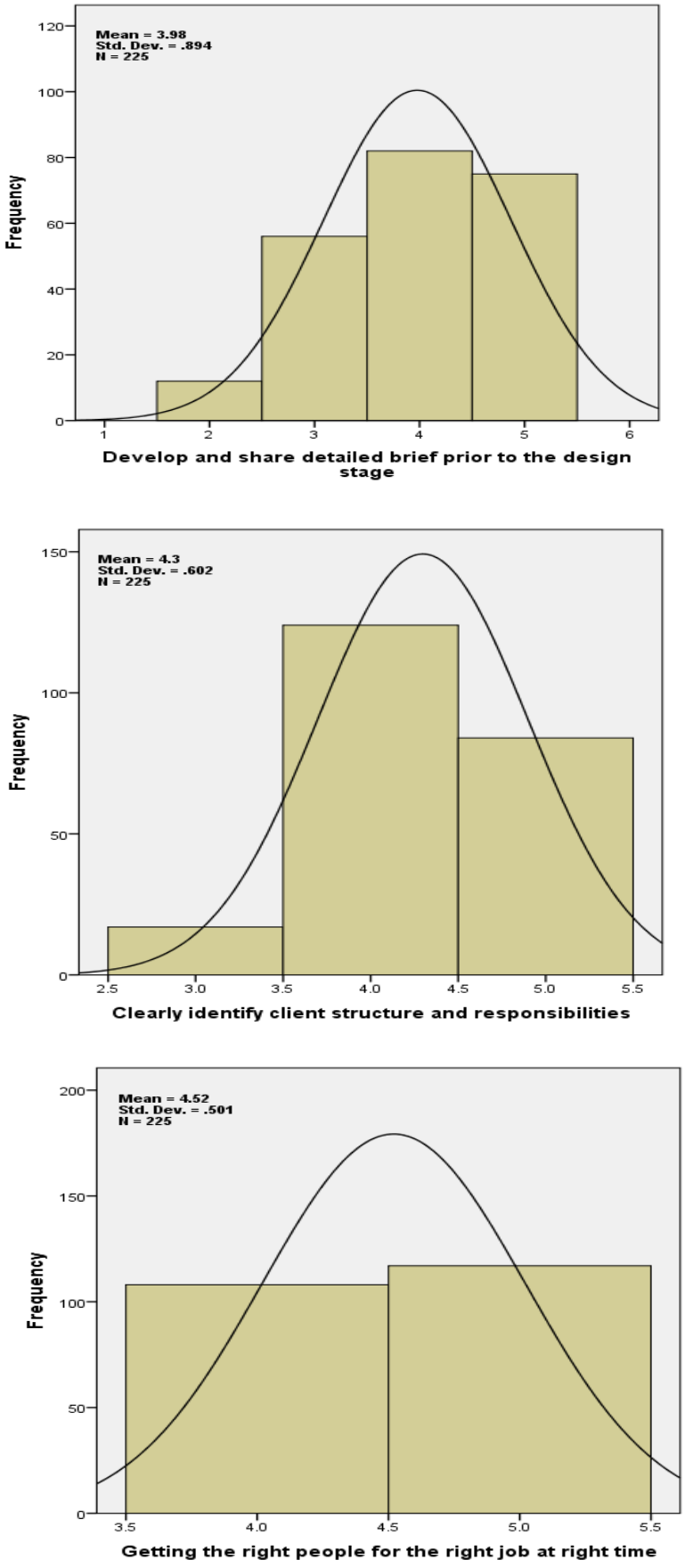


Figure 6.1 – Histogram of selected client role attributes showing nature of distribution

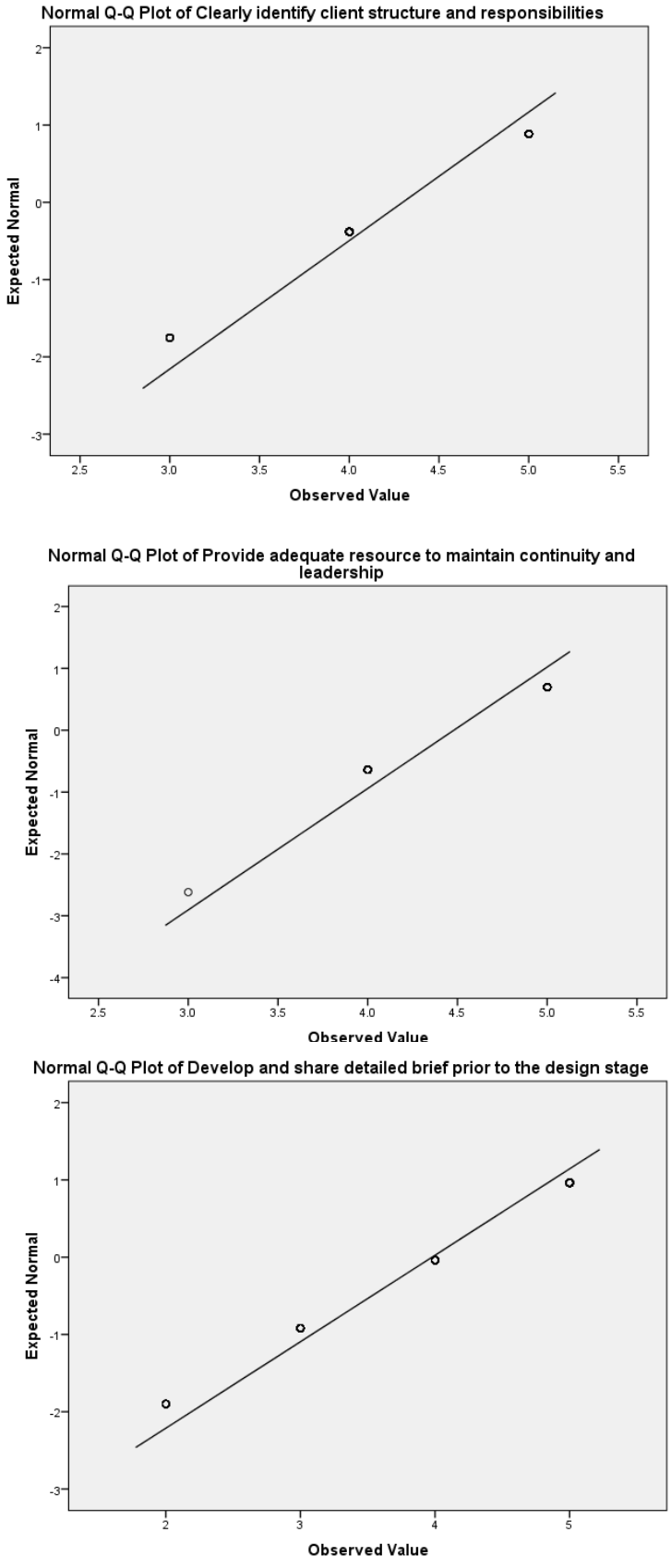


Figure 6.2 – Q – Q Plot of selected client role attributes

Table 6.9 - Non-parametric Tests of Normality for Importance of Client's Roles

Client's Roles/Responsibilities	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
Clearly identify client structure and responsibilities	0.316	225	0.000
Provide adequate resource to maintain leadership	0.342	225	0.000
Develop and share detailed brief prior to the design stage	0.208	225	0.000
Ensure compliance to standards and best practice	0.336	225	0.000
Getting the right people for the right job at right time	0.351	225	0.000
Drive clear, collaborative and flexible procurement policy	0.347	225	0.000
Demand effective quality management procedures	0.356	225	0.000
Insist on adoptions of collaborative behaviours.	0.383	225	0.000
Set behavioural and performance example	0.302	225	0.000
Evaluate decisions using evaluation criteria agreed upon	0.257	225	0.000
Insist on 'early-warning culture' from all involved	0.266	225	0.000
Establish long term relationships with partners/firms	0.305	225	0.000
Understand and align with other partners value system	0.263	225	0.000
Have clear criteria for selecting design team	0.381	225	0.000
Ensures robust change control process	0.332	225	0.000
Understand the key drivers for the design	0.318	225	0.000
Ensures that design delivers required function	0.355	225	0.000
Considers whole life cycle principles	0.261	225	0.000
Use of modern technologies	0.313	225	0.000
Use of design quality indicators	0.288	225	0.000

[a] Lilliefors Significance Correction

6.3.2 Importance of Client's Roles

Importance measures are common in researches that set out to apply constructs to study phenomena either (1) where the constructs been investigated is newly developed or (2) where existing constructs are applied to new phenomena (i.e. under a different context than previously existed). This research takes up the two combination - the constructs developed for this research were adopted from existing studies and modified to suit the research requirements on the one hand while on the other, the phenomenon of interest – influence of client's organisation on value is design is new. Hence an investigation of importance of the client's role is of paramount significance

towards achieving the study aim. Another reason for studying importance is that performance (or for use of an appropriate term to suit the study requirement – outcome e.g. behaviour) correlates highly with the level of importance attached therein (Robbins and Judge, 2013). Table 6.10 shows the descriptive statistics of the importance of client's roles by design team members while Figure 6.3 further illustrates the mean relative to the frequency of respondents who voted them as 'Extremely Important'. All the roles approximates either to 'Very Important' or 'Extremely Important'. Specifically, design team members indicates that the 'extremely important' roles of client organisations to achieving value in building designs include (in order of their mean values and standard deviation): 'Insist on adoption of collaborative behaviours', 'Getting the right people for the right job at right time', 'Drive collaborative and flexible procurement policy', 'Ensure compliance to standards and working to best practice', 'Provide resources for continuity and maintain leadership', and 'Demand effective quality management processes'. These roles all have the highest proportion of 'Extremely Important' ratings as shown in Figure 8.3 ranging between 46 – 58% making up 6 of the 8 'Leadership Roles' variable. Hence, the 'Leadership Roles' of client organisations are the most important roles considered by design team members during design stages of building projects.

Table 6.10 - Descriptive Statistics of Importance of Client's Roles

Client's Roles and Responsibilities	Mean	Std Dev	Order
Leadership			
Clearly identify client structure and responsibilities	4.30	0.602	11
Provide resource for continuity and leadership	4.48	0.510	5
Develop and share brief prior to the design stage	3.98	0.894	20
Ensure compliance to standards/best practice	4.49	0.519	4
Getting the right people for the right job at right time	4.52	0.501	2
Drive collaborative and flexible procurement policy	4.49	0.501	3
Demand effective quality management processes	4.45	0.508	6
Insist on adoptions of collaborative behaviours.	4.58	0.494	1
Procurement and Integration			
Set behavioural and performance example	4.40	0.598	7
Evaluate decisions using criteria agreed upon	4.24	0.683	14
Insist on 'early-warning culture' from all involved	4.22	0.676	15
Establish long term relationships with partners/firms	4.37	0.593	8
Understand and align with partners value system	4.21	0.681	16
Design Quality			
Have clear criteria for selecting design team	4.36	0.516	9
Ensures robust change cotrol process	4.28	0.588	12
Understand the key drivers for the design	4.08	0.625	18
Ensures that design delivers required function	4.36	0.549	10
Considers whole life cycle principles	4.26	0.678	13
Use of modern technologies	4.09	0.887	17
Use of design quality indicators	4.02	0.935	19

All the other roles considered approximates to 'Very Important' (based on their mean values) with the following being the next six most important roles showing their proportion of 'Extremely Important' votes in parenthesis: 'Set behavioural and performance examples' (46%), 'Establish long term relationships with partners and firms' (43%), 'Have clear criteria for selecting design team' (37%), 'Ensures that design delivers required function' (39%), clearly identify client structure and responsibilities' (37%), and 'Ensure robust change process' (35%). These roles are those of the 'Procurement and Integration Roles' category, 'Design Quality' Roles and the 'Leadership' Roles category respectively.

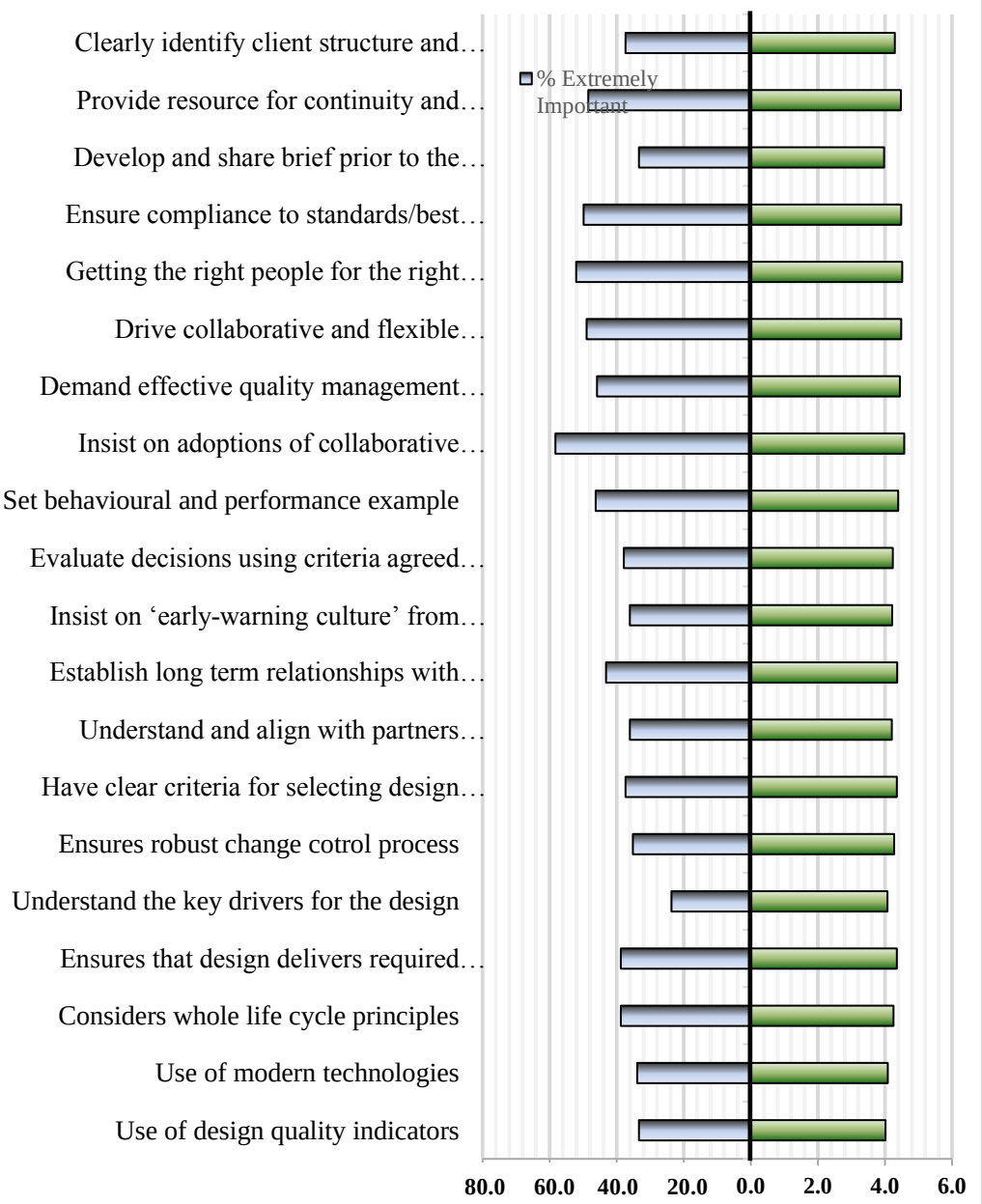


Figure 6.3 - Frequency 'Extremely Important' and Means of Importance of Client's Roles

The next set of 6 most important roles are drawn from 'Procurement and Integration' roles and the 'Design Quality' roles categories, with the former having three of them namely: 'Evaluate decision using criteria agreed upon' (38%), 'Insist on early-warning culture from all involved' (36%), and 'understand and align with partners value systems' (36%). This outcomes therefore makes the 'Procurement and Integration' roles category the second most important roles followed by those of 'Design Quality' having three of the four least important roles though judged 'Very Important'

including: ‘Use of modern technologies’ (34%), ‘Understand the key drivers for the design’ (24%) and ‘Use of design quality indicators’ (34%). The least important of the roles is ‘Develop and share brief prior to the design stage’ (33%).

6.3.3 Performance of Client’s Roles

One of the objects of this research is to find out the influence of client’s organisation on the design process, hence ‘performance’ (as perceived by the respondents) of the client’s organisation and that of the design process is required. This section discusses those of the client roles comprising ‘Leadership’ roles, ‘Procurement and Integration’ roles and ‘Design Quality’ roles. Respondents were requested to rate the performance of the client organisation on each of the client’s role attributes based on a five-point scale ranging from 1 signifying ‘Very Low’ performance to 5 signifying ‘Very High’ performance. The mean values and standard deviations of the performances for these three categories of client’s roles investigated are shown in Table 6.11 while Figures 6.4 and 6.5 further illustrates their means relative to the frequencies of respondents who judged them ‘Very High’ and between ‘Very Low’ to ‘Moderate’ respectively. The mean values of the role attributes ranges from 2.57 – 3.89 i.e. ‘Moderate’ and ‘High’. None assumed a ‘Very High’ status. Though the high standard deviations ranging between 0.850 – 1.126 is suggestive of some dispersions within the observations and mean values. However, such dispersions does not invalidate the suitability of the mean as a measure of their central tendencies as shown in the test for normality discussed in Section 6.1.2.1.

Table 6.11 - Descriptive Statistics of Performance of Client's Roles

Client's Roles and Responsibilities	Mean	Std Dev	Order
Leadership	**3.69**	**0.898**	
Clearly identify client structure and responsibilities	3.68	0.924	6
Provide resource for continuity and leadership	3.89	0.865	1
Develop and share brief prior to the design stage	3.81	0.851	4
Ensure compliance to standards/best practice	3.84	0.918	3
Getting the right people for the right job at right time	3.64	0.856	7
Drive collaborative and flexible procurement policy	3.26	0.909	18
Demand effective quality management processes	3.89	0.931	2
Insist on adoptions of collaborative behaviours.	3.48	0.931	9
Procurement and Integration	**3.30**	**1.015**	
Set behavioural and performance example	3.28	0.906	17
Evaluate decisions using criteria agreed upon	2.72	1.126	19
Insist on 'early-warning culture' from all involved	3.76	0.988	5
Establish long term relationships with partners/firms	3.29	1.102	16
Understand and align with partners value system	3.44	0.953	13
Design Quality	**3.32**	**0.948**	
Have clear criteria for selecting design team	3.49	0.955	8
Ensures robust change control process	3.46	1.039	12
Understand the key drivers for the design	3.48	1.035	10
Ensures that design delivers required function	3.47	1.026	11
Considers whole life cycle principles	2.57	0.710	20
Use of modern technologies	3.44	1.021	14
Use of design quality indicators	3.33	0.850	15

Again, as was the pattern noticed under the 'Importance' measures, client organisations exhibits their highest performances in these roles – 'Provide resource for continuity and maintaining leadership' (3.89), 'Demand effective quality management processes' (3.89), 'Ensure compliance to standards and working to best practice' (3.84), 'Develop and share brief prior to the design stage' (3.81), 'Insist on early-warning culture from all involved' (3.76), 'Clearly identify client organisational structure and responsibilities' (3.68), 'Getting the right people for the right job at right time' (3.64), 'Have clear criteria for selecting design team' (3.49), 'Insist on adoption of collaborative behaviours' (3.48), 'Understand the key drivers for the design' (3.48), 'Ensures that design delivers required function' (3.47), 'Ensures robust change control process' (3.46). These roles fall under 'High' performance. The other roles fall under the 'Moderate' performance category thus bringing out two distinct performance

levels – High Performance and Moderate Performance. None of the roles fall under either the ‘Very Low’ performance category or the ‘Low’ performance category.

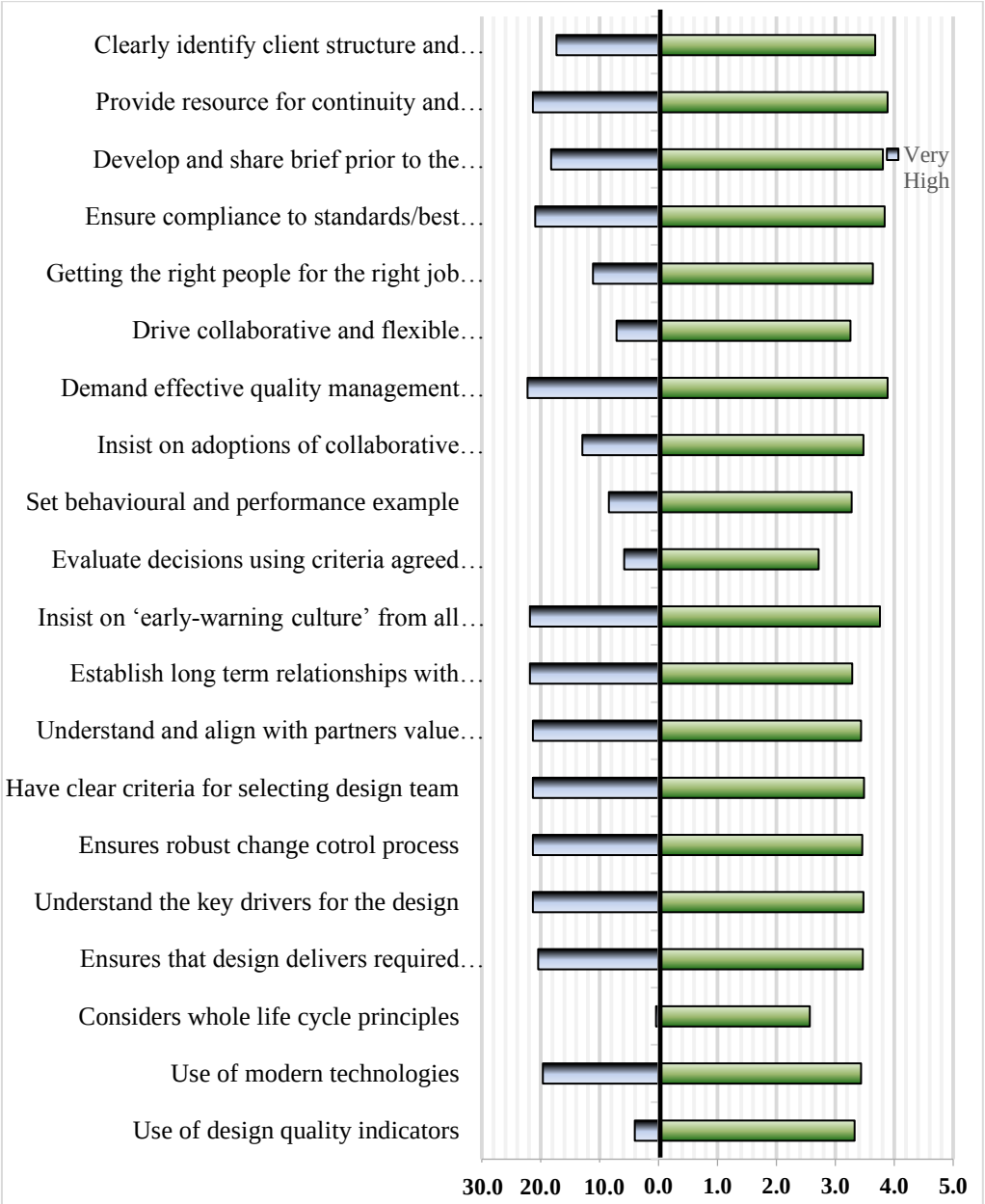


Figure 6.4 - Frequency 'Very High' and Means of Performance of Client's Roles

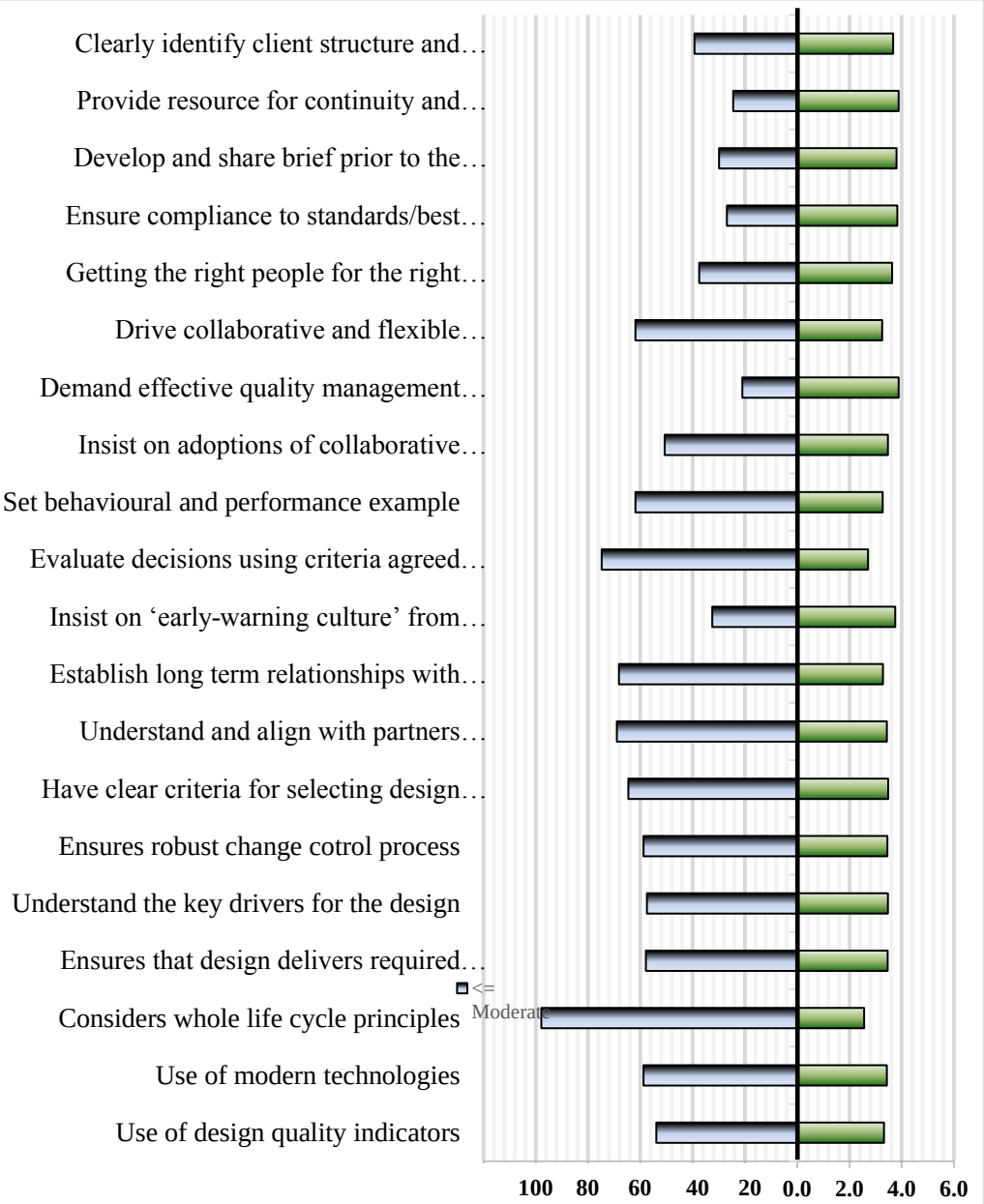


Figure 6.5 - Frequency 'Very Low - Moderate' and Means of Performance of Client's Roles

Table 6.12 presents client's organisation roles classifying them in order of their performance and specific role categories – Leadership, Procurement and Integration and Design Quality.

Table 6.12 – Client Roles categorised based on Performance

Client's Roles	High Performance	Moderate Performance
Leadership Roles	*Provide resource for continuity and maintaining leadership (1); Demand effective quality management processes (2); Ensure compliance to standards and working to best practice (3); Develop and share brief prior to the design stage (4); Clearly identify client organisation structure and responsibilities (6); Getting the right people for the right job at right time (7); Insist on adoption of collaborative behaviours (9).*	*Drive collaborative and flexible procurement policy (18),*
Procurement and Integration	*Insist on 'early-warning culture' from all involved (5)*	*Understand and align with partners value systems (13), Establish long term relationships with design partners (16); Set behavioural and performance examples (17); Evaluate decisions using criteria agreed upon (19).*
Design Quality	*Have clear criteria for selecting design team (8); Understand the key drivers for the design (10); Ensures that design delivers required function (11); Ensures robust change control process (12)*	*Use of modern technologies (14); Use of design quality indicators (15); Considers whole life cycle principles (20).*

Figures in bracket denote the ordering of roles based on their mean values

Clearly Table 6.12 indicates that client organisations give their best performances in their 'Leadership' roles, with regards to the design process, followed by their 'Design Quality' roles, though based on their mean values, these performances are not rated 'Very High' on the average. Client organisations' performances in all their 'Procurement and Integration' roles are 'Moderate' including some of their 'Design Quality' roles. Based on the aggregated mean values of the performances of client organisation roles, they perform best in their 'Leadership' roles, followed by 'Design Quality' roles then lastly, their 'Procurement and Integration' role as shown in Table 6.11 and corroborated by Table 6.12.

Despite these acceptable levels of performances a question worth asking is, are they satisfactory? One way of objectively determining satisfactory levels from subjective responses as the ones collected for this study, is to compare the level of 'Importance' with that of 'Performance', a method applied by Cheng (2008) in a study on an

assessment framework for client's satisfaction. Cheng (2008) indicates that a satisfaction level is a function of performance and importance such that:

$$Average\ Satisfaction = Performance\ mean\ (Pm) - \ Importance\ mean\ (Im)$$

However, Cheng's formula may not be too apt in terms of interpretability when it comes to measure of satisfaction level and would therefore require some form of transformations. Although, Cheng refers to satisfaction average not satisfaction level, they are considered similar Hence, while agreeing with Cheng's consideration of satisfaction being a function of both performance and importance, the argument that the relationship between the variables is one based on additive/subtractive properties is slightly modified. These properties lead to distances separated by a measure of the magnitude of the quantities of interests, if and only if the two quantities are measuring the same object. Since satisfaction is a state of being brought about by combining different levels of two or more 'states of being' (for instance expectations i.e. input on the one hand and actual performance i.e. outcome on the other) then it holds that a measure of satisfaction based on these objects should be guided by that of proportionality properties rather than additive or subtractive. Hence Cheng's formula is modified thus:

$$Satisfaction\ level\ (S_l) = \frac{Performance\ mean\ (P_m)}{Importance\ mean\ (I_m)}\ x\ 100\%$$

Based on the above equation, Table 6.13 is constructed showing the satisfaction levels of the various client roles investigated. Figure 6.6 also reflects the mean values of 'Importance' to that of 'Performance' for each of the client roles. Generally, client organisations attained satisfaction levels below 100% (ranging between 60 – 96%) in performing their design related roles towards obtaining value for money in building

designs. However, using some cut-offs to designate the scores thus: 0 – 50% as *'Dissatisfactory'*, 50 – 70% as *'Satisfactory'*, 70 - 90% as *'Very Satisfactory'*, 90 – 100% *'Extremely Satisfactory'*, and greater than 100% as *'Beyond Expectations'*, one distinct class of satisfaction level is evident i.e. roles client organisations performed *'Very Satisfactory'*. This class of satisfaction level represents 85% of the design related roles investigated. Satisfaction level is outstanding in the client's organisation role of 'Develop and share brief prior to the design stage' earning the 'Extremely Satisfactory' status. This may seem strange given that it ranked 4th in terms of mean performance level and ranked 20th (the lowest) in terms of Importance.

Table 6.13 - Satisfaction Level of the Performance of Client's Roles

Client's Roles and Responsibilities	**P_m**	**I_m**	**S_I *(%)***
Leadership	**3.69**	**4.41**	**84**
Clearly identify client structure and responsibilities	3.68	4.30	86
Provide resource for continuity and leadership	3.89	4.48	87
Develop and share brief prior to the design stage	3.81	3.98	96
Ensure compliance to standards/best practice	3.84	4.49	86
Getting the right people for the right job at right time	3.64	4.52	81
Drive collaborative and flexible procurement policy	3.26	4.49	73
Demand effective quality management processes	3.89	4.45	87
Insist on adoptions of collaborative behaviours.	3.48	4.58	76
Procurement and Integration	**3.30**	**4.29**	**77**
Set behavioural and performance example	3.28	4.40	75
Evaluate decisions using criteria agreed upon	2.72	4.24	64
Insist on 'early-warning culture' from all involved	3.76	4.22	89
Establish long term relationships with partners/firms	3.29	4.37	75
Understand and align with partners value system	3.44	4.21	82
Design Quality	**3.32**	**4.21**	**79**
Have clear criteria for selecting design team	3.49	4.36	80
Ensures robust change control process	3.46	4.28	81
Understand the key drivers for the design	3.48	4.08	85
Ensures that design delivers required function	3.47	4.36	80
Considers whole life cycle principles	2.57	4.26	60
Use of modern technologies	3.44	4.09	84
Use of design quality indicators	3.33	4.02	83

P_m - Performance mean I_m - Importance mean S_I - Satisfaction level in percentage

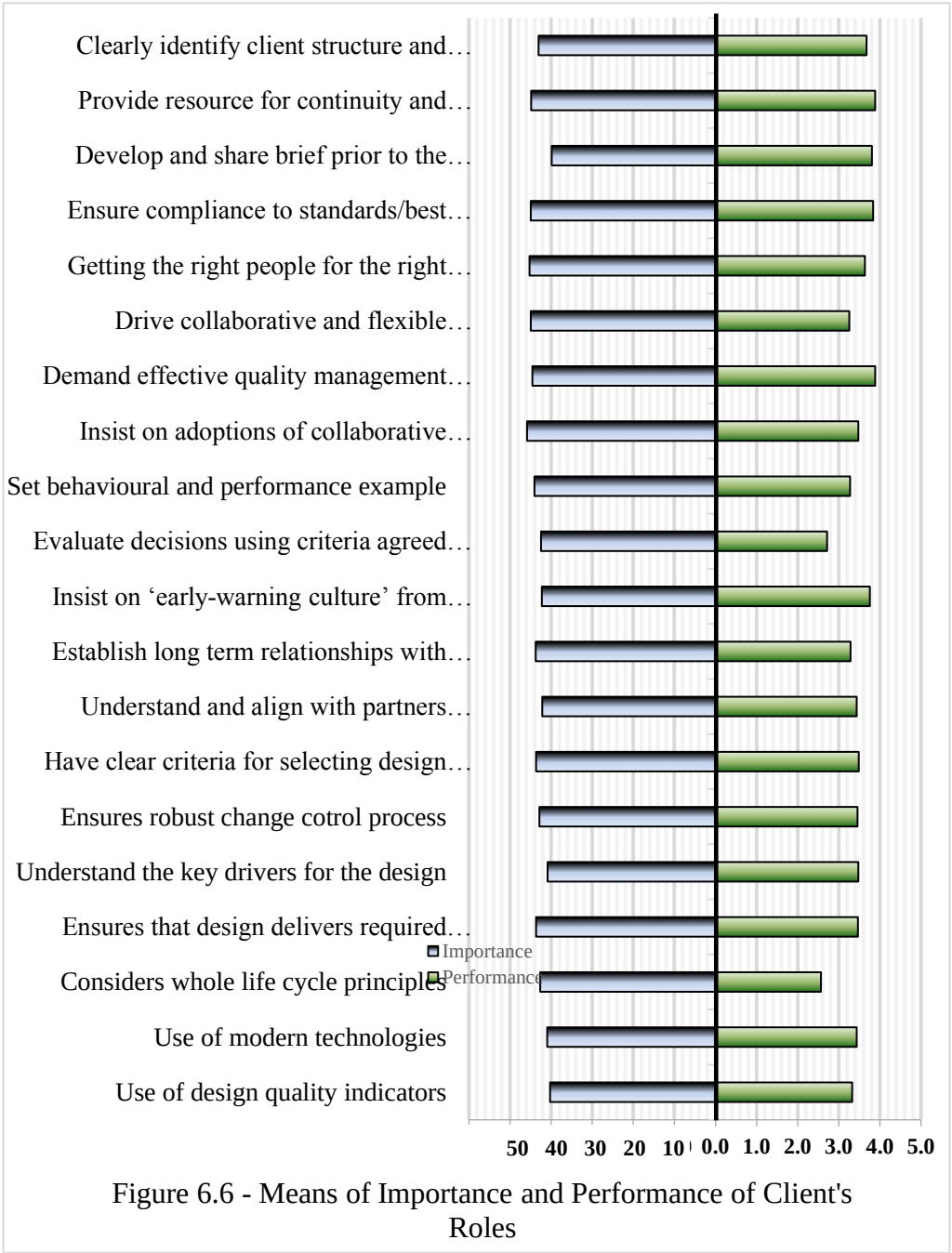


Figure 6.6 - Means of Importance and Performance of Client's Roles

Having instances where level of satisfaction is high given that the importance level is low is not surprising but expected. This is so because a role rated low on Importance will attain higher satisfaction level if its performance level is high and vice verse. What may be surprising is the reason why this role got such a low importance rating and ranked the lowest among the client roles. This may need further investigation as is with similar cases discovered in Section 6.1.2.2. Summarising the satisfaction levels

of performances of the three distinct client roles and their Importance (as shown in Table 6.13), 'Leadership' roles averages at 84% i.e. performed *'Very Satisfactory'* having a mean performance value of 3.69 (and performance level describable as *'High'*) and a mean importance value of 4.41 (and an importance level describable as *'Important'*); 'Procurement and Integration' roles are performed Very Satisfactorily at 77% with a performance mean value of 3.30 and a 4.29 importance mean value; while the 'Design Quality' roles averaged at 79% i.e. performed *'Very Satisfactory'* with a performance mean value of 3.32 and importance mean value of 4.21. Given these outcomes, and in terms of their derived satisfaction levels, the 'Leadership' role of client organisations ranks 1st followed by their 'Design Quality' role which ranks 2nd then their 'Procurement and Integration' role ranking 3rd.

6.3.4 Performance of Context-based Factors

Apart from the generic roles client organisations perform towards achieving their organisational outcomes, the nature of their organisation are known to influence interactions among its members – this is very much true for teams. Hence, the extent to which client organisations performed in terms of these contextual factors was investigated. Four main variables are investigated under the organisation context construct namely: Adequate Resources, Organisational Structure, Leadership and Organisational Culture, and Performance Evaluation and Reward. These were discussed in detail in Section 3.2.

Respondents were requested to rate their level of disagreement/agreement on the client organisations' performance on each of the context-based factors using a five-point scale ranging from '1' signifying 'Strongly Disagree' to '5' signifying 'Strongly Agree'. However, for the purpose of analysis, these scales were converted from a measure of agreement to one of performance ranging from '1' signifying 'Very Low'

performance to ‘5’ signifying ‘Very High’ performance correspondingly. This conversion was not only possible due to the requirements of the specific question and the definition of its accompanying scales but also desirable to bring all the measurement scales to the same base for the purpose of analysis. Re-scaling in terms of adjustments or transformation is an acceptable concept in research particularly where the variables investigated are such that collecting data would require a suitable and different scale mainly to ease data collection, from that which shall be used for analysis (Creswell, 2009; Kothani & Garg, 2014).

The mean values and standard deviations of the performances of factors in the four categories investigated are shown in Table 6.14 while Figures 6.7 and 6.8 visually illustrates their mean values relative to the frequencies of respondents who judged them ‘Very High’ and between ‘Very Low’ to ‘Moderate’ respectively. The mean values of the contextual factors ranges between 2.62 – 3.88 i.e. ‘Moderate’ and ‘High’ with none attaining a ‘Very High’ status. This is instigated by the relatively low and consistent proportion of those (13.8 – 16.0%) who judged the client organisations’ performance on these factors as ‘Very High’ and the high and varied proportion (14.6 – 68.9%) who judged them between ‘Very Low’ to ‘Moderate’. Though the presence of high standard deviations ranging between 0.750 – 1.432 indicates noticeable dispersions within the observations and mean values. However, the existence of such dispersions does not invalidate the mean suitability as a measure of their central tendencies as shown in the test for normality discussed in section 8.2.2.1.

Table 6.14 - Descriptive Statistics of Performance of Context-Related Factors

Contextual Factors	Mean	Std Dev	Order
Adequate Resources	**3.76**	**0.796**	
Provided timely information	3.81	0.750	2
Proper equipment and adequate staffing	3.73	0.852	5
Necessary support and encouragement	3.79	0.754	3
Adequate administrative assistance	3.70	0.828	7
Organisational Structure	**3.63**	**0.890**	
Clear definition of each member's role	3.72	0.837	6
Agreeing on specifics of work with members	3.67	0.880	8
Integrating and fitting individual members skills	3.67	0.886	9
Responsibility for teams performance	3.53	0.931	14
Clear channel of communication	3.54	0.921	13
Empower member by delegating responsibility	3.67	0.886	9
Leadership and Organisational Culture	**3.61**	**1.039**	
Leadership focus on work not persons	3.43	1.088	15
Ensure shared leadership	3.66	0.946	11
Promotes trust among team members	3.75	1.005	4
Encourages trust for team leadership	3.64	1.068	12
Willingness of members to take risks	3.88	0.876	1
Willingness to expose team's vulnerabilities	3.31	1.253	16
Performance Evaluation & Reward	**2.81**	**1.329**	
Evaluates team rather than individuals	2.75	1.351	19
Encourages joint accountability	2.62	1.432	20
Group-based appraisals	3.08	1.123	17
Profit/gains sharing incentives	2.79	1.408	18

Further, Table 6.14 shows that client organisations exhibits their highest performances in these organisation-related attributes – 'Willingness of members to take risk' (3.88), 'Provided timely information and knowledge sharing' (3.81), 'Provide necessary support and encouragement' (3.79), 'Promotes trust among team members' (3.75), 'Provides Adequate human resource with right skills/knowledge' (3.73), 'Clear definition of each member's role' (3.72), 'Adequate administrative assistance' (3.70), 'Agreeing on specifics of work with members' (3.67), 'Integrating and fitting individual members skills' (3.67), 'Empower member by delegating responsibility' (3.67), 'Ensures shared leadership' (3.66), 'Encourages trust for team leadership' (3.64), 'Clear channel of communication' (3.54), and 'Responsibility for teams performance' (3.53). These attributes fall under 'High' performance. The other

organisational-related attributes fall under the ‘Moderate’ performance category thus bringing out two distinct performance levels – High Performance and Moderate Performance for the contextual factors. None of the attributes under these factors fall under either the ‘Very Low’ performance category or the ‘Low’ performance category.



