KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF ARCHITECTURE AND PLANNING

DEPARTMENT OF BUILDING TECHNOLOGY

THE INFLUENCE OF PROCUREMENT SYSTEMS ON PROJECT TEAM PERFORMANCE IN ASHANTI REGION OF GHANA

A THESIS SUBMITTED TO THE DEPARTMENT OF BUILDING TECHNOLOGY IN PARTIAL FULFILMENT OF THE REQUIREMENT

OF THE

MASTER OF SCIENCE IN PROCUREMENT MANAGEMENT

BY

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DECLARATION

I declare that I have wholly undertaken the research reported upon here-in under supervision".

……. Date……

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I declare that I have supervised the student in undertaking the research reported herein and I confirm that the student has my permission to present it for assessment.

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ABSTRACT

In recent times clients have increasingly demanded for "better value for money" from their projects in term of cost, quality and time. An attempt by the construction industry to provide better deal to its clients has been through innovative or "fast-tracking" project procurement systems. However, unique project procurement systems present unique methods, processes and procedures of construction of projects for the client. These different systems also prescribe the variation of the organizational structure of the project team in term of role, responsibility and authority. So how do the different procurement systems affect the performance of the project team considering that the method, process, procedure and organization vary according to the systems? The aim of this research was to determine the influence of procurement systems on the performance of project teams in Ashanti Region of Ghana. In order to achieve the aim, two objectives were set which include: determination of critical roles performed by project team under Traditional and Design & Build procurement systems and determination of impact of the two procurement systems on the performance of the identified roles. This research took the form of literature review and survey using questionnaire approach. Responses to the questionnaire sent to project team members (Architects, Quantity Surveyors, Engineers and Land Surveyors) were collected, collated and analyzed. From the literature review and the analysis of the survey results, five findings were made as follows. Firstly, the critical roles of building project team do not vary under Traditional and Design & Build procurement systems. Secondly, the levels of importance attached to the identified key roles vary with the two systems. Thirdly, leadership role with regards to project team members changes under the two procurement systems. Fourthly, the two procurement systems have different levels of effectiveness of performance roles of project team. And lastly, procurement systems influence performance level of construction project team members. Based on these results, it was recommended that key roles and responsibilities of the construction team members (i.e. Architects, Quantity Surveyors Engineers and Surveyors) should be clearly defined under each building procurement systems. Also, in any building project, before selecting a particular procurement system, the performance indicators (in terms of cost, quality and time) should be set.

Keywords: Procurement Systems, Project Team, Project Performance Indicators,

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ABBREVIATIONS

A/E	Architectural and Engineering
APUC	America Public Utility Commission
BA	Bachelor of Art
BSc	Bachelor of Science
CBD	Central Business District
CIB	Charted Institution of Builders
D–B	Design and Build
D–B–B	Design/Bid/Build
D&B	Design and Build
EMS	Environmental Management Systems
GhIE	Ghana Institution Engineers
GhIS	Ghana Institution of Surveyors
GIA	Ghana Institution of Architect
HVAC	Heating, Ventilation and Air Conditioning
IIE	Institution of Incorporated Engineers
Km	Kilometer
Km/h	Kilometer Per Hour
KMA	Kumasi Metropolitan Assembly
KNUST	Kwame Nkrumah University of Science and Technology
LI	Legislative Instrument
MA	Master of Art
MEP	Mechanical, Electrical and Plumbing
MPhil	Master of Philosophy
MSc	Master of Science
NIST	National Institute of Standards and Technology
NE	North East
QS	Quantity Surveyor

CHAPTER ONE

INTRODUCTION

1.1 Background

Procurement is the processes required to acquire works, goods and services from outside the performing organization (Boswell and Lorna, 2004). The purchase of merchandise or services at the optimum possible total cost in the correct amount and quality through some processes is termed procurement (Rosli et al., 2006). These works, goods or services are also purchased at the correct time and location for the express gain or use by government, company, business or individuals by signing a contract. Almost all discussions of procurement are done from the perspective of the buyer in a buyer-seller relationship. Organized method or process and procedure for clients to obtain or acquire construction products are described as project procurement. It can be said that besides traditional procurement system approach, there are now other innovative procurement systems used by the construction industry worldwide. Different procurement systems differ from each other in terms of allocation of responsibilities, activities sequencing, process and procedure, and organizational approach in project delivery (Rosli et al., 2006). According to Chan (1996), these differences in procurement methods influence the time performance of construction projects. Time would be affected by the flow of project that is driven by different type of procurement method. It is said that one of the major factors affecting cost and time overruns were the procurement method adopted. This is supported by Bowen et al. (1999) with the view that one of the reasons contributing to the poor performance of the construction industry principally is the inappropriateness of selection of procurement method. These give an indication of the effect of using different types of procurement methods in project delivery. The

design-and-build approach for instance integrates the design and construction process whereas in the traditional method the two processes are separate. These differences invariably affect the performance of project team and this has great impact on overall project performance. Project performance can be defined as "*the degree of achievement of certain effort or undertaking*" which relates to the prescribed goals or objectives that form the project parameters. Project success can be determined using many other elements, but the popular once are parameters are cost, quality and time performance. The aim of this study is to look into the influence of the different procurement systems on the construction project team performance. Since there are many different project procurement systems, it is appropriate for the purpose of this study to limit to the common ones i.e. Traditional System, and Design and Build system.