Figure 6.7 - Frequency of 'Very High' and Means of Performance of Contextual Factors

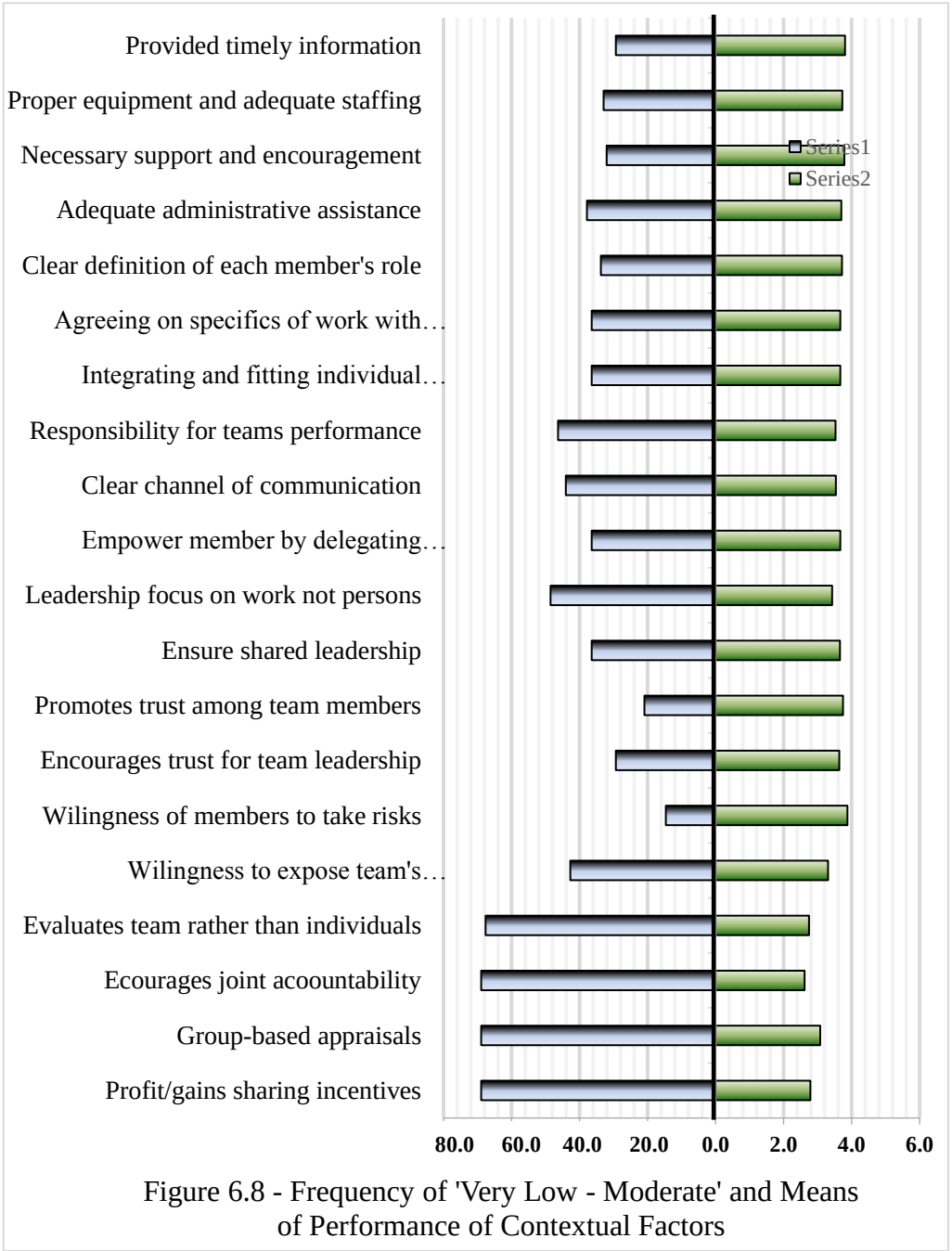


Figure 6.8 - Frequency of 'Very Low - Moderate' and Means of Performance of Contextual Factors

Table 6.15 presents the contextual factors investigated, classifying them in order of their performance and specific categories – Adequate Resources, Organisational Structure, Leadership and Organisational Culture and Performance Evaluation & Reward. The Table indicates that client organisations give their best performances in terms of 'Adequate Resources' – *providing information, necessary support, administrative assistance, have Adequate human resource with right skills/knowledge*;

'Organisational Structure' – *clearly defining members role, agreeing on work specifics, integrating and fitting members skills, and empowering members*; and in terms of 'Leadership and Organisational Culture – *providing atmosphere for member to take risk, promoting trust among team members, ensuring shared leadership, and encouraging trust for team leadership*. Client organisations' performances in all their 'Performance evaluation and Reward' related factors are 'Moderate' including some of those related to 'Leadership and Organisational Culture'.

Table 6.15 – Contextual Factors categorised based on Performance

Contextual Factors	**High Performance**	**Moderate Performance**
Resources	*Provide timely information (2); Necessary support and encouragement (3); Adequate human resource with right skills/knowledge (5); Adequate administrative assistance (7).*	
Organisational Structure	*Clear definition of each member's role (6); Agreeing on specifics of work with members (8); Integrating and fitting individual members' skills (9); Empowering members by delegating responsibility (9); Clear channel of communication (13); Responsibility of team's performance*	
Leadership and Organisation Culture	*Willingness of members to take risk (1); Promote trust among team members (4); Ensure shared leadership (11); Encourage trust for team leadership (12).*	*Leadership focuses on work not persons (15); Willingness to expose team's vulnerabilities (16).*
Performance Evaluation & Reward		*Group-based appraisal (17); Profit/Gain sharing incentives (18); Evaluates team rather than individuals (19); Encourages joint accountability (20).*

Based on the aggregated mean values of the performances of context-rated factors, Client organisation perform best in factors relating to 'Resources', followed by 'Organisational Structure' related roles, then in 'Leadership and Organisational Culture' related factors and lastly, in factors related to 'Performance Evaluation and Reward' as shown in Table 6.14.

The ‘Importance’ of these factors was not investigated for two reasons. These reasons equally apply to the other research variables – composition factors, design process and design team functioning:

- Existing instruments for measuring these factors were developed based on their ‘importance’, their validity and reliability were found to be consistent over several differing samples. Therefore the importance of these factors and their related attributes are not in doubt.

- In line with objective 4 of the study – to explore the relationships that exists between these factors and the design process, performance i.e. the ‘state of things’ is what the data type required and not how important they are. Outcomes (or actions, in this case – performance) are what influences others and not cognition (in this case – importance).

6.3.5 Performance of Composition Factors

In addition to the generic roles client organisations perform towards achieving their organisational outcomes and the influence of their organisational structure i.e. contextual factors thereof, the composition of the design team are expected to further influence interactions among members of a project organisation as was established in Chapter 3. To this end therefore, the extent to which design team members exhibits attributes needed for effective team performance were investigated. The reason this variable is taken as a client organisation parameter lies in the fact that the composition of design teams’ membership is a sole responsibility of the client organisation. A wrongly composed team is a consequence of the client organisation’s failings (Booth, 2010l; CABE, 2010; Constructing Excellence, 2008). Hence investigating team

members' performance is an indirect way of assessing the client organisation's performance in composing the team.

Three main variables are investigated under the composition factor construct namely: Member Abilities, Member Personality, and General Roles. Respondents were requested to rate the performance of the client organisation on each of the composition factors based on a five-point scale ranging between 1 signifying 'Very Low' performance to 5 signifying 'Very High' performance. The mean values and standard deviations of the performances of factors in the three categories investigated are shown in Table 6.16 while Figures 6.9 and 6.10 visually illustrates their mean values relative to the frequencies of respondents who judged them 'Very High' and between 'Very Low' to 'Moderate' respectively.

Table 6.16 - Descriptive Statistics of Performance of Composition Factors

Contextual Factors	Mean	Std Dev	Order
Members Abilities	**3.76**	**0.688**	
Technical knowledge and expertise	3.67	0.738	12
Problem-solving skills	3.60	0.726	15
Decision-making skills	3.80	0.694	9
Interpersonal skills	3.97	0.593	2
Members Personality	**3.90**	**0.642**	
Appreciably relating well with others	3.81	0.688	8
Cooperation and trust for others	3.91	0.655	5
Responsibleness and dependability	3.93	0.664	4
Highly organised and persistence	3.82	0.699	7
Emotional stability	3.93	0.567	3
Openness, creativity and sensitivity	4.00	0.579	1
General Roles	**3.68**	**0.756**	
Coordinating and integrating efforts	3.87	0.688	6
Initiates creative ideas	3.59	0.775	18
Champions ideas after been created	3.79	0.736	10
Offers insightful analysis of opinions	3.60	0.784	16
Provides directions and follow through	3.59	0.763	17
Examines details and enforces laws	3.68	0.760	11
Fight external influences to team	3.67	0.762	13
Encourages search for more information	3.65	0.783	14

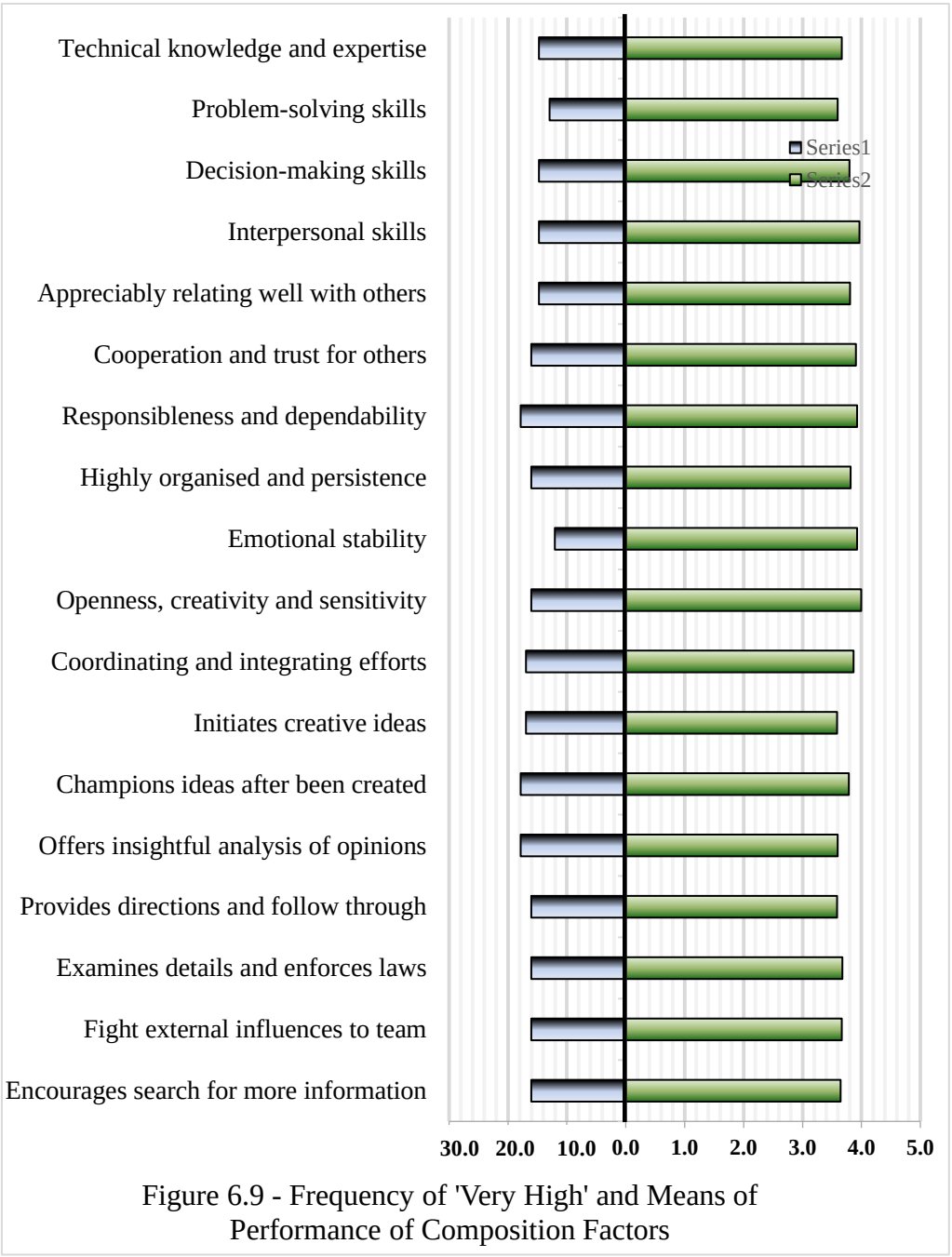


Figure 6.9 - Frequency of 'Very High' and Means of Performance of Composition Factors



Figure 6.10 - Frequency of 'Very Low - Moderate' and Means of Performance of Composition Factors

The mean values of the composition factors ranges between 3.59 – 4.00, all attaining 'High' status. This is instigated by the relatively low proportion of those (12.0 – 17.8%) who judged the client organisations' performance on these factors as 'Very High' and high proportion (26.2 – 70.2%) who judged them 'High'. The presence of high standard deviations ranging between 0.567 – 0.784 and further explained by the

high oscillations between the low and high end scales as shown in Figures 8.9 and 8.10 indicates some dispersions within the observations and mean values. However, the existence of such dispersions does not invalidate the mean suitability as a measure of their central tendencies as shown in the test for normality discussed in section 8.2.2.1.

Further, Table 6.16 shows that members of the design team, based on their composition by the client organisations, exhibits their highest performances in these attributes – 'Openness, creativity and sensitivity' (4.00), 'Interpersonal skills' (3.97), 'Emotional stability' (3.93), 'Responsibleness and dependability' (3.93), 'Cooperation and trust for others' (3.91), 'Coordinating and integrating efforts' (3.87), 'Highly organised and consistent' (3.82), 'Appreciably relating well with others' (3.81), 'Decision-making skills' (3.80), and 'Champions ideas after been created' (3.79). Others include 'Examines details and enforces laws' (3.68), 'Technical knowledge and expertise' (3.67), 'Fight external influences to team' (3.67), 'Encourages search for more information' (3.65), 'Problem-solving skills' (3.60), 'Offers insightful analysis of opinions' (3.60), 'Provides directions and follow through' (3.59) and lastly 'Initiates creative ideas' (3.59). All the memberships attributes investigated earned the 'High' status on the average in terms of their performance mean values.

Based on the aggregated mean values of the performances of composition-rated factors, Client organisation perform best in terms of the rightness in composing the design teams, in factors relating to 'Members Personality', followed by 'Members Abilities' related factors, then lastly, in factors related to 'General Roles' as shown in Table 6.16.

6.3.6 Performance of Design Process

Design process plays a significant role in building designs and plays an even greater role in this research in that it is looked at as a mediator between organisational parameters and the effectiveness of the design team. The study of the combined relationships between organisation parameter, design process and design team is uncommon in construction management. Hence the importance of design process in this research. Hitherto, design process within the built environment has not specifically been a major focus of research for reasons discussed in Section 2.4. And where they are considered emphasises have been on methods and techniques and not on the process dimensions inherent in teams. Hence, the extent to which design process attributes were exhibited in design teams towards effective team performance was investigated.

Three main variables are investigated under the design process construct namely: Communications, Team Collaboration, and Conflict Resolution. Respondents were requested to rate their agreement/disagreement on the client organisation's performance on each of the design process attributes based on a five-point scale ranging between 1 signifying 'Strongly Disagree' to 5 signifying 'Strongly Agree'. However, for the purpose of analysis, these scales were converted from a measure of agreement to one of performance ranging from 1 signifying 'Very Low' performance to 5 signifying 'Very High' performance correspondingly. This conversion was not only possible due to the requirements of the specific question and the definition of its accompanying scales but also desirable to bring all the measurement scales to the same base for the purpose of analysis. Re-scaling in terms of adjustments or transformation is an acceptable concept in research (Creswell, 2009; Kothani & Garg, 2014).

The mean values and standard deviations of the performances of the design process attributes are shown in Table 6.17 while Figures 6.11 and 6.12 further illustrates their mean values relative to the frequencies of respondents who judged them 'Very High' and between 'Very Low' to 'Moderate' respectively. The mean values of the design process ranges between 3.27 – 3.83, attaining either the 'Moderate' or 'High' status. These performance statuses are instigated by the relatively low proportion of those (1.33 – 16.0%) who judged the client organisations' performance on these attributes as 'Very High' and high proportion (26.2 – 70.2%) who judged them between 'Very Low' – 'Moderate'. The presence of relatively high standard deviations ranging between 0.607 – 1.041, further explained by the high oscillations between the low and high end scales as shown in Figures 6.11 and 6.12 indicates some dispersions within the observations and mean values. However, the existence of such dispersions does not invalidate the mean suitability as a measure of their central tendencies as shown in the test for normality discussed in Section 6.1.2.1

Table 6.17 - Descriptive Statistics of Performance of Design Process

Contextual Factors	Mean	Std Dev	Order
Communications	**3.49**	**0.778**	
Availability of project brief/client requirements	3.32	1.041	11
Adequate time for deliberations on brief	3.66	0.607	5
Availability of design related information	3.72	0.687	4
Authority to modify brief/requirement if need be	3.27	0.775	12
Team Collaboration	**3.73**	**0.684**	
Translate client's objective to team goals	3.83	0.646	1
Interdependence of members on each other	3.49	0.762	7
Confidence and trust amongst members	3.77	0.680	3
Members' total sense of commitment to the team	3.83	0.646	1
Conflict Resolution	**3.46**	**0.736**	
Common problem solving approach	3.40	0.700	10
Common understanding of the design problem	3.49	0.745	6
Existence of interpersonal incompatibility	3.48	0.744	8
Conflicts on task to be performed	3.48	0.756	9

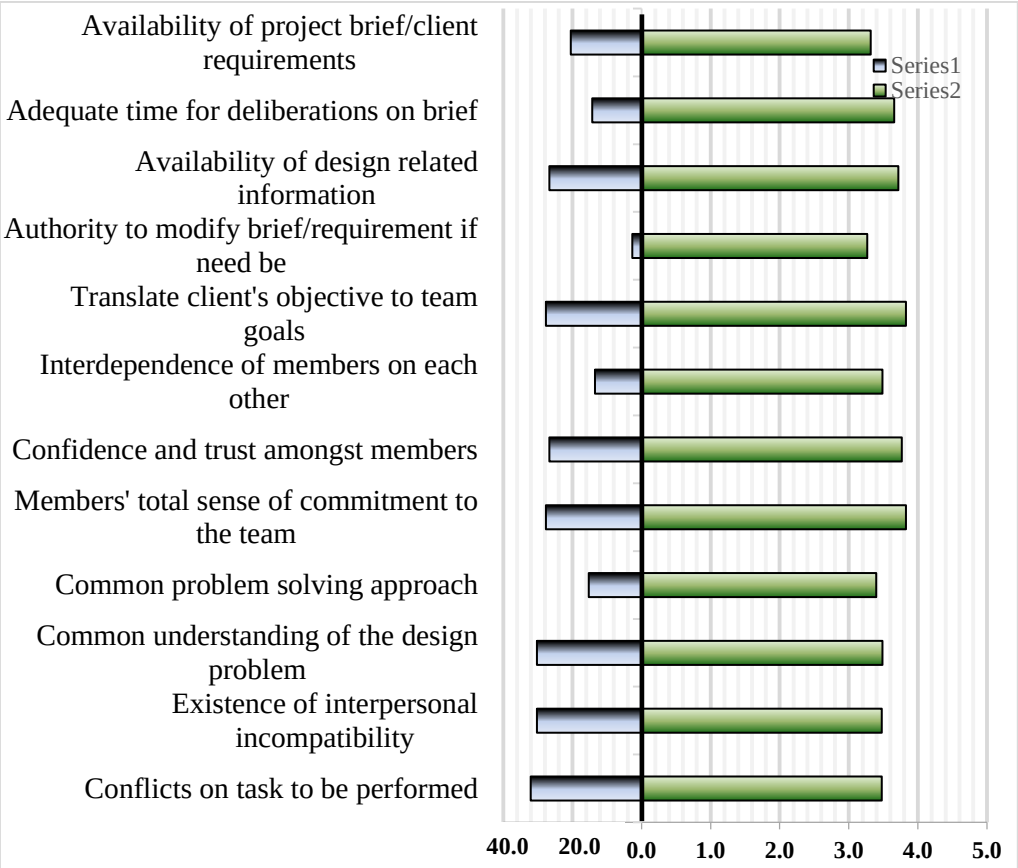


Figure 6.11 - Frequency of 'Very High' and Means of Performance of Design Process

Table 6.17 shows that during the design process the teams investigated exhibit their highest performances in these attributes – 'Translate client's objective to team goals' (3.83), 'Members' total sense of commitment to the team' (3.83), 'Confidence and trust amongst members' (3.77), 'Availability of design related information' (3.72), 'Adequate time for deliberation on brief' (3.66). Others include: 'Common understanding of the design problem' (3.49), 'Interdependence of members on each other' (3.49), 'Existence of interpersonal incompatibility' (3.48), 'Conflicts on task to be performed' (3.48). Performance is 'Moderate' in 'Common problem solving approach' (3.40)', 'Availability of project brief/client requirement' (3.32), 'Authority to modify brief/requirement if need be' (3.27).

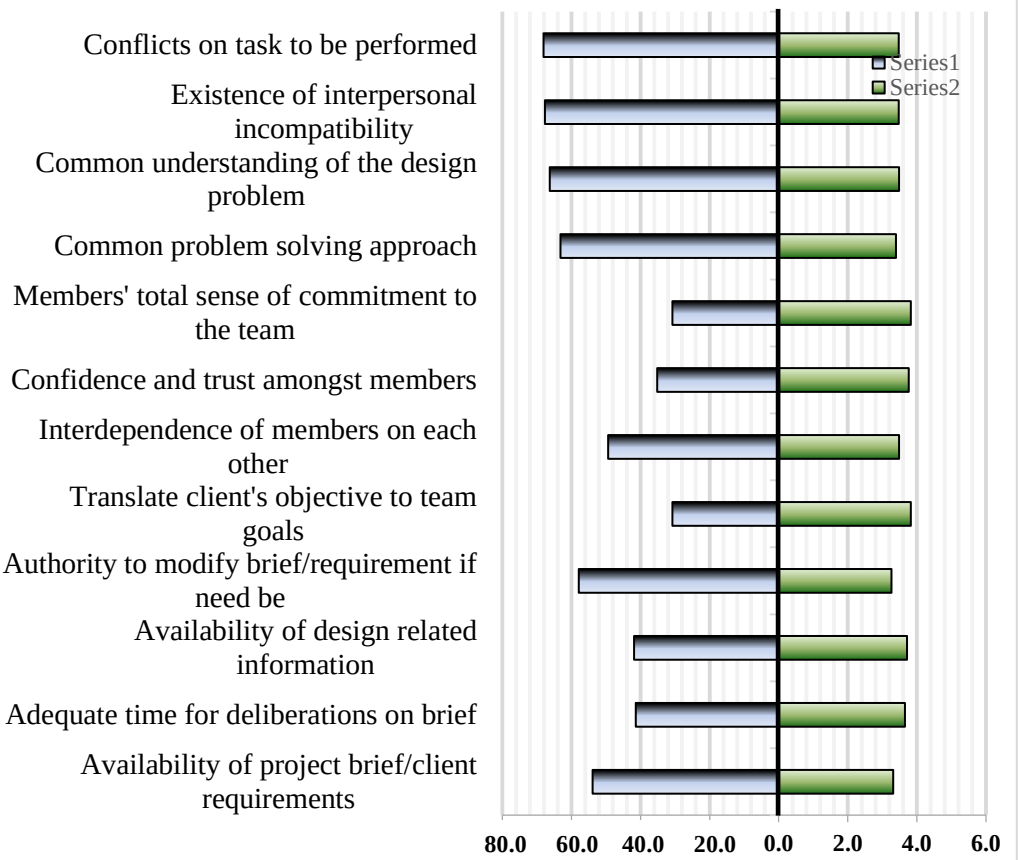


Figure 6.12 - Frequency of 'Very Low' - 'Moderate' and Means of Performance of Design Process

Further, Table 6.17 shows the aggregated mean values of the three design process variables investigated indicating that the best performance is Team Collaboration (3.73) followed by communications (3.49) and then lastly Conflict Resolution (3.46). The differences between these mean values are visually not significant hence it can be safely concluded that design teams perform equally in the three dimensions of design process.

6.3.7 Performance of Team Functioning

Teams outcome behaviours are measured in terms of team functioning – the quantity and quality of team's work output. Hence for the design team to be effective i.e. achieve value (for money) in building design it must do well in terms of its

functioning. Therefore, the extent to which team functioning attributes were exhibited in design teams towards effective team performance was investigated.

Team Functioning is a one-variable construct having 10 attributes. Respondents were requested to self-rate their performances as a team based on their level of agreement/disagreement on each of the functioning attributes on a five-point scale ranging between 1 signifying 'Strongly Disagree' to 5 signifying 'Strongly Agree'. However, for the purpose of analysis, these scales were converted from a measure of agreement to one of performance ranging from 1 signifying 'Very Low' performance to 5 signifying 'Very High' performance correspondingly. This conversion was not only possible due to the requirements of the specific question and the definition of its accompanying scales but also desirable to bring all the measurement scales to the same base for the purpose of analysis. Re-scaling in terms of adjustments or transformation is an acceptable concept in research particularly where the variables investigated are such that collecting data would require a suitable and different scale mainly to ease data collection, from that which shall be used for analysis (Creswell, 2009; Kothani & Garg, 2014).

The mean values and standard deviations of the performances of the design teams in terms of team functioning attributes are shown in Table 6.18 while Figures 6.13 and 6.14 further illustrates their mean values relative to the frequencies of respondents who judged them 'Very High' and between 'Very Low' to 'Moderate' respectively. The mean values ranges between 3.26 – 3.49, generally attaining the 'Moderate' status. This performance status is further explained by the extremely low proportion (0.9 – 5.8%) who judged the design team performance on these attributes as 'Very High' and the relatively high proportion (44.8 – 57.8%) who judged them between 'Very Low' – 'Moderate'. The presence of moderate standard deviations ranging

between 0.640 – 0.790 further explained by the high oscillations between the low and high end scales as shown in Figures 6.13 and 6.14 indicates some dispersions within the observations and mean values. However, the existence of such dispersions does not invalidate the mean suitability as a measure of their central tendencies as shown in the test for normality discussed in section 6.1.2.1

Table 6.18 - Descriptive Statistics of Performance of Team Functioning

Design Team Functioning	Mean	Std Dev	Order
'Value' was explicitly defined for the design	3.47	0.779	2
Brief contained function-quality-cost requirements	3.46	0.640	3
Client's 'Value' requirement understood by team	3.46	0.648	4
Functions/quality in design met client's expectations	3.39	0.680	7
Cost objectives of the client were met/exceeded	3.32	0.736	9
WLC formed the basis for design decisions	3.26	0.765	10
Efforts were made to balance function/quality/cost	3.33	0.790	8
Budgets were adjustable to meet objectives	3.44	0.631	5
Achieving client's value was the driver for the team	3.49	0.676	1
There exist a recognisable client value system	3.40	0.733	6

Table 6.18 shows that during the design stage the teams investigated exhibit similar performances in terms of functioning in all the attributes considered within this variable, having an aggregated mean of 3.40.

6.3.8 Summary of Central Tendencies of Value in Design Determinants

The results of data collected were snapshot to give a general feel of the pattern of responses to each of the main research variables and their sub-variables. Table 6.18 Show the aggregated mean values for each of these variables and the interpretations of these mean values within scales used in measuring them.

Table 6.18 – Summary Statistics of Value in Design Determinants

Main Research Variable	Mean[a]	Std. Dev.	Remarks	Rescaled
Client's Roles (Performance)[b]	**3.46**	**0.945**	**Moderate**	**Moderate**
Leadership (8)	3.69	0.898	High	High
Procurement (5)	3.30	1.015	Moderate	Moderate
Design (7)	3.32	0.948	Moderate	Moderate
Contextual Factors[c]	**3.49**	**1.000**	**Neutral**	**Moderate**
Resources (4)	3.76	0.796	Agree	High
Structure (6)	3.63	0.890	Agree	High
Culture (6)	3.61	1.039	Agree	High
Evaluation (4)	2.81	1.329	Neutral	Moderate
Composition Factors[c]	**3.77**	**0.703**	**Agree**	**High**
Abilities (4)	3.76	0.688	Agree	High
Personality (6)	3.90	0.642	Agree	High
General Roles (8)	3.68	0.756	Agree	High
Design Process[b]	**3.56**	**0.732**	**Moderate**	**Moderate**
Communications (4)	3.49	0.778	Moderate	Moderate
Collaboration (4)	3.73	0.684	High	High
Conflicts (4)	3.46	0.736	Moderate	Moderate
Team Functioning (10)[b]	**3.40**	**0.708**	**Moderate**	**Moderate**

[a] N = 225; [b] 1 - Very low 2 - Low 3 - Moderate 4 - High, 5 - Very High; [c] 1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agree

Generally on the average, within design teams, client's organisations *'moderately'* perform their design related roles, specifically exhibiting *'high'* performance in leadership roles, and *'moderate'* performances in both their procurement and design roles. By way of generalising this outcome, applying the principles of standard deviation, 2 standard deviation i.e. 2σ would gives the following lower and upper mean values: for Leadership – $3.69 \pm (0.898 \times 2)$ i.e. 1.89 and 5.49 respectively; for Procurement – $3.30 \pm (1.015 \times 2)$ i.e. 1.27 and 5.33 respectively; and for Design – $3.32 \pm (0.948 \times 2)$ i.e. 1.42 and 5.22 respectively. This suggests that expectedly, for at least 13.6% of the members of design teams, the client organisations' performance is low for their leadership role, and very low for both their procurement and design roles. At the other extreme, 13.6% of design team members would rate their performances as very high for the three roles.

In supporting teams towards achieving successful design outcomes, team members *'agree'* that the organisational contextual settings are adequate in terms of resources, organisation structure and culture thus performing *'high'* therein. However, members are neutral (not in agreement) on client's evaluation and reward mechanisms indicating a *'moderate'* performance. By way of generalising this outcome, applying the principles of standard deviation, 2 standard deviation i.e. 2σ would gives the following lower and upper mean values: for resources – $3.76 \pm (0.796 \times 2)$ i.e. 2.17 and 5.35 respectively; for structure – $3.63 \pm (0.890 \times 2)$ i.e. 1.85 and 5.41 respectively; for Culture – $3.61 \pm (1.039 \times 2)$ i.e. 1.52 and 5.69 respectively; and for Evaluation – $2.81 \pm (1.329 \times 2)$ i.e. 0.15 and 5.47 respectively. This suggests that expectedly, for at least 13.6% of the members of design teams, the client organisations' performance is low in terms of *resources*, *structure* and *culture* while very low in terms of *evaluation*. At the other extreme, 13.6% of design team members would rate their performances as very high on these four contextual aspects.

In composing the design team, members *'agree'* that teams are well composed by client organisations. They *'agree'* that members of design teams generally demonstrate and exhibit the necessary abilities, right personalities and perform the generic roles required in effective teams, thus earning the *'high'* performance status. By way of generalising this outcome, applying the principles of standard deviation, 2 standard deviation i.e. 2σ would gives the following lower and upper mean values: for abilities – $3.76 \pm (0.688 \times 2)$ i.e. 2.38 and 5.14 respectively; for personality – $3.90 \pm (0.642 \times 2)$ i.e. 2.62 and 5.18 respectively; and for general team role – $3.68 \pm (0.760 \times 2)$ i.e. 2.16 and 5.20 respectively. This suggests that expectedly, for at least 13.6% of the members of design teams, the client organisations' performance in composing the team is low in terms of members' abilities, and in terms of general

team roles but moderate in terms of members' personality. At the other extreme, 13.6% of design team members would rate their performances as very high for these three composition aspects.

There is a general consensus that design processes are characteristics of an effective team since members averagely *'agree'* to this, i.e. *'moderate'* performance. By way of generalising this outcome, applying the principles of standard deviation, 2 standard deviation i.e. 2σ would gives the following lower and upper mean values: for communications – $3.49 \pm (0.778 \times 2)$ i.e. 1.93 and 5.05 respectively; for collaboration – $3.73 \pm (0.684 \times 2)$ i.e. 2.36 and 5.10 respectively; and for conflict resolution – $3.46 \pm (0.736 \times 2)$ i.e. 1.99 and 4.93 respectively. This suggests that expectedly, for at least 13.6% of the members of design teams, the design teams' performance is low in terms of communications, collaboration and conflict resolution. While at the other extreme, 13.6% of design team members would rate the design process performances as very high for these three design process variables.

In assessing their design output in terms of team functioning, members believed it to be *'moderate'*. By way of generalising this outcome, applying the principles of standard deviation, 2 standard deviation i.e. 2σ would give lower and upper mean values of $3.40 \pm (0.708 \times 2)$ i.e. 1.98 and 4.82 respectively. This suggests that expectedly, for at least 13.6% of the members of design teams, the performance of design teams in terms of team functioning would be judged as low. At the other extreme, 13.6% of design team members would rate their performances as very high.

6.4 Cascading the Importance of Client Roles

Thus far, the variables of the study have been considered in their entirety. Measures of importance and performance on the one hand would give indication to specific aspects of roles to which special and extra attention must be given to either because they are of high importance or they are of low performances and needs to be improved upon. On the other hand, cascading variables based on likely control variables e.g. profession, years of experience etc can also give further insights into possible patterning in responses due to differentiation by the control variables under consideration. The assumption of potential differences based on some control variable e.g. profession is strongly supported by existing evidences on the differing value judgement by different stakeholders in the construction industry due mainly to their differing and inert 'values' (not value) systems (Mills G. R., 2013; Kelly J. , 2007).

Given the strong evident of possible cascading effects in terms of say profession, there is therefore the need to investigate the possibility of difference in response patterns across the various respondents' demographics – profession, years of experience, years in current employment and managerial position. These categories were found to influence outcomes: 1) of value management workshops (Kelly, Male, & Graham, 2004); 2) in making explicit the client value system and in value dialogues (Green S. D., 1996; Mills G. R., 2013; Thomson D. S., Austin, Root, Thrope, & Hammond, 2006); and 3) during the design process of building projects. Given the nature of this study (as mentioned below), only the 'Importance' dimension of the variables investigated are considered for further analysis in this section. The 'Performance' dimension is not considered for the fact that the research does not discriminate between low and high performances but rather takes the performances on their merit, and treating them as such in establishing the interactions between the variables.

However, areas of low performances as identified and discussed in Sections 6.1.2.2 – 6.1.2.7 suffices to advice on possible improvements as explained in the 'discussion' section of this chapter.

The 'Importance' dimension of the client roles is considered for further analysis in this section for the fact that given the theoretical saturations in support of the importance of the client roles toward achieving value in building designs, discriminations on its levels by the respondents is an indication of the following, thus demanding further considerations:

- Disagreement among design team members on levels of importance exposes the aspects of roles that members perceive would offer the greatest satisfaction upon performing them;
- Discriminations on levels of importance would further unearth aspects of client roles that would require that design team members be sensitised on and for them to rethink the level of importance they attach to these roles toward achieving value in building designs;
- Differentiations arising due to the influences of the control variables on these dimensions are potency for dissatisfaction amongst design teams on performances matters.

6.4.1 Cascading Client Roles based on Level of Importance

Design attributes whose mean values are 'Extremely Important' represent aspects where the greatest satisfaction can be derived and hence should be given priority during the design stages by client organisations. Though such selections can be made through the respective mean values of the attributes as shown in the appropriate Tables in Section 6.1.2, there is no way of visually determining if these mean values are

significantly different from those that do not fall within these levels. Hence, a test of statistical significant difference is required. The one-sample t-test was applied to test the attributes within the 'Client Roles' variables. The procedure was applied using the test mean value of 4.50. Hence, mean values above 4.50 are automatically accepted irrespective of the test result since there would definitely be a difference as the value increases beyond the acceptable tolerance.

Table 6.19 shows the outcome of the t-test conducted. Five client roles attributes are significantly not different from the 'Extremely Importance' rating namely: 'Provide resource for maintaining continuity and leadership', Ensure compliance to standards and best practice', Getting the right people for the right job at right time', 'Drive collaborative and flexible procurement policy', and 'Demand effective quality management behaviours'. All of these attributes are within the 'Leadership' roles variable, hence design teams and client organisations should be sensitised on the need to reconsider their perception on client's roles within 'Procurement and Integration' and 'Design Quality' dimensions. These attributes patterning also confirm the outcome of the mean values in Table 6.10.

Table 6.19 - One-Sample T-Test for Importance of Client Roles

Client's Roles and Responsibilities	Test Value = 4.50			Remarks
	Mean	Sig	Mean Diff	
Leadership				
Clearly identify client structure and responsibilities	4.30	0.000	-0.202	Reject
Provide resource for continuity and leadership	4.48	0.557	-0.020	Accept
Develop and share brief prior to the design stage	3.98	0.000	-0.522	Reject
Ensure compliance to standards/best practice	4.49	0.748	-0.011	Accept
Getting the right people for the right job at right time	4.52	0.550	0.020	Accept
Drive collaborative and flexible procurement policy	4.49	0.740	-0.011	Accept
Demand effective quality management processes	4.45	0.169	-0.047	Accept
Insist on adoptions of collaborative behaviours.	4.58	0.013	0.082	Reject
Procurement and Integration				
Set behavioural and performance example	4.40	0.017	-0.096	Reject
Evaluate decisions using criteria agreed upon	4.24	0.000	-0.264	Reject
Insist on 'early-warning culture' from all involved	4.22	0.000	-0.282	Reject
Establish long term relationships with partners/firms	4.37	0.002	-0.127	Reject
Understand and align with partners value system	4.21	0.000	-0.287	Reject
Design Quality				
Have clear criteria for selecting design team	4.36	0.000	-0.144	Reject
Ensures robust change control process	4.28	0.000	-0.220	Reject
Understand the key drivers for the design	4.08	0.000	-0.416	Reject
Ensures that design delivers required function	4.36	0.000	-0.144	Reject
Considers whole life cycle principles	4.26	0.000	-0.242	Reject
Use of modern technologies	4.09	0.000	-0.411	Reject
Use of design quality indicators	4.02	0.000	-0.482	Reject

6.4.2 Cascading Importance of Client Roles based on Profession

The differences in responses to the importance of client roles based on respondents' profession were compared. Table 6.20 shows the mean values across professions i.e. Client Organisation, Architect, Building Services Engineer, Structural Engineer and Quantity Surveyor. From the Table it is observed that Client Organisations tend to rate all their 'Leadership' roles higher (4.58) compared to those of the consultants (4.31 – 4.41), indicating that clients place more importance to these specific roles than do the consultants. They also rated some of their 'Procurement and Integration' roles and 'Design Quality' roles relatively lower (4.20, 4.13 respectively) than the consultants

(4.27 – 4.41; 4.11 – 4.21 respectively). For instance – 'Evaluate decisions using evaluation criteria agreed upon', 'Insist on 'early-warning culture' from all involved', 'Understand and align with other partner's value system', Use of modern technologies', and 'Use of design quality indicators'. For these groups of roles the consultants indicate they are of more importance compared to the client organisations.

Table 6.20 - Means of Importance of Client Roles Across Profession

Client's Roles and Responsibilities	Client	Arch	M & E	Struct	QS	Mean
Leadership	**4.58**	**4.41**	**4.43**	**4.31**	**4.33**	
Clearly identify client structure and responsibilities	4.51	4.40	4.31	4.07	4.20	**4.30**
Provide resource for continuity and leadership	4.69	4.47	4.47	4.38	4.40	**4.48**
Develop and share brief prior to the design stage	4.16	3.93	4.02	3.84	3.93	**3.98**
Ensure compliance to standards/best practice	4.64	4.47	4.56	4.33	4.44	**4.49**
Getting the right people for the right job at right time	4.67	4.53	4.51	4.47	4.42	**4.52**
Drive collaborative and flexible procurement policy	4.56	4.42	4.51	4.51	4.44	**4.49**
Demand effective quality management processes	4.56	4.44	4.44	4.40	4.42	**4.45**
Insist on adoptions of collaborative behaviours.	4.82	4.60	4.62	4.44	4.42	**4.58**
Procurement and Integration	**4.20**	**4.28**	**4.41**	**4.27**	**4.32**	
Set behavioural and performance example	4.51	4.31	4.56	4.31	4.33	**4.40**
Evaluate decisions using criteria agreed upon	3.93	4.27	4.38	4.31	4.29	**4.24**
Insist on 'early-warning culture' from all involved	3.93	4.27	4.36	4.27	4.27	**4.22**
Establish long term relationships with partners/firms	4.33	4.29	4.47	4.40	4.38	**4.37**
Understand and align with partners value system	3.93	4.27	4.36	4.24	4.27	**4.21**
Have clear criteria for selecting design team	4.44	4.36	4.36	4.24	4.38	**4.36**
Ensures robust change cotrol process	4.36	4.22	4.36	4.13	4.33	**4.28**
Design Quality	**4.13**	**4.21**	**4.11**	**4.14**	**4.21**	
Understand the key drivers for the design	4.36	3.98	4.07	4.00	4.02	**4.08**
Ensures that design delivers required function	4.47	4.36	4.33	4.24	4.38	**4.36**
Considers whole life cycle principles	4.18	4.33	4.20	4.24	4.33	**4.26**
Use of modern technologies	3.82	4.20	4.00	4.18	4.24	**4.09**
Use of design quality indicators	3.84	4.18	3.93	4.04	4.09	**4.02**

Amongst the consultants, Building Services Engineers (M & E) and Quantity Surveyors (QS) generally tend to rate individual roles slightly higher than those of the Architects (Arch) and Structural Engineers (Struct). However, for the 'Leadership' roles, Architects rated them higher than the Quantity Surveyors indicating that the Architects give more 'importance' to the client's 'Leadership' roles than do the Quantity Surveyors and Structural Engineers. In most of the roles, Structural

Engineers have the lowest mean values compared to the other consultants though in some instance they have mean values greater than the sample mean, for example, 'Drive collaborative and flexible procurement policy', 'Evaluate decisions using criteria agreed upon', 'Establish long term relationships with partners/firms', and 'Understand and align with partners value system', 'Use of modern technologies', and 'Use of design quality indicators'.

It is evident that there are some patterns in the responses thus signalling difference among the various professions. But locating the specific differences and the significance of these differences are not known. Hence, further analysis is required to determine the statistical significant difference of variances among the respondents in terms of profession. Due to the existence of possible non-normality of the distribution, two tools for test of differences of variance are employed – One-Way Analysis of Variance (ANOVA) and the Kruskal – Wallis One-Way ANOVA.

One-Way ANOVA Test

The procedure adopted for the test involves (IBM, 2012; Cohen & Lea, 2004) first, the establishment of the validity assumption that the variances of the test group are equivalent. This is achieved by testing for homogeneity of variance based on the Levene statistics - where the significance value i.e. ρ – value of the statistics is less than 0.05 then the null hypothesis that the group variances are equal is rejected making the ANOVA table invalid for studying the statistical significance of difference. Where this is the case, either of two things can be done – data transformation or perform a non-parametric test that does not require the equality of variance (Cooper & Schindler, 2008). For the latter, the Welch statistics tests for the equality of group mean values can be employed – it is preferable to the *F* – statistics when the assumption of equal

variance is violated. This procedure is employed for this analysis. Table 6.21 shows the summary result of the test conducted.

Table 6.21 - ANOVA Test of Importance of Client Roles Across Profession

Client's Roles and Responsibilities	Sig[a]	Asmptn	Sig[b]	Sig[c]	Diff
Leadership					
Clearly identify client structure and responsibilities	0.191	Not Violated	0.004	0.007	Yes
Provide resource for continuity and leadership	0.010	Violated	0.031	0.022	Yes
Develop and share brief prior to the design stage	0.876	Not Violated	0.542	0.550	No
Ensure compliance to standards/best practice	0.211	Not Violated	0.053	0.055	Yes
Getting the right people for the right job at right time	0.006	Violated	0.189	0.179	No
Drive collaborative and flexible procurement policy	0.778	Not Violated	0.716	0.721	No
Demand effective quality management processes	0.600	Not Violated	0.645	0.690	No
Insist on adoptions of collaborative behaviours.	0.000	Violated	0.001	0.000	Yes
Procurement and Integration					
Set behavioural and performance example	0.033	Violated	0.128	0.119	No
Evaluate decisions using criteria agreed upon	0.000	Violated	0.019	0.109	No
Insist on 'early-warning culture' from all involved	0.000	Violated	0.031	0.156	No
Establish long term relationships with partners/firms	0.062	Not Violated	0.679	0.685	No
Understand and align with partners value system	0.000	Violated	0.035	0.160	No
Have clear criteria for selecting design team	0.060	Not Violated	0.479	0.470	No
Ensures robust change cotrol process	0.763	Not Violated	0.279	0.316	No
Design Quality					
Understand the key drivers for the design	0.011	Violated	0.024	0.026	Yes
Ensures that design delivers required function	0.025	Violated	0.432	0.437	No
Considers whole life cycle principles	0.000	Violated	0.723	0.730	No
Use of modern technologies	0.000	Violated	0.132	0.295	No
Use of design quality indicators	0.000	Violated	0.477	0.513	No

[a]Test of Homogeneity of Variances [b]F - Statistics [c]Robust Tests of Equality of Means

The evidence in Table 6.21 indicates that there are 5 client roles related attributes having statistically significant differences in the mean level of importance across the professions. These differences occurred in four of the eight attributes under 'Leadership' role, none in the 'Procurement and Integration' roles with one occurring in the 'Design Quality' roles. Further tests using the ANOVA Post Hoc procedure revealed the locations of the difference i.e. the profession(s) that lead to the significant differences. Under 'Leadership' roles: 'Clearly identify client structure and

responsibilities' difference is located between Clients & Structural Engineers; 'Provide adequate resource to maintain continuity and leadership' difference is between Clients & Structural Engineers; 'Ensure compliance to standards and working to best practice' between Clients & Structural Engineers; and 'Insist on adoption of collaborative behaviours' difference located between Clients & Structural Engineers and Clients & Quantity Surveyors while under the 'Design Quality' roles for 'Understand the key drivers for the design' difference is located between Clients & Architects.