According to Obeng-Ayirebi (2002), construction started from the situation where, prospective building owners engaged contractors directly without drawings. The arrival of architects and architectural practices whereby clients engage the services of architects in the design of building construction projects marks the beginning of the traditional procurement system. Thus project delivery method in which the owner contracts with separate design team and separate construction team of a project. The three main sequential phases to the traditional procurement system, they are: the design phase, the bidding (or tender) phase and the construction phase.

Project delivery performance within the construction industry has been criticized due to its fragmented approach to project delivery (Latham, 1994; Egan, 2002 cited in Ibrahim et al; 2011).The traditional procurement system does not encourage proper integration, coordination and communication between project team needed to overcome this fragmentation (Latham, 1994; Forgues & Koskela, 2009 cited in

Ibrahim et al; 2011). This according to Egan (2002) and Love (1998) is because the various teams in the project are not able to properly collaborate and work together as expected to deliver projects effectively.

Anvuur and Kumaraswamy (2007) stated that increased complexity, uncertainty, and time pressure in construction projects have increased the need for cooperation among different project actors. This has led to the evolution of other procurement systems such as design and build. Despite the fact that each construction project procurement systems has its own merits and demerits, an analyzing of the influences of each procurement system on the performance of the project team will go a long way to enhance the project delivery in the construction industry.

This research presents a critical review on how different construction procurement systems can influence the performance of project team and eventually construction projects. The objective of this review is to determine the critical roles of project team under Traditional and Design & Build systems as well as to determine the impact of the two procurement systems on the project team performance.

1.2 Statement of Problem

In recent times, clients are increasingly demanding for "better value for money" from their projects in term of cost, quality and time. An attempt by the construction industry to provide better deal to its clients has been through innovative or "fast-tracking" project procurement systems. However, unique project procurement systems present unique methods, processes and procedures of construction of projects for the client. These different systems also prescribe the variation of the organizational structure of the project team in term of role, responsibility and authority. So how do the different construction procurement systems affect the performance of the project team considering that the method, process, procedure and

organization vary according to the systems? This study seeks to look at the different systems of procurement, their attributes and how each of them influences the performance of the project team.

1.3 Aim and Objectives of the Study

The aim of this study is to determine the influence of procurement systems on project team performance on building projects.

Specifically, the following objectives were set for this study:

1. To determine critical roles performed by the project team under the two procurement systems.
2. To determine the impact of procurement systems on the performance of the identified roles regarding cost, time and quality.

1.4 Research Questions

The research is designed to answer the following questions;

1. What are the critical roles of the project team under the two procurement systems?
2. What is the impact of the two procurement systems on the project team performance?

1.5 Scope of the Study

There are many different project procurement systems, however, it is appropriate for the purpose of this study to limit to the common ones i.e. Traditional, and Design & Build procurement systems. Moreover, this study does not cover all the construction project team. It is limited to surveyors, quantity surveyors, engineers and architects. This study is therefore limited to performance of project team under Traditional, and Design & Build systems. Again it was based on construction professionals in the

Kumasi Metropolis who had worked or were currently working on projects procured through Traditional and Design &Build procurement systems.

1.6 Significance and Benefits of the Research

It could be noted that specific operational solutions and recommendations that public procurement agents can adopt to enhance performance of project team through procurement system for the benefit of all economic agents (Governments, firms and individuals) is lacking. The unique significant of this research is its relevance for policy makers and stakeholders in construction procurement since the research aims to provide up-to-date and evidence-based recommendations to them on effective strategies that can be employed to ensure that project team work effectively and efficiently to the desire of all economic agents. This research seeks to make available an overview of the key roles of project team under each procurement system, and effectiveness of performance of key roles of project team under each procurement system.

This work serves as reference for upcoming generations because development of appropriate construction strategies first requires an understanding of roles of project team under the two procurement systems as well as impact of procurement systems on project team performance. The importance of this study cannot be over emphasized as it contributes to knowledge and development of literature in the construction industry; and also serve as a basis for further research for all those interested in this area.