Kruskal – Wallis **Test**

The tests of Normality carried out on the dataset in section 6.1.2.1 confirmed that the observations are normally distributed but that the fit is not significant. For this reason a non-parametric test is recommended as a confirmatory and complementary test to the parametric ANOVA. The Kruskal – Wallis test is analogous to the one-way ANOVA testing the null hypothesis that '*k*' independent random samples come from identical universes (Kothani & Garg, 2014). But unlike the ANOVA, Kruskal – Wallis does not depend on the normality and equality in variance assumptions and hence determines whether the difference between the medians of several groups in significant (Kemp & Kemp, 2004). The result of the test conducted is shown in Table 6.22, indicating the same pattern of differences as that of the parametric ANOVA. It should be noted that one of the client roles rejected in the ANOVA test (due to the violation of the equality assumption) is again introduced – 'Set behavioural and performance examples'.

Table 6.22 - Kruskal-Wallis Test of Importance of Client Roles Across Profession

Client's Roles and Responsibilities	Chi	df	Sig	Diff
Leadership				
Clearly identify client structure and responsibilities	14.519	4	0.006	Yes
Provide resource for continuity and leadership	10.731	4	0.030	Yes
Develop and share brief prior to the design stage	3.233	4	0.520	No
Ensure compliance to standards/best practice	10.526	4	0.032	Yes
Getting the right people for the right job at right time	6.134	4	0.189	No
Drive collaborative and flexible procurement policy	2.125	4	0.713	No
Demand effective quality management processes	2.949	4	0.566	No
Insist on adoptions of collaborative behaviours.	19.173	4	0.001	Yes
Procurement and Integration				
Set behavioural and performance example	9.587	4	0.048	Yes
Evaluate decisions using criteria agreed upon	8.527	4	0.074	No
Insist on 'early-warning culture' from all involved	7.755	4	0.101	No
Establish long term relationships with partners/firms	2.188	4	0.701	No
Understand and align with partners value system	7.663	4	0.105	No
Have clear criteria for selecting design team	3.669	4	0.453	No
Ensures robust change cotrol process	4.613	4	0.329	No
Design Quality				
Understand the key drivers for the design	11.683	4	0.020	Yes
Ensures that design delivers required function	4.933	4	0.294	No
Considers whole life cycle principles	1.012	4	0.908	No
Use of modern technologies	1.229	4	0.873	No
Use of design quality indicators	0.774	4	0.942	No

6.4.3 Cascading Client Roles based on Experience

The difference in response to the importance of client roles based on respondent's years of working experience was compared. Table 6.23 shows the mean values across experience i.e. 1 – 5 years, 6 – 10 years, 11 – 15 years, 15 – 20 years, and greater than 20 years. Generally, there seems not to be any noticeable difference in the mean values across the years of experience ranges for each of the client roles investigated. However, there may be some statistically significant differences for the 'Develop and share detailed brief prior to the design stage' role attribute. Respondents having working experiences between 1 – 5 years have an average mean value of 4.50 while those at the other extreme end of the experience range i.e. greater than 20 years have

an average mean value of 3.76. Those in between these experience ranges i.e. 5 – 10 years, 11 – 15 years and 16 – 20 years had average mean values of 3.92, 3.98 and 4.00 respectively.

Table 6.23 - Means of Importance of Client Roles Across Working Experience

Client's Roles and Responsibilities	1 - 5	6 - 10	11 - 15	'16 - 20	> 20	Mean
Leadership	**4.37**	**4.37**	**4.43**	**4.46**	**4.37**	**4.40**
Clearly identify client structure and responsibilities	4.25	4.30	4.29	4.45	4.16	**4.29**
Provide resource for continuity and leadership	4.33	4.35	4.53	4.48	4.52	**4.44**
Develop and share brief prior to the design stage	4.50	3.92	3.98	4.00	3.76	**4.03**
Ensure compliance to standards/best practice	4.33	4.43	4.53	4.48	4.48	**4.45**
Getting the right people for the right job at right time	4.42	4.51	4.50	4.67	4.48	**4.52**
Drive collaborative and flexible procurement policy	4.58	4.49	4.47	4.52	4.52	**4.52**
Demand effective quality management processes	4.08	4.46	4.48	4.48	4.44	**4.39**
Insist on adoptions of collaborative behaviours.	4.50	4.46	4.63	4.58	4.60	**4.55**
Procurement and Integration	**4.22**	**4.27**	**4.29**	**4.36**	**4.31**	**4.29**
Set behavioural and performance example	4.33	4.32	4.40	4.52	4.44	**4.40**
Evaluate decisions using criteria agreed upon	4.17	4.22	4.23	4.33	4.20	**4.23**
Insist on 'early-warning culture' from all involved	4.17	4.22	4.20	4.30	4.20	**4.22**
Establish long term relationships with partners/firms	4.33	4.32	4.34	4.55	4.40	**4.39**
Understand and align with partners value system	4.17	4.22	4.19	4.30	4.20	**4.22**
Have clear criteria for selecting design team	4.17	4.35	4.38	4.30	4.40	**4.32**
Ensures robust change cotrol process	4.17	4.24	4.31	4.24	4.32	**4.26**
Design Quality	**4.07**	**4.11**	**4.21**	**4.13**	**4.10**	**4.12**
Understand the key drivers for the design	4.08	3.86	4.16	4.15	3.96	**4.04**
Ensures that design delivers required function	4.17	4.32	4.39	4.30	4.40	**4.32**
Considers whole life cycle principles	4.08	4.27	4.30	4.18	4.24	**4.21**
Use of modern technologies	3.92	4.05	4.18	3.97	3.96	**4.02**
Use of design quality indicators	4.08	4.05	4.02	4.03	3.92	**4.02**

Looking across the 20 client roles attributes, those within the 1 – 5 years of working experience had the lowest mean values compared to those in the other experience ranges except for four attributes where they actually switched positions with those who have had greater than 20 years working experience. The four role attributes where respondents having 1 – 5 years working experience had higher mean values compared to those of others include: 'Develop and share detailed brief prior to the design stage', 'Drive clear, collaborative and flexible procurement policy', 'Use of design quality indicators'. And rather consistently, those having working experiences between 11 –

15 and 16 – 20 years gave higher ratings to the importance of client roles compared to those having work experiences within the 1 – 6 years, 6 – 10 years and those greater than 20 years. For instance, the former have mean values of 4.43 and 4.46 respectively for the Leadership roles compared to the former having mean values 4.37, 4.37 and 4.37 respectively. This pattern is also repeated for both the Procurement and Integration roles and Design Quality roles. None of the attributes have a mean value less than 3.90 except for 'Develop and share brief prior to the design stage (3.76) and 'Understand the key drivers for the design' (3.86) coming from respondents having working experiences greater than 20 years and those 6 – 10 years respectively.

There seem to be evident of some patterning in the responses thus signalling difference across the various categories of working experiences. But locating the specific differences and the significance of these differences are not known. Hence, further analysis is required to determine the statistical significant difference of variances among the respondents in terms of profession. Due to the existence of possible non-normality of the distribution, two tools for test of differences of variance were employed – One-Way Analysis of Variance (ANOVA) and the Kruskal – Wallis One-Way ANOVA. The procedures used were as explained in Section 6.1.3.2.

One-Way ANOVA Test

Table 6.24 shows the summary result of the test conducted indicating that none of the client roles has statistically significant differences in the mean level of importance across the categories of work experiences. What this portends is that level of work experience did not influence the responses gathered, despite the patterns that was visually detected above. In other words, irrespective of their working experience, respondents responded similarly to each of the 20 Client roles attributes. Hence, since

no difference exists across work experience, there was no need to locate where they exist – the Post Hoc test is not conducted.

Table 6.24 - ANOVA Test of Importance of Client Roles Across Work Experience

Client's Roles and Responsibilities	Sig[a]	Asmptn	Sig[b]	Sig[c]	Diff
Leadership					
Clearly identify client structure and responsibilities	0.812	Not Violated	0.457	0.513	No
Provide resource for continuity and leadership	0.419	Not Violated	0.351	0.399	No
Develop and share brief prior to the design stage	0.570	Not Violated	0.217	0.106	No
Ensure compliance to standards/best practice	0.290	Not Violated	0.718	0.805	No
Getting the right people for the right job at right time	0.001	Violated	0.451	0.447	No
Drive collaborative and flexible procurement policy	0.781	Not Violated	0.932	0.937	No
Demand effective quality management processes	0.000	Violated	0.139	0.182	No
Insist on adoptions of collaborative behaviours.	0.496	Not Violated	0.462	0.502	No
Procurement and Integration					
Set behavioural and performance example	0.767	Not Violated	0.727	0.684	No
Evaluate decisions using criteria agreed upon	0.985	Not Violated	0.925	0.918	No
Insist on 'early-warning culture' from all involved	0.998	Not Violated	0.957	0.951	No
Establish long term relationships with partners/firms	0.977	Not Violated	0.475	0.462	No
Understand and align with partners value system	0.996	Not Violated	0.949	0.942	No
Have clear criteria for selecting design team	0.786	Not Violated	0.660	0.731	No
Ensures robust change cotrol process	0.664	Not Violated	0.903	0.903	No
Design Quality					
Understand the key drivers for the design	0.095	Not Violated	0.101	0.123	No
Ensures that design delivers required function	0.674	Not Violated	0.655	0.697	No
Considers whole life cycle principles	0.501	Not Violated	0.807	0.815	No
Use of modern technologies	0.546	Not Violated	0.591	0.639	No
Use of design quality indicators	0.543	Not Violated	0.983	0.985	No

[a]Test of Homogeneity of Variances [b]F - Statistics [c]Robust Tests of Equality of Means

Kruskal-Wallis Test

The tests of Normality carried out on the dataset in Section 6.1.2.1 confirmed that the observations are normally distributed but that the fit is not significant. For this reason a non-parametric test is recommended as a confirmatory and complementary test to the parametric ANOVA. The Kruskal – Wallis test is analogous to the one-way ANOVA testing the null hypothesis that '*k*' independent random samples come from identical universes (Kothani & Garg, 2014). But unlike the ANOVA, Kruskal – Wallis

does not depend on the normality and equality in variance assumptions. The result of the test conducted is shown in Table 6.25, confirming the outcome of the parametric ANOVA test.

Table 6.25 - Kruskal-Wallis Test of Importance of Client Roles Across Experience

Client's Roles and Responsibilities	**Chi**	**df**	**Sig**	Diff
Leadership				
Clearly identify client structure and responsibilities	3.861	4	0.425	No
Provide resource for continuity and leadership	4.074	4	0.396	No
Develop and share brief prior to the design stage	5.663	4	0.226	No
Ensure compliance to standards/best practice	1.480	4	0.830	No
Getting the right people for the right job at right time	3.696	4	0.449	No
Drive collaborative and flexible procurement policy	0.859	4	0.930	No
Demand effective quality management processes	5.794	4	0.215	No
Insist on adoptions of collaborative behaviours.	3.626	4	0.459	No
Procurement and Integration				
Set behavioural and performance example	1.639	4	0.802	No
Evaluate decisions using criteria agreed upon	0.844	4	0.933	No
Insist on ‘early-warning culture’ from all involved	0.578	4	0.965	No
Establish long term relationships with partners/firms	3.647	4	0.456	No
Understand and align with partners value system	0.625	4	0.960	No
Have clear criteria for selecting design team	1.990	4	0.738	No
Ensures robust change cotrol process	1.064	4	0.900	No
Design Quality				
Understand the key drivers for the design	7.212	4	0.125	No
Ensures that design delivers required function	2.050	4	0.726	No
Considers whole life cycle principles	1.563	4	0.815	No
Use of modern technologies	3.603	4	0.462	No
Use of design quality indicators	0.128	4	0.998	No

6.4.4 Cascading Client Roles based on Managerial Position

The difference in response to the importance of client roles based on respondent’s managerial positions in their organisation was compared. Table 6.26 shows that there is consistency in mean values across the three different levels of managerial positions investigated. Looking at the aggregated mean values across the positions reveals that for the Leadership roles, respondents at Lower managerial level have a mean 4.45, those at middle level 4.42 while those at upper level have 4.40. These mean values

seem insignificantly different. The same pattern is replicated for Procurement and Integration roles having mean values of 4.36, 4.28, and 4.30 respectively and Design Quality roles with mean values of 4.19, 4.15, and 4.16 respectively. However, given these closeness in mean values across positions, those in lower managerial position have higher mean values compared to those at middle and upper levels for the three categories of client roles. More specifically, for the 'Develop and share brief prior to the design stage' role, respondents tend to differ on their rating, hence indicating that there exist difference in the mean values of the responses and that managerial position is responsibility for the difference. Further tests are carried out to check if this difference is statistically significant and if other differences exists among the remaining client roles attributes.

Table 6.26 - Means of Importance of Client Roles Across Managerial Position

Client's Roles and Responsibilities	Low	Mid	Upper	Mean
Leadership	**4.45**	**4.42**	**4.40**	**4.40**
Clearly identify client structure and responsibilities	4.27	4.34	4.28	**4.30**
Provide resource for continuity and leadership	4.36	4.49	4.49	**4.45**
Develop and share brief prior to the design stage	4.36	3.86	3.97	**4.06**
Ensure compliance to standards/best practice	4.50	4.54	4.47	**4.50**
Getting the right people for the right job at right time	4.59	4.49	4.52	**4.53**
Drive collaborative and flexible procurement policy	4.55	4.46	4.49	**4.50**
Demand effective quality management processes	4.36	4.56	4.42	**4.45**
Insist on adoptions of collaborative behaviours.	4.59	4.59	4.58	**4.59**
Procurement and Integration	**4.36**	**4.28**	**4.30**	**4.30**
Set behavioural and performance example	4.41	4.37	4.42	**4.40**
Evaluate decisions using criteria agreed upon	4.32	4.24	4.22	**4.26**
Insist on 'early-warning culture' from all involved	4.32	4.20	4.21	**4.24**
Establish long term relationships with partners/firms	4.45	4.29	4.40	**4.38**
Understand and align with partners value system	4.32	4.19	4.21	**4.24**
Have clear criteria for selecting design team	4.36	4.39	4.34	**4.36**
Ensures robust change cotrol process	4.32	4.29	4.27	**4.29**
Design Quality	**4.19**	**4.15**	**4.16**	**4.16**
Understand the key drivers for the design	4.09	4.00	4.12	**4.07**
Ensures that design delivers required function	4.36	4.34	4.36	**4.35**
Considers whole life cycle principles	4.32	4.27	4.24	**4.28**
Use of modern technologies	4.09	4.10	4.08	**4.09**
Use of design quality indicators	4.09	4.03	4.00	**4.04**

One-Way ANOVA Test

Table 6.27 shows the summary result of the test conducted. The Table indicates that for each of the attributes, none violated the Levene's test of homogeneity of variance; hence there was no need to undertake a test of equality of means. Therefore evident of difference can be based on the ANOVA *F* – statistics. Table 6.27 indicates that none of the client roles has statistically significant differences in the mean level of importance across the categories of managerial levels. This result shows that level of work experience did not influence the responses gathered, despite the patterns that was visually detected above. In other words, irrespective of managerial level, respondents responded similarly to the 20 Client role attributes. Hence, since no difference exists across work experience the Post Hoc procedure is not performed.

Table 6.27 - ANOVA Test of Importance of Client Roles Across Managerial Levels

Client's Roles and Responsibilities	**Sig[a]**	**Asmptn**	**Sig[b]**	**Sig[c]**	Diff
Leadership					
Clearly identify client structure and responsibilities	0.894	Not Violated	0.827	N/A	No
Provide resource for continuity and leadership	0.022	Not Violated	0.531	N/A	No
Develop and share brief prior to the design stage	0.747	Not Violated	0.078	N/A	No
Ensure compliance to standards/best practice	0.109	Not Violated	0.628	N/A	No
Getting the right people for the right job at right time	0.103	Not Violated	0.731	N/A	No
Drive collaborative and flexible procurement policy	0.614	Not Violated	0.773	N/A	No
Demand effective quality management processes	0.359	Violated	0.154	N/A	No
Insist on adoptions of collaborative behaviours.	0.890	Not Violated	0.973	N/A	No
Procurement and Integration					
Set behavioural and performance example	0.107	Not Violated	0.894	N/A	No
Evaluate decisions using criteria agreed upon	0.392	Not Violated	0.829	N/A	No
Insist on 'early-warning culture' from all involved	0.470	Not Violated	0.765	N/A	No
Establish long term relationships with partners/firms	0.280	Not Violated	0.400	N/A	No
Understand and align with partners value system	0.391	Not Violated	0.734	N/A	No
Have clear criteria for selecting design team	0.065	Not Violated	0.823	N/A	No
Ensures robust change cotrol process	0.157	Not Violated	0.933	N/A	No
Design Quality					
Understand the key drivers for the design	0.132	Not Violated	0.475	N/A	No
Ensures that design delivers required function	0.223	Not Violated	0.964	N/A	No
Considers whole life cycle principles	0.883	Not Violated	0.877	N/A	No
Use of modern technologies	0.808	Not Violated	0.991	N/A	No
Use of design quality indicators	0.847	Not Violated	0.904	N/A	No

[a]Test of Homogeneity of Variances [b]F - Statistics [c]Robust Tests of Equality of Means

Kruskal-Wallis Test

The tests of Normality carried out on the dataset in Section 6.1.2.1 confirmed that the observations are normally distributed but that the fit is not significant. For this reason a non-parametric test is recommended as a confirmatory and complementary test to the parametric ANOVA. The Kruskal – Wallis test is analogous to the one-way ANOVA testing the null hypothesis that '*k*' independent random samples come from identical universes (Kothani & Garg, 2014). But unlike the ANOVA, Kruskal-Wallis does not depend on the normality and equality in variance assumptions. The result of the test conducted is shown in Table 6.28, confirming the outcome of the parametric ANOVA test shown in Table 6.27.

Table 6.28 - Kruskal-Wallis Test of Importance of Client Roles Across Managerial Levels

Client's Roles and Responsibilities	**Chi**	**df**	**Sig**	Diff
Leadership				
Clearly identify client structure and responsibilities	0.395	2	0.821	No
Provide resource for continuity and leadership	1.354	2	0.508	No
Develop and share brief prior to the design stage	5.413	2	0.067	No
Ensure compliance to standards/best practice	1.265	2	0.531	No
Getting the right people for the right job at right time	0.632	2	0.729	No
Drive collaborative and flexible procurement policy	0.520	2	0.771	No
Demand effective quality management processes	3.535	2	0.171	No
Insist on adoptions of collaborative behaviours.	0.056	2	0.972	No
Procurement and Integration				
Set behavioural and performance example	0.061	2	0.970	No
Evaluate decisions using criteria agreed upon	0.494	2	0.781	No
Insist on 'early-warning culture' from all involved	0.636	2	0.728	No
Establish long term relationships with partners/firms	1.261	2	0.532	No
Understand and align with partners value system	0.676	2	0.713	No
Have clear criteria for selecting design team	0.619	2	0.734	No
Ensures robust change cotrol process	0.298	2	0.862	No
Design Quality				
Understand the key drivers for the design	1.024	2	0.599	No
Ensures that design delivers required function	0.022	2	0.989	No
Considers whole life cycle principles	0.319	2	0.852	No
Use of modern technologies	0.088	2	0.957	No
Use of design quality indicators	0.037	2	0.982	No

6.5 Structuring the Determinants of V_fM in Design – Exploratory Analysis

As previously discussed one of the main objectives of this study is to appraise the relationships between client organisation parameters, design process and team functioning. The constructs developed for the study in Chapter 3 are all new based on the modifications to the Robbins and Judge's (2013) framework. Thus, operationalising them was based on concepts and theories reviewed and discussed in Chapter 2. Chapter 3 further provided the theoretical underpinning for the research and the conceptual framework developed from theoretical and empirical evidences finally conceptualising the variables and sub-variables for the constructs. This section reports on the analysis carried out to ensure the reliability and validity of the constructs for the purpose of achieving the research objectives.

Two fundamental operations need to be done to ensure that the constructs are fit for further analysis given that the multi-items multi-scales method – multidimensional scale is chosen as the appropriate method of data collection. The first of these operations would require that the measurement instrument be restructured based on the response pattern received by *reducing to a manageable number many variables that belong together and have overlapping measurement characteristics* (Cooper & Schindler, 2008, p. 562) since the structure of the questionnaire hasn't been tested based on the items used in developing the constructs' variables. However, after ascertaining the validity of the instrument as discussed in Chapter 4, there was still need to verify its structure. Factor analysis is employed for this purpose and discussed in Section 6.6. This further improves the instrument's construct validity (Cooper & Schindler, 2008) and enhances it generalisability (Frankfort-Nachmias & Nachmias, 1999).

The second of these operations confirms the appropriateness of the structure determined in Section 6.6 in terms of the reliabilities of the items/attributes making up the restructured variables i.e. content reliability. This is particularly important for this study given the nature of the measurement scale used. The degree to which the instrument items are homogenous and reflect the same underlying construct would greatly improve its internal consistency. Considered with improved validity, reliable instruments provide confidence of non-interference of transient and situational errors (Cooper & Schindler, 2008). Cronbach's Alpha test is applied to test the reliability of the measurement instrument and discussed in Section 6.2.2.

6.5.1 Factor Analysing the Determinants of Value in Design

For a dataset to qualify for factor analysis, it must be suitable and adequate. The Kaiser-Meyer-Oklin measure of sampling adequacy tests whether the partial correlations among variables are small. The procedure compares the magnitude of sum of the squared partial correlation coefficients of all variables to the sum of their squared correlation coefficients. If the magnitude is small, the KMO measure is close to 1. Burns & Burns (2008) suggest that KMO values greater than 0.5 indicates dataset suitability for factor analysis. The Bartlett's test of sphericity tests whether the correlation matrix is an identity matrix, which would indicate that the factor model is inappropriate, otherwise the determinant value of the matrix is close to 0. This implies that one or more dependent variables are a linear function of another. Hence, the null hypothesis is rejected because the significant level is large i.e. > 0.05 and safely accept the suitability of the dataset for factor analysis since there exist interdependency among the variables under consideration (Cooper & Schindler, 2008).

Four steps are fundamental to factor analysis. The first is the computation of correlation matrix of all variables giving indications of . . . . This is followed by the

construction of a new set of variables based on the inherent relationships in the correlation matrix. This process is referred to as factor extraction and it is done iteratively based on a set stopping criterion for instance, predetermined number of factors to extract based on eigenvalues. Several extraction methods are available, the principal component being the most commonly used. The next step is factor rotation which reveals the underlining structure in the dataset, improving interpretability of the factors by removing ambiguities. Finally, factor scores are obtained to help explain what the factors mean and can be used to perform several multivariate analyses (Cooper & Schindler, 2008).

Discussed below are the specific procedures common in the application of factor analysis and used in this section. For factor extraction the Principal Component Analysis (PCA) is adopted. This method linearly transforms the variables in the dataset into a set of principal components that are unrelated – called factors together accounting for the total variance of the dataset. Accordingly, PC factors account for the largest variability compared to other methods since it maximises the sum of squared loadings of each factor extracted in turns. As to the number of PCs or factors to retain, a number of criteria have been suggested but the commonly used one is the Kaiser's criterion – only principal components having latent root (eigenvalue) greater than 1 are consider. One commonly used method but less deterministic is the scree plot where cut-off point for selection is the point of inflexion where variation accounted for by factors may be so small.

Factor rotation is necessary for improving the interpretability of factors based on their variables via orthogonal and oblique methods. For Orthogonal rotation, which suits this research i.e. to identify underlying structures, the Vaximax method is the most common and it attempts to isolate those variables that have a high loading on a single

factor (Burns & Burns, 2008; Pallant, 2007). The methods describe above are applied to the procedures in structuring the research data below.

This section employs factor analysis to each of the five constructs of the research – Client Roles, Contextual Factor, Composition Factors, Design Process and Team Functioning. Table 6.29 shows the KMO and Bartlett's Tests for each of the construct's dataset. All the datasets are suitable for factor analysis having KMO coefficients (> 0.50) ranging between 0.879 – 0.941 and Bartlett's significance < 0.05. The communalities, variance explanations, eigenvalues and rotated sums loadings used in determining the principal components and rotations of each construct is shown in Appendix G. References are made to them in discussing Sections 6.2.1.1 – 6.2.1.5. Regarding factor loading, values between 0.30 – 0.40 are considered significant, between 0.40 – 0.50 very important and greater than 0.50 is considered very significant. (Burns & Burns, 2008). The criteria for selecting attributes within a factor adopted for this section is as follows: first the attribute must load at > 0.500 on that factor and second must not cross-load at > 0.35 on any other factor, else it is excluded.

Table 6.29 - KMO and Bartlett's Tests

Data Set	**KMO**	**Bartlett's Test of Sphericity**		
		Chi-Square	**df**	**Sig**
Client Roles	0.941	6732.441	190	0.000
Contextual Factors	0.901	8349.298	190	0.000
Composition Factors	0.903	8179.822	153	0.000
Design Process	0.879	2855.276	55	0.000
Team Functioning	0.887	970.170	45	0.000

6.5.2 Structuring the Client Roles Construct

Three main categories of client roles were established from literature and investigated namely: Leadership having 8 attributes, Procurement and Integration 5 attributes, and Design Quality with 7 attributes. The Client roles construct has 20 attributes defining the roles clients perform to enhance achieving value in design by design teams. Based on Kaiser's criterion i.e. using the eigenvalues greater than 1, for selecting number of factor to retain, a three-factor solution is proffered explaining a total of 74.705% of the total variance in the dataset as shown in the Appendix G. The rotation procedure improved Factor 2 and 3 increasing their explained variance from 1.914 to 2.46% and 1.060 to 1.37% respectively.

Table 6.30 shows the rotated component matrix of the three-factor model and their factor loadings. Factor 1 explaining 55.56% of the variance is composed of attributes from the Leadership roles attributes 1, 2, 3, 4, 5, & 7; Procurement and Integration roles attributes 3, 4, & 5; and Design Quality roles attributes 1, 2, 3, 4, 6 and 7. None of the roles cross-loads into either Factor 2 or Factor 3 hence all are retained as Factor 1 roles except Leadership roles attribute 5 – Getting the right people for right job at right time which cross-loads on Factor 3 (0.420 > 0.350). Since the roles contained in this factor cuts across all the three distinct roles identified from literature, Factor 1 is labelled 'Leadership and Design' Roles.

Factor 2 explains 12.285% of the variance and is composed of two attributes from 'Leadership' role – *Drive clear, collaborative and flexible procurement policy*, and *Insist on adoption of collaborative behaviours*; and two attributes from 'Procurement and Integration' roles – *Set behavioural and performance examples*, and *Evaluate decisions using evaluation criteria agreed upon*. All the role attributes are retained in Factor 2 since neither of them significantly cross-loads on Factors 1 nor 3. Hence,

giving the nature of the four attributes loading to Factor 2, it retains its former title but re-labelled 'Procurement' roles. Only one attribute loads on Factor 3 – *Consideration of whole life cycle principles* and explains 6,860% of the variance. This factor is labelled 'WLC' role.

Table 6.30 - Rotated Component Matrix[a] for Client Roles

	Client Roles and Responsibilities	Component		
		1	**2**	**3**
	Leadership			
1	Clearly identify client structure and responsibilities	**0.758**	0.230	0.276
2	Provide adequate resource to maintain leadership	**0.894**	0.172	0.270
3	Develop and share brief prior to the design stage	**0.821**	0.100	0.303
4	Ensure compliance to standards and best practice	**0.837**	0.177	0.281
5	Getting the right people for the right job at right time	0.544	0.121	0.420
6	Drive clear, collaborative procurement policy	0.115	**0.775**	0.174
7	Demand effective quality management processes	**0.880**	0.174	0.289
8	Insist on adoptions of collaborative behaviours.	0.035	**0.600**	0.070
	Procurement and Integration			
1	Set behavioural and performance example	0.328	**0.645**	0.139
2	Evaluate decisions using criteria agreed upon	0.106	**0.836**	-0.129
3	Insist on 'early-warning culture' from all involved	**0.809**	0.239	0.117
4	Establish long-term relationships with partners/firms	**0.832**	0.117	-0.234
5	Understand/align with other partners value system	**0.943**	0.123	-0.100
	Design Quality			
1	Have clear criteria for selecting design team	**0.949**	0.102	-0.069
2	Ensures robust change control process	**0.964**	0.110	0.037
3	Understand the key drivers for the design	**0.961**	0.111	0.043
4	Ensures that design delivers required function	**0.959**	0.108	0.041
5	Considers whole life cycle principles	0.057	0.099	**0.759**
6	Use of modern technologies	**0.888**	0.116	0.129
7	Use of design quality indicators	**0.644**	0.238	0.200

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a] *Rotation converged in 4 iterations.*

6.5.3 Structuring the Contextual Factors Construct

Contextual Factors are factors relative to organisations that affects team functioning. Four main independent categories were identified namely: Resources with 4 attributes, Organisational Structure 6 attributes, Leadership and Organisational Culture 6 attributes, and Performance Evaluation and Reward having 4 attributes. Based on Kaiser's criterion i.e. using the eigenvalues greater than 1, for selecting number of

factor to retain, a two-factor solution is proffered explaining a total of 80.071% of the total variance in the dataset as shown in the Appendix G. Appling the Varimax rotating technique improvements was made on Factor 1 and 2 by reducing the explained variance from 71.228 to 43.486% and increasing from 8.843 to 36.584% respectively.

Table 6.31 shows the rotated component matrix of the two-factor model and their factor loadings. Factor 1 explains 43.486% of the variance and is wholly composed of the Adequate Resources attributes 1, 2, 3, 4; Organisation Structure attributes 1, 2, 3, 4, 5 & 6; and Leadership and Organisational Culture attributes 1, 2, 3, 4, 5 & 6. All of these attributes except Leadership and Organisational Culture attributes 3, 4, 5 & 6 cross-loads into Factor 2 and are therefore removed from Factor 1. Since the attributes contained in this factor are from the same category and based on their nature, Factor 1 is labelled 'Trust/Culture' comprising – *Promotes trust among team members*, *Encourages trust for team members*, and *Willingness of members to take risks*, *Willingness to expose team's vulnerabilities*.

Factor 2 explains 36.584% of the variance and is largely composed of Adequate Resources attributes 1, 2, 3 & 4; Organisation Structure attributes 1, 2, 3, 4, 5 & 6; Leadership and Organisational Culture attribute 2 – *Ensure shared leadership*; and Performance Evaluation and Reward attributes 1, 2 & 3. All the attributes in the Adequate Resources and Organisation Structure categories cross-loads on Factor 1 including Leadership and Organisational Culture attribute 2 – *Ensure shared leadership*; and Performance Evaluation and Reward attribute 1- *Group-based appraisal* loading at 0.430 > 0.300. They are excluded from Factor 2. Therefore three attributes makes up Factor 2 – *Evaluates team rather than individuals*, *Encourages*

joint accountability and *Profit/gains sharing incentives*. Thus, it retains its original label but renamed 'Evaluation'.

Table 6.31 - Rotated Component Matrix[a] for Contextual Factors

	Contextual Factors/Variables	Component	
		1	2
	Adequate Resources		
1	Provided timely information	0.649	0.619
2	Proper equipment and adequate staffing	0.595	0.611
3	Necessary support and encouragement	0.665	0.667
4	Adequate administrative assistance	0.601	0.649
	Organisational Structure		
1	Clear definition of each member's role	0.709	0.618
2	Agreeing on specifics of work with members	0.793	0.514
3	Integrating and fitting individual members skills	0.799	0.520
4	Responsibility for teams performance	0.650	0.564
5	Clear channel of communication	0.628	0.518
6	Empower member by delegating responsibility	0.777	0.541
	Leadership and Organisation Culture		
1	Leadership focus on work not persons	0.747	0.439
2	Ensure shared leadership	0.792	0.561
3	Promotes trust among team members	**0.801**	0.235
4	Encourages trust for team leadership	**0.774**	0.270
5	Willingness of members to take risks	**0.881**	0.303
6	Willingness to expose team's vulnerabilities	**0.660**	-0.086
	Performance Evaluation and Reward		
1	Evaluates team rather than individuals	0.194	**0.905**
2	Encourages joint accountability	0.162	**0.958**
3	Group-based appraisals	0.430	0.766
4	Profit/gains sharing incentives	0.205	**0.916**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a] *Rotation converged in 3 iterations.*

6.5.4 Structuring the Composition Factors Construct

Team composition is one of the factors affecting team effectiveness. The Composition Factors comprise of attributes that operationalises this construct. Three main independent categories were identified namely: Member Abilities with 4 attributes, Member Personality 6 attributes, and General Roles having 8 attributes. Based on Kaiser's criterion i.e. using the eigenvalues greater than 1, for selecting number of factor to retain, a two-factor solution is proffered explaining a total of 82.900% of the

total variance in the dataset as shown in the Appendix G. Applying the Varimax rotating technique, improvement was made on Factor 1 and 2 by reducing the explained variance from 72.947 to 48.105% and increasing from 9.952 to 36.794% respectively.

Table 6.32 shows the rotated component matrix of the two-factor model and their factor loadings. Factor 1 explains 48.105% of the variance and is wholly composed of attributes from Member Abilities and General Roles as follows: Member Abilities attributes 1, 2 & 3; and General Roles attributes 1, 2, 3, 4, 5, 6, 7 & 8. All the attributes under Member Abilities i.e. 1, 2 & 3 cross-loads on Factor 2 and those of General Roles attributes 1, 2, & 3. These 6 attributes are therefore removed from Factor 1. And since the attributes contained in this Factor are from the same category, the original name is retained hence Factor 1 is labelled 'General Roles' comprising – *Offers insightful analysis of opinions*, *Provides directions and follow through*, *Examines details and enforces laws, Fight external influence to team,* and *Encourages search for more information*.

Factor 2 explains 36.794% of the variance and is wholly composed of attributes from Members Abilities and Members Personality as follows: Member Abilities attributes 1, 2, 3, & 4; Personality attributes 1, 2, 3, 4, 5 & 6; and General Roles attribute 1 – *Coordinating and integrating efforts*. All the attributes in Member Abilities (except for *Interpersonal skills*) and Member Personality attributes 4, 5, & 6 cross-loads on Factor 1 and are thus excluded from Factor 2. Therefore three attributes make up Factor 2 – *Appreciably relating well with others*, *Cooperation and trust for others* and *Responsibleness and dependability*, retaining its original label but renamed 'Personality'.

Table 6.32 - Rotated Component Matrix[a] for Composition Factors

	Contextual Factors/Variables	Component	
		1	2
	Member Abilities		
1	Technical knowledge and expertise	0.752	0.540
2	Problem-solving skills	0.703	0.536
3	Decision-making skills	0.557	0.683
4	Interpersonal skills	0.401	**0.879**
	Member Personality		
1	Appreciably relating well with others	0.218	**0.870**
2	Cooperation and trust for others	0.292	**0.876**
3	Responsibleness and dependability	0.231	**0.547**
4	Highly organised and persistence	0.441	0.754
5	Emotional stability	0.371	0.812
6	Openness, creativity and sensitivity	0.463	0.806
	General Roles		
1	Coordinating and integrating efforts	0.713	0.501
2	Initiates creative ideas	0.855	0.405
3	Champions ideas after been created	0.838	0.378
4	Offers insightful analysis of opinions	**0.886**	0.350
5	Provides directions and follow through	**0.904**	0.326
6	Examines details and enforces laws	**0.920**	0.331
7	Fight external influences to team	**0.915**	0.310
8	Encourages search for more information	**0.899**	0.324

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a] *Rotation converged in 3 iterations.*

6.5.5 Structuring the Design Process Construct

The design process can be viewed as the nerve centre for team functioning comprising of three main independent categories namely: Communications having 4 attributes, Collaboration 3 attributes, and Conflict Resolution having 4 attributes. In the questionnaire (see Appendix D) Collaboration has 4 attributes. Factor extraction lead to a matrix that is not positive definite (positive definite matrix is a square matrix, symmetric about the main diagonal, with positive eigenvalues) thus violating the condition for factor analysis. Two attributes were responsible for this – *Translate clients objective to team goals* and *Members' total sense of commitment to the team*. Both loaded similarly on all the factors having the same mean and standard deviation (see Table 6.17). Eliminating any of them solves this problem, hence, *Members' Members' total sense of commitment to the team* was removed from the dataset. Using

the Kaiser's criterion i.e. using eigenvalues greater than 1 to select the number of factor to retain, a three-factor solution is proffered explaining a total of 76.294% of the total variance in the dataset as shown in the Appendix G. Applying the Varimax rotating technique improvements was made on Factor 1, 2 and 3 by reducing the explained variance from 56.435 to 36.297% and increasing from 10.599 to 30.187% and 9.260% to 9.811% respectively.

Table 6.33 shows the rotated component matrix of the three-factor model and their factor loadings. Factor 1 explains 36.297% of the variance and is composed of Communications attribute 3 – *Availability of design related information*; Collaboration attribute 1 – *Translate client's objective to team goals*; and Conflict Resolution attributes 1, 2, 3, & 4. The following attributes cross-loads on either Factor 2 or Factor 3, and are therefore removed from Factor 1: Communications attribute 3 – *Availability of design related information*, Collaboration attribute 1 – *Translate client's objective to team goals* and Conflict Resolution attributes 2, 3, & 4. Since only one attribute remained in Factor 1 – *Common problem solving approach*, the original corresponding name is retained, hence Factor 1 is labelled 'Conflict Resolution'.

Factor 2 explains 30.187% of the variance. It is composed of Communications attributes 1, 2 & 3 and Collaboration attribute 1 – *Translate client's objective to team goals*. None of the Conflict Resolution attributes loaded on this Factor 2. The following attributes cross-loads on either Factor 1 or Factor 3 and are therefore removed from Factor 2: Communications attributes 2 – *Adequate time for deliberations on brief* and 3 – *Availability of design related information* and Collaboration attribute 1 – *Translate client's objective to team goals*. Since only one attributes remained in Factor 2 – *Availability of project brief/client requirements*, the original corresponding name is retained, hence Factor 2 is labelled 'Communications'.

Similarly, only one attribute loads on Factor 3 – *Confidence and trust amongst members*, hence it is labelled 'Collaboration'.

Table 6.33 - Rotated Component Matrix[a] for Design Process

	Design Process Variables	Component		
		1	**2**	**3**
	Communications			
1	Availability of project brief/client requirements	0.297	**0.776**	0.075
2	Adequate time for deliberations on brief	0.408	0.811	0.040
3	Availability of design related information	0.534	0.796	0.054
4	Authority to modify brief/requirement if need be	0.232	0.479	0.341
	Collaboration			
1	Translate client's objective to team goals	0.500	0.745	0.042
2	Interdependence of members on each other	0.308	-0.428	0.263
3	Confidence and trust amongst members	-0.023	0.055	**0.931**
	Conflict Resolution			
1	Common problem solving approach	**0.863**	0.160	0.022
2	Common understanding of the design problem	0.876	0.390	0.070
3	Existence of interpersonal incompatibility	0.881	0.379	0.066
4	Conflicts on task to be performed	0.874	0.365	0.067

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a] *Rotation converged in 5 iterations.*

6.5.6 Structuring the Team Functioning Construct

The team functioning construct was not having any category when administered therefore it could be referred to as Team Functioning category having 10 attributes Based on Kaiser's criterion i.e. using the eigenvalues greater than 1 for selecting number of factor to retain, a two-factor solution is proffered explaining a total of 56.063% of the total variance in the dataset as shown in the Appendix G. Applying the Varimax rotating technique minimal improvements was recorded.

Table 6.34 shows the rotated component matrix of the two-factor model and their factor loadings. Factor 1 explains 44.768% of the variance and is composed of the Team Functioning attributes 1, 2, 3, 4, 5, 6, 7 & 8. None of these attributes cross-loads into Factor 2 hence, based on the nature of the attributes, Factor 1 is labelled 'Efforts'.

Factor 2 explains 11.296% of the variance and is comprises of Team Functioning attributes 1 – *Achieving clients value was the primary drivers for the team*, and 2 – *There exist a recognisable, objective client value system*. None of these attributes cross-loads into Factor 1 hence, based on the nature of the attributes, Factor 2 is labelled 'Drivers'.

Table 6.34 - Rotated Component Matrix[a] for Team Functioning

	Team Functioning Variables	Component	
		1	2
	Efforts		
1	The term 'value' was explicitly defined for the design	**0.690**	0.195
2	Brief contained clear function-quality-cost requirements	**0.620**	-0.144
3	Client's 'Value' requirement adequately understood by team	**0.904**	-0.020
4	Functions and quality as designed met client's expectations	**0.849**	-0.015
5	Cost objectives of the client were met and/or exceeded	**0.761**	-0.012
6	WLC formed the basis for design decisions/solutions	**0.530**	0.125
7	Efforts were made to balance function, quality and cost	**0.642**	-0.318
8	Budgets were adjustable to meet function/quality objectives	**0.898**	-0.096
	Drivers		
1	Achieving client's value was the primary driver for the team	-0.023	**0.534**
2	There exist a recognisable, objective client value system	0.023	**0.812**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a] *Rotation converged in 3 iterations.*

6.5.7 Summary of Factor Analysis – Structuring Value in Design Determinants

The structure inherent in the dataset investigated needed to be ascertained since the constructs are only being applied for the first to researches of this nature. Researches on team performances applied these constructs to describe *'the nature of systems'* whereas in this case they have been used to describe *'the performance of systems'* for instance the performance of the client organisation in: achieving their design roles, providing supports, and composing the design teams. Table 6.35 shows the outcome of the factor analysis performed.

Table 6.35 – Summary of Factor Analysis on Research Variables

Original Constructs	Factor Analysis Constructs	% Var	KMO	Sig
Client Roles (20) - (17)[b]		**74.705**		
Leadership (8)	Leadership & design (14)	55.560	0.941	0.000
Procurement (5)	Procurement (4)	12.285		
Design (7)	WLC Considerations (1)	6.860		
Contextual Factors (20) - (7)[a]		**80.071**		
Resources (4)	Culture (4)	43.486	0.901	0.000
Structure (6)	Evaluation (3)	36.584		
Culture (6)				
Evaluation (4)				
Composition Factors (18) - (8)[a]		**82.900**		
Abilities (4)	Generic Roles (5)	46.105	0.903	0.000
Personality (6)	Personality (4)	36.793		
Generic Roles (8)				
Design Process (12) - (3)[c]		**76.294**		
Communications (4)	Conflicts (1)	36.297	0.879	0.000
Collaboration (4)	Communications (1)	30.187		
Conflicts (4)	Cohesion (1)	9.811		
Team Functioning (10) - (10)[a]		**56.063**		
No sub variables	Efforts (8)	44.768	0.887	0.000
	Drivers (2)	11.296		

Extraction method: Principal Component analysis
Rotation Method: Varimax with Kaiser Normalisation
Rotation convergence iterations: [a]3 [b]4 [c]5

All the constructs showed high potentials for factor analysis having high Kaiser-Meyer-Olkin measure of sampling adequacy coefficient ranging between 0.879 – 0.941 and all were significant at 99% on the Bartlett's Test of Sphericity. The constructs as extracted from literature indicate the following multi-scale items: ***'client roles'*** having a total of 20 items consisting of *'leadership role'* 8 items, *'procurement and integration roles'* 5 items and *'design role'* 7 items; ***'contextual factors'*** with a total of 20 items consisting of *'resources'* having 5 items, *'structures'* 6, *'culture'* 4 and *'evaluation'* 6 items; ***'composition factor'*** has 18 items consisting of *'abilities'* having 4 items, *'personality'* 6 and *'general roles'* 8 items; ***'design process'*** has 12 items in total consisting of 4 items each for *'communications'*, *'collaboration'* and *'conflicts'*; lastly ***'team functioning'*** contains 10 items and no sub variables.

Upon conducting factor analysis, for ***'client role'*** three components are extracted like in the original construct but reconstituted as follows: '*leadership and design roles'* with 13 items loading on it and explaining 55.56% of the variance in the factor; *'procurement'* having 4 items with a 12.285% explanation; and *'WLC considerations'* having only one item and explaining 6.860% of the variance. These three components, having a total of 17 items explain 74.705% of the variance in the original construct. There is a massive reduction in the items of the ***'contextual factor'*** construct from 20 to 7. Only two components are extracted: '*Culture'* having 4 items and explaining 43.486% of the variance, and *'Evaluation'* with 3 items explaining 36.584%. These two components explain 80.071% of the variance in the original 20 items construct.

Similarly, there is a remarkable drop in the items for ***'composition factor'*** too from 18 to 8 items with only two components extracted: '*general roles'* having 5 items and explaining 46.105% of the variance, and *'personality'* with 3 items explaining 36.793%. These two components explain 82.900% of the variance in the original 18 items construct. The ***'design process'*** constructs also experience marked reduction in its items from 12 to 3. Three components are extracted explaining up to 76.294% of the variance in the original construct. The components are: *'conflicts'* having 1 items explaining 36.297%, *'communications'* having 1 item explaining 30.187% and *'cohesion'* having 1 item too and explaining 9.811%. Originally, the ***'team functioning'*** construct was a one-variable construct but upon performing factor analysis, two components are extracted explaining 56.063% of the variance of all the items in the construct. The *'efforts'* variable has 8 items explaining 44.768% while the *'drivers'* variable has 2 items explaining 11.296%.

6.6 Reliability Analysis of the Determinants of Value in Design

After conducting factor analysis on the determinants in section 6.5, the reliability of the restructured variables has to be tested. Of particular interest at this stage of the research is the internal consistency of the new dataset structure. Internal consistency is aimed at measuring the degree to which the items in a survey instrument are homogenous and reflect the same underlying constructs (Cooper & Schindler, 2008, p. 293). A popular tool for checking internal consistency is the Cronbach's alpha coefficient. Every measurement has two components – a true component and an error component. Cronbach's alpha test computes the ratio between the variance of the true component to the total variance in the scores as measured (Frankfort-Nachmias & Nachmias, 1999).

Further, the Cronbach's alpha test can be interpreted as the correlation of the observed scale with all other possible scales measuring the same object and using the same number of items. In other words, the computation of Cronbach's alpha is based on the number of items on a survey and the ratio of the average inter-item covariance to the average variance (IBM, 2012). Hence, the reliability measure varies from 0 to 1, the former being when the measurement involves only the error component and reaching 1 when only the true component is measured. Though, there is no universally agreed acceptability cut-off coefficient. However, researches have generally considered 0.60 an acceptable cut-off, and tends to establish a convention *'that alpha should be at least 0.70 or higher to retain an item in an 'adequate' scale; and many researcher require a cut-off of 0.80 for a 'good scale'*" (Allen and Yen, 2002 cited in Chen, 2008, p.140).

Discussed below are the reliability tests conducted on the research variables based on the outcome of the factor analysis procedure reported in Section 6.2.1. However, the

variables under the Design Process construct (i.e. communication, collaboration and conflict resolution) were not tested for reliability – the three variables contain either one or two attributes (items). This is considered too small an item scale for applying the Cronbach's alpha test.

6.6.1 Reliability of Client Roles Variables

The original Client Roles construct was designed having three variables namely: Leadership, Procurement & Integration, and Design Quality. Following the outcome of factor analysis these were reconstituted as Leadership & Design, Procurement and WLC. Only the Leadership & Design and Procurement variables are considered in this section. WLC is not considered having only one attribute.

6.6.1.1 Leadership & Design Role Variable

Table 6.36 shows the 14 attributes of Leadership & Design variable. It contains attributes on clients doing what will engender an atmosphere for effectiveness of the design process by setting standards and management processes. The variable also contains those attributes focusing on managing the design process. These 14 attributes are tested for reliability. The result is shown in Table 6.37.

Table 6.36 - Items: Leadership & Design

S/N	Description
1	Clearly identify client structure and responsibilities
2	Provide adequate resource to maintain continuity and leadership
3	Develop and share detailed brief prior to the design stage
4	Ensure compliance to standards and working to best practice
5	Demand effective quality management processes and procedures
6	Insist on 'early-warning culture' from all involved
7	Establish long term relationships with partners/firms
8	Understand and align with other partners value system
9	Have clear criteria for selecting design team
10	Ensures robust change control process
11	Understand the key drivers for the design
12	Ensures that design delivers required function
13	Use of modern technologies
14	Use of design quality indicators

Table 6.37 shows a Cronbach's alpha of 0.977 indicating that the attributes combination is much more than a 'very good' scale to measure the Leadership and Design variable. From the Table, improvements can be made to the coefficient by deleting Leadership Items 14 – *Use of design quality indicators*, from 0.977 to 0.978. However, since these improvements are minimalistic all 14 attributes are retained for further analysis.

Table 6.37 Reliability & Item-Total Statistics for Leadership and Design

Cronbach's Alpha 0.977	**Nr of Items** 14			
Item Labels	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Leadership item 1	50.240	138.038	0.792	0.976
Leadership item 2	50.020	136.580	0.928	0.974
Leadership item 3	50.100	138.535	0.840	0.976
Leadership item 4	50.080	136.624	0.867	0.975
Leadership item 5	50.020	135.352	0.917	0.974
Leadership item 6	50.150	136.161	0.822	0.976
Leadership item 7	50.620	135.299	0.763	0.977
Leadership item 8	50.470	134.982	0.912	0.974
Leadership item 9	50.420	134.772	0.920	0.974
Leadership item 10	50.450	132.159	0.956	0.974
Leadership item 11	50.430	132.309	0.953	0.974
Leadership item 12	50.440	132.561	0.951	0.974
Leadership item 13	50.470	134.089	0.886	0.975
Leadership item 14	50.580	141.950	0.663	0.978

6.6.1.2 Procurement Role Variable

Table 6.38 shows that after factor analysing the Client Roles construct, Procurement variable is best explained by 4 attributes. These attributes relate to the client organisation having robust procurement policies and evaluation mechanisms, and then providing and demanding collaborative behaviours. These attributes are tested for reliability. The result is shown in Table 6.39.

Table 6.38 - Items: Procurement

S/N	Description
1	Drive clear, collaborative and flexible procurement policy
2	Insist on adoptions of collaborative behaviours.
3	Set behavioural and performance example
4	Evaluate decisions using evaluation criteria agreed upon

Table 6.39 shows a Cronbach's alpha of 0.721 indicating that the attributes combination is just an 'adequate' scale to measure the Procurement variable. Further, the Table indicates that deleting Procurement Item 3 – *Set behavioural and performance example*, will improve the measurement scale to 0.741. This attribute is retained given that the improvement is minimal.

Table 6.39 Reliability & Item-Total Statistics for Procurement

Cronbach's Alpha 0.721	**Nr of Items** 4			
Item Labels	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Procurement item 1	9.480	5.027	0.584	0.619
Procurement item 2	9.260	5.755	0.361	0.741
Procurement item 3	9.450	5.284	0.511	0.660
Procurement item 4	10.020	4.178	0.606	0.598

6.6.2 Reliability of Contextual Factors Variables

The initial construct related to client organisational make up comprised of four variables – Resources, Organisation Structure, Leadership and Organisational Culture, and Performance Evaluation. The outcome of factor analysis restructured it into a two variable construct – Culture and Evaluation each having up to 3 attributes. Hence scales of both variables are tested for reliability.

6.6.2.1 Culture Variable

Four attributes loaded to the Culture variable as shown in Table 6.40 which bothers on client organisations' ability to allow members of the design team trust themselves and the leadership and giving room for risk-taking while accepting teams' shortcomings. These attributes are tested for reliability; the result is shown in Table 6.41.

Table 6.40 - Items: Culture

S/N	Description
1	Promotes trust among team members
2	Encourages trust for team leadership
3	Willingness of members to take risks
4	Willingness to expose team's vulnerabilities

Table 6.41 shows a Cronbach's alpha of 0.871 indicating that the attributes combination is more than a 'very good' scale to measure the Culture variable. Further inspection of the Table reveals that deleting Culture Item 4 – *Willingness to expose team's vulnerabilities*, will substantially improve the measurement scale to 0.939. Therefore, this attribute is deleted from the scale leaving three attributes for further analysis namely – *Promotes trust among team members*, *Encourages trust for team leadership* and *Willingness of members to take risks*.

Table 6.41 Reliability & Item-Total Statistics for Culture

Cronbach's Alpha 0.871	**Nr of Items** 4			
Item Labels	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Culture item 1	10.830	7.391	0.830	0.794
Culture item 2	10.940	7.282	0.782	0.811
Culture item 3	10.700	7.880	0.872	0.792
Culture item 4	11.280	7.799	0.509	0.939

6.6.2.2 Evaluation Variable

Three attributes loaded to the Evaluation variable as shown in Table 6.42 bordering on client organisations' ability to evaluate members based on team output making them jointly accountable and providing sharing incentives. These attributes are tested for reliability and the result shown in Table 6.43.

Table 6.42 - Items: Evaluation

S/N	Description
1	Evaluates team rather than individuals
2	Encourages joint accountability
3	Profit/gains sharing incentives

Table 6.43 shows a Cronbach's alpha of 0.979 indicating that the attributes combination is much more than a 'very good' scale to measure the Evaluation variable. Further inspection of the Table reveals that deleting Evaluation Item 1 – *Evaluate team rather than individuals,* will improve the measurement scale to 0.982. However, this improve is minimal hence the attribute is retained. Therefore the three attributes measuring the Evaluation variable used for further analysis are: *Evaluate teams rather than individuals*, *Encourages joint accountability* and *Profit/gains sharing incentives*.

Table 6.43 Reliability & Item-Total Statistics for Evaluation

Cronbach's Alpha 0.979	**N of Items** 3			
Item Labels	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Evaluation item 1	5.400	7.921	0.937	0.982
Evaluation item 2	5.530	7.241	0.984	0.949
Evaluation item 3	5.360	7.563	0.946	0.976

6.6.3 Reliability of Composition Factors Variables

The construct relating to design team composition, a vital function of the client organisation comprised of three variables – Member Abilities, Members Personality, and General Roles. The outcome of factor analysis restructured it into a two variable construct – General Roles and Personality, each having more than 3 attributes. Hence scales of both variables are tested for reliability.

6.6.3.1 General Roles Variable

Five attributes loaded to the General Roles variable as shown in Table 6.44 which bothers on the ability of the design team members to undertake roles that are known to affect the effectiveness of team. These roles include helping team members through insightful guided interactions, maintaining laws and protecting each other. These attributes are tested for reliability, the result is shown in Table 6.45.

Table 6.44 - Items: General Roles

S/N	Description
1	Offers insightful analysis of opinions
2	Provides directions and follow through
3	Examines details and enforces laws
4	Fight external influences to team
5	Encourages search for more information

Table 6.45 shows a Cronbach's alpha of 0.985 indicating that the attributes combination is much more than a 'very good' scale to measure the General Roles variable. Further inspection of the Table reveals that deleting any of the attributes – even General Role Item 1 – *Offers insightful analysis of opinions*, will not substantially improve the measurement scale from its 0.985 alpha level. Therefore, all the five attributes are retained for further analysis namely – *Offers insightful analysis of opinions*, *Provides directions and follow through*, *Examine details and enforces law*, *Fight external influences to team* and *Encourages search for more information*.

Table 6.45 – Reliability & Item-Total Statistics for General Roles

Cronbach's Alpha	N of Items			
0.985	5			
Item Labels	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
General Role item 1	14.580	9.030	0.924	0.986
General Role item 2	14.600	9.054	0.951	0.982
General Role item 3	14.510	8.974	0.977	0.978
General Role item 4	14.520	8.992	0.969	0.979
General Role item 5	14.540	8.919	0.956	0.981

6.6.3.2 Personality Variable

Four attributes loaded to the Personality variable as shown in Table 6.46. These attributes pertains to the extent to which team members can interact, appreciate and cooperate with other members of their team by showing acceptable levels of responsibleness and dependability. The attributes are therefore tested for reliability, and the result shown in Table 6.47.

Table 6.46 - Items: Personality

S/N	Description
1	Interpersonal skills
2	Appreciably relating well with others
3	Cooperation and trust for others
4	Responsibleness and dependability

Table 6.47 shows a Cronbach's alpha of 0.888 indicating that the attributes combination is a 'very good' scale to measure the Personality variable. Further inspection of the Table reveals that deleting Personality Item 4 – *Responsibleness and dependability,* will significantly improve the measurement scale to 0.941. Therefore, this attribute is deleted from the scale leaving three attributes for further analysis namely – *Interpersonal skills*, *Appreciably relating well with others* and *Cooperation and trust for others*.

Table 6.47 Reliability & Item-Total Statistics for Personality

Cronbach's Alpha	N of Items			
0.888	4			
Item Labels	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Personality Item 1	11.650	2.924	0.892	0.810
Personality Item 2	11.810	2.762	0.808	0.836
Personality Item 3	11.710	2.813	0.837	0.825
Personality Item 4	11.690	3.365	0.524	0.941

6.6.4 Reliability of Team Functioning Variables

Team functioning is an outcome behaviour under organisational behaviour studies which is the basis of assessing teams effectiveness. The original Team Functioning construct was designed as a single-variable construct. However, upon conducting factor analysis it became a two-variable construct having Efforts and Drivers as its variables. Therefore the scales of the two variables are testable for reliability. However, the scale for measuring Driver is not tested given that it contains only two attributes.

6.6.4.1 Efforts Variable

Eight attributes loaded to the Efforts variable as shown in Table 6.48 bordering on the specific outcomes of the design teams investigated. These outcomes includes teams ability to defined, understand and work within the client's system; and meeting and balancing client's requirements of function, quality and cost. The outcome of the reliability test conducted on these attributes is shown in Table 6.49.

Table 6.48 - Items: Efforts

S/N	Description
1	The term 'value' was explicitly defined for the design
2	Brief contained clear function-quality-cost requirements
3	Client's 'Value' requirement adequately understood by team
4	Functions and quality as designed met client's expectations
5	Cost objectives of the client were met and/or exceeded
6	WLC formed the basis for design decisions/solutions
7	Efforts were made to balance function, quality and cost
8	Budgets were adjustable to meet function/quality objectives

Table 6.49 shows a Cronbach's alpha of 0.875 indicating that the attributes combination is much more than a 'very good' scale to measure the Efforts variable. Further inspection of the Table reveals that no further improvement can be made by deleting any of the attributes. Hence all the attributes are retained for further analysis.

Table 6.49 Reliability & Item-Total Statistics for Efforts

Cronbach's Alpha 0.875	**N of Items** 8			
Item Labels	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
Effort Item 1	23.660	13.405	0.571	0.867
Effort Item 2	23.670	14.321	0.524	0.870
Effort Item 3	23.660	12.966	0.833	0.840
Effort Item 4	23.730	13.062	0.762	0.846
Effort Item 5	23.800	13.205	0.659	0.857
Effort Item 6	23.870	14.205	0.430	0.882
Effort Item 7	23.800	13.467	0.549	0.870
Effort Item 8	23.690	13.037	0.841	0.840

6.7 Relationships between the Determinants of V_fM in Design

6.7.1 Redefinition of the Determinants of Value in Design

The outcome of the reliability analysis performed on the attributes of the restructured determinants, discussed in Section 6.6 revealed that some items should be deleted from the respective scales to improve their reliabilities. This section outlines the variables defined for use in establishing the relationships and effects of the determinants of value in design. In order to establish relationships and determine the effect of these relationships, the research employs multiple regression procedure. And to do this therefore, the variables to use, given that they are based on multi-items scales, must firstly be arrived at. There are several methods of arriving at these variables particularly those that have been structured using factor analysis as is the case for this research (refer to Section 6.2.1).

Among the approaches advocated in researches and practice include:

- For each of the constructs, the respective factors represents the independent variables given that by the nature of their 'factoring' they are unrelated to a very large extent (Cooper & Schindler, 2008).
- Getting the appropriate representation of the items within a variable can be achieved either by selecting the item with the greatest loading on that factor (i.e. variable) (IBM, 2012) or alternatively,
- Get an aggregated mean of all the items that loads on the factor and use the mean value as the input data into the regression model (Farquhar, 2011; Chen, 2008)
- It has also been advocated that during the factor analysis procedure, standardised factor scores can be generated and used for regression analysis and other analytical procedures (Kothani & Garg, 2014; Frankfort-Nachmias & Nachmias, 1999).

However, there is no consensus on which approach is most accurate and adequately representative. Hence, the aggregated mean value is adopted for the research. A preliminary test using the three approaches i.e. aggregated mean values, factor scores and highest loading item, indicates that there aren't significant differences in the outcome of a regression analysis using either of these approaches. Nonetheless, the former approach – aggregated mean values however tends to provide a slightly higher R^2 value and standardised beta values. Table 6.50 shows the descriptive statistics of the determinants of value in design based on the outcome of the reliability analysis performed as reported and discussed above, indicating their variable names. These statistics form the basis of further analyses. The mean values in Table 6.50 differ slightly from those in Table 6.18 due to the restructuring (factor analysis) of the variable within each research construct and eventual reliability analysis conducted.

From Table 6.50 the mean values of the variables tend to favour the high end of their scales – the mean values of the independent variable ranges from 2.57 (WLC role) to 3.90 (Personality composition factor) while the mean values of the mediating and dependent variables ranges from 3.32 (communications) to 3.77 (collaboration) and from 3.39 (efforts) to 3.45 (drivers) respectively.

Table 6.50 - Statistics of Restructured Determinants of Value in Design

Variable Name	Code	Min[a]	Max[a]	Mean[a]	Std. Dev	Remarks
Client Roles						
Leadership & Design	Cr1	1	5	3.59	0.856	High
Procurement	Cr2	2	5	3.18	0.717	Moderate
WLC	Cr3	1	5	2.57	0.710	Moderate
Contextual Factors						
Culture	Cx1	1	5	3.76	0.931	High
Evaluation	Cx2	1	5	2.72	1.369	Moderate
Composition Factors						
General Roles	Cp1	2	5	3.64	0.748	High
Personality	Cp2	2	5	3.90	0.611	High
Design Process						
Conflicts	Dp1	2	5	3.40	0.700	Moderate
Communication	Dp2	1	5	3.32	1.041	Moderate
Collaboration	Dp3	2	5	3.77	0.680	High
Team Functioning						
Efforts	Tf1	2	5	3.39	0.519	Moderate
Drivers	Tf2	2	5	3.45	0.510	Moderate
Group Aggregate						
Client Roles	Cr0	1	4	3.12	0.537	Moderate
Context	Cx0	1	5	3.24	1.003	Moderate
Composition	Cp0	2	5	3.77	0.611	High
Design Process	Dp0	2	5	3.50	0.548	Moderate
Functioning	Tf0	3	4	3.42	0.356	Moderate

[a] *1 – Very Low, 2 – Low, 3 – Moderate, 4 – High, 5 – Very High*
Valid N (listwise) = 225

6.7.2 Relationship between the Determinants of Value in Design

Literature on small teams and work group provides sufficient evidence of the existence of relationship between structural (input) variables and team processes on one hand, between structural variables and outcomes (dependent variables) and between the process variables and outcomes on the other hand (Chen, Kirkman, Kanfer, Allen, & Rosen, 2007; Mathieu, Gilson, & Ruddy, 2006; Aime, Meyer, & Humphrey, 2010; Napier & McDaniel, 2006; Neill & Allen, 2011; Oh, Wang, & Mount, 2011; Robbins & Judge, 2013). Empirical studies on teams and their processes have relied on establishing relationships based on respondents' disagreement/agreement to the extent to which they believed their firm or team exhibits the variables been measured e.g. Chen, Kirkman, Kanfer, Allen, & Rosen (2007); Chen (2008); Farquhar (2011). This study however, takes a similar approach

by relating perceptions based on extent of disagreement/agreement to on actual performance – extent to which each of the variables investigated is exhibited in design teams. This approach gives an indication to the current performance level of design teams in terms of their design processes and functioning (referred to herein as design performance) given the nature of the client organisation parameters.

In order to establish the nature of relationships (in terms of magnitude and direction) between client's organisation parameters, design process and team functioning i.e. design team performance, the Pearson's product moment correlation coefficient was employed. This procedure reveals the magnitude and direction of relationships with the former telling the degree to which variables move in unison or opposition while the latter gives an indication whether large values on one variable are associated with large values on the other (Cooper & Schindler, 2008). Table 6.51 shows the result of the correlation analysis.

Table 6.51 – Correlations Analysis of the Determinants of Value in Building Design

	Mean	Cr1	Cr2	Cr3	Cx1	Cx2	Cp1	Cp2	Dp1	Dp2	Dp3	Tf1	Tf2
Cr1	3.59	-											
Cr2	3.18	.378**	-										
Cr3	2.57	.169*	.176**	-									
Cx1	3.76	.554**	.251**	.156*	-								
Cx2	2.72	.339**	0.083	0.119	.502**	-							
Cp1	3.64	.448**	.200**	0.096	.329**	.299**	-						
Cp2	3.90	.491**	.288**	.132*	.289**	.248**	.612**	-					
Dp1	3.40	0.102	.208**	-0.072	.163*	.359**	.360**	.251**	-				
Dp2	3,32	.243**	0.021	-0.014	.255**	.458**	.271**	0.110	.371**	-			
Dp3	3.77	0.128	0.063	-0.026	0.064	0.011	0.038	0.048	0.020	0.078	-		
Tf1	3.39	.223**	.137*	0.097	.171*	.212**	.554**	.252**	.282**	0.114	0.054	-	
Tf2	3.45	-0.056	0.060	-0.020	0.081	0.048	-0.022	-0.099	0.034	0.032	-0.035	-0.042	-
Tf0		0.122	.143*	0.056	.183**	.188**	-388**	0.113	.230**	0.106	0,015	.699**	.685**

*Cr1 - Role: Leadership and Design, Cr2 - Role: Procurement, Cr3 - Role: WLC, Cx1 - Context: Culture, Cx2 - Context: Evaluation, Cp1 - Composition: General roles, Cp2 - Composition: Personality, Dp1 - Process: Conflict, Dp2 - Process: Communications, Dp3 - Process: Collaboration, Tf1 - Functioning: Efforts, Tf2 - Functioning: Drivers, Tf0 – Team Functioning (aggr); ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).*

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6.7.3 Client's Organisational Parameters and Design Process

Conflict resolution (Dp1) correlates significantly with the following client's organisation parameters: procurement roles (Cr2, $r = 0.208$, $p < 0.010$), contextual factor: culture (Cx1, $r = 0.163$, $p < 0.050$), contextual factor: evaluation (Cx2, $r = 0.359$, $p < 0.010$), composition factor: general role (Cp1, $r = 0.360$, $p < 0.010$), and composition factor: Personality (Cp2, $r = 0.251$, $p < 0.010$). While all these relationships are positively correlated they are very weak for culture, weak for both procurement roles and personality while they are modest for both evaluation and general roles. Two variables did not correlate significantly with the conflict resolution process namely leadership and design role (Cr1, $r = 0.102$) and WLC role (Cr3 = -0.072) but had very weak positive and negative relationship respectively.

Contextualising these findings within building design teams in terms of the data collected, the higher the tendency of client organisations to improve on the following, their: procurement role during the design process, organisation culture, mechanism for evaluating team performance, ability to compose team with members that would fulfil the required generic roles and having the right balance in terms of members' personality, then the higher the chances of design team members to improve on their conflict resolution process though these improvements are either weak or modest. Though, while these considerations are not significant, when client organisations tends to improve on their leadership and design role they provide the chance of improving conflict management within team albeit very weakly though, but consequentially slightly diminishing this chance when they improve on their WLC role.

Though while not exactly of similar nature to this research, the findings of Farquhar (2011) while studying board processes (as small teams) and their influences on board performance mediated by the roles board members perform do not substantially differ

from those of this research for similar variables. For instance, in this research, correlations between conflict and the following client organisation parameters: leadership and design roles, procurement roles, and culture are: 0.102, $p > 0.05$; 0.208, $p < 0.01$; and 0.165, $p < 0.05$ compared to Farquhar's 0.101, $p < 0.01$; 0.155, $p < 0.05$; and 0.145, $p < 0.01$ respectively. However, compared to Chen's (2008) study on organisational factors affecting knowledge management processes and organisational performance, there exist some differences. For instance, Chen (2008) establishes a correlate of 0.394, $p < 0.1$ between internalisation (a part measure of conflict in this research) and culture compared to 0.145, $p < 0.01$ in this research.

The second design process variable communications (Dp2) correlates significantly with the following client's organisation parameters: leadership and design role (Cr1, $r = 0.243$, $p < 0.01$), contextual factor: culture (Cx1, $r = 0.255$, $p < 0.01$), contextual factor: evaluation (Cx2, $r = 0.458$, $p < 0.01$), and composition factor: general role (Cp1, $r = 0.271$, $p < 0.01$). While all these relationships are positively correlated they are weak for leadership and design role, culture and general team roles while it is modest for evaluation. Three variables did not significantly correlate with the communication process variable namely procurement roles (Cr2, $r = 0.021$) and personality (Cp2, $r = 0.011$) both having very weak positive correlations while WLC role (Cr3 = -0.014) has a very weak negative correlation.

Contextualising these findings within building design teams in terms of the data collected, the higher the tendency of client organisations improving on the following, their: leadership and design role during the design process, organisational culture, mechanism for evaluating team performance, and ability to compose team with members that would fulfil the required generic roles, then the higher the chances of design team members to improve on their communication process though these improvements are

either weak or modest. Yet, while these considerations are not significant based on the data collected, when client organisations tends to improve on their procurement role and their ability to having the right balance of team members in terms of personality, they provide the chance of improving the communication processes within team albeit very weakly, they also slightly diminishes this process when they improve on their WLC role.

Though while not exactly of similar nature to this research, the findings of Farquhar (2011) while studying board processes (as small teams) and their influences on board performance mediated by the roles board members perform however differs from those of this research for similar variables. For instance, in this research, correlations between communications and the following client organisation parameters: leadership and design roles, culture, and evaluation (effort norm in Farquhar's) are: 0.243, $p > 0.01$; 0.255, $p < 0.01$; 0.458, $p < 0.01$ compared to Farquhar's 0.547, $p < 0.01$; 0.640, $p < 0.01$; and 0.580, $p < 0.01$ respectively. Similarly, compared to Chen's (2008) study on organisational factors affecting knowledge management processes and organisational performance, they exists some differences. For instance, Chen (2008) establishes a correlate of 0.307, $p < 0.1$ between combination (a part measure of communications in this research) and culture compared to 0.255, $p < 0.01$ in this research.

The third design process variable collaboration (Dp3) does not significantly correlates with any of the client's organisation parameters but has evidence of very weak to negligible positive correlation for leadership and design role, procurement role, culture, evaluation, general team roles, and personality while it has a negligible negative correlation with WLC role. Contextualising these findings within building design teams in terms of the data collected, the higher the tendency of client organisations to improve on their leadership and design role during the design process will provide the chance for design team members to improve in their collaboration process albeit very weak.

However, the higher the efforts of client organisations at improving the following, their: procurement role, WLC role, organisational culture, mechanism for evaluating team performance, ability to compose team with members that would fulfil the required generic roles and of the right balance of personality, there would practically be no effect on the chances of design team members to improve on their process of collaboration.

6.7.4 Design Process and Design Team Functioning

Team efforts as a measure of team outcome behaviour (Tf1) correlates significantly only with the conflicts resolution process of design teams (Dp1, $r = 0.282$, $p < 0.010$). While having a positive relationship it is rather weak. Two design process variables did not correlate significantly with the efforts variable of team functioning. These are communications (Dp2, $r = 0.114$) and collaboration (Dp3, $r = 0.054$) having very weak and negligible positive relationship respectively. Hence, given the nature of data collected, attempts at improving the design process in terms of conflict resolution processes would result in weak improvement in the outcome of the design teams' efforts while improving the design process in terms of either communications or collaboration processes may not produce any resultant improvement in teams' efforts.

The team functioning driver variable (Tf2) did not have significant correlation with any of the three design process variables thus: conflict (Dp1, $r = 0.034$), communications (Dp2, $r = 0.032$) and collaboration (Dp3 = -0.042). These correlations are negligible hence efforts at improving the design process in terms of conflict resolution, communications and collaboration processes would have practically no effect on the chances of design teams as a whole to improve on their functioning in terms of the drivers.

While these findings are not expected, they are a representation of the design team members studied since these outcomes reflects the perceived realities in terms of client organisations' parameters as they relate to design team theirs processes and functioning of the 45 construction projects that formed the basis for studying design teams dynamics. While these outcomes are not specifically expected, given the evidence of established relationship between the determinants of value in building designs as proposed in the hypothesised study framework in Section 6.x.x and as documented in extant literature, they are not surprising.

These outcomes only go to raise the question of: what actually is the construction industry practising in terms of building designs – teamwork or group work? The lack of strong correlations between the client organisations' parameters and design process particularly communications and collaboration on the one hand and the non existence of significant correlation between these design process variable and team functioning driver and weak correlations with team functioning efforts on the other hand attests to the suspicion that design processes with the Nigerian construction industry may be managed through *'design groups'* rather than *'design teams'*. However, the subsequent section will further illuminate the authenticity of this suspicion.

6.7.5 Client's Organisation Parameters and Design Team Functioning

Though the research hypothesises the existence of the design process as a mediating variable between design team inputs in terms of organisation parameters and their output in terms of team functioning. This section investigated the direct correlations between the input and output variables. The cardinal reason for doing so lies in the principles establishing mediation i.e. first and foremost there must be evidence of a relationship between the input and output variable in this case client's organisation parameters and team functioning. Thereafter, evidence of relationships is then examined between these

two variables when the mediating variable is introduced (Barrow, 2006; Burns & Burns, 2008; Cooper & Schindler, 2008; Kothani & Garg, 2014).

The team functioning variable efforts (Tf1) significantly correlates with the following client's organisation parameters: leadership and design role (Cr1, $r = 0.223$, $p < 0.01$), procurement role (Cr2, $r = 0.137$, $p < 0.05$), culture contextual factor (Cx1, $r = 0.171$, $p < 0.05$), contextual factor: evaluation (Cx2, $r = 0.212$, $p < 0.01$), composition factor: general role (Cp1, $r = 0.554$, $p < 0.01$), and composition factor: personality (Cp2, $r = 0.252$, $p < 0.01$). While all these relationships are positively correlated they are weak for leadership and design role, procurement role, culture, evaluation and personality while it is modest for general team roles. Only one variables did not significantly correlate with the efforts variable of team functioning i.e. WLC role (Cr3 = 0.097) having a negligible positive correlation.

Contextualising these findings within building design teams in terms of the data collected, the higher the tendency of client organisations to improve on their: leadership and design roles and procurement roles during the design process, organisational culture, mechanism for evaluating team performance, and ability to compose team with members that would fulfil the generic roles required in teams and balance members' personality, then the higher the chances of design team members to improve on their team functioning in terms of efforts though these improvements are either weak or modest. Attempts at improving their WLC role would have no effect on the chances of design teams as a whole to improve on their functioning in terms efforts.

Though while not exactly of similar nature to this research, the findings of Farquhar (2011) while studying board processes (as small teams) and their influences on board performance mediated by the roles board members perform however differs from those

of this research for similar variables. For instance, in this research, correlations between efforts and the following client organisation parameters: leadership and design roles, culture, and evaluation (effort norm in Farquhar's) are: 0.223 – $p > 0.01$, 0.171 – $p < 0.05$, 0.212 – $p < 0.01$ compared to Farquhar's 0.544 – $p < 0.01$, 0.622 – $p < 0.01$, and 0.533 – $p < 0.01$ respectively. Similarly, compared to Chen's (2008) study on organisational factors affecting knowledge management processes and organisational performance, they exists some differences. For instance, Chen (2008) establishes a correlate of 0.387 – $p < 0.10$ between creativity (a proxy for team functioning in this research) and culture compared to 0.171 – $p < 0.05$ in this research.

The team functioning driver variable (Tf2) did not have significant correlation with any of the seven client's organisation variables. Though not significant, evidence of correlation exists with some of the relationships been positive and some negative. Since all the correlations are negligible efforts by client organisations improving these variables would have practically no effect on the chances of design teams to improve on their functioning in terms of the drivers.

While these outcomes were not specifically anticipated, given the evidence of established relationship between the determinants of value in building designs as proposed in the hypothesised study framework in Section 6.x.x and as documented in extant literature, they are not surprising. Though not expected, however, they are a representation of the design team members studied since these outcomes reflects the perceived realities in terms of client organisations' parameters as they relate to design teams, theirs processes and functioning. And as was the case with considerations of the design process variables, the lack of strong correlations further raises the question of: what actually is the Nigerian construction industry practising in terms of building

designs – teamwork or group work? Are design been managed through *'design groups'* rather than *'design teams'*? This will be further illuminated in the subsequent section.

6.7.6 Summary of Relationships between Determinants of Value in Design

Table 6.52 shows the nature of relationships between client organisation's parameters, design process related variables and team functioning variables for only relationships that are significant at 95% confidence interval. The Table reveals that all the relationships that are significant are actually the positive ones. None of the negative correlations were significant. The conflict variable of the design process is significantly related to the following client organisation's parameters in order of their strength: composition: general roles, contextual: evaluation, composition: personality, roles: procurement and contextual: culture. In the same order, the communications variable correlated to: contextual: evaluation, composition: general roles, contextual: culture, and roles: leadership and design.

Table 6.52 – Summary of Relations between Determinants

Organisational Parameters	**Conflict**	**Communication**	**Collaboration**	**Efforts**	**Drivers**
Roles: Leadership and Design	NS	0.243	NS	0.223	NS
Roles: Procurement	0.208	NS	NS	0.137	NS
Roles: WLC	NS	NS	NS	NS	NS
Contextual: Culture	0.163	0.255	NS	0.171	NS
Contextual: Evaluation	0.359	0.458	NS	0.212	NS
Composition: General Roles	0.360	0.271	NS	0.554	NS
Composition: Personality	0.251	NS	NS	0.252	NS
Conflict	NA	NA	NA	0.282	NS
Communications	NA	NA	NA	NS	NS
Collaboration	NA	NA	NA	NS	NS

NS – Not significant, NA – Not applicable

The collaboration variable is not significantly related to any of the seven client organisation's parameters. This pattern is also shown for the drivers variable of team functioning. The efforts variable of team functioning, a dependent variable of the research however correlates to the following client organisation's parameters in order of their strength: composition: general roles, composition: personality, roles: leadership and design, contextual: evaluation and lastly contextual: culture. The roles: WLC variable does not significantly correlate to neither of the design process variables nor with those of the team functioning variables. For relationships between the design process variables and those of the team functioning variables, only the conflict variable significantly relates to the efforts variable respectively. These outcomes will aid in the explanation of the effects client organisation parameters have upon: the design process, and on team functioning when not mediated and mediated by the design process. This is the focus of Section 6.9.

6.8 Hypothesis Testing of the Determinants of Value in Design

The previous section established the relationships between the determinants of value in building design based on bi-variate correlation analysis. This procedure only gives indication to the magnitude and direction of the relationship between two variables irrespective of the nature of the variable i.e. whether independent or a dependent variable. To test the hypotheses formulated in Chapter 3, establish the effects of the relationships in terms of their influences and the predictability of the dependent variable i.e. team functioning based on the independent and mediating variables i.e. client organisation parameters and design process respectively, multiple regression analysis is employed. As stated in the Chapter 4, multiple regression analysis require the meeting of a number of assumptions to guarantee the robustness of the modelling technique. Some of these assumptions includes: linearity, independence (including problems of multi-collinearity), homoscedasticity (Kothari and Garg, 2014) and were tested and satisfied

before the regression analyses are interpreted as appropriate. Test for normality, which is requirement for employing regression analysis (Cooper & Schindler, 2008) were conducted during the description statistical analysis reported in Section 6.1.2. The data set approximates a normal distribution.

6.8.1 Relationship between Design Process and Team Functioning

This section establishes the relationship between the design process variables i.e. communication, collaboration and conflict resolution (the independent variables) and team functioning (the dependent variable). This section would not require the test of presence of multi-collinearity or otherwise since the procedure is that of a simple linear regression i.e. having only one independent variable. The aggregated mean values of the efforts variable (Tf1) and driver variable (Tf2) defined as Tf0 (see Table 6.50) is used in this section.

6.8.1.1 Relationship between Communication and Team Functioning

The results in Table 6.53 show that regression analysis statistics and parameters between communication and design team functioning, testing hypothesis H1a which states that communication is positively related to team functioning. Testing the model against the assumptions of regression indicates that the linearity assumption is violated F-sig 0.113 (>0.05), satisfies the independent error assumption i.e. independence with Durbin-Watson statistics of 1.923 (i.e. not between 0 to 1 or 3 to 4), and also satisfies the homoscedasticity condition given that maximum value for the Cook's Distance is 0.070 (<1).

Table 6.53 – Relationship between Communication and Design Team Functioning

Variable and Statistics	Team Functioning
Communication (β)	0.108
Adjusted R^2	0.007
F – Sig	0.113
Durbin-Watson	1.923
Cook's Distance (max)	0.070

*Standardised coefficient shown, F – sig based on ANOVA statistics, Level of significance are *<0.05, **<0.01*

This suggests that the relationship between communications amongst design team members during the design process is not linear. A further test of curvilinear relationship by regressing the square of the communication variable against the team functioning variable, proved otherwise too. This is further explained by the low adjusted r squared value and a very weak regression coefficient of 0.108 which is not significant at 90% confidence interval. Hence, the results show that though design team members communication is positively related to team functioning this relationship is very weak and not significant, thus partially accepting Hypothesis H1a.

6.8.1.2 Relationship between Collaboration and Team Functioning

Table 6.54 show that regression analysis statistics and parameters between collaboration and design team functioning, testing hypothesis H1b which states that collaboration is positively related to team functioning. Testing the model against the assumptions of regression indicates that the linearity assumption is violated F-sig 0.829 (>0.05), satisfies the independent error assumption i.e. independence with Durbin-Watson statistics of 1.937 (i.e. not between 0 to 1 or 3 to 4), and also satisfies the homoscedasticity condition given that the maximum value for the Cook's Distance is 0.052 (<1).

Table 6.54 – Relationship between Collaboration and Design Team Functioning

Variable and Statistics	Team Functioning
Collaboration	0.015
Adjusted R^2	-0.004
F – Sig	0.829
Durbin-Watson	1.937
Cook's Distance (max)	0.052

*Standardised coefficient shown, F – sig based on ANOVA statistics, Level of significance are *<0.05, **<0.01*

The above revelation suggests that the relationship between collaboration amongst design team members during the design process is not linear. A further test of curvilinear relationship by regressing the square of the communication variable against the team functioning variable, proved otherwise too. This is further explained by the low adjusted r squared value and a very weak regression coefficient of 0.015 which is not significant at 90% confidence interval. Hence, the results show that though design team members collaboration is positively related to team functioning this relationship is very weak and not significant, thus partially accepting Hypothesis H1b.

6.8.1.3 Relationship between Conflict Resolution and Team Functioning

Table 6.55 shows the regression analysis statistics and parameters between conflict resolution and design team functioning, testing hypothesis H1c which states that conflict resolution among design team members will have a positive impact on the functioning of the team. Testing the model against the assumptions of regression indicates that the linearity assumption is satisfied having F-sig of 0.000 (<0.05), satisfies the independent error assumption i.e. independence with Durbin-Watson statistics of 1.933 (i.e. not between 0 to 1 or 3 to 4), and satisfies the homoscedasticity condition given that the maximum value for the Cook's Distance is 0.118 (<1).

Table 6.55 – Relationship between Conflict resolution and Design Team Functioning

Variable and Statistics	Team Functioning
Conflict Resolution	.230**
Adjusted R^2	0.049
F – Sig	0.000
Durbin-Watson	1.933
Cook's Distance (max)	0.118

*Standardised coefficient shown, F – sig based on ANOVA statistics, Level of significance are *<0.05, **<0.01*

Given that regression analysis is a robust technique to model to relationship between conflict resolution and design team functioning, the results on Table 6.55 shows that there is a positive relationship between them and that the relationship is significant at 99% confidence interval. However, this relationship exhibits a very low adjusted determination of correlation i.e. Adjusted R^2 of 0.049 indicating that conflict resolution of members explains approximately 5% of the variance of the functioning of design teams towards achieving value for money in building designs. Given the aforementioned, conflict resolution during design process is positively related the performance of design teams in term of their functioning towards achieving value for money in building designs and that this relationship is significant at 99% confidence level, hence hypothesis H1c is accepted.

6.8.1.4 Combined Effect of Design Process Variables on Team Functioning

So far, each of the design process variables has been considered individually. In practice these actions are undertaken simultaneously, hence having individual effect when they act in a system is desirable. Table 6.56 show the result of the multiple regression analysis procedure performed using the three design process variables i.e. communication, collaboration and conflict resolution as independent variable and the team functioning variable as the dependent variable.

Table 6.56 – Relationship between Design Process and Design Team Functioning

Variable and Statistics	Team Functioning
Communication	0.023
Collaboration	0.008
Conflict Resolution	.222**
Adjusted R^2	0.041
F – Sig	0.007
Durbin-Watson	1.935
Cook's Distance (max)	0.074

*Standardised coefficient shown, F – sig based on ANOVA statistics, Level of significance are *<0.05, **<0.01*

Testing the model against the assumptions of regression indicates that the linearity assumption is satisfied having F-sig of 0.007 (<0.05), it satisfies the independent error assumption i.e. independence with Durbin-Watson statistics of 1.935 (i.e. not between 0 to 1 or 3 to 4), and also satisfies the homoscedasticity condition given that the maximum value for the Cook's Distance is 0.074 (<1). Also, the test for multi-collinearity indicates that the independent variables are truly independent to each other having a Variance Inflation Factor (VIF) of 1.166, 1.006 and 1.159 for communication, collaboration and conflict resolution respectively, all being less than 5.00 as suggested by Kathori and Garg (2014).

The Adjusted R^2 of 0.041 implies that the three design process variable explains only 4% of the variance in the functioning of the design team which is quite low. This notwithstanding, the ANOVA statistics suggest that the model developed based on these three variables is statistically significant i.e. F-Sig at 0.007 which is <0.05. The standardised coefficients of regression indicates that communication impacts on team functioning by 0.023 (ρ = 0.744) while collaboration and conflict resolution have impacts of 0.008 (ρ = 0.901) and 0.222 (ρ = 0.002) respectively. Only the conflict resolution variable impacts significantly on team functioning and thus the best predictor of it thereof, having the highest impact. This further confirms the outcome of the analysis conducted in Sections 6.8.1.1 – 6.8.1.3.

6.8.2 Relationship between COPs, Design Process and Team Functioning

One of the main prepositions of this research is the consideration of the effects of the mediating variables i.e. the *design process* on the dependent variable i.e. the effectiveness of the design team in terms of *team functioning*. Hence the existence of the mediating variable must first be established by testing and confirming the hypothecation of the conceptual framework developed in Chapter 3. A three stage process using regression analysis as suggested by Baron and Kenny (1986) and De Vaus (1996) was adopted. First, the independent variable is regressed against the mediating variables. In the second step, the independent variable is regressed against the dependent variable. These regressions are performed separately. Finally, both the independent and mediating variables are jointly regressed against the dependent variable. If the condition of significance in relationship and in the predicted direction holds for all the regressions performed, then the effect of the independent variable on the dependent variable must be less in the third step compared to the second. The procedure was followed to test and establish the relationships and effects of the input variables (leadership and design role, procurement and integration role, design quality role, trust/culture, evaluation, general roles, and personality) and design team functioning mediated by the design process variables (conflicts, communications, and cohesion). The procedure was not carried out for the following variables: *resources, Organisational structure*, and *members' abilities* to test hypotheses H5, H6, and H9 respectively. The reason is due to the restructuring of the determinants of value for money in building design after performing function analysis which led to the elimination of these variables.

6.8.3 Relationship between Client Roles, Design Process & Functioning

6.8.3.1 Leadership and Design Role, Design Process and Team Functioning

Table 6.57 shows the regression analysis statistics and parameters of all the three steps described above between leadership and design role, design process, and design team

functioning; and to test hypothesis H2a which states that the leadership and design role of client organisation is positively related to design team functioning; and hypothesis H2b – that the relationship in H2a is: (i) mediated by team members communication; (ii) not mediated by their collaboration; and (iii) mediated by their conflict resolution.

Table 6.57 - Regression of Leadership Role, Design Process, and Team Functioning

Variables and Statistics	**Step 1**			**Step 2**	**Step 3**		
	1	**2**	**3**	**Funct**	**Team Functioning**		
					1	**2**	**3**
Leadership & Design	0.243**	0.128*	0.102	0.122†	0.102	0.121†	0.100
Communication (1)					0.081		
Collaboration (2)						-0.001	
Conflict Resltn (3)							0.220**
Adjusted R^2	0.055	0.012	0.006	0.010	0.012	0.006	0.054
F-Sig	0.000	0.056	0.125	0.068	0.094	0.189	0.001
Durbin-Watson	2.046	2.531	2.152	1.924	1.919	1.923	1.935
Cook's Distance (max)	0.059	0.121	0.039	0.184	0.122	0.129	0.121

*The parameters of the variables are the standardised coefficients (β). Levels of significance are †<0.10 *<0.05; **<0.01*

Testing the model against the assumptions of regression indicates that the linearity assumption is satisfied for all the models developed having F-sig between 0.000 to 0.094 (<0.10) except models 3 in Stage 1 having ρ = 0.125 and model 2 in Stage 3 with ρ = 0.189; the models also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics between 1.919 to 2.531 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances are between 0.039 to 0.184 (<1).

Table 6.57 indicates that in the first step, independent variable *'leadership and design role'* was regressed against the three mediating variables – *'communications'*, *'collaboration'* and *'conflict resolution'* while in the second step *'leadership and design role'* was regressed against dependent variable *'team functioning'*. In the first step, independent variable *'leadership and design role'* was significantly and positively related to two mediating variables, *communication* (β = 0.243, ρ < 0.01) and

collaboration ($\beta = 0.128$, $\rho < 0.05$) and the dependent variable *'team functioning'* ($\beta = 0.122$, $\rho < 0.10$) but not to the third moderating variable *conflict resolution* ($\beta = 0.102$, $\rho > 0.10$). These results for *communication* and *collaboration* meets the first and second criteria in establishing mediation i.e. the independent variable must affect the dependent variable and also affect the mediating variable and in so doing, significantly.

For the third step, the independent variable and each of the mediating variables are jointly regressed against the dependent variable separately. The independent variable *'leadership and design role'* significantly and positively relates with the dependent variable *'team functioning'* when regressed with only one of the mediating variables i.e. *collaboration* ($\beta = 0.121$, $\rho < 0.10$) and its coefficient is slightly lower than that in the second stage i.e. ($0.121 < 0.122$). However only the mediating variable *conflict resolution* significantly relates with the dependent variable *'team functioning'* ($\beta = 0.220$, $\rho < 0.01$) thus satisfying the third criteria. Both the *communication* and *cohesion* design process variables failed to meet the third criteria since neither significantly related to the dependent variable. Hence, we conclude that the relationship between *leadership and design role* (independent variable) and *team functioning* (dependent variable) is partially and significantly mediated by *conflict resolution* during the design process while those of *communication* and *collaboration* do not mediate this relationship. With reference to the hypotheses, these results tend to support: Hypothesis H2a, client organisation leadership and design role is positively related to design team functioning in achieving value for money in building designs; Hypothesis H2b(ii) that this relationship is not mediated by collaboration among team members; and Hypothesis H2b(iii) that this relationship is mediated by conflict resolution among team members during the design process; but does not support H2b(i) that this relationship is mediated by members communication during the design process.

6.8.3.2 Procurement and Integration Role, Design Process and Team Functioning

Table 6.58 shows the regression analysis statistics and parameters of all the three steps described above between procurement and integration role, design process, and design team functioning; and to test hypothesis H3a which states that the procurement and integration role of client organisation is positively related to design team functioning; and hypothesis H3b – that the relationship in H3a is: (i) not mediated by design team members communication; (ii) not mediated by their collaboration; and (iii) mediated by their conflict resolution.

Table 6.58 - Regression of Procurement Role, Design Process, and Team Functioning

Variables and Statistics	**Step 1**			**Step 2**	**Step 3**		
	1	**2**	**3**	**Funct**	**Team Functioning**		
					1	**2**	**3**
Procurement Role	0.021	0.083	0.208**	0.143*	0.141*	0.143*	0.100
Communication (1)					0.102		
Collaboration (2)						0.005	
Conflict Resltn (3)							0.210**
Adjusted R^2	-0.004	-0.001	0.039	0.016	0.022	0.012	0.054
F-Sig	0.752	0.348	0.002	0.032	0.030	0.100	0.001
Durbin-Watson	2.036	2.493	2.259	1.936	1.931	1.939	1.931
Cook's Distance (max)	0.070	0.043	0.057	0.047	0.061	0.054	0.097

*The parameters of the variables are the standardised coefficients (β). Levels of significance are †<0.10 *<0.05; **<0.01*

Testing the model developed in Table 6.58 against the assumptions of regression indicates that the linearity assumption is satisfied for all the models developed having F-sig between 0.000 to 0.094 (<0.10) except models 1 and 2 in Stage 1 having $\rho = 0.752$ and $\rho = 0.348$ respectively; and model 2 in Stage 3 with $\rho = 0.100$; the models also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics between 1.931 to 2.493 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances are between 0.043 to 0.097 (<1).

Table 6.58 indicates that in the first step, independent variable *'procurement and integration role'* was regressed against the three mediating variables – *'communications'*, *'collaboration'* and *'conflict resolution'* while in the second step *'procurement and integration role'* was regressed against dependent variable *'team functioning'*. In the first step, independent variable *''procurement and integration role'* was significantly and positively related to only one mediating variable, *conflict resolution* ($\beta = 0.208$, $\rho < 0.01$) and the dependent variable *'team functioning'* ($\beta = 0.143$, $\rho < 0.10$) but not to the first and second moderating variables thus: *communication* ($\beta = 0.021$, $\rho > 0.10$) and *collaboration* ($\beta = 0.083$, $\rho > 0.10$). This result for *conflict resolution* meets the first and second criteria in establishing mediation i.e. the independent variable must affect the dependent variable and also affect the mediating variable and in so doing, significantly.

For the third step, the independent variable and each of the mediating variables are jointly regressed against the dependent variable separately. The independent variable *'procurement and integration role'* significantly and positively relates with the dependent variable *'team functioning'* when regressed with two of the mediating variables i.e. *communication* ($\beta = 0.141$, $\rho < 0.05$) and *collaboration* ($\beta = 0.143$, $\rho < 0.05$) and their coefficients were slightly lower than that in the second stage i.e. $\beta = 0.141 < 0.143$ and $0.143 <= 0.143$ respectively. However only the mediating variable *conflict resolution* significantly relates with the dependent variable *'team functioning'* ($\beta = 0.210$, $\rho < 0.01$) thus satisfying the third criteria. Both the *communication* and *collaboration* design process variables failed to meet the third criteria since neither significantly related to the dependent variable. Hence, we conclude that the relationship between *leadership and design role* (independent variable) and *team functioning* (dependent variable) is partially but significantly mediated by *conflict resolution* during the design process while those of *communication* and *collaboration* do not mediate this

relationship. With reference to the hypotheses, these results tend to support: Hypothesis H3a, client organisation procurement and integration role is positively related to design team functioning in achieving value for money in building designs; Hypothesis H3b(i) that this relationship is not mediated by communication among team members; Hypothesis H3b(ii) that this relationship is not mediated by collaboration among team members during the design process; and partially supports Hypothesis H3b(iii) that this relationship is mediated by conflict resolution among team members during the design process.

6.8.3.3 Design Quality Role, Design Process and Team Functioning

Table 6.59 shows the regression analysis statistics and parameters of all the three steps described above between design quality role, design process, and design team functioning; and to test hypothesis H4a which states that the design quality role of client organisation is negatively related to design team functioning; and hypotheses H4b – that the relationship in H4a is: (i) mediated by design team members communication; (ii) not mediated by their collaboration; and (iii) mediated by their conflict resolution.

Table 6.59 - Regression of Design Quality Role, Design Process, and Team Functioning

Variables and Statistics	**Step 1**			**Step 2**	**Step 3**		
	1	**2**	**3**	**Funct**	**Team Functioning**		
					1	**2**	**3**
Design Quality Role	-0.014	-0.026	-0.072	-0.056	0.058	0.057	0.079
Communication (1)					0.107		
Collaboration (2)						0.016	
Conflict Resltn (3)							0.236**
Adjusted R^2	-0.004	-0.004	0.001	-0.001	0.005	-0.006	0.050
F-Sig	0.837	0.703	0.282	0.402	0.197	0.684	0.001
Durbin-Watson	2.031	2.471	2.198	1.928	1.920	1.936	1.934
Cook's Distance (max)	0.071	0.042	0.063	0.046	0.048	0.038	0.090

*The parameters of the variables are the standardised coefficients (β). Levels of significance are †<0.10 *<0.05; **<0.01*

Testing the model developed in Table 6.59 against the assumptions of regression indicates that the linearity assumption is not satisfied by all the models developed except

for model 3 in Stage 3 with $\rho = 0.001$; all the models satisfied the independent error assumption i.e. independence with Durbin-Watson statistics between 1.920 to 2.471 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances are between 0.042 to 0.090 (<1). This finding indicates that none of the independent variables in the models developed has a linear relationship with the independent variable. This may suggest the likely existence of a curvilinear relationship between the design quality role of client organisation to team functioning during the design stage.

Table 6.59 indicates that in the first step, independent variable *'design quality role'* was regressed against the three mediating variables – *'communications'*, *'collaboration'* and *'conflict resolution'* while in the second step *'design quality role'* was regressed against dependent variable *'team functioning'*. In the first step, independent variable *'design quality role'* was negatively related to all the mediating variables and positively related to the dependent variable *'team functioning'*. However none of these relationships is significant and hence does not meet either the first or second criterion in establishing mediation i.e. the independent variable must affect the dependent variable and also affect the mediating variable and in so doing, significantly.

Similar patterns are evident, for the third step whereby the independent variable and each of the mediating variables are jointly regressed against the dependent variable separately. The independent variable *'design quality role'* positively relates with the dependent variable *'team functioning'* when regressed with the three mediating variables i.e. *communication* ($\beta = 0.058$, $\rho > 0.10$), *collaboration* ($\beta = 0.057$, $\rho > 0.10$), and *conflict resolution* ($\beta = 0.079$, $\rho > 0.10$), their coefficients were however higher than that in the second stage i.e. $\beta = 0.058, 0.057, 0.079 > 0.056$ respectively. However only the mediating variable *conflict resolution* significantly relates with the dependent variable

'team functioning' ($\beta = 0.236$, $\rho < 0.01$) thus satisfying the third criteria. Both the *communication* and *collaboration* design process variables failed to meet the third criteria since neither significantly related to the dependent variable. Hence, we conclude that the relationship between *design quality role* (independent variable) and *team functioning* (dependent variable) is partially but not significantly mediated by *conflict resolution* during the design process while those of *communication* and *collaboration* do not mediate this relationship. With reference to the hypotheses, these results tends to partially support: Hypothesis H4a, client organisation design quality role is negatively related to design team functioning in achieving value for money in building designs, though the relationship is not statistically significant; supports Hypothesis H4b(ii) that this relationship is not mediated by collaboration among team members; and Hypothesis H4b(iii) that this relationship is mediated by conflict resolution among team members during the design process but does not support Hypothesis H4b(i) that this relationship is mediated by communication;.

6.8.4 Relationship between Context, Design Process & Team Functioning

6.8.4.1 Culture, Design Process and Team Functioning

Table 6.60 shows the regression analysis statistics and parameters of all the three steps described previously between organisation culture, design process, and design team functioning; and to test hypothesis H7a which states that the culture of client organisation is positively related to design team functioning; and hypotheses H7b – that the relationship in H7a is: (i) mediated by team members communication; (ii) not mediated by their collaboration; and (iii) mediated by their conflict resolution.

Table 6.60 - Regression Analysis of Culture, Design Process, and Team Functioning

Variables and Statistics	Step 1			Step 2	Step 3		
	1	2	3	Funct	Team Functioning		
					1	2	3
Culture	0.255**	0.064	0.163**	0.183**	0.167*	0.183**	0.149*
Communication (1)					0.063		
Collaboration (2)						0.003	
Conflict Resltn (3)							0.206**
Adjusted R^2	0.061	0.000	0.022	0.029	0.028	0.025	0.066
F-Sig	0.000	0.342	0.014	0.006	0.015	0.023	0.000
Durbin-Watson	1.955	2.482	2.131	1.919	1.919	1.920	1.935
Cook's Distance (max)	0.073	0.095	0.103	0.098	0.065	0.067	0.119

*The parameters of the variables are the standardised coefficients (β). Levels of significance are †<0.10 *<0.05; **<0.01*

Testing the model against the assumptions of regression indicates that the linearity assumption is satisfied for all the models developed having F-sig between 0.000 to 0.023 (<0.05) except model 2 in Stage 1 having ρ = 0.342; the models also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics between 1.919 to 2.482 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances are between 0.067 to 0.118 (<1).

Table 6.60 indicates that in the first step, independent variable *'Culture'* was regressed against the three mediating variables – *'communications'*, *'collaboration'* and *'conflict resolution'* while in the second step *'culture'* was regressed against dependent variable *'team functioning'*. In the first step, independent variable *'culture'* was significantly and positively related to two mediating variables, *communication* (β = 0. 255, ρ < 0.01) and *conflict resolution* (β = 0. 163, ρ < 0.01) and the dependent variable *'team functioning'* (β = 0.183, ρ < 0.01) but not to the third moderating variable *collaboration* (β = 0.064, ρ > 0.10). These results for *communication* and *conflict resolution* meets the first and second criteria in establishing mediation i.e. the independent variable must affect the dependent variable and also affect the mediating variable and in so doing, significantly.

For the third step, the independent variable and each of the mediating variables are jointly regressed against the dependent variable separately. The independent variable *'culture'* significantly and positively relates with the dependent variable *'team functioning'* when regressed with all the mediating variables i.e. *communication* ($\beta = 0.167$, $\rho < 0.05$), *collaboration* ($\beta = 0.183$, $\rho < 0.01$), and *conflict resolution* ($\beta = 0.149$, $\rho < 0.05$) and their coefficients slightly lower than that in the second stage i.e. $\beta < 0.183$). However only one mediating variable *conflict resolution* significantly relates with the dependent variable *'team functioning'* ($\beta = 0.206$, $\rho < 0.01$) thus satisfying the third criteria. Both the *communication* and *cohesion* design process variables failed to meet the third criteria since neither significantly related to the dependent variable. Hence, we conclude that the relationship between *culture* (independent variable) and *team functioning* (dependent variable) is significantly mediated by *conflict resolution* during the design process while those of *communication* and *collaboration* do not mediate this relationship. With reference to the hypotheses, these results tend to support: Hypothesis H7a, client organisation's culture is positively related to design team functioning in achieving value for money in building designs; Hypothesis H7b(ii) that this relationship is not mediated by collaboration among team members; and Hypothesis H7b(iii) that this relationship is mediated by conflict resolution among team members during the design process; but does not support H7b(i) that this relationship is mediated by members communication during the design process.

6.8.4.2 Evaluation, Design Process and Team Functioning

Table 6.61 shows the regression analysis statistics and parameters of all the three steps described previously between evaluation, design process, and design team functioning; and to test hypothesis H8a which states that the way teams are evaluated by client organisation is positively related to design team functioning; and hypotheses H8b – that

the relationship in H8a is: (i) mediated by team members communication; (ii) not mediated by their collaboration; and (iii) mediated by their conflict resolution.

Table 6.61 - Regression of Evaluation, Design Process, and Team Functioning

Variables and Statistics	Step 1			Step 2	Step 3		
	1	2	3	Funct	Team Functioning		
					1	2	3
Evaluation	0.458**	0.011	0.359**	0.188**	0.177*	0.188**	0.121†
Communication (1)					0.025		
Collaboration (2)						0.012	
Conflict Resltn (3)							0.187**
Adjusted R^2	0.206	-0.004	0.125	0.031	0.027	0.027	0.057
F-Sig	0.000	0.873	0.000	0.005	0.017	0.018	0.001
Durbin-Watson	2.014	2.477	2.053	1.885	1.886	1.891	1.911
Cook's Distance (max)	0.045	0.031	0.067	0.066	0.056	0.056	0.095

*The parameters of the variables are the standardised coefficients (β). Levels of significance are †<0.10 *<0.05; **<0.01*

Testing the model against the assumptions of regression indicates that the linearity assumption is satisfied for all the models developed having F-sig between 0.000 to 0.018 (<0.05) except model 2 in Stage 1 having ρ = 0.873; the models also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics between 1.885 to 2.477 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances are between 0.031 to 0.095 (<1).

Table 6.61 indicates that in the first step, independent variable *'evaluation'* was regressed against the three mediating variables – *'communications'*, *'collaboration'* and *'conflict resolution'* while in the second step *'evaluation'* was regressed against dependent variable *'team functioning'*. In the first step, independent variable *'evaluation'* was significantly and positively related to two mediating variables, *communication* (β = 0. 558, ρ < 0.01) and *conflict resolution* (β = 0. 359, ρ < 0.01) and the dependent variable *'team functioning'* (β = 0.188, ρ < 0.01) but not to the third moderating variable *collaboration* (β = 0.011, ρ > 0.10). These results for *communication* and *conflict resolution* meets the first and second criteria in establishing

mediation i.e. the independent variable must affect the dependent variable and also affect the mediating variable and in so doing, significantly.

For the third step, the independent variable and each of the mediating variables are jointly regressed against the dependent variable separately. The independent variable *'evaluation'* significantly and positively relates with the dependent variable *'team functioning'* when regressed with all the mediating variables i.e. *communication* ($\beta = 0.177$, $\rho < 0.05$), *collaboration* ($\beta = 0.188$, $\rho < 0.01$), and *conflict resolution* ($\beta = 0.121$, $\rho < 0.10$) and their coefficients slightly lower than that in the second stage i.e. $\beta < 0.188$). However only one mediating variable *conflict resolution* significantly relates with the dependent variable *'team functioning'* ($\beta = 0.187$, $\rho < 0.01$) thus satisfying the third criteria. Both the *communication* and *collaboration* design process variables failed to meet the third criteria since neither significantly related to the dependent variable. Hence, we conclude that the relationship between *evaluation* (independent variable) and *team functioning* (dependent variable) is significantly mediated by *conflict resolution* during the design process while those of *communication* and *collaboration* do not mediate this relationship. With reference to the hypotheses, these results tend to support: Hypothesis H8a, client organisation's evaluation is positively related to design team functioning in achieving value for money in building designs; Hypothesis H8b(ii) that this relationship is not mediated by collaboration among team members; and Hypothesis H8b(iii) that this relationship is mediated by conflict resolution among team members during the design process; but does not support H8b(i) that this relationship is mediated by members communication during the design process.

6.8.5 Relationship between Composition, Design Process & Functioning

6.8.5.1 Personality, Design Process and Team Functioning

Table 6.62 shows the regression analysis statistics and parameters of all the three steps described previously between personality, design process, and design team functioning; and to test hypothesis H10a which states that the way teams are evaluated by client organisation is positively related to design team functioning; and hypotheses H10b – that the relationship in H10a is: (i) mediated by team members communication; (ii) mediated by their collaboration; and (iii) mediated by their conflict resolution.

Table 6.62 - Regression of Personality, Design Process, and Team Functioning

Variables and Statistics	Step 1			Step 2	Step 3		
	1	2	3	Funct	Team Functioning		
					1	2	3
Personality	0.110†	0.048	0.251**	0.113†	0.102*	0.112†	0.059
Communication (1)					0.095		
Collaboration (2)						0.009	
Conflict Resltn (3)							0.216**
Adjusted R^2	0.008	-0.002	0.059	0.008	0.013	0.004	0.048
F-Sig	0.100	0.475	0.000	0.092	0.089	0.240	0.002
Durbin-Watson	2.025	2.485	2.152	1.919	1.914	1.923	1.969
Cook's Distance (max)	0.026	0.029	0.075	0.046	0.049	0.050	0.081

*The parameters of the variables are the standardised coefficients (β). Levels of significance are †<0.10 *<0.05; **<0.01*

Testing the model against the assumptions of regression indicates that the linearity assumption is satisfied for all the models developed having F-sig between 0.000 to 0.100 (<0.10) except model 2 in Stage 1 having $\rho = 0.475$ and model 2 in step 3 having $\rho = 0.240$; the models also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics between 1.914 to 2.485 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances are between 0.026 to 0.081 (<1).

Table 6.62 indicates that in the first step, independent variable *'personality'* was regressed against the three mediating variables – *'communications'*, *'collaboration'* and *'conflict resolution'* while in the second step *'evaluation'* was regressed against dependent variable *'team functioning'*. In the first step, independent variable

'personality' was significantly and positively related to two mediating variables, *communication* ($\beta = 0.110$, $\rho < 0.10$) and *conflict resolution* ($\beta = 0.251$, $\rho < 0.01$) and the dependent variable *'team functioning'* ($\beta = 0.113$, $\rho < 0.05$) but not to the third moderating variable *collaboration* ($\beta = 0.048$, $\rho > 0.10$). These results for *communication* and *conflict resolution* meets the first and second criteria in establishing mediation i.e. the independent variable must affect the dependent variable and also affect the mediating variable and in so doing, significantly.

For the third step, the independent variable and each of the mediating variables are jointly regressed against the dependent variable separately. The independent variable *'personality'* significantly and positively relates with the dependent variable *'team functioning'* when regressed with two mediating variables i.e. *communication* ($\beta = 0.102$, $\rho < 0.05$), and *collaboration* ($\beta = 0.112$, $\rho < 0.10$), and their coefficients lower than that in the second stage i.e. $\beta < 0.113$. However only one mediating variable *conflict resolution* significantly relates with the dependent variable *'team functioning'* ($\beta = 0.216$, $\rho < 0.01$) thus satisfying the third criteria, though the regression coefficient of the independent variable i.e. personality on team functioning herein is not significant. Both the *communication* and *collaboration* design process variables failed to meet the third criteria since neither significantly related to the dependent variable. Hence, we conclude that the relationship between *personality* (independent variable) and *team functioning* (dependent variable) is partially mediated by *conflict resolution* during the design process while those of *communication* and *collaboration* do not mediate this relationship. Therefore referring to the hypotheses, these results tend to support: Hypothesis H10a, the personality of design team members is positively related to design team functioning in achieving value for money in building designs; and Hypothesis H10b(iii) that this relationship is mediated by conflict resolution among team members during the design process; but does not support: H10b(i) that this relationship is

mediated by members communication during the design process; and Hypothesis H10b(ii) that this relationship is not mediated by collaboration among team members;

6.8.5.2 General Roles, Design Process and Team Functioning

Table 6.63 shows the regression analysis statistics and parameters of all the three steps described previously between general roles, design process, and design team functioning; and to test hypothesis H11a which states that the general roles team members undertake is positively related to design team functioning; and hypotheses H11b – that the relationship in H11a is: (i) not mediated by team members communication; (ii) not mediated by their collaboration; and (iii) mediated by their conflict resolution.

Table 6.63 - Regression of General Roles, Design Process, and Team Functioning

Variables and Statistics	**Step 1**			**Step 2**	**Step 3**		
					Team Functioning		
	1	**2**	**3**	**Funct**	**1**	**2**	**3**
General roles	0.271**	0.038	0.380**	0.388**	0.388**	0.388**	0.351**
Communication (1)					0.001		
Collaboration (2)						0.000	
Conflict Resltn (3)							0.104
Adjusted R^2	0.069	-0.003	0.128	0.147	0.143	0.143	0.153
F-Sig	0.000	0.573	0.000	0.000	0.000	0.000	0.000
Durbin-Watson	1.961	2.489	2.123	1.961	1.961	1.961	1.966
Cook's Distance (max)	0.033	0.072	0.080	0.076	0.069	0.091	0.105

*The parameters of the variables are the standardised coefficients (β). Levels of significance are †<0.10 *<0.05; **<0.01*

Testing the model against the assumptions of regression indicates that the linearity assumption is satisfied for all the models developed having F-sig of 0.000 (<0.01) except model 2 in Step 1 having $\rho = 0.573$; the models also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics between 1.961 to 2.489 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances are between 0.033 to 0.105 (<1).

Table 6.63 indicates that in the first step, independent variable *'general roles'* was regressed against each of the three mediating variables – *'communications'*, *'collaboration'* and *'conflict resolution'* while in the second step *'general roles'* was regressed against dependent variable *'team functioning'*. In the first step, independent variable *'general roles'* significantly and positively relates to two mediating variables, *communication* ($\beta = 0.271$, $\rho < 0.01$) and *conflict resolution* ($\beta = 0.380$, $\rho < 0.01$) and the dependent variable *'team functioning'* ($\beta = 0.388$, $\rho < 0.01$) but not to the third moderating variable *collaboration* ($\beta = 0.038$, $\rho > 0.10$). These results for *communication* and *conflict resolution* meets the first and second criteria in establishing mediation i.e. the independent variable must affect the dependent variable and also affect the mediating variable and in so doing, significantly.

For the third step, the independent variable and each of the mediating variables are jointly regressed against the dependent variable separately. The independent variable *'general roles'* significantly and positively relates with the dependent variable *'team functioning'* when regressed with all the mediating variables i.e. *communication* ($\beta = 0.388$, $\rho < 0.01$), *collaboration* ($\beta = 0.388$, $\rho < 0.01$), and *conflict resolution* ($\beta = 0.351$, $\rho < 0.01$) and their coefficients lower than or equal to that in the second stage i.e. $\beta <= 0.388$. However none of the mediating variables significantly relates with the dependent variable *'team functioning'* thus, not satisfying the third criteria. Hence, we conclude that the relationship between *general roles* (independent variable) and *team functioning* (dependent variable) is not mediated by *communication, collaboration* and *conflict resolution* during the design process. Therefore referring to the hypotheses, these results tend to support: Hypothesis H11a, that general roles is positively related to design team functioning in achieving value for money in building designs; Hypothesis H11b(i) that this relationship is not mediated by members communication during the design process; and Hypothesis H11b(ii) that this relationship is not mediated by collaboration among

team members; but does not support Hypothesis H11b(iii) that this relationship is mediated by conflict resolution among team members during the design process.

6.8.6 Summary of Hypotheses Testing

Table 6.64 show the summary of tests conducted to confirm the hypothecation of the conceptual framework developed in Chapter 3. Due to the restructuring of the determinants of value in design, some of the hypotheses set up were not tested as explained earlier, thus the conceptual framework is modified as shown in Figure 6.13 to reflect the outcome of the hypothesis testing. Based on evidences contained in literature on both generic team studies and construction related studies, 43 hypotheses were developed while 31 were tested. Twelve hypotheses could not be tested since the relevant variables did not scale through the factor analysis procedure. Seven of the 31 hypotheses tested were rejected which may account for the nature of teams in construction in terms of been project-based and their virtuality. It should be noted that the test conducted treated the client organisation parameters at their individual levels and not looking at them jointly from a systems perspective. The latter is the basis of the analyses reported in Section 6.9.

Table 6.64 – Summary of Hypothesis Testing

No	Hypothesis	Outcomes
H1a	Communication is positively related to design team functioning	Partially
H1b	Collaboration is positively related to design team functioning	Partially
H1c	Conflict resolution is positively related to design team functioning	Accepted
H2a	Leadership role is positively related to design team functioning	Accepted
2bi	This relationship is mediated by communication	Rejected
2bii	This relationship is not mediated by collaboration	Accepted
2biii	This relationship is mediated by conflict resolution	Partially
H3a	Procurement role is positively related to design team functioning	Accepted
3bi	This relationship is not mediated by communication	Accepted
3bii	This relationship is not mediated by collaboration	Accepted
3biii	This relationship is mediated by conflict resolution	Partially
H4a	Design quality role is negatively related to design team functioning	Partially
4bi	This relationship is mediated by communication	Rejected
4bii	This relationship is not mediated by collaboration	Accepted
4biii	This relationship is mediated by conflict resolution	Partially
H7a	Culture is positively related to design team functioning	Accepted
7bi	This relationship is mediated by communication	Rejected
7bii	This relationship is not mediated by collaboration	Accepted
7biii	This relationship is mediated by conflict resolution	Accepted
H8a	Evaluation is positively related to design team functioning	Accepted
8bi	This relationship is mediated by communication	Rejected
8bii	This relationship is not mediated by collaboration	Accepted
8biii	This relationship is mediated by conflict resolution	Accepted
H10a	Personality is positively related to design team functioning	Accepted
10bi	This relationship is mediated by communication	Rejected
10bii	This relationship is not mediated by collaboration	Rejected
10biii	This relationship is mediated by conflict resolution	Partially
H11a	General roles is positively related to design team functioning	Accepted
11bi	This relationship is not mediated by communication	Accepted
11bii	This relationship is not mediated by collaboration	Accepted
11biii	This relationship is mediated by conflict resolution	Rejected

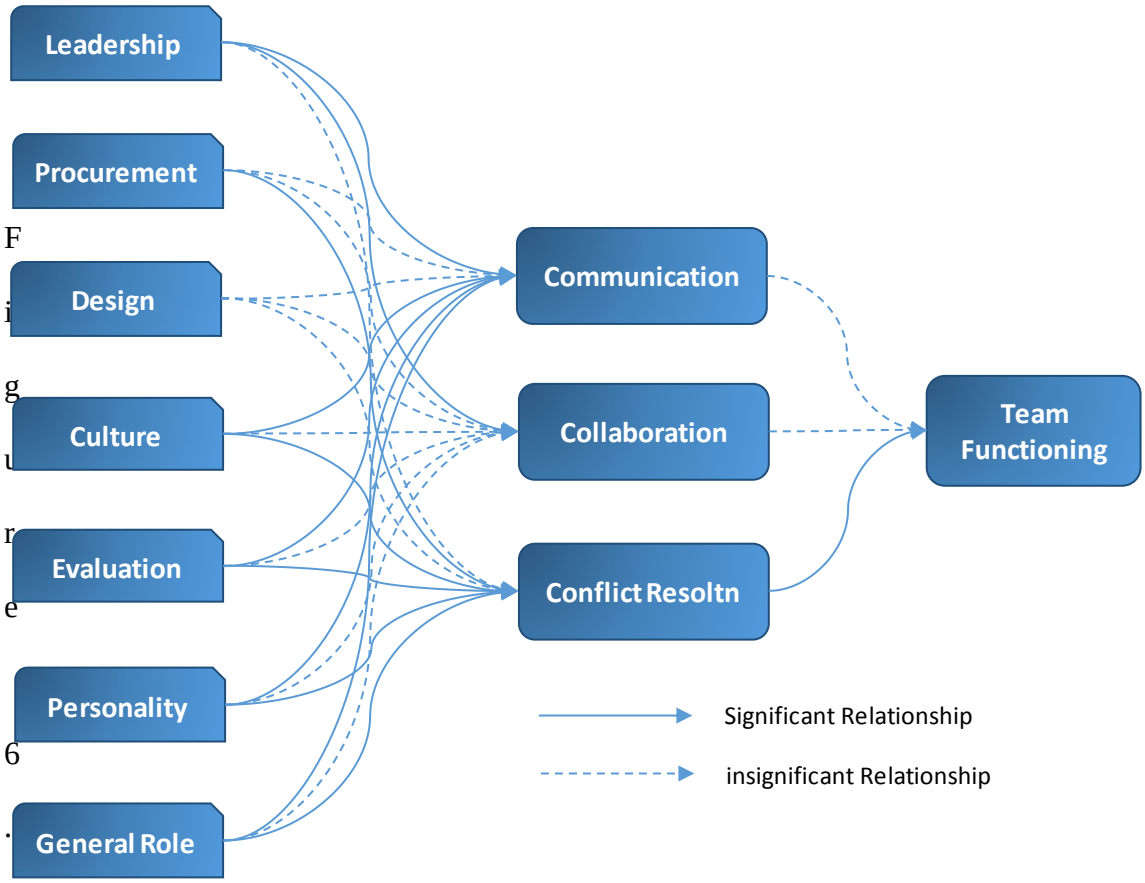


Figure 6.13 – Modified Conceptual Framework for Value in Design based on Hypothesis Testing

Figure 6.13 show that the following client organisation parameters have significant relationship with the communication variable during design process: leadership and design role, organisation culture, evaluation, team member personality, and the general team roles they perform. Only one client organisation parameter relates significantly with the collaboration variable namely leadership and design role while the following has significant relationship with the conflict resolution variable of the design process: leadership and design role, procurement and integration role, organisation culture, evaluation, team members' personality and the general roles they perform. Further, Figure 6.13 indicate that communication and collaboration are not significant mediators between client organisation parameters and design team functioning. Conflict resolution is the only significant mediator between client organisation parameters and design team functioning.

6.9 Effects of the Determinants of Value in Design

The previous section tested the hypothesised relationships using regression analysis procedure. These relationships were constructed at the individual level i.e. employing an idiosyncratic approach to studying the influence each of the determinants have on each other to achieving value in building designs. While this approach adequately serves the purpose of testing the hypotheses formulated based on their nature, it would not be adequate at studying the effects of these determinants at a systems level. Hence, the nomothetic approach which is common in team studies (Mathieu et al., 2008; Farquhar, 2011; National Research Council, 2015) is adopted. This approach considers the interactions of all the determinants at the same time rather than examining them separately, which is in line with the systems theory and more so the contingency approach to viewing an organisation (Mullins, 2010; Robbins and Judge, 2013) and upon which the research is predicated.

The regression analysis procedure is once again applied in establishing the effects of the determinants of value in building designs as was done in the previous section, using the Baron and Kenny (1986) and De Vaus (1996) method to investigate the existence of mediation between variables where appropriate. Four specific experiments were conducted to establish and investigate the following: effects of client organisation parameters on the three design process variables; their effects on design team functioning; their effects on design team functioning when mediated by each of the three design process variables, their effects on team functioning when mediated by the combination of the three design process variables. As was the case of applying regression analysis technique for the testing of hypotheses, the regression models developed are tested for the assumption underpinning the regression analysis procedure i.e. linearity, independency and homoscedasticity. Due to the number of independent variables been considered, the existence or otherwise of multi-collinearity among them

is checked. This is done by examining the variance inflation factor (VIF) of each independent variable. Kathori and Garg (2014) opine that VIF values greater than 5 indicate the presence of multi-collinearity amongst the explanatory variables. Table 6.65 summarise the outcome of the first three experiments performed as highlighted above using regression analysis. The Table, showing statistics to test the assumption of regression analysis, shall serve the main purpose of the analyses contained in this section. However, appropriate and associated Tables shall be provided for the various experiments performed as required, to further buttress the accompanying explanations and description of the analyses.

Table 6.65 - Regression of COPs, Design Process, and Team Functioning (Summary)

Variables and Statistics	**Step 1**			**Step 2**	**Step 3**		
	1	**2**	**3**	**Funct**	**Team Functioning**		
					1	**2**	**3**
Leadership	0.127	0.144	**-0.213**	-0.108	-0.101	-0.109	-0.093
Procurement	-0.039	0,023	**0.220**	**0.120**	**0.119**	**0.120**	0.105
Design Role	-0.073	-0.049	**-0.146**	0.014	0.010	0.014	0.024
Culture	-0.027	0.009	-0.041	0.066	0.065	0.066	0.069
Evaluation	**0.417**	-0.032	**0.348**	0.085	0.106	0.085	0.060
Personality	**-0.154**	-0.009	0.052	**-0.214**	**-0.222**	**-0.214**	**-0.217**
General Roles	**0.207**	-0.015	**0.303**	**0.495**	**0.505**	**0.495**	**0.473**
Communication (1)					-0.049		
Collaboration (2)						0.008	
Conflict Resltn (3)							0.071
Adjusted R^2	0.230	-0.011	0.252	0.175	0.173	0.171	0.175
F-Sig	0.000	0.719	0.000	0.000	0.000	0.000	0.000
Durbin-Watson	2.011	2.526	2.295	1.986	1.982	1.989	1.984
Cook's Distance (max)	0.043	0.067	0.067	0.044	0.093	0.091	0.095

The parameters of the variables are the standardised coefficients (β). Bold figures indicate levels of significance <0.05

6.9.1 Effect of Client Organisation Parameters on Communication

In an attempt to determine the effect of client organisation parameters on the design process engaged by design team members for achieving value in building designs, Table 6.65, under Step 1 column label '1' indicating communication as the dependent variable and Table 6.65 shows the regression coefficients of the client organisation parameters regressed against communication, and some associated regression statistics. Testing the

regression model against the assumptions of regression indicates that the linearity assumption is satisfied having a F-sig value of 0.000 (<0.01). The model also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics of 2.011 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances is 0.043 (<1). Another assumption that must be met for the suitability of employing regression is the test of multi-collinearity. Additionally, Table 6.66 shows the VIF for each of the explanatory variables i.e. the client organisation parameters, amongst other statistics.

Table 6.66 - Regression Coefficient and Statistics for Communication

Client Organisation Parameters	**Coefficients**			**Correlations**		**Collinear Stat**	
	B[a]	**Beta[b]**	**Sig.**	**Partial**	**Part**	**Tol**	**VIF**
(Constant)	2.444		0.000				
Leadership	0.154	0.127	0.117	0.106	0.092	0.532	1.879
Procurement	-0.056	-0.039	0.549	-0.041	-0.035	0.822	1.217
WLC	-0.107	-0.073	0.227	-0.082	-0.071	0.948	1.055
Culture	-0.030	-0.027	0.729	-0.024	-0.020	0.574	1.742
Evaluation	0.317	0.417	0.000	0.379	0.353	0.719	1.391
Personality	-0.262	-0.154	0.052	-0.132	-0.115	0.555	1.803
General Roles	0.289	0.207	0.008	0.180	0.158	0.582	1.719

Dependent Variable: Communication; [a] Unstandardized Coefficients; [b] standardized Coefficients

The VIFs of the client organisation parameters range from 1.055 to 1.879 thus indicating the absence of multi-collinearity (since each is < 5.00). Hence, the model satisfies all the conditions for regression. Table 6.65 further indicates that the seven client organisation parameters generated an Adjusted R^2 value of 0.230, implying that client organisation parameters i.e. explanatory variables, explains 23% of the variation in the mean value of the communication variable while up to 77% of this variation is accounted for by other factors that may not have been considered by this study or that they may just be as a result of random variations. This is a fairly moderate result given that Adjusted R^2 of less than 0.50 are considered as respectful and are acceptable (Cheng, 2008; Farquhar, 2011). Judging from the ANOVA F – statistics of 0.000, at least one of the client organisation parameters does linearly influence communication during design

confirming the appropriateness of regression analysis in establishing causal relationship (Barrow, 2006).

Three client organisation parameter significantly effects communication among design team members during design process namely: *evaluation* ($\beta = 0.417$, $\rho < 0.01$); *personality* ($\beta = -0.152$, $\rho < 0.05$); and *general team role* ($\beta = 0.207$, $\rho < 0.01$). *Evaluation* has the greatest effect upon communication potentially increasing it by 41.7% for every unit improvement in the way client organisations evaluate their design teams, this is followed by *general roles*, improving communication by 20.7% for every unit improvement in the extent to which team members perform their general roles within the design team; and then lastly *personality* which potentially reduces the communication efficiency by 15.4% when efforts are made by the client organisation at improving the membership mix of their design team in term of personality.

The part correlation value shows the correlation between the dependent variable and an independent variable when the linear effects of the other independent variables in the model have been removed from the independent variable. This is value is related to the change in R^2 when a variable is added to an equation (SPSS). Squaring the part correlation value of an independent variable gives an indication of its specific contribution to explaining the variance in the model. Table 6.66 shows the part correlations of each of the client organisation parameters and indicate that, *evaluation* having a part correlation of 0.353 when squared, specifically contributes 12.5% to the explanation of the variance in communication; *general role* having a part correlation of 0.158 when squared, specifically contributes 2.5%; while *personality* with a part correlation of -0.115 specifically contributes 1.3%.

Comparing the outcomes of the correlation analysis (Experiment 'Exp' 1), hypothesis testing (Exp 2) and the analysis contained herein (Exp 3), three client organisation parameters showed significant relationship with *communication* in Exp 1 and Exp 2 namely: *leadership and design role*, *organisation culture* and *general team roles*. Of these, only *evaluation* significantly relates to communication in Exp 3 making it the only variable that is common in all the three experiments. Further, *general role* is significant in both Exp 1 and Exp 3 while *personality* is significant in Exp 2 and Exp 3. While Exp 1 and Exp 2 investigates relationships at individual level of the client organisation parameters and Exp 3 does that at the systems level i.e. combining the effects of whole variables simultaneously, the difference between Exp 1, 2 (which are largely of similar results) on the one hand and Exp 3 on the other is expected showing that when client organisation parameters are considered within a systems perspective which is the situation in design teams, *leadership and design role* and *organisation culture* do not have significant effect upon communication during the design process. The summary of this comparison is depicted in Table 6.67.

Table 6.67 - Significant Client Organisation Parameters for Communication

Variables	**Corr[1]**	**Hypo[2]**	**Effect[3]**
Leadership & Design Role	●	●	-
Procurement & Integration Role	-	-	-
Design Quality Role – WLC	-	-	-
Organisation Culture	●	●	-
Evaluation	●	●	●
Personality	-	●	●
General Roles	●	●	●

[1] correlation analysis (see Table 6.51); [2] Hypothesis testing (see Tables 6.57 – 6.63); [3] Combination of client organisation parameters (see Tables 6.64 & 6.65)

6.9.2 Effect of Client Organisation Parameters on Collaboration

Table 6.65, under Step 1 column label '2' indicating collaboration as the dependent variable and Table 6.66 shows the regression coefficients of the client organisation parameters regressed against collaboration, and some associated regression statistics. Testing the regression model against the assumptions of regression indicates that the linearity condition is not met having F-sig of 0.719 (>0.10). However, the model satisfied the independent error assumption i.e. independence with Durbin-Watson statistics of 2.526 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances is 0.067 (<1). Another assumption that must be met for the suitability of employing regression is the test of multi-collinearity. Additionally, Table 6.68 shows the VIF for each of the explanatory variables i.e. the client organisation parameters, amongst other statistics.

Table 6.68 - Regression Coefficient and Statistics for Collaboration

Client Organisation Parameters	Coefficients			Correlations		Collinear Stat	
	B[a]	Beta[b]	Sig.	Partial	Part	Tol	VIF
(Constant)	3.518		0.000				
Leadership	0.114	0.144	0.119	0.106	0.105	0.532	1.879
Procurement	0.021	0.023	0.761	0.021	0.020	0.822	1.217
WLC	-0.047	-0.049	0.479	-0.048	-0.048	0.948	1.055
Culture	0.007	0.009	0.916	0.007	0.007	0.574	1.742
Evaluation	-0.016	-0.032	0.683	-0.028	-0.028	0.719	1.391
Personality	-0.010	-0.009	0.923	-0.007	-0.007	0.555	1.803
General Roles	-0.013	-0.015	0.868	-0.011	-0.011	0.582	1.719

Dependent Variable: Collaboration; [a] Unstandardized Coefficients; [b] standardized Coefficients

The VIFs of the client organisation parameters range from 1.055 to 1.879 thus indicating the absence of multi-collinearity (since each is < 5.00). Hence, the model satisfies all the conditions for regression. Table 6.64 further indicates that the seven client organisation parameters generated an Adjusted R^2 value of -0.011, implying that client organisation parameters i.e. explanatory variables, explains 1% of the variation in the mean value of the communication variable while the remaining 99% of this variation is accounted for

by other factors that may not have been considered by this study or that they may just be as a result of random variations. This is not a respectful result given that the ANOVA F – statistics of 0.719 is not significant. Further, this indicates that the client organisation parameters do not linearly influence collaboration during design, suggesting the existence of a curvilinear relationship between the variables and thus, the inappropriateness of regression analysis in establishing causal relationship (Barrow, 2006). Hence, none of the client organisation parameter is expected to significantly have an effect upon team collaboration during the design process as shown by the regression coefficients in Tables 6.65 and 6.68. This outcome is in conformity with the results of the experiments conducted to: determine the relationship among the variables in Section 6.7, and test the hypotheses in Section 6.8.

6.9.3 Effect of Client Organisation Parameters on Conflict Resolution

In an attempt to determine the effect of client organisation parameters on the design process engaged by design team members for achieving value in building designs, Table 6.65, under Step 1 column label '3' indicating conflict resolution as the dependent variable and Table 6.69 shows the regression coefficients of the client organisation parameters regressed against conflict resolution, and some associated regression statistics. Testing the regression model against the assumptions of regression indicates that the linearity assumption is satisfied having an F-sig value of 0.000 (<0.01). The model also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics of 2.295 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances is 0.044 (<1). Another assumption that must be met for the suitability of employing regression is the test of multi-collinearity. Additionally, Table 6.69 shows the VIF for each of the explanatory variables i.e. the client organisation parameters, amongst other statistics.

Table 6.69 - Regression Coefficient and Statistics for Conflict resolution

Client Organisation Parameters	Coefficients			Correlations		Collinear Stat	
	B[a]	Beta[b]	Sig.	Partial	Part	Tol	VIF
(Constant)	2.076		0.000				
Leadership	-0.174	-0.213	0.008	-0.179	-0.155	0.532	1.879
Procurement	0.215	0.220	0.001	0.228	0.200	0.822	1.217
WLC	-0.144	-0.146	0.015	-0.164	-0.142	0.948	1.055
Culture	-0.031	-0.041	0.594	-0.036	-0.031	0.574	1.742
Evaluation	0.178	0.348	0.000	0.327	0.295	0.719	1.391
Personality	0.059	0.052	0.506	0.045	0.039	0.555	1.803
General Roles	0.284	0.303	0.000	0.262	0.231	0.582	1.719

Dependent Variable: Conflict resolution; [a] Unstandardized Coefficients; [b] standardized Coefficients

The VIFs of the client organisation parameters range from 1.055 to 1.879 thus indicating the absence of multi-collinearity (since each is < 5.00). Hence, the model satisfies all the conditions for regression and the results interpretable as such. Table 6.65 further indicates that the seven client organisation parameters generated an Adjusted R^2 value of 0.252, implying that client organisation parameters i.e. explanatory variables, explains 25.2% of the variation in the mean value of the communication variable while up to 77% of this variation is accounted for by other factors that may not have been considered by this study or that they may just be as a result of random variations. This is a fairly moderate result given that Adjusted R^2 of less than 0.50 are considered as respectful and are acceptable (Cheng, 2008; Farquhar, 2011). Judging from the ANOVA F – statistics of 0.000, at least one of the client organisation parameters does linearly influence communication during design confirming the appropriateness of regression analysis in establishing causal relationship (Barrow, 2006).

Five client organisation parameter significantly effects conflict resolution among design team members during the design process. These variables are *leadership and design role* ($\beta = -0.213$, $\rho < 0.01$); *procurement and integration* ($\beta = 0.220$, $\rho < 0.01$); *design quality - WLC* ($\beta = -0.146$, $\rho < 0.05$); *evaluation* ($\beta = 0.348$, $\rho < 0.01$); and *general team role* ($\beta = 0.303$, $\rho < 0.01$). *Evaluation* has the greatest effect upon conflict resolution, potentially

increasing it by 34.8% for every unit improvement in the way client organisations evaluate their design teams, this is followed by *general roles*, improving conflict resolution by 30.3% for every unit improvement in the extent to which team members perform their general roles within the design team; followed by *procurement and integration role*, improving conflict resolution by 22.3% for every unit improvement in the extent to which client organisation perform the procurement and integration role; then followed by *leadership and design role*, reducing the efficiency in conflict resolution by 21.3% for every unit improvement in the extent to which client organisation perform this role; and then lastly *design quality role - WLC* which potentially reduces the conflict resolution efficiency of the design team by 14.6% when efforts are made by the client organisation at improving its design quality role.

The part correlation value shows the correlation between the dependent variable and an independent variable when the linear effects of the other independent variables in the model have been removed from the independent variable. This value is related to the change in R^2 when a variable is added to an equation (SPSS). Squaring the part correlation value of an independent variable gives an indication of its specific contribution to explaining the variance in the model. Table 6.69 shows the part correlations of each of the client organisation parameters as follows, *evaluation* having a part correlation of 0.295 when squared, specifically contributes 8.7% to the explanation of the variance in conflict resolution; *general role* having a part correlation of 0.231 when squared, specifically contributes 5.3%; *procurement and integration role* having a part correlation of 0.200 when squared, specifically contributes 4.0%; *leadership and design role* having a part correlation of 0.155 when squared, specifically contributes 2.4%; while *design quality role - WLC* with a part correlation of -0.142 specifically contributes 2.0%.

Comparing the outcomes of the correlation analysis (Experiment 'Exp' 1), hypothesis testing (Exp 2) and the analysis contained herein (Exp 3), five client organisation parameters showed significant relationship with conflict resolution in Exp 1 and Exp 2 namely: *procedure and integration role*, *organisation culture*, *evaluation*, *personality*, and *general team roles*. Of these, three parameters significantly relates to conflict resolution in Exp 3 namely: *procurement and integration role*, *evaluation* and *general roles* making them common in all the three experiments. Further, *leadership and design role*, and *design quality role – WLC* are only significant in Exp 3. While Exp 1 and Exp 2 investigates relationships at individual level of the client organisation parameters and Exp 3 does that at the systems level i.e. combining the effects of whole variables simultaneously, the difference between Exp 1, 2 (which are largely of similar results) on the one hand and Exp 3 on the other, is expected showing that when client organisation parameters are considered within a systems perspective, *design quality role*, *organisation culture*, and team members' *personality* do not have significant effect upon conflict resolution during the design process. The summary of this comparison is depicted in Table 6.70.

Table 6.70 - Significant Client Organisation Parameters for Conflict Resolution

Variables	**Corr[1]**	**Hypo[2]**	**Effect[3]**
Leadership & Design Role	-	-	●
Procurement & Integration Role	●	●	●
Design Quality Role – WLC	-	-	●
Organisation Culture	●	●	-
Evaluation	●	●	●
Personality	●	●	-
General Roles	●	●	●

[1] correlation analysis (see Table 6.51); [2] Hypothesis testing (see Tables 6.57 – 6.63); [3] Combination of client organisation parameters (see Tables 6.64 & 6.67)

6.9.4 Effect of COPs upon Team Functioning (Direct Consequences)

In an attempt to determine the effect of client organisation parameters on design team functioning in achieving value in building designs, Table 6.65, under Step 2 indicating

team functioning as the dependent variable and Table 6.71 shows the regression coefficients of the client organisation parameters regressed against team functioning, and some associated regression statistics. Testing the regression model against the assumptions of regression indicates that the linearity assumption is satisfied having an F-sig value of 0.000 (<0.01). The model also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics of 1.986 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances is 0.043 (<1). Another assumption that must be met for the suitability of employing regression is the test of multi-collinearity. Additionally, Table 6.68 shows the VIF for each of the explanatory variables i.e. the client organisation parameters, amongst other statistics.

Table 6.71 - Regression Coefficient and Statistics for Team Functioning

Client Organisation Parameters	**Coefficients**			**Correlations**		**Collinear Stat**	
	B[a]	**Beta[b]**	**Sig.**	**Partial**	**Part**	**Tol**	**VIF**
(Constant)	2.845		0.000				
Leadership	-0.045	-0.108	0.197	-0.088	-0.079	0.532	1.879
Procurement	0.060	0.120	0.073	0.121	0.109	0.822	1.217
WLC	0.007	0.014	0.827	0.015	0.013	0.948	1.055
Culture	0.025	0.066	0.408	0.056	0.050	0.574	1.742
Evaluation	0.022	0.085	0.236	0.080	0.072	0.719	1.391
Personality	-0.125	-0.214	0.009	-0.175	-0.159	0.555	1.803
General Roles	0.236	0.495	0.000	0.389	0.377	0.582	1.719

Dependent Variable: Functioning; [a] Unstandardized Coefficients; [b] standardized Coefficients

The VIFs of the client organisation parameters range from 1.055 to 1.879 thus indicating the absence of multi-collinearity (since each is < 5.00). Hence, the model satisfies all the conditions for regression. Table 6.64 further indicates that the seven client organisation parameters generated an Adjusted R^2 value of 0.173, implying that client organisation parameters i.e. explanatory variables, explains 17.3% of the variation in the mean value of the team functioning variable while up to 82.7% of this variation is accounted for by other factors that may not have been considered by this study or that they may just be as a result of random variations. This is a relatively poor result given that Adjusted R^2 of

0.350 to 0.50 are considered as respectful and are acceptable (Cheng, 2008; Farquhar, 2011). Judging from the ANOVA F – statistics of 0.000, at least one of the client organisation parameters does linearly influence team functioning during design confirming the appropriateness of regression analysis in establishing causal relationship (Barrow, 2006).

Three client organisation parameters have significant effect upon team functioning during design process namely: *procurement and integration role* ($\beta = 0.120$, $\rho < 0.05$); *personality* ($\beta = -0.214$, $\rho < 0.01$); and *general team roles* ($\beta = 0.495$, $\rho < 0.01$). *General roles* has the greatest effect upon team functioning potentially increasing it by 49.5% for every unit improvement in the extent to which design team members perform their general roles within design teams, this is followed by *personality* which potentially reduces the communication efficiency by 15.4% when efforts are made by the client organisation at improving the membership mix of their design team in term of personality; and then lastly *procurement and integration role*, improving team functioning by 12% for every unit improvement in the extent to which client organisations perform their procurement and integration roles relative to achieving value in building designs.

The part correlation value shows the correlation between the dependent variable and an independent variable when the linear effects of the other independent variables in the model have been removed from the independent variable. This is value is related to the change in R^2 when a variable is added to an equation (SPSS). Squaring the part correlation value of an independent variable gives an indication of its specific contribution to explaining the variance in the model. Table 6.71 shows the part correlations of each of the client organisation parameters and indicate that, *general role* having a part correlation of 0.377 when squared, specifically contributes 14.2% to the

explanation of the variance in team functioning; *personality* having a part correlation of -0.159 when squared, specifically contributes 2.5%; while *procurement and integration role* with a part correlation of 0.109 specifically contributes 1.2%.

Comparing the outcomes of the correlation analysis (Experiment 'Exp' 1), hypothesis testing (Exp 2) and the analysis contained herein (Exp 3), four client organisation parameters showed significant relationship with team functioning in Exp 1 and Exp 2 namely: *procurement and integration role, organisation culture, evaluation* and *general team roles*. Of these, two parameters significantly relates to team functioning in Exp 3 namely: *procurement and integration role* and *general roles* making them common in all the three experiments. Further, *personality* is only significant in Exp 3. While Exp 1 and Exp 2 investigates relationships at individual level of the client organisation parameters and Exp 3 does that at the systems level i.e. combining the effects of whole variables simultaneously, the difference between Exp 1, 2 (which are fairly of similar results) on the one hand and Exp 3 on the other is expected, showing that when client organisation parameters are considered within a systems perspective which is the situation in design teams, *Leadership and design role*, design quality role, *organisation culture*, and *evaluation* do not have significant effect upon team functioning in terms of achieving value in design during the design process. The summary of this comparison is depicted in Table 6.72.

Table 6.72 - Significant Client Organisation Parameters for Design Functioning

Variables	**Corr[1]**	**Hypo[2]**	**Effect[3]**
Leadership & Design Role	-	●	-
Procurement & Integration Role	●	●	●
Design Quality Role – WLC	-	-	-
Organisation Culture	●	●	-
Evaluation	●	●	-
Personality	-	●	●
General Roles	●	●	●

[1] correlation analysis (see Table 6.51); [2] Hypothesis testing (see Tables 6.57 – 6.63); [3] Combination of client organisation parameters (see Tables 6.64 & 6.68)

6.9.5 Effect of COPs on Team Functioning, Mediated by Communication

In an attempt to determine the effect of client organisation parameters on design team functioning in achieving value in building designs, Table 6.65, under Step 2 under column '1' indicating team functioning as the dependent variable and communication as the mediating variable, and Table 6.73 both shows the regression coefficients of the client organisation parameters regressed against team functioning, and some associated regression statistics. Testing the regression model against the assumptions of regression indicates that the linearity assumption is satisfied having an F-sig value of 0.000 (<0.01). The model also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics of 1.982 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances is 0.043 (<1). Another assumption that must be met for the suitability of employing regression is the test of multi-collinearity. Additionally, Table 6.73 show the VIF for each of the explanatory variables i.e. the client organisation parameters, amongst other statistics.

Table 6.73 - Regression Analysis for Functioning Mediated by Communication

Client Organisation Parameters	**Coefficients**			**Correlations**		**Collinear Stat**	
	B[a]	**Beta[b]**	**Sig.**	**Partial**	**Part**	**Tol**	**VIF**
(Constant)	2.886		0.000				
Leadership	-0.042	-0.101	0.227	-0.082	-0.074	0.526	1.901
Procurement	0.059	0.119	0.079	0.119	0.107	0.820	1.219
WLC	0.005	0.010	0.873	0.011	0.010	0.942	1.062
Culture	0.025	0.065	0.418	0.055	0.049	0.574	1.743
Evaluation	0.027	0.106	0.174	0.092	0.083	0.616	1.624
Personality	-0.129	-0.221	0.008	-0.180	-0.163	0.545	1.834
General Roles	0.240	0.505	0.000	0.391	0.379	0.563	1.777
Communication	-0.017	-0.049	0.484	-0.048	-0.043	0.746	1.341

Dependent Variable: Functioning; [a] Unstandardized Coefficients; [b] standardized Coefficients

The VIFs of the client organisation parameters range from 1.062 to 1.901 thus indicating the absence of multi-collinearity (since each is < 5.00). Hence, the model satisfies all the conditions for regression. Table 6.65 further indicates that the seven client organisation

parameters generated an Adjusted R^2 value of 0.173, implying that client organisation parameters i.e. explanatory variables, explains 17.3% of the variation in the mean value of the team functioning variable when the *communication* variable is introduced as a mediator while up to 82.7% of this variation is accounted for by other factors that may not have been considered by this study or that they may just be as a result of random variations. This is a relatively poor result given that Adjusted R^2 of 0.350 to 0.50 are considered as respectful and are acceptable (Cheng, 2008; Farquhar, 2011). Judging from the ANOVA F – statistics of 0.000, at least one of the client organisation parameters does linearly influence team functioning during design confirming the appropriateness of regression analysis in establishing causal relationship (Barrow, 2006).

Three client organisation parameters have significant effect upon team functioning during design process when mediated by *communication* namely: *procurement and integration role* ($\beta = 0.119$, $\rho < 0.05$); *personality* ($\beta = -0.221$, $\rho < 0.01$); and *general team roles* ($\beta = 0.505$, $\rho < 0.01$). *General roles* has the greatest effect upon team functioning potentially increasing it by 50.5% for every unit improvement in the extent to which design team members perform their general roles within design teams, this is followed by *personality* which potentially reduces it by 22.1% when efforts are made by the client organisation at improving the membership mix of their design team in term of personality; and then lastly *procurement and integration role*, improving team functioning by 11.9% for every unit improvement in the extent to which client organisations perform their procurement and integration roles relative to achieving value in building designs. However, it is worthy to note that *communication* does not have significant effect as a mediating variable between the client organisation parameters and team functioning.

The part correlation value shows the correlation between the dependent variable and an independent variable when the linear effects of the other independent variables in the model have been removed from the independent variable. This is value is related to the change in R^2 when a variable is added to an equation (SPSS). Squaring the part correlation value of an independent variable gives an indication of its specific contribution to explaining the variance in the model. Table 6.69 shows the part correlations of each of the client organisation parameters when *communication* is introduced as a mediating variable and indicate that, *general role* having a part correlation of 0.379 when squared, specifically contributes 14.4% to the explanation of the variance in team functioning; *personality* having a part correlation of -0.163 when squared, specifically contributes 2.7%; while *procurement and integration role* with a part correlation of 0.107 specifically contributes 1.1%.

Comparing the outcomes of the hypothesis testing (Exp 2) and the analysis contained in this section (Exp 3) (note correlation analysis i.e. 'Exp 1' is not applicable for this section), five client organisation parameters showed significant relationship with team functioning in Exp 2 namely: *procurement and integration role*, *organisation culture, evaluation, personality* and *general team roles*. Of these, three parameters significantly relates to team functioning in Exp 3 namely: *procurement and integration role, personality* and *general roles* making them common in all the three experiments. While Exp 2 investigates relationships at individual level of the client organisation parameters and Exp 3 does that at the systems level i.e. combining the effects of whole variables simultaneously, the difference between Exp 2 and Exp 3 is expected, showing that when client organisation parameters are considered within a systems perspective which is the situation in design teams, organisation culture, and evaluation do not have significant effect upon team functioning in terms of achieving value in design during the design process. The summary of this comparison is depicted in Table 6.74.

Table 6.74 - Significant COPs for Design Functioning mediated by Communication

Variables	Corr[1]	Hypo[2]	Effect[3]
Leadership & Design Role	*NA*	-	-
Procurement & Integration Role	*NA*	●	●
Design Quality Role – WLC	*NA*	-	-
Organisation Culture	*NA*	●	-
Evaluation	*NA*	●	-
Personality	*NA*	●	●
General Roles	*NA*	●	●

[1] correlation analysis (see Table 6.51); [2] Hypothesis testing (see Tables 6.57 – 6.63); [3] Combination of client organisation parameters (see Tables 6.64 & 6.69); NA – not applicable

6.9.6 Effect of COPs on Functioning, Mediated by Conflict Resolution

Given the regression coefficient of *collaboration* when mediating between client organisation parameters and team functioning i.e. 0.008, and its insignificant effect as shown in Table 6.65 Step 3, under column '3', the results obtained when there isn't mediation, as shown in Table 6.65 Step 2, would be same as that when mediation exist. Hence the outcomes obtained in Section 6.9.5 will be same when the collaboration variable is introduced as shown in Table 6.59. For this reason discussion on the effect of client organisation parameters on team functioning mediated by collaboration is not presented.

Table 6.65, under Step 2 under column '3' and Table 6.75 both shows the regression coefficients of the client organisation parameters regressed against team functioning when mediated by conflict resolution, and some associated regression statistics. Testing the regression model against the assumptions of regression indicates that the linearity assumption is satisfied having an F-sig value of 0.000 (<0.01). The model also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics of 1.984 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances is 0.095 (<1). Another assumption that must be met for the suitability of employing regression is the test of

multi-collinearity. Additionally, Table 6.75 shows the VIF for each of the explanatory variables i.e. the client organisation parameters, amongst other statistics.

Table 6.75 - Regression Analysis for Functioning Mediated by Conflict resolution

Client Organisation Parameters	Coefficients			Correlations		Collinear Stat	
	B[a]	Beta[b]	Sig.	Partial	Part	Tol	VIF
(Constant)	2.770		0.000				
Leadership	-0.039	-0.093	0.274	-0.074	-0.067	0.515	1.942
Procurement	0.052	0.105	0.129	0.103	0.093	0.779	1.284
WLC	0.012	0.024	0.705	0.026	0.023	0.923	1.084
Culture	0.027	0.069	0.389	0.059	0.052	0.573	1.744
Evaluation	0.016	0.060	0.425	0.054	0.048	0.642	1.557
Personality	-0.127	-0.217	0.008	-0.179	-0.162	0.554	1.806
General Roles	0.225	0.473	0.000	0.364	0.348	0.542	1.846
Conflicts	0.036	0.071	0.322	0.067	0.060	0.725	1.379

Dependent Variable: Functioning; [a] Unstandardized Coefficients; [b] standardized Coefficients

The VIFs of the client organisation parameters range from 1.084 to 1.942 thus indicating the absence of multi-collinearity (since each is < 5.00). Hence, the model satisfies all the conditions for regression. Table 6.65 further indicates that the seven client organisation parameters generated an Adjusted R^2 value of 0.175, implying that client organisation parameters i.e. explanatory variables, explains 17.5% of the variation in the mean value of the team functioning variable when the *conflict resolution* variable is introduced as a mediator while up to 82.5% of this variation is accounted for by other factors that may not have been considered by this study or that they may just be as a result of random variations. This is a relatively poor result given that Adjusted R^2 of 0.350 to 0.50 are considered as respectful and are acceptable (Cheng, 2008; Farquhar, 2011). Judging from the ANOVA F – statistics of 0.000, at least one of the client organisation parameters does linearly influence team functioning during design confirming the appropriateness of regression analysis in establishing causal relationship (Barrow, 2006).

Two client organisation parameters have significant effect upon team functioning during design process when mediated by *conflict resolution* namely: *personality* ($\beta = -0.217$, $\rho < 0.01$); and *general team roles* ($\beta = 0.473$, $\rho < 0.01$). *General roles* has the greatest effect upon team functioning potentially increasing it by 47.3% for every unit improvement in the extent to which design team members perform their general roles within design teams, followed by *personality* which potentially reduces it by 21.7% when efforts are made by the client organisation at improving the membership mix of their design team in term of personality. It is however worthy to note that *conflict resolution* does not have significant effect as a mediating variable between the client organisation parameters and team functioning.

The part correlation value shows the correlation between the dependent variable and an independent variable when the linear effects of the other independent variables in the model have been removed from the independent variable. This is value is related to the change in R^2 when a variable is added to an equation (SPSS). Squaring the part correlation value of an independent variable gives an indication of its specific contribution to explaining the variance in the model. Table 6.75 shows the part correlations of each of the client organisation parameters when *communication* is introduced as a mediating variable and indicate that, *general role* having a part correlation of 0.348 when squared, specifically contributes 12.1% to the explanation of the variance in team functioning while *personality* having a part correlation of -0.162 when squared, specifically contributes 2.6%.

Comparing the outcomes of the correlation analysis (Experiment 'Exp' 1), hypothesis testing (Exp 2) and the analysis contained herein (Exp 3), four client organisation parameters showed significant relationship with team functioning in Exp 1 and Exp 2 namely: *procurement and integration role*, *organisation culture*, *evaluation* and *general*

team roles. Of these, only *general roles* significantly relates to team functioning in Exp 3 making it common to all the three experiments. Further, *personality* is only significant in Exp 3. While Exp 1 and Exp 2 investigates relationships at individual level of the client organisation parameters and Exp 3 does that at the systems level i.e. combining the effects of whole variables simultaneously, the difference between Exp 1, 2 (which are largely of similar results) on the one hand and Exp 3 on the other is expected, showing that when client organisation parameters are considered within a systems perspective which is the situation in design teams, organisation culture, and evaluation do not have significant effect upon team functioning in terms of achieving value in design during the design process.

Table 6.76 - Significant COPs for Design Functioning mediated by Conflict Resolution

Variables	**Corr[1]**	**Hypo[2]**	**Effect[3]**
Leadership & Design Role	*NA*	●	-
Procurement & Integration Role	*NA*	●	-
Design Quality Role – WLC	*NA*	●	-
Organisation Culture	*NA*	●	-
Evaluation	*NA*	●	-
Personality	*NA*	●	●
General Roles	*NA*	-	●

[1] correlation analysis (see Table 6.51); [2] Hypothesis testing (see Tables 6.57 – 6.63); [3] Combination of client organisation parameters (see Tables 6.64 & 6.70); NA – not applicable

6.9.7 Effect of COPs on Functioning, Mediated by Design Process (Combined Effect)

Earlier experiments on establishing the effect of client organisation parameters were based on the aggregated *team functioning* variable i.e. Tf0 as described in Table 6.50. However, the *team functioning* variable was structured as a two variable construct after factor analysis namely *effort* – Tf1 and *drivers* – Tf2. Hence Tf0 is the aggregate of Tf1 and Tf2. A study of the correlation between the determinants of value in building design (see Table 6.51) reveals that where a significant correlation exist between any determinant and team functioning, it is with the effort variable i.e. Tf1 rather than with

Tf2. This definitely will affect the pattern of relationships the client organisation parameters will have with the three measures of team functioning i.e. Tf0, Tf1 and Tf2. Tf1 will give a better representation when the level of significant is of paramount importance as is the case in this section. This is expected to improve the goodness of fit of the regression models generated. Hence, the effort variable for the team functioning construct – Tf1 forms the basis of the analysis and discussions in this section.

This particular experiment describes the last of the four experiments performed for this section i.e. Section 6.9 as reported in the introductory section i.e. establishing and investigating the effect of client organisation parameters on team functioning when mediated by the combination of the three design process variables. For the purpose of clarity and simplification in presenting the results of the experiment performed using regression analysis, the outcomes of the first three experiments are replicated in Table 6.77 alongside those of the current experiment shown in column labelled '4'. Particularly, Table 6.77 shows statistics to test the assumptions underpinning the use of regression analysis, while Table 6.78 provides detailed and additional statistics as required to further buttress the accompanying explanations and description of this analysis.

Table 6.77 - Regression of COPs, Design Process, & Functioning (Based on Efforts)

Variables and Statistics	Step 1			Step 2	Step 3			
	1	2	3	Funct	Team Functioning			
					1	2	3	4
Leadership	0.127	0.144	**-0.213**	-0.014	-0.004	-0.020	0.005	0.019
Procurement	-0.039	0,023	**0.220**	0.058	0.055	0.057	0.038	0.026
Design Role	-0.073	-0.049	**-0.146**	0.047	0.041	0.049	0.060	0.058
Culture	-0.027	0.009	-0.041	-0.045	-0.047	-0.045	-0.041	-0.043
Evaluation	**0.417**	-0.032	**0.348**	0.079	0.113	0.080	0.047	0.087
Personality	**-0.154**	-0.009	0.052	**-0.158**	**-0.170**	**-0.157**	**-0.162**	**-0.181**
General Roles	**0.207**	-0.015	**0.303**	**0.632**	**0.649**	**0.633**	**0.604**	**0.621**
Communication (1)					-0.083			**-0.115**
Collaboration (2)						0.040		0.045
Conflict Resltn (3)							0.091	**0.118**
Adjusted R^2	0.230	-0.011	0.252	0.307	0.309	0.306	0.310	0.315
F-Sig	0.000	0.719	0.000	0.000	0.000	0.000	0.000	0.000
Durbin-Watson	2.011	2.526	2.295	2.123	2.133	2.213	2.083	2.099
Cook's Distance (max)	0.043	0.067	0.067	0.101	0.089	0.091	0.091	0.077

The parameters of the variables are the standardised coefficients (β). Bold figures indicate levels of significance <0.05

Table 6.77 Step 3 under column '4' indicating team functioning i.e. Tf1 as the dependent variable and communication, collaboration, and conflict resolution as the mediating variables together with Table 6.78 show the regression coefficients of the client organisation parameters regressed against team functioning, and some associated regression statistics. Testing the regression model against the assumptions of regression indicates that the linearity assumption is satisfied having an F-sig value of 0.000 (<0.01). The model also satisfied the independent error assumption i.e. independence with Durbin-Watson statistics of 2.099 (i.e. not between 0 to 1 or 3 to 4), and also satisfying the homoscedasticity condition given that the maximum value for the Cook's Distances is 0.077 (<1). Another assumption that must be met for the suitability of employing regression is the test of multi-collinearity. Additionally, Table 6.78 shows the VIF for each of the explanatory variables i.e. the client organisation parameters, amongst other statistics.

Table 6.78 - Regression Analysis for Functioning Mediated by Design Process

Client Organisation Parameters	Coefficients			Correlations		Collinear Stat	
	B[a]	Beta[b]	Sig.	Partial	Part	Tol	VIF
(Constant)	1.975		0.000				
Leadership	0.011	0.019	0.810	0.016	0.013	0.499	2.006
Procurement	0.019	0.026	0.676	0.029	0.023	0.771	1.297
WLC	0.042	0.058	0.316	0.069	0.056	0.919	1.088
Culture	-0.024	-0.043	0.555	-0.040	-0.033	0.573	1.745
Evaluation	0.033	0.087	0.231	0.082	0.066	0.582	1.718
Personality	-0.154	-0.181	0.017	-0.163	-0.133	0.542	1.846
General Roles	0.431	0.621	0.000	0.489	0.454	0.534	1.872
Communication	-0.058	-0.115	0.083	-0.118	-0.096	0.698	1.432
Collaboration	0.035	0.045	0.420	0.055	0.045	0.975	1.026
Conflicts	0.088	0.118	0.078	0.120	0.098	0.682	1.466

Dependent Variable: Functioning; [a] Unstandardized Coefficients; [b] standardized Coefficients

The VIFs of the client organisation parameters and design process variables range from 1.026 to 2.006 thus indicating the absence of multi-collinearity (since each is <5.00). Hence, the model satisfies all the conditions for regression. Table 6.77 further indicates that the seven client organisation parameters generated an Adjusted R^2 value of 0.315, implying that client organisation parameters i.e. explanatory variables, with the mediating variables explain 31.1% of the variation in the mean value of the team functioning variable while up to 68.9% of this variation is accounted for by other factors that may not have been considered by this study or that they may just be as a result of random variations. This is a good and acceptable result given that Adjusted R^2 of 0.350 to 0.50 are considered as respectful and are acceptable (Cheng, 2008; Farquhar, 2011). Judging from the ANOVA F – statistics of 0.000, at least one of the client organisation parameters does linearly influence team functioning during design confirming the appropriateness of regression analysis in establishing causal relationship (Barrow, 2006).

Two client organisation parameters have significant effect upon team functioning during design process when mediated by the three design process variables in combination

namely: *personality* ($\beta = -0.181$, $\rho < 0.01$); and *general team roles* ($\beta = 0.621$, $\rho < 0.01$). *General roles* has the greatest effect upon team functioning potentially increasing it by 62.1% for every unit improvement in the extent to which design team members perform their general roles within design teams, this is followed by *personality* which potentially reduces team functioning by 18.1% when efforts are made by the client organisation at improving the membership mix of their design team in term of personality relative to achieving value in building designs. It is however worth noting that when combined in the regression model *communication* and *conflict resolution* have significant effect as mediators at 90% level of significance ($\rho = 0.083$ and 0.078 respective) while *collaboration* is not a significant mediator ($\rho = 0.420$) between the client organisation parameters and team functioning.

The part correlation value shows the correlation between the dependent variable and an independent variable when the linear effects of the other independent variables in the model have been removed from the independent variable. This value is related to the change in R^2 when a variable is added to an equation (SPSS). Squaring the part correlation value of an independent variable gives an indication of its specific contribution to explaining the variance in the model. Table 6.78 shows the part correlations of each of the client organisation parameters when *communication, collaboration* and *conflict resolution* were introduced as mediating variables indicate that, *general role* having a part correlation of 0.454 when squared, specifically contributes 20.6% to the explanation of the variance in team functioning while *personality* having a part correlation of -0.133 when squared, specifically contributes 1.8%.

6.10 Chapter Summary

The previous Chapter provides insight into the supply management practices of client organisations in the construction industry and how they manage their respective value system. Revealing that in spite of the challenges faced by client organisations in managing their supply chain and value systems, value is seen to be adequately delivered in building designs, as evidenced by the high value assessment scores in most of the projects studied. While this may give a preliminary indication to the fact that client organisation practices i.e. supply management and value (not parameters) do not have significant influence on value delivery during the design stage, the results of the analyses conducted in this Chapter either corroborates or opposes this viewpoint.

6.10.1 General perspectives of Value in Design Determinants

Fundamental conclusions drawn from the frequency analysis include amongst others: that data was drawn from an experienced and knowledgeable construction practitioners who indicated that the three client roles investigated are of high importance for effective value delivery during the design stage, with the leadership role having the highest importance incidences. However, in terms of performing these roles, client organisations only moderately excel at them. Looking at how client organisations performed in terms of the organisational context variables, while majority agreed that they excelled in adequate resources, organisational structure and leadership & organisational culture, majority disagreed that they did excelled in performance evaluation.

In terms of team composition, majority scored client organisations high on members' ability and their personality while on general team roles of the members, an equal proportion scored them either average or high. Given these outlook, there was stronger agreement on the design teams' performance on collaboration than there was on communication and conflict resolution with the latter having the least agreement

amongst the respondents. In term of effective team delivering i.e. functioning, there is an equal proportion of agreement and neutrality that design teams demonstrated an acceptable performance. The relatively high incidence of neutrality raises some concerns which may support the supposition of the case study that value considerations in building design are within the precinct of architects and quantity surveyors. This however wasn't supported by the findings of the survey.

6.10.2 Specificities of the Determinants of Value Delivery in Design

To arrive at specificity of the determinants, the mean and standard measures of central tendency were mainly employed given their robustness and suitability for advanced statistical and inferential analysis. The dataset used for the analyses satisfied the normality assumption required for verifying the suitability of the mean as representative of the distribution. For importance of client roles, leadership role has a mean of 4.41 (very important) ranging between 3.98 – 4.58, procurement role 4.29 (very important) ranging between 4.21 – 4.40 and design quality 4.21 (very important) ranging between 4.02 – 4.36; while in term of performance of these roles by the client organisation, leadership role has a mean value of 3.69 (high) ranging between 3.26 – 3.89, procurement role has 3.30 (moderate) ranging between 2.70 – 3.76, and design quality has 3.32 (moderate) ranging between 2.57 – 3.49. The levels of satisfaction achieved based on both the importance and performances of these roles are as follows: leadership role – 84% (very satisfactory) ranging between 73 – 96%, procurement role – 77% (very satisfactory) ranging between 64 – 89%, and design quality role – 79% (very satisfactory) ranging between 60– 85%.

Performance of the client organisations on organisational context variables reveals that adequate resource has a mean value of 3.76 (high) ranging between 3.70 – 3.81, organisational structure 3.63 (high) ranging between 3.53 – 3.72, leadership and

organisational culture 3.61 (high) ranging between 3.31 – 3.88, and performance evaluation 2.81 (moderate) ranging between 2.65 – 3.08. In composing design teams, client organisations performances were as follows: members' ability 3.76 (high) ranging between 3.60 – 3.97, members personality 3.90 (high) ranging between 3.81 – 4.00, and general team roles 3.68 (high) ranging between 3.59 – 3.87. Performances of the design teams during the design process indicates that all the three processes are moderate for communication (3.49) and conflict resolution (3.46) while it is high for collaboration (3.73). And finally for the team functioning variable, the performance of design teams is moderate (3.40) ranging between 3.26 – 3.49.

Three variables known to influence value determination and value dialogues considerations in the construction industry – profession, experience and position occupied in industry – were investigated. While there was agreement on the level of importance amongst the various items of client roles investigated all of which were judged 'very importance' except for five items under leadership role which were judged 'extremely important'; profession influenced the level of agreement in five of the twenty client role attributes investigated with difference prevalent among clients and structural engineers; experience and position in organisation did not influence the level of agreement of the importance of client roles in value delivery amongst design team members.

6.10.3 Structure of the Determinants

The constructs as extracted from literature indicate the following multi-scale items: ***'client roles'*** having a total of 20 items consisting of *'leadership role'* 8 items, *'procurement and integration roles'* 5 items and *'design role'* 7 items; ***'contextual factors'*** with a total of 20 items consisting of *'resources'* having 5 items, *'structures'* 6, *'culture'* 4 and *'evaluation'* 6 items; ***'composition factor'*** has 18 items consisting of

'abilities' having 4 items, *'personality'* 6 and *'general roles'* 8 items; ***'design process'*** has 12 items in total consisting of 4 items each for *'communications'*, *'collaboration'* and *'conflicts'*; lastly ***'team functioning'*** contains 10 items and no sub variables.

Upon conducting factor analysis, for ***'client role'*** three components are extracted like in the original construct but reconstituted as follows: '*leadership and design roles'* with 13 items loading on it and explaining 55.56% of the variance in the factor; *'procurement'* having 4 items with a 12.285% explanation; and *'WLC considerations'* having only one item and explaining 6.860% of the variance. These three components, having a total of 17 items explain 74.705% of the variance in the original construct. Undertaking a reliability test on these items, all the items were retained. There is a massive reduction in the items of the ***'contextual factor'*** construct from 20 to 7. Only two components are extracted: '*Culture'* having 4 items and explaining 43.486% of the variance, and *'Evaluation'* with 3 items explaining 36.584%. These two components explain 80.071% of the variance in the original 20 items construct. Reliability test on these 7 items indicated that they are all reliable and hence retained for further analysis.

Similarly, there is a remarkable drop in the items for ***'composition factor'*** too from 18 to 8 items with only two components extracted: '*general roles'* having 5 items and explaining 46.105% of the variance, and *'personality'* with 3 items explaining 36.793%. These two components explain 82.900% of the variance in the original 18 items construct. The ***'design process'*** constructs also experience marked reduction in its items from 12 to 3. Three components are extracted explaining up to 76.294% of the variance in the original construct. The components are: *'conflicts'* having 1 items explaining 36.297%, *'communications'* having 1 item explaining 30.187% and *'cohesion'* having 1 item too and explaining 9.811%. Originally, the ***'team functioning'*** construct was a one-variable construct but upon performing factor analysis, two components are extracted

explaining 56.063% of the variance of all the items in the construct. The *'efforts'* variable has 8 items explaining 44.768% while the *'drivers'* variable has 2 items explaining 11.296%.

6.10.4 Significant Relationships between the Determinants

Outcome of the correlation analysis performed indicates that the conflict variable of the design process is significantly related to the following client organisation's parameters in order of their strength: composition: general roles, contextual: evaluation, composition: personality, roles: procurement and contextual: culture. In the same order, the communications variable correlated to: contextual: evaluation, composition: general roles, contextual: culture, and roles: leadership and design. The collaboration variable on the other hand, is not significantly related to any of the seven client organisation's parameters. This pattern is also shown for the drivers variable of team functioning. The efforts variable of team functioning, a dependent variable of the research however correlates to the following client organisation's parameters in order of their strength: composition: general roles, composition: personality, roles: leadership and design, contextual: evaluation and lastly contextual: culture. The roles: WLC variable does not significantly correlate to neither of the design process variables nor with those of the team functioning variables. For relationships between the design process variables and those of the team functioning variables, only the conflict variable significantly relates to the efforts variable respectively.

Extending the bi-variate associative relationships of the determinants of value delivery during the design stage to that of multi-variate causative relationships, the conceptual framework was hypothecated which when tested indicated as follows: for direct positive relationships with design team functioning that were accepted includes conflict resolution, leadership role, procurement role, culture, evaluation, personality and general

roles; for direct positive relationships with design team functioning that were partially accepted includes communication, and collaboration; for direct negative relationships with design team functioning that was partially accepted include design quality role; for mediations that were accepted includes collaboration for leadership role; communication and collaboration for procurement role; collaboration for design quality role; collaboration and conflict resolution for culture and evaluation; communication and collaboration for general roles; for mediations that were partially accepted include conflict resolution for leadership role, procurement role, design quality role and personality; and for mediations that were rejected include communication for leadership role, design quality role, culture, evaluation and personality; collaboration for personality.

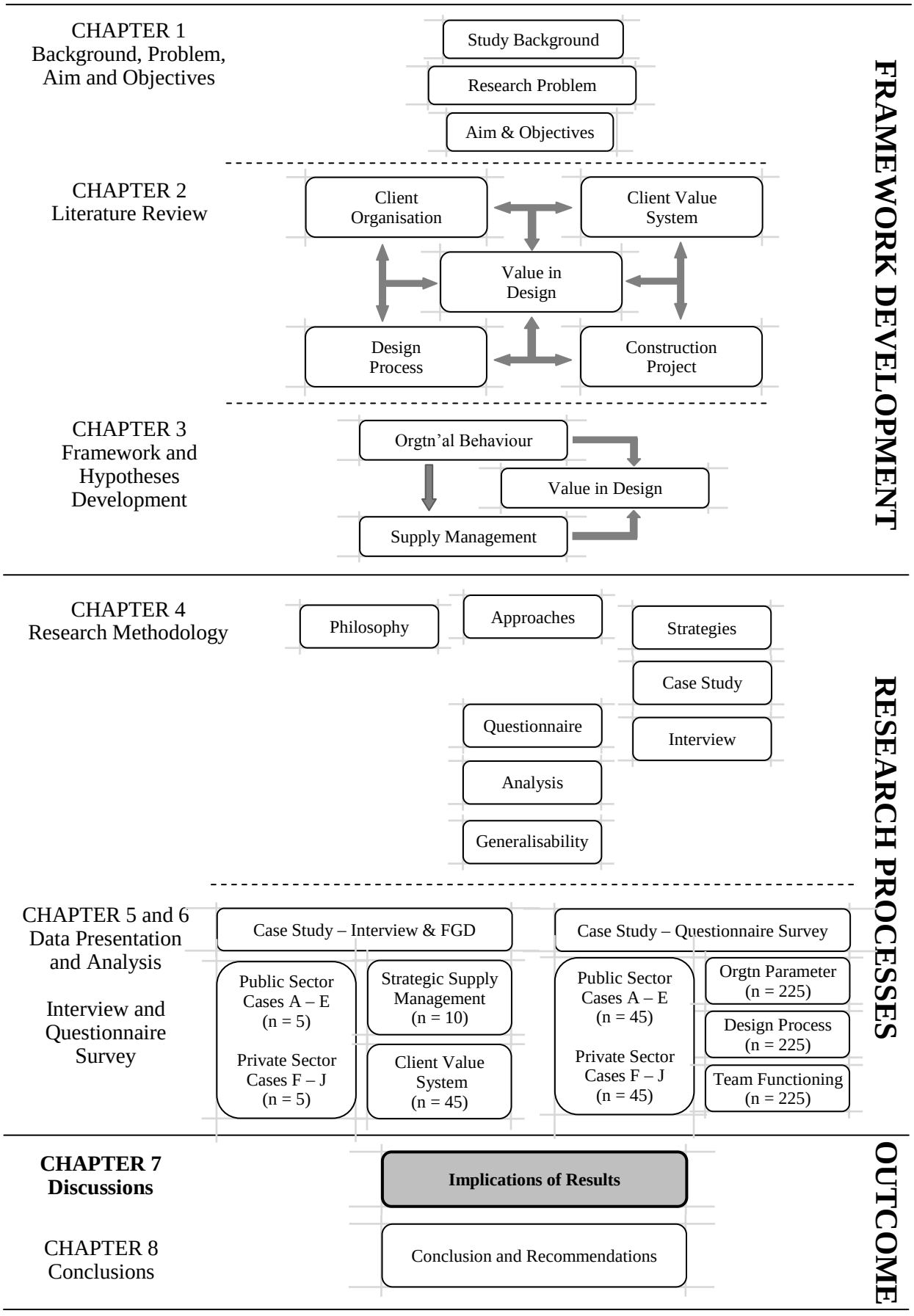
6.10.5 Significant Influencing Determinants

When considered from a systems point of view, the following COPs have significant direct influence (strength of influence shown in bracket) on these design process variables: on communication – evaluation (41.7%), personality (-15.2%) and general roles (20.7%); collaboration – none; and conflict resolution – leadership role (-21.3%), procurement role (22.0%), design quality role (-14.6%), evaluation (34.8%) and general roles (30.3%). Giving considerations to direct influences on design team functioning, the flowing COPs were found to have significant influences – procurement role (12.0%), personality (-21.4%), and general team roles (49.5%).

Under mediation, the following COPs have significant influence on design team functioning when mediated by: communication – procurement role (11.9%), personality (-22.1%), and general team roles (50.5%); collaboration – the result is the same when no mediation exists due to the very weak nature of its regression coefficient; and conflict resolution – personality (-21.7%) and general team roles (47.3%). And when the three

design process variables act together in the design stage as mediators, which is what happens in practice, two COPs are discovered to have significant influence on design team functioning, namely: personality (-18.1%) and general team roles (62.1%). And within this combined mediation, communication and conflict resolution are the only significant influencers.

Chapter 7 – Discussions: Implication of Findings



7.1 Introduction

Chapters 5 reports the case study conducted pursuant of Objective 3 to appraise the client organisations in terms of their supply management practices and their management of their value system. Chapter 6 also reports the results of the questionnaire survey conducted pursuant of Objectives 4, 5 and 6 to appraise the determinants of value in design, determine their effects and model them for predicting organisational outcomes. This Chapter discusses the major findings and their implications to both theory and practice.

7.2 Implications for Supply Management

This investigation shows that client organisations are mostly underdeveloped for strategic supply management (they seem more apt for operational supply management. This is supported by the fact that most client organisations are of the first generation, focusing on management of inputs into their organisation rather than focusing on engaging on collaborative relationships and managing their supply chain as a key strategic issue. Cousins et al. (2008) and Stevenson (2009) had advocated the latter two approaches as a necessity for effective strategic supply management. Further to this outcome, the study showed that client organisations practice more of implementing strategies or supporting strategies none of them adopts the driving strategies approach. This finding shows that despite the maturity of the construction industry, client organisations are at varying stages of development in terms of their supply management – though indicating that they are all at their infancy despite the their level of existence in the industry. Industry reports e.g. Wolstenholme (2009) and BIS (2013) admonishes the industry to further improve on its supply management practice by seeking to be more strategic in their approach and effective management of partners amongst others.

There was seen to be slightly differing perspectives to client organisations' consideration of factors affecting their sourcing strategies. Referring to the same market, most client organisations indicate that the impact of design to the operations of their organisation is high while some of them described the complexity of the design market as low. This finding shows that client organisation will have differing views about the nature of market and how design impacts on their organisation and that this perception will inform their sourcing strategies for engaging design partners. However, empirical evidence showed that this may not necessarily be – the two factors seems not to be the basis of client organisation's sourcing strategies – most of their choice of strategies contradicts the requirements of the Kraljic Positioning Matrix. Another finding of this study is that based on client organisation's considerations of the factors affecting sourcing strategies, public sector client organisation differ in their choice of sourcing strategies with the most apt for the former been 'leverage: best deal' strategy while for the latter, the 'critical: cooperation' strategy. These strategies are in dissonance with what obtains in the Nigerian construction industry – 'routine: efficiency' strategy. Similar case was discovered with the sourcing structure, where client organisations adopt wrong structuring based on their choice of sourcing strategy. These findings also demonstrate that the lack of client organisations' conformance with theory is a support for Fernie (2005), Fernie (2007), and Tennant and Fernie (2014) consideration of the 'acontextual' nature and unsuitability of the supply management concept to construction – particularly the inappropriateness of adopting any sourcing strategy outside 'routine: efficiency' which still promotes adversarial relationship and opportunism amongst partners.

Previous studies identified five competitive priorities that are responsible for framing corporate strategies of client organisations (Cousins et al., 2008; Pryke, 2009; Konukcu, 2011; BIS, 2013). This research, however finds the three of these priorities are

considered in the public sector client organisations while all the five are considered in the private sector client organisations. Relating these findings with the outcomes of the assessment of value delivery in building designs, it was found that slight differences occurred in the performances between the public sector projects and private sector projects. This can be interpreted to mean that innovation and flexibility are not significant factors to consider in the framing of corporate strategies of client organisations whether public or private. While this finding contradicts the theory of supply management (Cousins' et al., 2008; BIS, 2013), it actually resonates well with practice, wherein client organisations do not necessarily engage in the supply of building designs hence no competition exist for them to want to gain competitive advantage in the design market.

Client organisations do not comply with theory's requirement of having strategies at all levels i.e. corporate, functional and operational; and in instances where these strategies exist, they are loosely aligned. Relating this finding with those of assessing the performance of value delivery during the design stage further reveals interesting results. Firstly, it was noted that private sector client organisation are more susceptible of developing strategies at all levels in their organisation. The results of the value assessment of building design shows slightly higher performance in private sector projects compared to those of the public sector. This finding draws out the fact that when strategies are developed at the various levels of an organisation and where these strategies are in alignment, the higher the value delivery performance of that organisation in their building design. Thus, theory of supply management on strategy management is supported by the practices in the client organisations.

Performance measurement is identified as a mean of guiding and road-mapping the direction of supply management towards its goals. Arguments on whether the

construction is measuring what it ought to or rather just been a 'fad'. This has brought divergent views on measuring performance in the industry (...). The findings in this research are supportive of the diverseness which characterises most of the client organisations. Connected to this, is the evaluative approach adopted by client organisations to performance measurement with a system based mostly on financial measures which are not primarily targeted at internal business process, innovation, and learning.

These performance management related issues have been found to thwart the effectiveness of strategic supply management in construction (Egan, 1998; Pryke, 2009; CABE, 2010; BIS, 2013), But relating the study's findings on performance management practices in client organisations to that of the value performance of their design teams reveals otherwise. That there seem not be noticeable relationship between performance measurement practices of client organisation to the effectiveness of supply management particularly on design team functioning While this is not in support of the theory of supply management, a possible reason for the dissonance is threefold:

1) Client organisations, and by extension their Supply Management Units, are not in alignment with their design suppliers – lack of vertical integration; as depicted in the targets of the measurement – not aimed at the internal business of the client organisation on the one hand and its evaluative approach on the other. This can only exacerbate the adversarial nature of relationships prevalent in the industry;

2) The design consultants not seeing the need for alignment due to the perception of the industry's approach to viewing customers – consultants see themselves as drivers of the industry rather than as service providers for their clients;

3) The perceptions both the clients and design suppliers have of the other. The client see the designer as one that wants to maximise profit which of they are and the design consultants sees the client as one who would always strive for cost minimisation which they actually do, thus, the main cause of distrust among industry players.

7.3 Implications for Client Value Systems

There has not been specific researches targeting the whole management and practices spectrum of client value systems per se other than those that concentrate on either developing value determination metrics, investigating the performance of these metrics, save for the Mills (2013) that attempts at understanding values beyond that which the VALiD Framework propose, found out the challenges of the framework in terms of value determination and value dialoguing during the design stage with full participation of the design team members; toward *offering a more nuanced and intertwined relationship between stakeholder values, attitudes, behaviours and qualities during the design process that promotes compromise and sense-making*. This research extent behaviour beyond those within design teams to those of project organisation in term of client organisations as parent organisations

The divergence in understanding of value and its definition is further confirmed in client organisations studied, a position that has been accepted as typical of the industry due to the multiple stakeholders involved for which methodologies exist in managing the diverseness – value system. Though, the worrisome aspect of the research finding is the existence of two perspectives to value determination within the client value system namely institutional and the user perspectives, with the former been the more common perspective. This reveals that the approach to value determination in client organisations is still plagued with having value propositions been forced on the end-users of building.

These were issues that earlier reports in construction provided solutions to (Latham, 1994; Egan, 1998, SFC, 2002; NAO, 2005; OGC, 2007; CABE, 2010. This may be a potential culprit for client organisations been very dissatisfied with the building projects – buildings do not achieve the performance needed to positively impact on the users' productivity. This points to a possibility that was hitherto considered to be an impossibility in terms of satisfying client's requirement i.e. the consideration of the client organisation itself. This finding and so many others like it, as outlined in this Chapter fully supports the earlier proposition of the research work on the ability and capability of the client organisation toward successful value delivery. Pryke (2008) suggests the capabilities and abilities client organisation should possess towards the effective toward delivery of value by members of their supply chains.

Another practice within client organisations relative to managing their value system, which is aside the perspectives of determining value, is the non-involvement if user department during the value dialoguing, value determination. The complexity of the client organisation is beginning to be the focus of consideration within the industry toward achievements (Berteslen and Emmitt, 2005; Walker, 2007; Eisma and Volker, 2014; Herman and Eisma, 2015), Also the study discovered that in cases where value dialoguing takes place, no mechanism exist to manage the process, thereby making it ineffective. Such results in restrictive practices which see the reliance of the value dialoguing process on a predetermined set of value criteria which may not necessarily be those required.

7.4 Implications for Client Organisation Interface with Design

The study finds out that conflict resolution during the design process is significantly related to the following client organisation's parameters in order of their strength: composition: general roles, contextual: evaluation, composition: personality, roles:

procurement and contextual: culture. In the same order, the communications variable correlated to: contextual: evaluation, composition: general roles, contextual: culture, and roles: leadership and design. The collaboration variable on the other hand, is not significantly related to any of the seven client organisation's parameters. This pattern is also shown for the drivers variable of team functioning. The efforts variable of team functioning, a dependent variable of the research however correlates to the following client organisation's parameters in order of their strength: composition: general roles, composition: personality, roles: leadership and design, contextual: evaluation and lastly contextual: culture. The roles: WLC variable does not significantly correlate to neither of the design process variables nor with those of the team functioning variables. For relationships between the design process variables and those of the team functioning variables, only the conflict variable significantly relates to the efforts variable respectively.

The following determinants have direct positive relationships with design team functioning: conflict resolution, leadership role, procurement role, culture, evaluation, personality and general roles. Partial direct positive relationships with design team functioning exists in the following communication, and collaboration; while direct negative relationships with design team functioning that was partially existed in design quality role; for mediations that were accepted includes collaboration for leadership role; communication and collaboration for procurement role; collaboration for design quality role; collaboration and conflict resolution for culture and evaluation; communication and collaboration for general roles; for mediations that were partially accepted include conflict resolution for leadership role, procurement role, design quality role and personality; and for mediations that were rejected include communication for leadership role, design quality role, culture, evaluation and personality; collaboration for personality.

When considered from a systems point of view, the following COPs have significant direct influence on these design process variables: on communication – evaluation, personality and general roles; collaboration – none; and conflict resolution – leadership role, procurement role, design quality role, evaluation and general roles. Giving considerations to direct influences on design team functioning, the flowing COPs were found to have significant influences – procurement role, personality, and general team roles.

Under mediation, the following COPs have significant influence on design team functioning when mediated by: communication – procurement role, personality, and general team roles; collaboration – the result is the same when no mediation exists due to the very weak nature of its regression coefficient; and conflict resolution – personality and general team roles. And when the three design process variables act together in the design stage as mediators, which is what happens in practice, two COPs are discovered to have significant influence on design team functioning, namely: personality and general team roles. And within this combined mediation, communication and conflict resolution are the only significant influencers.

7.5 Implications for Theory

7.5.1 Managing the Design Supply Chain

Theory suggests that for effective supply management, strategies within an organisation should not only exist in all the levels of the organisation but that they must all be aligned (Cousins et al., 2008; Pryke, 2009; BIS, 2013). First, the research has shown that client organisations have corporate level strategies related to the procurement of construction works but they are not popular at having them at functional level. At the operational level i.e. within supply management units, strategies are formulated but in some of the client organisations these strategies are informally developed and managed. A possible

explanation for this is the non-competitiveness of client organisations – given that they do not compete for design services and hence would not need to have competitive edge over others in the market. This position is amply reflected by the outcome of investigating the five factors that determines competitive priorities for organisations. Three factors are dominant – cost time and quality, with cost and quality given the highest priorities.

This finding further confirms the cost minimisation approach of the construction industry which is inimical to collaborative relationships needed for effective strategic supply management. These results are in line with the findings of previous studies which had either pointed out how difficult it will be for the construction industry to give up its cost minimisation approach to price determination and supply management or those that have severally insisted on the 'acontextual' nature of the theories of supply chain management as used in the manufacturing industry to that of construction (Fernie, 2005; Green, 2006; Bresnen, 2010; Eriksson, 2010; de Valence, 2012; BIS, 2013; Fulford and Standing, 2014:Tennant and Fernie, 2014; Hermans and Eisma, 2015). Given the aforementioned, one implication of the outcome of this research on supply management theory is that these considerations do not and should not apply equally to all organisations. Their consideration should be dependent on the nature of the organisation in terms of its role in the supply chain, side of the market it is domiciled demand or supply (which is mostly tier determined).

The theory of supply management specific to organisational strategies is supported by the practice in client organisation but only to a minimal extent. The value delivery performances when discriminated against sectors i.e. public and private, does not show significant difference. This is a further indication, to earlier studies, that 1) applying the current theory of supply chain management to construction may not necessarily achieve

the desired impact on performance improvement (Wolstenholme, 2009; Tennant and Fernie, 2014; Arantes et al., 2015; Behera et al., 2015); 2) understanding the uniqueness of the construction industry is not enough to guarantee improvements but also the understanding and working around the complex nature of the client organisation too (

Though both theory and practice converge on processes of performance management in client organisations, practice does not replicate the intended outcomes as shown in theort – there seem on be any relationship between undertaking performance measurement and organisational outcomes. The performance didn't seem to change for client organisations that usually undertake and those that didn't. This finding, though contradictory to empirical evidences on the existence of relationship, provides a good ground to preposition that there may exists conditions under which performance measurement considerations would positively affect supply performance while in some this would not matter.

7.5.2 Managing the Client's Value System

General thinking within construction is the dire need of achieving value from the client's perspective which must be determined by or on behalf of the client organisations. This finding also strongly supports this position which is correct both from the theoretical perspective and in practice (Kelly, 2007). The definition of value and its determination within client organisations is still reliant on imposition of value criteria on users irrespective of when they consider value warrants further investigation of the theory of supply management relative to client organisations managing their value systems. Though not a study consideration of this current research, it however has become evident the potency of the way client's value systems having significant influences on supply management practices. This proposition would require further studies.

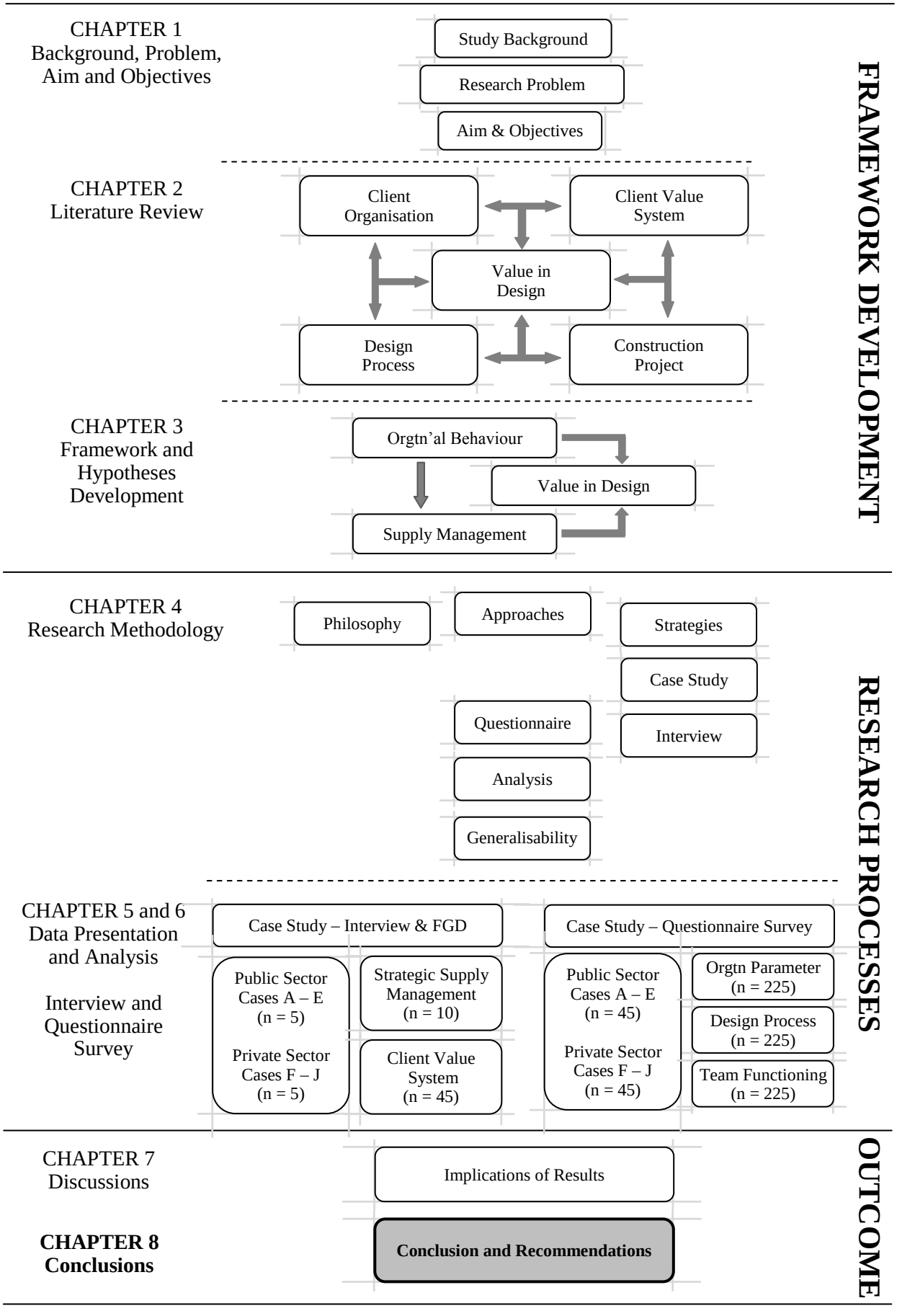
7.6 Implications for Practice

For supply management to be effective, strategic approaches has to be adopted by organisations in the industry across the tiers of the chain (Pryke, 2009, Booth, 2010, BIS, 2013). Client organisations, though not a source of competition in the market, hence may not offer any form of competitive advantage, are challenged at exploring strategic approaches to supply management, This is as a result of the underdeveloped nature of client organisation – still operating at 1st generation level, mostly adopting an implementing strategy, at the passive stage of their development and not too keen at the 'make' side of the 'make-buy' option to procurement – which is highly influenced by the nature of construction market. A cultural and operational change is required to advance the client organisation beyond its present developmental stage to a more strategic position. For instance, where the client organisation can separate itself from the user (given that they need the buildings to accommodate users of and employees for the services they provide) and see the procurement of building as a major part of their function, as would a car manufacturer see the assembly of the parts as fundamental to its business, then would strategic consideration be of importance to them – since a decision to 'make' would place them at a more collaborative and cooperative position rather than on a competitive advantage path.

Wrong strategic choices in term of sourcing and structuring, is prevalent in the industry. Client organisations may not be and are indeed not guided by the factors known to affect these choices. The study demonstrates that there is a total disconnect between the strategic choices made and the factors that leads to those choices as is required in theory (Cousins et al., 2008; Booth, 2010). Client organisations are mainly guided by the trend in the industry rather than by some set of factors. This would confirm Green and Fernie (2006) assertion that despite the lack of theoretical understanding of supply chain management within the construction industry, choices made will not be guided by

theoretical underpinnings. While it wasn't part of this investigation to explore the implication of these mismatched choices relative to performance in the industry, there seems to be some correlations between these mismatches and performance. The results indicate that where the mismatches were highest the assessment of the performance of the design team effectiveness in terms of functioning by members of the client organisation were the lowest. Hence, choosing the right strategies lead to better design functioning and in turn better value for money in designs.

Chapter 8 – Conclusions and Recommendations



8.1 Introduction

Chapter 7 discusses the implications of the research findings bringing out the implications for theory, and implications for practice, drawing inferences from literature. This section outlines the extent to which each of the objectives were met and the implications for the study. Drawing on the main aspects of the research and the implications discussed in Chapter 7, this section provides summaries on the major findings and their implications by way of conclusions and then it gives recommendations to the main issues made.

8.2 Achievement of Research Objectives

8.2.1 Exploring the Value for Money Concept and Associated Factors

The first objective of the study – *Explore the V_fM concept and the associated factors affecting its achievement for construction clients during early design stages*. The research work began with a detailed literature review that firstly focused on the concept of value for money within construction in terms of context and its principles i.e. looking at its definitions, justifications, and considerations surrounding its measurement. A major outcome of this review is the diverseness in defining the concept and subjective nature in its measurement. This helped in conceptualising and operationalising the 'value (for money) in design' concept both subjectively and objectively in the case study and questionnaire survey respectively. Another fundamental outcome of reviewing the value for money concept is the identification of four fundamental aspects known to significantly affect the delivery of value for money for clients of the construction industry thus serving as the broad factors upon which the research is founded, namely: clients in construction, client value system, construction project performance, and building design management and processes.

In order to understand clients within the construction industry the review on ‘client in construction’ specifically explored the possible ways of defining and describing the client and most especially the client organisation and bringing out the various categories with the view to properly situating the work within construction. Arising from this is the consideration for the roles they play within the industry identifying amongst others project role, design role and then their ‘executive role’ in term of strategy role, control role and service role. The ‘executive’ roles referred to as client roles in this research are adapted from both board and organisation theories. This was matched theoretically with the client responsibility frameworks in the construction to conceptualise the client roles construct (one of the constructs investigated in the research). Considering client roles within the concept of ‘team’ provides one of the strengths of this research work in that no empirical evidence exist on the specific influence that client roles have on design teams toward value delivery in their designs.

Further, considerations under ‘clients in construction’ sought the link between client requirements and satisfying them within the context of construction project and with specific relevance to value for money. This leads to the discovery of a gap in requirement management which neglects the client supply management role in bridging the linkage between identifying and defining requirements on the one hand and measuring outcome on the other. This gap further popularises the non consideration of the influences client organisations exert on their project outcomes through supply management (discussed in Chapter 3). This and the consideration of the client value system formed the basis of the case studies undertaken in Chapter 5. Recent thinking of client organisation views it as equally a complex system as is the production system which delivers its requirements for building. This aspect of the review characterises the client organisation in terms of three behaviours: general, evolutionary and connective, which will impact on how it interact with the other component of the construction

industry. Lastly within the client in construction review, theory of organisation was explored which helped identified the four approaches of delineating the study of client organisation within the construction via consideration of one of the following approaches: classical, human relations, systems or contingency. The outcome of this – selecting the systems/contingency approach – informed the development of both the theoretical and conceptual frameworks discussed in Chapter 3.

The review of literature on 'client value system' – the second main factor related to value delivery – traced the developments in the attempts at establishing client value system, bringing out its benefits towards value delivery. Over the years, the realisation of the multi-stakeholders and multi-parameterisation of value definition and judgement, integrative approaches to client value system emerged. These developments brought about three popular frameworks for client value systems which were influenced by the Payne and Holt (2001) Relationship Value Management Framework. The first framework, the Kelly and Male (2006) Client Value System Matrix, was developed to make explicit functional benefits of project, eliminate the trial and error approaches and newer procurement requirements. This framework is based on a predetermined value criteria set which revolves around cost, time and quality. The second framework, the Thomson and Austin (2004) VALiD Framework was developed as an approach to value delivery that integrates stakeholders values into the value process based on six principles whose benefits are anchored on three elements namely: understand values, define values, and assess value. Accompanying the VALiD Framework are two tools, the Values Survey and the Dashboard. The third framework, the OGC (2007) Framework for Achieving Construction Excellence, formulated several procurement guides and gives more attention to getting the client organisation to first understand their organisation as a prerequisite for determining their value system. The outcome of this

review formed the basis for developing the framework in Chapter 3 and the Case Study conducted in Chapter 5.

An understanding of 'construction project performance' – the third main factor related to value delivery – was sought, bringing out: the basis for defining project success, a fundamental consideration for achieving value in design, the criteria for measuring success and the inherent variability of the success concept, which recognises three aspect of measuring success in construction projects – client/owner, designer, and contractor. Continuing review in this area introduces the effectiveness and efficiency concepts, differentiating between them, relating them to the criteria for measuring success and further reinforcing the fact to the differing perceptual criteria upon which success can be measured. This leads to the realisation for a unified system upon which industry's success should be measured i.e. the client value system. An important outcome of this review thus far is the linkage between success criteria and client value system, with the latter describing the former. Going forward, critical success factors in construction was reviewed further indicating its link to success, fitting it within the four COM model which conceptualised the CSFs within four categories – comfort, competence, commitment and communication.

The constituents of the Four COM model i.e. CSFs, though not targeted at teams, were found to mirror the factors affecting team effectiveness which is the second defining measure of performance. Considering the CSFs separately from the SC in terms of measuring the performance of performance has been criticised due to the inability to the growing demand for modern management and complex nature of present day projects. Hence, linking the success criteria concept to that of CSFs closely fits the performance-effectiveness-efficiency puzzle of the client value system (CVS), whereby performance equates to client value system which consists of effectiveness (CSFs) and efficiency

(success criteria) measure i.e. CVS = CSFs + SC. Attempts at linking the SC and CSFs brought about the Project Excellence Model (PEM) and the European Foundation of Quality Management (EFQM) model amongst others, for measuring performance. These models provided fundamental basis for the conceptualisation of the constructs making up the conceptual framework in Chapter 3.

The final aspect of the review pursuant to the first objective requires the study and understanding of 'building design management and process' i.e. the fourth main factor for value delivery. Design is described as the most critical of a construction project life cycle and whose effective management is equally critical to the success of projects. The processes of design are becoming complex, calling for changing leadership and placing greater emphasis on design management. The review also revealed that the client organisation are indeed empowered to provide the necessary leadership and are motivated to facilitate this change. Further, the review identified three areas fundamental to the consideration of design in terms of value delivery, namely: design and organisations, managing the design and exclusivity on design.

'Design and organisation' review defines design within the context of an organisation, bringing out its peculiarities e.g. design for aesthetics, design for function, and design for reliability and quality in use, linking them all towards providing competitive advantage to client organisations. An important knowledge for this research is that apart from the influence client can have on building designs, is the recognition of the importance of designs to organisation in achieving organisational goals, particularly emphasising client leadership role in design, and its *'business function'* for the construction industry in general. The review established links between client organisation and improvement in construction with interventions of the design process, in order to avoid sub-optimisation of clients' requirements. This aspect of the review

found its way at positioning the client organisation at the helm of affairs in the management of their supply chain for their construction related procurements. Supply management is fully explored in Chapter 3 toward developing the conceptual framework and investigating its principles in client organisation in Chapter 5. Further, the review relates to the arguments of appropriateness and applicability of supply chain management in construction, and particularly bringing out its value-adding advantages.

'Managing the design' review starts by looking at the nature of design in construction – multi-disciplinary and high information processing, or a knowledge driven task, hence the need for an effective management frameworks e.g. project management, supply management and design management. Design management is disserted in terms of definition, functions and construction specific problems and then bringing in the client organisation within the context indicating not only their importance providing leadership therein but also drawing attention to the fact that they exert the greatest influence during these early stages of the project life. Tightly coupled with design management is the design process characterised by formulation, analysis, search, decision, specification and modifications having several frameworks aimed at classifying the various stages of building project and its related design process. The review of literature related to managing the design cumulated to that of design team identified as the catalyst for solving the industry's problem through its central role of engaging with design process. Researches in design team have mostly concentrated on membership and its influence on performance mainly at individual level not taking into cognisance organisational contextual factors as suggested by the systems/contingency approach to organisation management reviewed earlier. This brings out an important gap in knowledge – influence of membership on design team outcomes taking into cognisance organisational context – which was investigated in this research. Boundary issue was another factor found to affect the performance of design teams since they operate as temporary multi-

organisations. This therefore informs this research that not only is the client organisation procuring projects but also the inherent complex relationships and performance which are inimical to project success thus requiring essential managerial interventions from the client organisation. Finally, the 'managing the design' review brings out the importance of multi-stakeholders and value dialogue in the determination of the client value system, specifically drawing attention to the role of collaboration, communication and conflict resolution in the design process. This outcome with those of the review of client value system frameworks mentioned earlier, aided the designing of the interview and checklist protocols used in conducting the case study.

The 'exclusivity in design' review establishes the non-involvement of clients in design decision using the legality of terms, approaches and processes within the industry to support this phenomenon. Using the concept of supply chain management, the argument is made yet again that the responsibility of ensuring that the design meets organisational goals is that of the client organisation thereby not only stressing the importance of client organisation involvement in the design process but also showing how strategic such involvement towards value delivery. Further emphasis was placed on supply management as the vehicle for achieving the change agenda – improvement advocated for the construction industry. Drawing analogies from other industries – production and manufacturing, the review highlights on the uniqueness of projects in construction (not for mass market) and how this affects client participation and provides reasons why this should not be so and provides insights to the changing nature of contemporary design approach that seeks a more client-involved approach to solving client building need through designs. Closing on the issue of exclusivity, the review also points to the members of the design team as also being guilty of exclusivist tendency towards themselves, as they strive to deliver value in building design.

8.2.2 Establish Frameworks for Value Delivery in Building Design

The second objective of the study – *Establish frameworks for explaining the relationships amongst the determinants for* V_fM *in building designs*. One of the outcomes of the first objective was the lack of an integrative framework – theoretical and conceptual – for relating client organisation and value delivery at the early design stages. In solving this problem, a second detailed review of related literature was undertaken to pursue and achieve 3 sub-objectives for this aspect of the research namely: developing an theoretical framework for the study, development of a conceptual framework for value delivery and hypothecating the conceptual framework. This is reported in Chapter 3 – Frameworks and Hypothesis Development.

Review of 'theories of organisational behaviour' – the first aspect of developing the theoretical framework – was informed by the lack of an integrative approach towards understanding organisational outcomes within construction industry as suggested in construction management literature as found in the earlier literature review conducted. Relating the main aspects of value delivery identified while exploring the V_fM concept in the first objective – client in construction, client value system, construction project performance and building design management and process – five main aspects of the organisational behaviour field became relevant for the development of the framework. First, definition and contextualisation, this review explores the definition of organisational behaviours bringing out its main emphasis on the people aspect of organisation.

Second, construction management and organisation behaviour, the review interrogates the theory of construction management and identifies its main thrust – the inherently difficult indicators – which resonates well with organisational behaviour, further drawing on the people's aspect of organisation, the review draws parallel between these

two fields thereby situating organisational behaviour within the core of construction management related problems – understanding and interpretation of behaviours – providing a means of solving these problems through a more scientific and defendable approach towards making predictions. The outcome of this review points to the fact that for the research problem to be solved – understanding of the determinants of value for money in building design from an organisational perspective, 'organisational behaviour' must form the basis of the investigation. Third, concept of groups within organisations defines group within the context of organisation, and fourthly, explored its development stages.

Continuing with the understanding of the theories of organisational behaviour, the fifth aspect, team and team effectiveness, explored team definition from generic literature and teams within construction bringing out the unique considerations in construction i.e. temporary multi-organisations, defining the various type of team in construction. The review focused on team effectiveness, studying various effectiveness models and mapping them – the team diagnostic survey tool, Robbins and Judge Model, and the Group Management Questionnaire; indicating the appropriateness of the Robbins and Judge Model. The RJM – composed of three elements which are influential to team effectiveness: contextual factors, composition factors and team process – was the basis of developing the conceptual framework. For each of the dimensions, the review explored their constituents in terms of definition scope, applications and measurability towards their conceptualisation and operationalisation.

The second aspect of developing the theoretical framework, 'theories of strategic supply management', was also informed by the lack of an integrative approach towards understanding organisational outcomes within construction industry as suggested in construction management literature, found in the earlier literature review conducted.

Relating the main aspects of value delivery – client in construction, client value system, construction project performance and building design management and process – three sub-aspects of the 'theories of strategic supply management' became relevant for the development and conceptualisation of the framework, namely: concept of strategic supply management, framework of strategic supply management, and the implication of supply management in construction.

General reviews under 'concept of strategic supply management' leading to: understanding of the concept, differentiating it from traditional supply management, identifying three types of strategic approaches – implementing, supporting and driving strategy. Three specific areas are reviewed under this section. First, development and taxonomy of supply function, leading to: identifying the four stage model for supply function development – passive, independent, supportive, and integrative; using these outcomes to classify client organisations in terms of their supply management practices. Second is the 'the make-buy decision' review which explored three theoretical perspectives – neoclassical economic (NCE) theory, transaction cost economics (TCE) theory and the resource-based view (RBV) theory. Under the NCE theory firms are viewed as unit of production with the sole purpose of maximising profit; not a fundamental contributor to the make-buy decision per se, and not too apt for consideration in the construction industry particularly within client organisations.

The TCE is premised on 'transaction cost', decisions to make-buy is dependent on two behavioural assumptions – bounded rationality and opportunism; and two transaction assumptions – asset specificity and uncertainty; the review also explained the use of the transaction cost curves at making the make-buy decision; outlining the benefits over the NCE and its criticism. Under the RBV theory, firms are viewed as a bundle of productive resources under the direct control of the administrative unit which are

characterised with differential levels of efficiency; the review reveals three conditions under which competitive advantage can be gained – imperfect imitability, imperfect substitutability and imperfect mobility; and also related this decision to the nature of current capabilities relative to the undertakings envisaged.

The third aspect of the 'concept of strategic supply management' review looks at 'sourcing strategies and supply structure', indicating that sourcing strategies are depended on the importance of the good or service to the firm (impact on business) , the competitiveness of the supply market (supply market complexity), and complexity of product; identifying four different sourcing strategies based on the Kraljic Position Matrix – routine: efficiency, bottleneck: supply continuity, critical: cooperation, and leverage: best deal; and further similarly identifying the following sourcing structure depending on the sourcing strategy – multiple sourcing, parallel sourcing, single sourcing, and delegated sourcing.

The second aspect of the 'theories of strategic supply management' reviews i.e. 'framework for strategic supply management' leads to: the understanding that trust, effective communication, information velocity, supply chain visibility, event management capabilities and performance metrics are required for effective supply management; exploring the Cousins (2002) supply management model which integrates three parts – policy, process and procedure. Five specific areas are reviewed under this section. First, aligning corporate and supply strategies, leading to: identifying three levels of strategy consideration within organisation – corporate, business and functional; understanding of strategic alignment, process of aligning supply and corporate strategies. Second is the 'competencies and skills for strategic supply' review, which explored its importance; the required competencies for each of the four quadrant in the

Kraljic Positioning Matrix and the specialised skills requirements – strategic planning, communication, financial, technical and team building.

Third consideration within the 'framework for strategic supply management' is the review of performance measurement, bringing out: its importance to supply chain success; the uses of performance measure; essential in performance management in comparison with the traditional approach;

8.3 Conclusions

This research aimed at determining the influence of client organisation on achieving value in building designs through design team functioning, mediated by the design process. Based on the major finding and their implications as discussed in Chapter 7, the following are what is known of client organisation influence in the construction industry with specific attention to achieving value in building designs:

i. Clients organisation are increasingly becoming more involved with their building but yet are the least considered when it comes to value delivery. This non-consideration does not align with the theory of organisational behaviour, which links organisational performances to the behaviours inherent in the organisation. This creates a gap in knowledge. However, such consideration would only further complicate an already complex nexus of stakeholders to manage during the design stage. Gathering evidences from existing knowledge points to the fact that the lack of an integrative framework that could assist in unearthing how behaviours in client organisations influence design outcomes is responsible for the non-consideration.
ii. The outcome of the detailed literature review undertaken indicated four main areas to which to concentrate on as determinants of client influence on value

delivery within construction – client organisation, client value systems, construction projects and building design management. Advancing further with the literature review, it was discovered that due to the complex nature of the client organisation a multi-theoretic approach was needed to develop the theoretical framework. This is with the view to providing the exploratory pluralism for the theoretic framework lacking in construction management.

iii. There are conscious efforts at managing supply chains in client organisations, which are mostly evaluative in nature and not strategic. This notwithstanding, the supply management practices in these organisations are: driven by strategies mostly at the corporate levels that are fairly aligned; reliant on cost minimisation approach. Mechanisms for managing value system exists in client organisation most of should are informal. These mechanisms mainly allows for value determination and value dialogue, though to a lesser extent than should is expected. Four main approaches to value determination were uncovered. However, value judgements and assessment are not practiced within these organisations.

iv. The lack of a strategically oriented approach to supply management in client organisation is occasioned and particularly challenged by the: infancy level of the development stage at which units responsible for managing supply chains are operating at; discordance in their views of the determinants of strategic sourcing and sourcing structure, and mismatches within and between sourcing strategies and sourcing structures; non-existence of supply specific strategies; lack of competence and skills in both the strategic critical and strategic security aspects, and those specially required for strategic planning and team building; lack of strategic focus on performance management; insufficiency in its measuring criteria and its skewed targeting; inability to deal with supply management cost

beyond initial considerations; and lack of a robust formal intra- and inter-firm relationship management system, and inherent deficiencies in the existing informal system.

v. The management of value systems within client organisation is particularly challenged by; adopting a rather less appropriate approach to value determination which excludes end-users; the inflexibility of the value determination process and its reliance on the iron triangle of construction – cost, time and quality; the less importance accorded the main stakeholders i.e. end-users and their non-involvement during the design stage; and the lack of a system to manage the value dialoguing process and lack of value assessment of building designs.

vi. The roles of client organisations in the industry are rated as *extremely important*, but the level of their performance by client organisations is out of sync with the level of importance attached to them – their performance is *moderate*. Of the three client organisation parameters (COPs), client roles (design, leadership, procurement) have significant influences of -14.6%, -21.3.0%, 22.0% respectively on conflict resolution; organisational context (evaluation) has significant influence of 41.7% on communication and 34.8% on conflict resolution; while team composition (personality and general roles) also have significant influences of -15.5% and 20.7% respectively on communication and 0% and 30.3% respectively on the conflict resolution. None of the COPs have significant influence on collaboration.

vii. Finally, it was established that under mediation, client roles and organisational contexts do not have significant influence on team functioning; while team composition (personality and general roles) have significant influences of -18.1% and 63.1% respectively on team functioning. And that of the three known mediators of teamwork, communication and collaboration have significant

mediation influences of -11.5% and 11.8% respectively between the COPs and team functioning while collaboration is not a significant mediator between them.

8.4 Limitations of the Study

To improve on its generalisation, repeatability, validity and reliability, this study employed many tactics as discussed in Chapter 4. But as typical with all research endeavours, this study is inhibited by some limitations which will in turn affect the conclusions and recommendations made. The limitations to this study include:

- The use of case study design to elicit data on organisational practices may limit the contextual validity of the response and thus affect generalisability of the outcomes. However, attempts at improving the validity included the use of multiple data collection method and careful selection of cases and building project which typified the construction industry.
- The conceptual framework developed exemplifies projects procured under the traditional methods of procurement – this is the prevalent method within the Nigerian Construction Industry – where data was collected. Since supply management and to some certain extent, client value system (client's interface with design team) will be affected by the type of procurement method e.g. design and build will require a more collaborative approach compared to traditional, the finding may be limited in universality but only to the extent that supply management principles greatly differs across procurement methods.
- The cases studied were drawn from the educational sector. Although, the depth of insights gathered from these cases was high and specific, they can be generalised for buildings in other sectors.
- The study is cross-sectional hence faces similar problem as would any cross-sectional study i.e. it is time specific and lack generalisability over time. Whilst

longitudinal studies may have their own specific limitations, the findings from this study may need to be tested again at a later time.

- While the study attempted at establishing mediation between the antecedents of design process and its concomitance – team functioning, the lack of existing theoretical frameworks to explore the nature of relationships therein and similar studies to aid in the development of propositions, limited the use of the structural equation model at establishing mediation between these variables. This may limit the robustness of the relationship and effects established using regression technical.

8.5 Recommendations

Arising from the detailed literature review reported in Chapters 2 and 3; the major findings of the case studies and surveys conducted to investigate the practices of client organisations in terms of managing their supply chain and value system as reported in Chapters 5; and investigating the determinants of value delivery reported in Chapter 6, respectively, the following are made:

i. The construction industry would need to take a more proactive step at re-examining the current theories of supply management due to its inappropriateness for application in construction. The importance of this lies in the extent to which client organisations are reliant on these theories in managing their supply chains., which they indeed do and can be improved upon In so doing, however, specific attention should be focused on aspects of the theories that relate to: differentials in the public and private sectors, intra-firm alignment of strategies; strategic consideration to supply management i.e. cost minimisation and differentiation; and sourcing strategies.

ii. Client organisations need to have a cultural change towards managing their supply chain by adopting strategic approaches and particularly rethinking their relationship management strategies. Improvements in these aspects would greatly minimise the deficiencies currently inhibiting effective supply management in the areas of: development stage and strategic goals; strategic alignment, competences and skills; and total cost analysis. These are the areas that they need to develop their supply management capabilities.

iii. To engender improvement in their value delivery agenda, Client organisation would need to be more proactive in align with the core users of buildings in order to adequately capture value to the user through an improved value system that not only recognises corporate goals but that also: commits to adopting a more flexible approach towards value determination; promotes value dialoguing with systems in place that adequately manage these dialogues; and facilitates value judgement and assessments during early stages of building designs.

iv. Given the primordial and strategic importance of building projects to client organisations, client organisations should champion the industry's improvement and agenda for change campaign, by improving the performance of their value delivery roles, developing standard guidelines cataloguing the roles and how they should be managed by various agencies within but public and private sectors; improving on their organisational culture and reward system to design team members; and up skilling themselves in terms of composing design teams that have the right balance of team members' personality.

v. Client organisation greatest influence on value delivery during design stage are through the communication and conflict resolution processes and thus would need to pay more attention on them. Rightly composing the design team is only but one aspect to achieving successful design outcomes, understanding how their

roles (leadership, procurement and design quality), culture, reward systems, the personality of the design teams they compose and the general roles team members perform within their team, is the other and equally fundamental aspect.

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APPENDICES

APPENDIX ‘A’
INTERVIEW & CHECKLIST PROTOCOL

INTERVIEW PROTOCOL

SUPPLY CHAIN MANAGEMENT

This interview protocol is read in conjunction with the checklist to enhance the data collection process particularly where recordings of the interview session is not permitted. Furthermore, in the event that questions are not be clear to the interviewee, the checklist is used as a guide to provide further clarifications and specificity.

1. As a functional unit of the Institution, can you kindly describe the function(s) of the Procurement unit?
2. In procuring construction projects, what role(s) does the Unit play?
3. How is construction projects procured?
4. How does the Unit relate with Top Management of the Institute in terms of policy formulation and implementation? What is the nature of this relationship?
5. Is the unit guided by any strategy? If Yes then "Can you elaborate further?"
6. At the corporate level, are there goals, strategies, objectives etc that relates to the provision of academic spaces relative to improving service delivery?
7. How does the Unit fit within the goals and objectives of the Institution?
8. What would you say is/are the University's priority(ies) in terms of satisfaction from the buildings they procure?
9. Please can you briefly explain how these strategies are developed i.e. the corporate level strategies?
10. What factors affect your choice/selection of design consultants?
11. Can you briefly describe the nature of your sourcing strategy?
12. How would you describe the working structure between your Unit and design consultants?
13. Briefly, based on the guide provided, what is the nature of competencies and skills in your Unit?
14. And how would you rank them?
15. If your Unit were to take a more strategic view of supply management, how you rank the competencies and skills needed?
16. Describe the specialised skills sets in terms of their adequacy in your organisation.
17. Do you measurement the performance of supply process as a Unit? If you do can you please briefly describe the system?
18. Why do you measure the performance?
19. What are the main components or targets of the measurement metrics?
20. Kindly describe how the metrics work.
21. How are costs associated with supply management managed?
22. At what stages of the procurement (design) are cost considered by your unit?
23. Can you define the term 'relationship' as applicable to your Unit.

24. What aspects do you consider in managing relationships? Inter or intra-firm relationships or both?
25. Do you have strategies in place to manage inter-firm relationships? What inform them?
26. What approach to relationship management do you adopt?
27. Describe you level of dependency on your design consultants and your level of certainty with them.
28. What is the nature of your relationship with your design suppliers?

CHECKLIST PROTOCOL

Client Organisation Supply Management Practice

Classification and Development of Procurement Units and their decision to make or buy

Generation of Procurement Unit
- ❑ 1st Generation
- ❑ 2nd Generation
- ❑ 3rd Generation

Development Stage of Procurement Unit
- ❑ Passive
- ❑ Independent
- ❑ Supportive
- ❑ Integrative

Type of purchasing strategy
- ❑ Implementing Strategy
- ❑ Supporting Strategy
- ❑ Driving Strategy
- ❑ Flexible

Theory supporting the make-buy decision
- ❑ Neoclassical Economic Theory
- ❑ Transactional Cost Economic Theory
- ❑ Resource-Based View Theory

Sourcing Strategy & Structure . . .

Main Sourcing Strategy of the Procurement Unit
- ❑ Routine: Efficiency
- ❑ Leverage: Best Deal
- ❑ Bottleneck: Continuity
- ❑ Critical: Cooperation

Predominate Sourcing Structure
- ❑ Single Sourcing
- ❑ Multiple Sourcing
- ❑ Delegated Sourcing
- ❑ Parallel Sourcing

Aligning Corporate & Supply Strategies towards effective Supply Management . .

Are there existing corporate strategies?
- ❑ Yes
- ❑ No

What are the Institution's competitive priorities?
- ❑ Cost
- ❑ Quality
- ❑ Delivery
- ❑ Flexibility
- ❑ Innovation
- ❑ Others

Are there existing supply function strategies?
- ❑ Yes
- ❑ No

How were these strategies developed?
- ❑ Corporate strategy is informed by participation of Procurement Unit
- ❑ Corporate strategy is developed based on the Procurement Unit Strategy
- ❑ Purchasing strategy is developed based on the corporate strategy
- ❑ Purchasing strategy is developed independent of the corporate strategy
- ❑ Purchasing strategy is also dependent on inputs from Departments and the likes

Competencies and Skills base of Procurement Unit. . .

Determination of Procurement Unit Skills and competences (Rank them in order of Unit's strength)

___ Assertiveness
___ Aggregate needs
___ Communications skills
___ Competitiveness
___ Computer literacy
___ Cross-functional working
___ Forecasting ability
___ Volume/cost analysis
___ Profitability analysis
___ Inventory management skills
___ Negotiation skills
___ Numeracy
___ Product/Service knowledge
___ Relationship management skills
___ Risk assessment skills
___ Strategic thinking
___ Supply industry knowledge

Specialised Procurement skills requirements of Unit. Indicate extent of availability 1 = None, 2 = Not adequate, 3 = Adequate

	1	2	3
Planner	❑	❑	❑
Goal-setter	❑	❑	❑
Completer	❑	❑	❑
Presenting	❑	❑	❑
Public speaking	❑	❑	❑
Listening	❑	❑	❑
Writing	❑	❑	❑
Cost accounting	❑	❑	❑
Business case	❑	❑	❑
Economics	❑	❑	❑
Computer literacy	❑	❑	❑
Mathematics	❑	❑	❑
Process Development	❑	❑	❑
Leader	❑	❑	❑
Decision maker	❑	❑	❑
Influencer	❑	❑	❑

Performance Management . . .

Do you undertake any form of performance measurement of your function with reference to the supply chain?

❑ Yes
❑ No

Is the performance measurement system a formalised system?

❑ Yes
❑ No

Specifically, what is/are the function(s) of the performance measurement undertaken?

❑ Aid strategy implementation
❑ Monitoring and evaluating activities
❑ Controlling purchasing activities
❑ Signalling the actions of people
❑ Influencing the actions of people
❑ Aids in identifying critical success areas

Measures considered in the performance measurement metrics used in the Organisation

❑ Efficiency measures
❑ Effectiveness measures
❑ Financial measures
❑ Non-financial measures

What are the targets of the main metrics of the performance measurement system?

❑ Financial perspectives
❑ Customer focus
❑ Internal business process
❑ Innovation and learning
❑ Supplier performance

Features of the performance measurement system.

___ Linkage to corporate objectives
___ Combines different measures
___ Captures both efficiency & effectiveness
___ Identification of trade-offs
___ Balance of quantitative and qualitative
___ Mix of leading/lagging indicators
___ Incapable of manipulation
___ Systemic collection and analysis of data
___ Differentiates btw measures & objectives
___ Allows cross-functional working

Total Cost/Benefit Analysis Considerations of Procurement Unit . . .

Approaches to Cost considerations
- ❑ Management of price
- ❑ Total cost management

Stages at which costs are considered by Procurement Unit
- ❑ Initial acquisition
- ❑ Reception/Handover
- ❑ Possession/Post Handover/Pre-use
- ❑ Utilisation/Operations
- ❑ Elimination/Termination

Levels at which costs are aggregated and considered by Procurement Unit
- ❑ Supplier level
- ❑ Order-level
- ❑ Unit-level

Managing iter-firm Relationships by Procurement Unit . . .

There exists a clear understanding of the term 'relationship' relative to supply chain
- ❑ Yes
- ❑ No

Considerations are given to
- ❑ Intra-firm relationships
- ❑ Inter-firms relationships

In determining the appropriate strategy to manage inter-firm relationships what factors do you consider?
- ❑ Strategy of the organisation
- ❑ the product/service sourced
- ❑ Others _____

What approach to managing relationship does the organisation adopt?
- ❑ Cost-focused approach
- ❑ Differentiation-focused approach
- ❑ Others _____

Level of Dependency with Supplier with respect to relationship management strategies
- ❑ Low dependency
- ❑ Medium dependency
- ❑ High dependency

Level of Certainty with Supplier with respect to relationship management strategies
- ❑ Low certainty
- ❑ Medium certainty
- ❑ High certainty

Nature of relationship with Suppliers
- ❑ Short-term
- ❑ Medium-term
- ❑ Long-term

APPENDIX 'B'
FOCUS GROUP DISCUSSION PROTOCOL

FOCUS GROUP DISCUSSION PROTOCOL

MANAGING CLIENT VALUE SYSTEM

1. Definition of Value (what does value mean in your unit?)
2. Is value looked at for each project or at the Institutional level and applied to all projects?
3. How is value determined in your organisation?
4. Where stakeholders are involved in (3) above, how are they managed?
5. Where a formal process is identified in (3) kindly describe this process.
6. How do you ensure that the design team captures your value requirements during the design process and in the design?
7. Do you appraise designs after they are produced by the design team and how is the appraisal done?

APPENDIX ‘C’
VALUE ASSESSMENT FORM

FOCUS GROUP DISCUSSION PROTOCOL

VALUE ASSESSMENT FORM (Post Design)

(Demonstrate the use of this protocol before assessment exercise)

Case ID _____

Respondent ID _____

Project Descriptions:

Pr1 _____

Pr2 _____

Pr3 _____

Pr4 _____

Pr5 _____

Below are value criteria applicable to building projects. For each of the projects and based on the consensus reached by your group while considering the specific value criteria for a particular project, kindly tick (in the 'Vc' column) all the criteria which represents the content of the brief upon which the design was based. And at the appropriate time give your assessment of the extent to which each of these value criteria were achieved in the design. Using the scales 1 – 10, where 1 indicates *'poorly achieved'* and 10 represents *'excellently achieved'*, enter your score for each of project as appropriate in the 'Sc' column against each of value criteria.

Value Criteria	**Pr1**		**Pr2**		**Pr3**		**Pr4**		**Pr5**	
	Vc	**Sc**	**Vc**	**Sc**	**Vc**	**Sc**	**Vc**	**Sc**	**Vc**	**Sc**
Capital Cost	__	__	__	__	__	__	__	__	__	__
Operation Cost	__	__	__	__	__	__	__	__	__	__
Time	__	__	__	__	__	__	__	__	__	__
Environment	__	__	__	__	__	__	__	__	__	__
Esteem	__	__	__	__	__	__	__	__	__	__
Flexibility	__	__	__	__	__	__	__	__	__	__
Comfort	__	__	__	__	__	__	__	__	__	__
Community/Accessibility	__	__	__	__	__	__	__	__	__	__

Thank you for participating.

APPENDIX ‘D’
SURVEY QUESTIONNAIRE

Section A - Case Project Particulars

Case ID _____ Project ID _____

Respondent's Information

Profession: Client Rep ☐ Architecture ☐ Services Engg ☐ Structural Engg ☐ QS ☐

Years of Experience: 1 - 5yrs ☐ 6 - 10yrs ☐ 11 - 15yrs ☐ 16 - 20yrs ☐ > 20yrs ☐

Years with Organisation: 1 - 5yrs ☐ 6 - 10yrs ☐ 11 - 15yrs ☐ 16 - 20yrs ☐ > 20yrs ☐

Position in Organisation: Lower Management ☐ Middle Management ☐ Top Management ☐

Please indicate the general performance of the team and client organisation towards achieving the design objectives of this project during its design stage. Use the following scale to indicate your choice by circling as appropriate: *1 - Very Low; 2 - Low; 3 - Moderate; 4 - High; 5 - Very High*

Measure of Team Functioning and Cohesion at Design Stage	Performance				
The extent to which the design team is able to meet up its design responsibilities	1	2	3	4	5
The extent to which members within the team worked together towards design goals	1	2	3	4	5
The extent to which the Client Organisation performed its roles towards the team	1	2	3	4	5

Section B - Client's Role & Responsibilities

Below are roles and responsibilities of clients' organisation in ensuring a sucessful design outcome towards achieiving value for money. However, there are contentions whether some are indeed the clients' roles or roles of the design team. Please indicate by circling the most appropriate for both *'importance'* and *'performance'* as they relate to this partcular client and project. ***'Importance'*** measures how important you think the role is to achieving succesful design outcome; ***'Performance'*** is a measure of the extent to which you believe the role was achieved/discharged by the client (***Importance:*** *1 - Not Important; 2 - Less Important; 3 - Important. 4 - Very Important; 5 - Extremely Important and* ***Performance:*** *1 - Very Low 2 - Low; 3 - Moderate; 4 - High; 5 - Very High*)

Roles and Responsibilities	Importance					Performance				
Client Leadership										
Clearly identify client structure and responsibilities	1	2	3	4	5	1	2	3	4	5
Provide adequate resource to maintain continuity and leadership	1	2	3	4	5	1	2	3	4	5
Develop and share detailed brief prior to the design stage	1	2	3	4	5	1	2	3	4	5
Ensure compliance to standards and working to best practice	1	2	3	4	5	1	2	3	4	5
Getting the right people for the right job at right time	1	2	3	4	5	1	2	3	4	5
Drive clear, collaborative and flexible procurement policy	1	2	3	4	5	1	2	3	4	5
Demand effective quality management processes and procedures	1	2	3	4	5	1	2	3	4	5
Insist on adoptions of collaborative behaviours.	1	2	3	4	5	1	2	3	4	5
Procurement and Integration										
Set behavioural and performance example	1	2	3	4	5	1	2	3	4	5
Evaluate decisions using evaluation criteria agreed upon	1	2	3	4	5	1	2	3	4	5
Insist on *'early-warning culture'* from all involved	1	2	3	4	5	1	2	3	4	5
Establish long term relationships with partners/firms	1	2	3	4	5	1	2	3	4	5
Understand and align with other partners value system	1	2	3	4	5	1	2	3	4	5
Design Quality										
Have clear criteria for selection of design team	1	2	3	4	5	1	2	3	4	5
Ensure a robust change control process	1	2	3	4	5	1	2	3	4	5
Understand the key driver for the design	1	2	3	4	5	1	2	3	4	5
Ensure that the design delivers the required functionality	1	2	3	4	5	1	2	3	4	5
Consideration of whole life cycle principles	1	2	3	4	5	1	2	3	4	5
Enable use of modern technologies & cost-effective solutions	1	2	3	4	5	1	2	3	4	5
Use Design Quality Indicators	1	2	3	4	5	1	2	3	4	5

Section C: Factors Affecting Team Behaviours

Here are some characteristerics about team's composition. Please for this specific Project (as specified in the cover letter), indicate the extent to which members of the project/design team demonstrated/exhibited these characteristics while working on the project. Use the following scales by circling the appropriate number against each of the characteristics: *1 - Very Low; 2 - Low; 3 - Moderate; 4 - High; 5 - Very High*

An example has been provided as a guide. The respondent believes that for this particular Project up to half the team members exhibited or demonstrated *'their ability to work as a team'* thus selecting *'Moderate'* by circling *'3'*.

Composition Factors Affecting Team Perfomance	**Measure of Extent**				
Example: Ability to work as a team	*1*	*2*	*(3)*	*4*	*5*
Abilities of Members					
Technical knowledge and expertise	1	2	3	4	5
Problem-solving skills	1	2	3	4	5
Decision-making skills	1	2	3	4	5
Interpersonal skills	1	2	3	4	5
Personality of members					
Appreciably relating well with others	1	2	3	4	5
Cooperation and trust for others	1	2	3	4	5
Responsibleness and dependability	1	2	3	4	5
Highly organised and persistence	1	2	3	4	5
Emotional stability	1	2	3	4	5
Openness, creativity and sensitivity	1	2	3	4	5
General Roles toward team success					
Coordinating and integrating efforts	1	2	3	4	5
Initiates creative ideas	1	2	3	4	5
Champions ideas after been created	1	2	3	4	5
Offers insightful analysis of opinions	1	2	3	4	5
Provides directions and follow through	1	2	3	4	5
Examines details and enforces laws	1	2	3	4	5
Fight external influences to team	1	2	3	4	5
Encourages search for more information	1	2	3	4	5

Definition and description of measuring scales

'Very Low' describes the situation where none or only one of the team member exhibits the character

'Low' describes the situation where less than half but more than one of the team members exhibits this character

'Moderate' describes the situation where half of the team members exhibits the character

'High' should describe the situation where more than half but not all the team members exhibited the character

'Very High' should describe the situation where all the team members exhibited the character

Below are measures towards achieving value for money in building designs. Kindly indicate the extent to which you agree/disagree that these measures were demonstrated/exhibited by the design team while working on the design of this project. Use the following scales by circling the appropriate number against each of the characteristics as they relate to this project: *1 - Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree*

Requirements for Achieving Value for Money	**Measure of Extent**				
The term 'value' was explicitly defined for the design	1	2	3	4	5
Brief contained clear function-quality-cost requirements	1	2	3	4	5
Client's 'Value' requirement adequately understood by team	1	2	3	4	5
Functions and quality as designed met client's expectations	1	2	3	4	5
Cost objectives of the client were met and/or exceeded	1	2	3	4	5
WLC formed the basis for design decisions/solutions	1	2	3	4	5
Efforts were made to balance function, quality and cost	1	2	3	4	5
Budgets were adjustable to meet function/quality objectives	1	2	3	4	5
Achieving client's value was the primary driver for the team	1	2	3	4	5
There exist a recognisable, objective client value system	1	2	3	4	5

Definition and description of measuring scales

'Strongly Disagree' see below

'Disagree' same as below

'Neutral' same as below

'Agree' same as below

'Strongly Disagree' see below

Here are some characteristerics about team's contextual settings. They specifically relate to the **roles of the client organisation within project teams** and have been found to affect design outcomes. Please indicate your level of agreement to which the client organisation demonstrated/exhibited these characteristics while executing this particular project. Use the following scales by circling the appropriate number against each characteristics: *1 - Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree*

Contextual Factors Affecting Team Perfomance	Level of Agreement				
Adequate Resources from Client Organisation					
Provided timely information and knowledge shaing	1	2	3	4	5
Adequate human resource with right skills/knowledge	1	2	3	4	5
Necessary support and encouragement	1	2	3	4	5
Adequate administrative assistance	1	2	3	4	5
Organisational Structure of Client Organisation					
Clear definition of each member's role	1	2	3	4	5
Agreeing on specifics of work with members	1	2	3	4	5
Integrating and fitting individual members skills	1	2	3	4	5
Responsibility for teams performance	1	2	3	4	5
Clear channel of communication	1	2	3	4	5
Empower member by delegating responsibility	1	2	3	4	5
Leadership by and Culture of Client Organisation					
Leadership focus on work not persons	1	2	3	4	5
Ensure shared leadership	1	2	3	4	5
Promotes trust among team members	1	2	3	4	5
Encourages trust for team leadership	1	2	3	4	5
Wilingness of members to take risks	1	2	3	4	5
Wilingness to expose team's vulnerabilities	1	2	3	4	5
Performance Evaluation & Reward by Client					
Evaluates team rather than individuals	1	2	3	4	5
Ecourages joint acoountability	1	2	3	4	5
Group-based appraisals	1	2	3	4	5
Profit/gains sharing incentives	1	2	3	4	5

Definition and description of measuring scales

'Strongly Disagree' should describe the situation where this characteristics was never or nearly never exhibited in the team by the client Organisation/team members

'Disagree' should describe the situation where this characteristic was mostly not exhibited by the client organisation/team member within the team

'Neutral' should describe the situation where the client organisation/team members sometimes exhibits the characteristic

'Agree' Should be use to describe the situation where more often than not the characteristic is exhibited in the team

'Strongly Agree' should describe the situation where the characteristic is always exhibited by the client/team members within the team

Below are design process related characteristerics that do affect team effectiveness. Kindly indicate your level of agreement to which each of these characteristics were demonstrated/exhibited by/in the team during the designing of this particular Project. Use the following scales by circling the appropriate number against each characteristics: *1 - Strongly Disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree*

Design Process Factors Affecting Team Perfomance	Level of Agreement				
Communications					
Availability of project brief/client requirements	1	2	3	4	5
Adequate time for deliberations on brief	1	2	3	4	5
Availability of design related information	1	2	3	4	5
Authority to modify brief/requirement if need be	1	2	3	4	5
Team Collaboration					
Translate client's objective to team goals	1	2	3	4	5
Interdependence of members on each other	1	2	3	4	5
Confidence and trust amongst members	1	2	3	4	5
Members' total sense of commitment to the team	1	2	3	4	5
Conflict Resolutions					
Common problem solving approach	1	2	3	4	5
Common understanding of the design problem	1	2	3	4	5
Existence of interpersonal incompatibility	1	2	3	4	5
Conflicts on task to be performed	1	2	3	4	5

Definition and description of measuring scales

'Strongly Disagree' see above

'Disagree' same as above

'Neutral' same as above

'Agree' same as above

'Strongly Agree' same as above

APPENDIX ‘E’
DETAILED VALUE SCORING FOR SOME CASES

Table E1 – Value Assessment of Auditorium for Case A

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	A2	A3	A4	A5	A6	a	b	c = a * b
A. CAPEX	8	7	7	7	8	7	4	30
B. OPEX	8	7	7	7	8	7	4	30
C. Time	7	7	7	7	8	7	2	14
D. Environment	7	7	7	7	6	7	3	20
E. Esteem	7	6	7	7	6	7	0	0
F. Flexibility	7	8	7	7	7	7	3	22
G. Comfort	7	8	7	7	7	7	5	36
H. Accessibility	7	7	7	7	8	7	6	43
						Aggregated Average Score i.e. ∑c/∑b		**7.21**

Weight is the value contained in the CVSM as shown in Figure 5.2

Table E2 – Value Assessment of Blocks of Classrooms for Case A

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	A2	A3	A4	A5	A6	A	b	c = a * b
A. CAPEX	6	6	6	7	6	6	7	43
B. OPEX	7	7	5	7	7	7	2	13
C. Time	7	7	7	7	7	7	4	28
D. Environment	5	7	7	8	6	7	4	26
E. Esteem	5	6	7	8	6	6	0	0
F. Flexibility	7	8	7	8	7	7	2	15
G. Comfort	7	7	6	6	7	7	5	33
H. Accessibility	7	7	7	8	7	7	1	7
						Aggregated Average Score i.e. ∑c/∑b		**6.64**

Weight is the value contained in the CVSM as shown in Figure 5.3

Table E3 – Value Assessment of Language Laboratory for Case A

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	A2	A3	A4	A5	A6	A	b	c = a * b
A. CAPEX	8	8	8	7	7	8	7	53
B. OPEX	7	7	7	7	7	7	3	21
C. Time	7	7	7	8	7	7	4	29
D. Environment	6	7	7	7	6	7	2	13
E. Esteem	6	6	7	6	6	6	0	0
F. Flexibility	5	6	5	5	5	5	2	10
G. Comfort	7	8	7	8	7	7	6	44
H. Accessibility	7	7	7	8	7	7	1	7
						Aggregated Average Score i.e. ∑c/∑b		**7.13**

Weight is the value contained in the CVSM as shown in Figure 5.4

Table E4 – Value Assessment of Office Complex for Case A

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	A2	A3	A4	A5	A6	a	b	c = a * b
A. CAPEX	8	7	8	7	6	7	7	50
B. OPEX	7	7	5	6	7	6	2	13
C. Time	6	7	7	8	7	7	4	28
D. Environment	5	7	7	8	6	7	4	26
E. Esteem	5	6	7	8	6	6	0	0
F. Flexibility	7	8	7	8	7	7	2	15
G. Comfort	7	8	7	8	7	7	5	37
H. Accessibility	7	7	7	8	7	7	1	7
						Aggregated Average Score i.e. ∑c/∑b		**7.06**

Weight is the value contained in the CVSM as shown in Figure 5.5

Table E5 – Value Assessment of Twin Lecture Theatre for Case B

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	B2	B3	B4	B5	B6	a	b	c = a * b
A. CAPEX	7	8	7	7	7	7	5	36
B. OPEX	7	8	8	8	7	8	4	30
C. Time	7	6	8	8	7	7	3	22
D. Environment	7	7	7	8	7	7	2	14
E. Esteem	7	7	7	8	7	7	0	0
F. Flexibility	7	8	7	8	7	7	3	22
G. Comfort	8	8	7	8	7	8	5	38
H. Accessibility	8	8	7	8	7	8	6	46
						Aggregated Average Score i.e. ∑c/∑b		**7.44**

Weight is the value contained in the CVSM as shown in Figure 5.7

Table E6 – Value Assessment of Musuem for Case B

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	B2	B3	B4	B5	B6	a	b	c = a * b
A. CAPEX	8	8	8	8	8	8	7	56
B. OPEX	8	7	7	8	7	7	4	30
C. Time	7	7	8	8	8	8	3	23
D. Environment	7	7	7	8	8	7	4	30
E. Esteem	7	7	7	6	7	7	0	0
F. Flexibility	7	8	7	8	8	8	2	15
G. Comfort	8	7	8	8	8	8	5	39
H. Accessibility	7	7	8	8	8	8	2	15
						Aggregated Average Score i.e. ∑c/∑b		**7.68**

Weight is the value contained in the CVSM as shown in Figure 5.8

Table E7 – Value Assessment of Library Complex for Case B

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	B2	B3	B4	B5	B6	a	b	c = a * b
A. CAPEX	7	8	8	9	8	8	7	56
B. OPEX	7	8	7	9	8	8	4	31
C. Time	7	7	7	8	8	7	5	37
D. Environment	7	7	7	7	7	7	2	14
E. Esteem	7	7	7	7	7	7	0	0
F. Flexibility	7	7	7	8	8	7	3	22
G. Comfort	7	7	8	9	8	8	6	47
H. Accessibility	7	7	7	8	8	7	1	7
						Aggregated Average Score i.e. ∑c/∑b		**7.66**

Weight is the value contained in the CVSM as shown in Figure 5.9

Table E8 – Value Assessment of Office Complex for Case B

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	B2	B3	B4	B5	B6	a	b	c = a * b
A. CAPEX	8	9	8	8	8	8	7	57
B. OPEX	7	8	8	7	8	8	3	23
C. Time	8	9	8	8	7	8	4	32
D. Environment	7	7	8	8	8	8	5	38
E. Esteem	7	7	8	7	7	7	0	0
F. Flexibility	7	8	8	8	8	8	2	16
G. Comfort	8	8	8	8	8	8	6	48
H. Accessibility	7	8	8	8	7	8	1	8
						Aggregated Average Score i.e. ∑c/∑b		**7.91**

Weight is the value contained in the CVSM as shown in Figure 5.10

Table E9 – Value Assessment of Twin Lecture Theatre for Case E

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	B2	B3	B4	B5	B6	a	b	c = a * b
A. CAPEX	5	7	8	7	8	7	7	49
B. OPEX	5	7	8	7	8	7	4	28
C. Time	8	7	8	8	8	8	5	39
D. Environment	6	5	7	7	8	7	1	7
E. Esteem	6	7	7	8	8	7	0	0
F. Flexibility	5	7	7	7	8	7	3	20
G. Comfort	7	8	7	8	8	8	6	46
H. Accessibility	8	8	7	7	8	8	2	15
						Aggregated Average Score i.e. ∑c/∑b		**7.28**

Weight is the value contained in the CVSM as shown in Figure 5.12

Table E10 – Value Assessment of Classroom/Office Complex for Case E

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	B2	B3	B4	B5	B6	a	b	c = a * b
A. CAPEX	8	7	8	7	8	8	7	53
B. OPEX	8	8	8	7	7	8	4	30
C. Time	8	8	8	7	7	8	5	38
D. Environment	7	7	8	8	7	7	3	22
E. Esteem	7	7	8	8	8	8	0	0
F. Flexibility	6	8	8	7	7	7	1	7
G. Comfort	7	8	8	7	7	7	5	37
H. Accessibility	7	7	8	7	7	7	2	14
						Aggregated Average Score i.e. ∑c/∑b		**7.50**

Weight is the value contained in the CVSM as shown in Figure 5.13

Table E11 – Value Assessment of Centre for Entrepreneurship for Case E

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	B2	B3	B4	B5	B6	a	b	c = a * b
A. CAPEX	8	8	7	8	8	8	7	55
B. OPEX	8	8	7	8	7	8	3	23
C. Time	7	8	8	8	7	8	4	30
D. Environment	8	7	8	8	8	8	5	39
E. Esteem	7	7	7	7	7	7	0	0
F. Flexibility	7	7	7	8	8	7	2	15
G. Comfort	8	8	8	8	8	8	6	48
H. Accessibility	7	7	7	8	8	7	1	7
						Aggregated Average Score i.e. ∑c/∑b		**7.75**

Weight is the value contained in the CVSM as shown in Figure 5.14

Table E12 – Value Assessment of Science Lab and Offices for Case E

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	B2	B3	B4	B5	B6	a	b	c = a * b
A. CAPEX	7	7	7	8	7	7	7	50
B. OPEX	7	7	8	8	7	7	6	44
C. Time	7	7	7	8	7	7	4	29
D. Environment	7	7	7	8	7	7	3	22
E. Esteem	7	7	7	8	7	7	0	0
F. Flexibility	7	7	6	8	7	7	2	14
G. Comfort	7	7	7	8	7	7	5	36
H. Accessibility	7	7	7	8	7	7	1	7
						Aggregated Average Score i.e. ∑c/∑b		**7.23**

Weight is the value contained in the CVSM as shown in Figure 5.15

Table E13 – Value Assessment of Block of Classrooms for Case G

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	G2	G3	G4	G5	G6	a	b	c = a * b
A. CAPEX	8	9	9	9	9	9	6	53
B. OPEX	8	9	9	9	9	9	5	44
C. Time	8	9	9	8	8	8	4	34
D. Environment	8	9	8	8	8	8	3	25
E. Esteem	7	9	8	8	8	8	2	16
F. Flexibility	7	9	8	8	8	8	1	8
G. Comfort	8	9	9	9	9	9	7	62
H. Accessibility	7	7	7	7	8	7	0	0
						Aggregated Average Score i.e. ∑c/∑b		**8.59**

Weight is the value contained in the CVSM as shown in Figure 5.17

Table E14 – Value Assessment of Science Complex for Case G

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	G2	G3	G4	G5	G6	a	b	c = a * b
A. CAPEX	8	9	9	9	9	9	7	62
B. OPEX	8	9	9	9	9	9	5	44
C. Time	8	8	9	9	8	8	4	34
D. Environment	8	8	9	8	8	8	3	25
E. Esteem	8	8	8	8	8	8	0	0
F. Flexibility	8	8	8	8	9	8	2	16
G. Comfort	8	9	9	9	9	9	6	53
H. Accessibility	8	8	9	8	9	8	2	17
						Aggregated Average Score i.e. ∑c/∑b		**8.61**

Weight is the value contained in the CVSM as shown in Figure 5.18

Table E15 – Value Assessment of Library Complex for Case G

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	G2	G3	G4	G5	G6	a	b	c = a * b
A. CAPEX	9	9	9	9	9	9	7	63
B. OPEX	9	9	9	9	9	9	3	27
C. Time	8	8	9	9	9	9	4	34
D. Environment	8	9	8	8	8	8	1	8
E. Esteem	8	8	8	8	8	8	0	0
F. Flexibility	9	9	9	9	9	9	2	18
G. Comfort	9	9	9	9	9	9	5	45
H. Accessibility	9	9	9	9	9	9	6	54
						Aggregated Average Score i.e. ∑c/∑b		**8.91**

Weight is the value contained in the CVSM as shown in Figure 5.19

Table E16 – Value Assessment of Administrative Block for Case G

Value Criteria	FGD Members' Scores (Max Score 10points)					Average Scores	Weight	Weighted Scores
	G2	G3	G4	G5	G6	a	b	c = a * b
A. CAPEX	9	8	9	9	9	9	5	44
B. OPEX	9	8	9	9	9	9	7	62
C. Time	9	8	9	8	9	9	2	17
D. Environment	8	8	9	9	8	8	3	25
E. Esteem	8	8	8	8	8	8	0	0
F. Flexibility	8	8	8	8	8	8	1	8
G. Comfort	9	8	9	9	9	9	6	53
H. Accessibility	9	8	9	9	9	9	4	35
						Aggregated Average Score i.e. ∑c/∑b		**8.71**

Weight is the value contained in the CVSM as shown in Figure 5.20

APPENDIX ‘F’
FREQUENCY DISTRIBUTION

Table F1 – Percentage Response: Importance of Client's Roles

Client's Roles and Responsibilities	NI	LI	IM	VI	EI
Clearly identify client structure and responsibilities	-	-	7.6	55.1	37.3
Provide resource for continuity and leadership	-	-	0.4	51.1	48.4
Develop and share brief prior to the design stage	-	5.3	24.9	36.4	33.3
Ensure compliance to standards/best practice	-	-	0.9	49.3	49.8
Getting the right people for the right job at right time	-	-		48.0	52.0
Drive collaborative and flexible procurement policy	-	-		51.1	48.9
Demand effective quality management processes	-	-	0.4	53.8	45.8
Insist on adoptions of collaborative behaviours.	-	-		41.8	58.2
Set behavioural and performance example	-	-	5.8	48.0	46.2
Evaluate decisions using criteria agreed upon	-	-	14.2	48.0	37.8
Insist on ‘early-warning culture’ from all involved	-	-	14.2	49.8	36.0
Establish long term relationships with partners/firms	-	-	5.8	51.1	43.1
Understand and align with partners value system	-	-	14.7	49.3	36.0
Have clear criteria for selecting design team	-	-	1.8	60.9	37.3
Ensures robust change control process	-		7.1	57.8	35.1
Understand the key drivers for the design	-	0.4	14.2	61.8	23.6
Ensures that design delivers required function	-	0.4	2.2	58.7	38.7
Considers whole life cycle principles	-	0.4	12.0	48.9	38.7
Use of modern technologies	-	10.2	4.4	51.6	33.8
Use of design quality indicators	-	11.1	9.3	46.2	33.3

NI - Not Important LI - Less Important IM - Important VE - Very Important EI - Extremely Imporant

Table F2 – Percentage Response: Performance of Client's Roles

Client's Roles and Responsibilities	VL	LO	MO	HI	VH
Clearly identify client structure and responsibilities	3.6	3.6	32.0	43.6	17.3
Provide resource for continuity and leadership	3.6	0.4	20.4	54.2	21.3
Develop and share brief prior to the design stage	3.1	0.9	25.8	52.0	18.2
Ensure compliance to standards/best practice	3.6	3.6	19.6	52.4	20.9
Getting the right people for the right job at right time	3.6	3.1	30.7	51.6	11.1
Drive collaborative and flexible procurement policy	4.9	9.8	47.1	31.1	7.1
Demand effective quality management processes	3.6	5.3	12.0	56.9	22.2
Insist on adoptions of collaborative behaviours.	3.1	8.4	39.1	36.4	12.9
Set behavioural and performance example	4.0	10.2	47.6	29.8	8.4
Evaluate decisions using criteria agreed upon	16.0	27.6	31.1	19.6	5.8
Insist on ‘early-warning culture’ from all involved	4.0	4.4	24.0	45.8	21.8
Establish long term relationships with partners/firms	3.6	17.8	46.7	10.2	21.8
Understand and align with partners value system	3.6	0.9	64.4	9.8	21.3
Have clear criteria for selecting design team	3.6	0.9	60.0	14.2	21.3
Ensures robust change cotrol process	3.6	9.3	45.8	20.0	21.3
Understand the key drivers for the design	3.6	8.9	44.9	21.3	21.3
Ensures that design delivers required function	3.6	8.9	45.3	21.8	20.4
Considers whole life cycle principles	9.8	25.8	62.2	1.8	0.4
Use of modern technologies	3.6	9.3	45.8	21.8	19.6
Use of design quality indicators	3.6	10.2	40.0	42.2	4.0

VL - Very Low LO - Low MO - Moderate HI - High VH - Very High

Table F3 – Percentage Response: Existence of Contextual Factors during Design Process

Contextual Factors	SD	DI	NE	AG	SA
Provided timely information	-	4.9	24.4	55.1	15.6
Proper equipment and adequate staffing	0.9	8.0	24.0	51.6	15.6
Necessary support and encouragement	-	4.4	27.6	52.4	15.6
Adequate administrative assistance	-	8.0	29.8	46.7	15.6
Clear definition of each member's role	-	9.3	24.4	50.7	15.6
Agreeing on specifics of work with members	-	12.0	24.4	48.0	15.6
Integrating and fitting individual members skills	-	12.4	24.0	48.0	15.6
Responsibility for teams performance	-	15.6	30.7	38.7	15.1
Clear channel of communication	-	16.0	28.0	42.2	13.8
Empower member by delegating responsibility	-	12.4	24.0	48.0	15.6
Leadership focus on work not persons	6.7	11.1	30.7	36.0	15.6
Ensure shared leadership	4.4	4.4	27.6	48.0	15.6
Promotes trust among team members	5.8	8.0	7.1	63.6	15.6
Encourages trust for team leadership	7.1	8.0	14.2	54.7	16.0
Wilingness of members to take risks	4.4	4.0	6.2	69.8	15.6
Wilingness to expose team's vulnerabilities	11.6	18.2	12.9	42.7	14.7
Evaluates team rather than individuals	17.8	37.8	12.0	16.9	15.6
Ecourages joint acoountability	28.0	28.9	12.0	15.6	15.6
Group-based appraisals	4.9	28.9	35.1	15.6	15.6
Profit/gains sharing incentives	28.0	12.0	28.9	15.6	15.6

SD - Strogly Disagrre DI - Disagree NE - Neutral AG - Agree SA - Strongly Agree

Table F4 – Percentage Response: Exhibition of Composition Factors

Composition Factors	VL	LO	MO	HI	VH
Technical knowledge and expertise	-	1.3	45.3	38.7	14.7
Problem-solving skills	-	1.3	50.2	35.6	12.9
Decision-making skills	-	1.3	32.0	52.0	14.7
Interpersonal skills	-	1.3	15.1	68.9	14.7
Appreciably relating well with others	-	1.3	30.7	53.3	14.7
Cooperation and trust for others	-	1.3	22.2	60.4	16.0
Responsibleness and dependability	-	0.9	23.1	58.2	17.8
Highly organised and persistence	-	0.9	32.4	50.7	16.0
Emotional stability	-	0.9	16.9	70.2	12.0
Openness, creativity and sensitivity	-	0.9	13.8	69.3	16.0
Coordinating and integrating efforts	-	0.9	28.4	53.8	16.9
Initiates creative ideas	-	0.9	56.0	26.2	16.9
Champions ideas after been created	-	0.9	36.9	44.4	17.8
Offers insightful analysis of opinions	-	0.9	55.6	25.8	17.8
Provides directions and follow through	-	0.9	55.1	28.0	16.0
Examines details and enforces laws	-	1.8	44.9	37.3	16.0
Fight external influences to team	-	1.8	45.8	36.4	16.0
Encourages search for more information	-	3.1	44.9	36.0	16.0

VL - Very Low LO - Low MO - Moderate HI - High VH - Very High

Table F5 - Percentage Response: Existence of Design Process Related Factors in Design Teams

Design Process	SD	DI	NE	AG	SA
Availability of project brief/client requirements	8.4	7.6	37.8	36.0	10.2
Adequate time for deliberations on brief	-	-	41.3	51.6	7.1
Availability of design related information	-	-	41.8	44.9	13.3
Authority to modify brief/requirement if need be	2.2	12.0	43.6	40.9	1.3
Translate client's objective to team goals	-	-	30.7	55.6	13.8
Interdependence of members on each other	1.3	5.8	42.2	44.0	6.7
Confidence and trust amongst members	-	0.9	34.2	51.6	13.3
Members' total sense of commitment to the team	-	-	30.7	55.6	13.8
Common problem solving approach	-	4.9	58.2	29.3	7.6
Common understanding of the design problem	-	-	66.2	18.7	15.1
Existence of interpersonal incompatibility	-	-	67.6	17.3	15.1
Conflicts on task to be performed	-	-	68.0	16.0	16.0

SD - Strogly Disagrre DI - Disagree NE - Neutral AG - Agree SA - Strongly Agree

Table F6 – Percentage Response: Performance in terms of Team Functioning

Team Functioning	SD	DI	NE	AG	SA
'Value' was explicitly defined for the design	-	12.0	35.1	47.1	5.8
Brief contained function-quality-cost requirements	-	6.2	43.6	48.4	1.8
Client's 'Value' requirement understood by team	-	6.2	43.6	48.0	2.2
Functions and quality met client's expectations	0.9	8.0	42.7	48.0	0.4
Cost objectives were met and/or exceeded	1.8	8.9	46.2	41.3	1.8
WLC formed the basis for design decisions	1.3	14.7	41.8	41.3	0.9
Efforts made to balance function-quality-cost	1.8	12.0	40.4	43.1	2.7
Budgets were adjustable to meet function/quality	0.9	2.7	50.7	43.6	2.2
Achieving client's value was the primary driver	0.4	7.1	37.3	53.3	1.8
There exist a recognisable client value system	0.9	9.8	39.6	47.6	2.2

SD - Strogly Disagrre DI - Disagree NE - Neutral AG - Agree SA - Strongly Agree

APPENDIX ‘G’
FACTOR ANALYSIS RESULTS

Table G1 – Communalities: Client Roles

	Initial	Extraction
Clearly identify client structure and responsibilities	1.000	0.704
Provide adequate resource to maintain leadership	1.000	0.901
Develop and share brief prior to the design stage	1.000	0.776
Ensure compliance to standards and best practice	1.000	0.812
Getting the right people for the right job at right time	1.000	0.486
Drive clear, collaborative procurement policy	1.000	0.645
Demand effective quality management processes	1.000	0.888
Insist on adoptions of collaborative behaviours.	1.000	0.366
Set behavioural and performance example	1.000	0.586
Evaluate decisions using criteria agreed upon	1.000	0.727
Insist on 'early-warning culture' from all involved	1.000	0.726
Establish long-term relationships with partners/firms	1.000	0.760
Understand/align with other partners value system	1.000	0.914
Have clear criteria for selecting design team	1.000	0.916
Ensures robust change control process	1.000	0.944
Understand the key drivers for the design	1.000	0.937
Ensures that design delivers required function	1.000	0.933
Considers whole life cycle principles	1.000	0.590
Use of modern technologies	1.000	0.818
Use of design quality indicators	1.000	0.512

Extraction Method: Principal Component Analysis.

Table G2 – Total Variance Explained - Client Roles

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Var	Cum %	Total	% of Var	Cum %
1	11.967	59.835	59.835	11.112	55.560	55.560
2	1.914	9.571	69.407	2.457	12.285	67.845
3	1.060	5.299	74.705	1.372	6.860	74.705
4	0.857	4.283	78.988			
5	0.817	4.087	83.075			
6	0.777	3.885	86.960			
7	0.508	2.542	89.502			
8	0.464	2.322	91.823			
9	0.404	2.021	93.844			
10	0.302	1.509	95.354			
11	0.244	1.222	96.576			
12	0.220	1.098	97.674			
13	0.183	0.913	98.587			
14	0.087	0.437	99.025			
15	0.076	0.380	99.404			
16	0.054	0.268	99.673			
17	0.036	0.180	99.853			
18	0.017	0.083	99.936			
19	0.008	0.040	99.975			
20	0.005	0.025	100.000			

Extraction Method: Principal Component Analysis.

Table G3 – Communalities Contextual Factors

	Initial	Extraction
Provided timely information	1.000	0.805
Proper equipment and adequate staffing	1.000	0.727
Necessary support and encouragement	1.000	0.886
Adequate administrative assistance	1.000	0.782
Clear definition of each member's role	1.000	0.884
Agreeing on specifics of work with members	1.000	0.893
Integrating and fitting individual members skills	1.000	0.908
Responsibility for teams performance	1.000	0.741
Clear channel of communication	1.000	0.663
Empower member by delegating responsibility	1.000	0.896
Leadership focus on work not persons	1.000	0.751
Ensure shared leadership	1.000	0.942
Promotes trust among team members	1.000	0.696
Encourages trust for team leadership	1.000	0.672
Willingness of members to take risks	1.000	0.867
Willingness to expose team's vulnerabilities	1.000	0.444
Evaluates team rather than individuals	1.000	0.857
Encourages joint accountability	1.000	0.945
Group-based appraisals	1.000	0.772
Profit/gains sharing incentives	1.000	0.882

Extraction Method: Principal Component Analysis.

Table G4 – Total Variance Explained - Contextual Factors

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Var	Cum %	Total	% of Var	Cum %
1	14.246	71.228	71.228	8.697	43.486	43.486
2	1.769	8.843	80.071	7.317	36.584	80.071
3	0.922	4.611	84.681			
4	0.688	3.442	88.123			
5	0.589	2.945	91.068			
6	0.327	1.636	92.705			
7	0.285	1.427	94.132			
8	0.208	1.041	95.174			
9	0.199	0.997	96.171			
10	0.185	0.923	97.094			
11	0.144	0.721	97.816			
12	0.123	0.613	98.429			
13	0.094	0.471	98.900			
14	0.074	0.370	99.270			
15	0.060	0.300	99.570			
16	0.039	0.195	99.765			
17	0.023	0.113	99.879			
18	0.011	0.057	99.936			
19	0.009	0.045	99.980			
20	0.004	0.020	100.000			

Extraction Method: Principal Component Analysis.

Table G5 – Communalities Composition Factors

	Initial	Extraction
Technical knowledge and expertise	1.000	0.857
Problem-solving skills	1.000	0.781
Decision-making skills	1.000	0.777
Interpersonal skills	1.000	0.934
Appreciably relating well with others	1.000	0.804
Cooperation and trust for others	1.000	0.853
Responsibleness and dependability	1.000	0.352
Highly organised and persistence	1.000	0.763
Emotional stability	1.000	0.797
Openness, creativity and sensitivity	1.000	0.863
Coordinating and integrating efforts	1.000	0.760
Initiates creative ideas	1.000	0.895
Champions ideas after been created	1.000	0.845
Offers insightful analysis of opinions	1.000	0.913
Provides directions and follow through	1.000	0.923
Examines details and enforces laws	1.000	0.956
Fight external influences to team	1.000	0.934
Encourages search for more information	1.000	0.914

Extraction Method: Principal Component Analysis.

Table G6 – Total Variance Explained - Composition Factors

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Var	Cum %	Total	% of Var	Cum %
1	13.131	72.947	72.947	8.299	46.105	46.105
2	1.791	9.952	82.900	6.623	36.794	82.900
3	0.713	3.960	86.859			
4	0.648	3.602	90.461			
5	0.396	2.198	92.658			
6	0.318	1.765	94.424			
7	0.242	1.343	95.766			
8	0.228	1.268	97.034			
9	0.171	0.951	97.986			
10	0.118	0.656	98.641			
11	0.071	0.396	99.037			
12	0.063	0.352	99.389			
13	0.047	0.262	99.651			
14	0.019	0.104	99.755			
15	0.018	0.100	99.856			
16	0.014	0.078	99.933			
17	0.009	0.049	99.982			
18	0.003	0.018	100.000			

Extraction Method: Principal Component Analysis.

Table G7 – Communalities - Design Process (Modified)

	Initial	Extraction
Availability of project brief/client requirements	1.000	0.696
Adequate time for deliberations on brief	1.000	0.826
Availability of design related information	1.000	0.922
Authority to modify brief/requirement if need be	1.000	0.400
Translate client's objective to team goals	1.000	0.807
Interdependence of members on each other	1.000	0.348
Confidence and trust amongst members	1.000	0.871
Common problem solving approach	1.000	0.770
Common understanding of the design problem	1.000	0.925
Existence of interpersonal incompatibility	1.000	0.925
Conflicts on task to be performed	1.000	0.902

Extraction Method: Principal Component Analysis.

Table G8 – Total Variance Explained - Design Process

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Var	Cum %	Total	% of Var	Cum %
1	6.208	56.435	56.435	3.993	36.297	36.297
2	1.166	10.599	67.034	3.321	30.187	66.484
3	1.019	9.260	76.294	1.079	9.811	76.294
4	0.977	8.882	85.177			
5	0.716	6.511	91.687			
6	0.319	2.903	94.590			
7	0.298	2.713	97.303			
8	0.197	1.793	99.096			
9	0.052	0.469	99.565			
10	0.035	0.319	99.884			
11	0.013	0.116	100.000			

Extraction Method: Principal Component Analysis.

Table G9 – Communalities Team Functioning

	Initial	Extraction
The term 'value' was explicitly defined for the design	1.000	0.514
Brief contained clear function-quality-cost requirements	1.000	0.405
Client's 'Value' requirement adequately understood by team	1.000	0.817
Functions and quality as designed met client's expectations	1.000	0.721
Cost objectives of the client were met and/or exceeded	1.000	0.580
WLC formed the basis for design decisions/solutions	1.000	0.296
Efforts were made to balance function, quality and cost	1.000	0.513
Budgets were adjustable to meet function/quality objectives	1.000	0.815
Achieving client's value was the primary driver for the team	1.000	0.285
There exist a recognisable, objective client value system	1.000	0.660

Extraction Method: Principal Component Analysis.

Table G10 – Total Variance Explained - Team Functioning

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Var	Cum %	Total	% of Var	Cum %
1	4.490	44.901	44.901	4.477	44.768	44.768
2	1.116	11.162	56.063	1.130	11.296	56.063
3	0.975	9.752	65.816			
4	0.813	8.125	73.941			
5	0.676	6.755	80.696			
6	0.643	6.432	87.128			
7	0.511	5.115	92.243			
8	0.365	3.652	95.895			
9	0.273	2.726	98.621			
10	0.138	1.379	100.000			

Extraction Method: Principal Component Analysis.