1.7 Brief Methodology for the Research

This research was approached by the use of both primary and secondary data. The primary data was collected using structured questionnaires from project team

professionals. The nucleus of the target group was architects, quantity surveyors, engineers and land surveyors in the construction industry. There was also an extensive review of literature on the subject to identify current practices and unique strategies in the area. Further to this, appropriate descriptive statistical tools were employed in analyzing the data collected to meet the desired research objectives.

1.8 Organization of the Study

The study is divided into five chapters. Chapter One deals with the introduction, the statement of the problems, and significant of the study, aim and objectives, brief methodology and organization of the study. Chapter Two provided an overview of existing literature. This chapter provides a review of already existing literature on this topic.

Moreover, Chapter three discussed research methods for the study thoroughly. This chapter also describes the data that form the basis for the research that are reported in this paper. Empirical analysis of the results was reported in the Chapter Four. Thus, it deals with the presentation, analysis and discussion of the data collected from the field. Chapter Five which is the last chapter looked at the conclusion, recommendation and policy implications of the research.

1.9 Summary of Chapter One

This Chapter discussed the general introduction of the research area by defining the topic, stating the problem, coming up with the aim and setting the research objectives to achieve the aim. The methodology adopted, scope of the study and justification of the study were all presented in this chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of both published and unpublished literature on procurement systems (specifically traditional and design & build systems), composition of construction project team, performances of project team under Traditional and Design & Build procurement systems. The purpose is to provide the necessary background, to demonstrate the significance of the study and to identify the specific knowledge gaps associated with the influence of procurement systems on the performance of project team. The review provides a clear and balanced picture of current concepts, theories and data relevant to the subject of the study. It is not a continuous piece of writing but has several sections covering different concerns at different locations in its structure. Description and analysis of the literature is organised around three issues namely: procurement systems, project team and the influence of project team's performance by different procurement systems in a way as to bring to the fore both the knowledge-base and argumentation elements surrounding the topic of study. The chapter concludes with a summary of areas of theoretical and empirical weakness identified from the review.

However, the objectives of the study are used as basis to review the literature which includes the following;

1. Construction procurement systems: traditional and design & build
2. The process of the procurement systems (traditional and design & build systems)
3. Composition of project team
4. Measurement of performance of project team

5. The effect of the different procurement systems on project team performance
6. Reasons for choice of design and build over traditional procurement system

2.2 Construction Project Procurement Systems

Procurement has been defined by many authors and some of the definitions are summarized in this section. Procurement has been defined as, “the overarching function that describes the activities and processes to acquire goods and services” (Business Dictionary, 2011). The purchase of merchandise or services at the optimum possible total cost in the correct amount and quality through some processes is termed procurement. Moreover, according to World Bank (2003), procurement is the acquisition of goods and services at the best possible total cost of ownership, in the right quantity and quality, at the right time, in the right place for the direct benefit or use of governments, corporations, or individuals, generally via a contract. Importantly, and distinct from “purchasing”, procurement involves the activities involved in establishing fundamental requirements, sourcing activities such as market research and vendor evaluation and negotiation of contracts”.

From the above definition, procurement is the processes required to acquire works, goods and/or services from outside the performing organization. The procurement process not only involves the purchasing of commodities but also adopting quality and quantity checks. Most of the times, suppliers or sellers are listed and pre-determined by the procuring company. This makes the process smoother, promoting a good business relationship between the buyer and the seller. In the building industry, procurement describes the activities undertaken by the client to obtain a building.

Before discussing the effect of the different procurement systems on project team performance, it is most appropriate to familiarize ourselves with the concept and operation of the different project procurement systems.

Mastermann (1996) classify project procurement systems into several categories based on the relationship and critical interaction between design and construction responsibilities. The categorization of the various procurement systems are as follows (refer Figure 2.1):

1) Separated and Cooperative System

2) Integrated System

3) Management Oriented System

The different category and sub-classification of construction project procurement systems can be shown in **Figure 2.1**below:

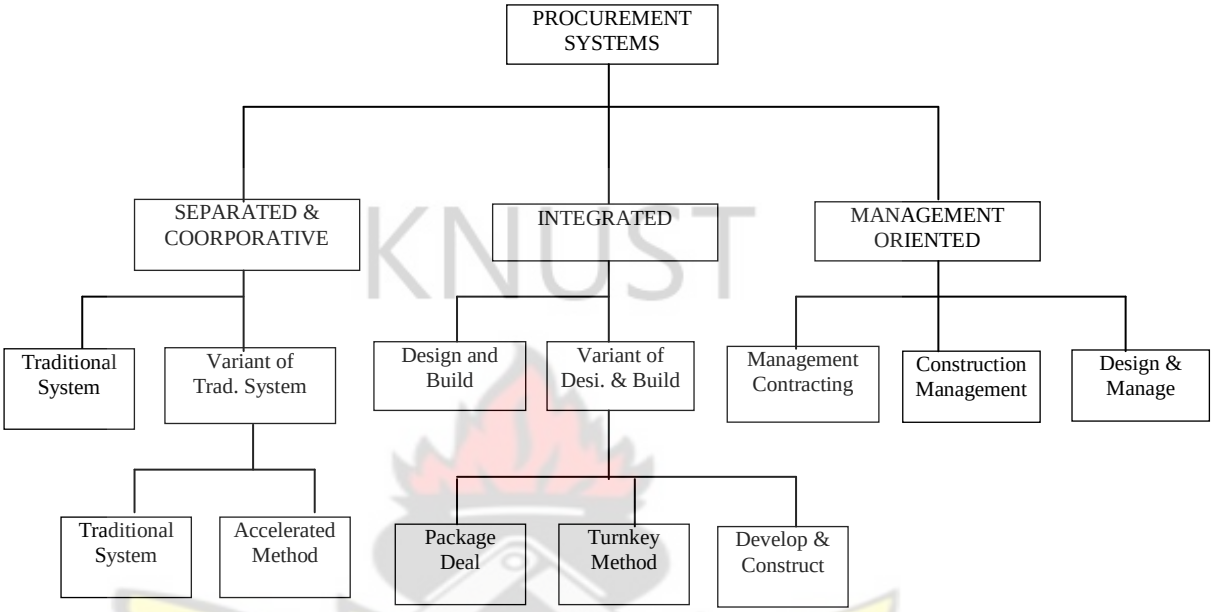

Figure 2.1 – Category of Building Procurement Systems

Source: Masterman (1996) Building Procurement Systems: An Introduction

2.2.1 Separated and Cooperative Procurement System

Under this system, the responsibilities of designing and construction of the project are separated and are carried out by different independent organizations namely the designers and contractors. It is sometimes called linear or sequential contracting system or multiple responsibilities contracting approach. It is a system where the project development activities that start from feasibility study, preliminary design, documentation to construction and hand over, are carried out sequentially one after another. Traditionally, the complete working drawings or design has to be prepared by the designers before tender and construction activities can take place. It is sub-divided into 2 sub-categories – Traditional System and Variants of the Traditional

Systems. The Variant System is further sub-divided into (i) Sequential Method, and (ii) Accelerated Method.

Under the sequential method or a single stage tendering approach, the building owner will appoint a team of consultants to act on his behalf to produce construction drawings, specification and tender document and to administer the tendering processes to select a contractor. Once selected and awarded the contract, the contractor will carry out based on the drawings and specification prepared by the client's consultants.

The accelerated method can be considered as an innovative approach to speed up the selection of contractor and the commencement of construction. The method can be divided into 2 sub-categories i.e. two-stage and negotiated tendering methods. Both methods involve preliminary discussion with selected few contractors, submission of fixed tender and/or cost negotiation.

2.2.1.1 Traditional / Design–bid–build Procurement System

The Traditional method is also known as Design–bid–build (or design/bid/build, and abbreviated D–B–B or D/B/B accordingly) or Design–tender (or "design/tender") or hardbid, is a project delivery method in which the agency or owner contracts with separate entities for each the design and construction of a project. There are three main sequential phases to the design–bid–build delivery method:

1. The design phase
2. The bidding (or tender) phase and
3. The construction phase

In the Design Phase, the owner retains an architect (or engineer for infrastructure works) to design and produce tender documents on which various general contractors will in turn bid, and ultimately be used to construct the project. For

building projects, the architect will work with the owner to identify the owner's needs, develop a written program documenting those needs and then produce a conceptual or schematic design. This early design is then developed, and the architect will usually bring in other professionals including quantity surveyors, mechanical, electrical, and plumbing engineers (MEP engineers), a fire engineer, structural engineer, sometimes a civil engineer and often a landscape architect to complete documents (drawings and specifications). These documents are then coordinated by the project manager and put out for tender to various general contractors.

In the bidding phase, bids can be "open", in which any qualified bidder may participate, or "selective", in which a limited number of pre-selected contractors are invited to bid. The various general contractors bidding on the project obtain copies of the tender documents, and then put them out to multiple subcontractors for bids on sub-components of the project. Sub-components include items such as the concrete work, structural steel frame, electrical systems, and landscaping.

Once bids are received, the architect typically reviews the bids, seeks any clarifications required of the bidders, ensures all documentation is in order (including bonding if required), and advises the owner as to the ranking of the bids. If the bids fall in a range acceptable to the owner, the owner and architect discuss the suitability of various bidders and their proposals. The owner is not obligated to accept the lowest bid, and it is customary for other factors including past performance and quality of other work to influence the selection process. The project is usually awarded to the lowest bid by a qualified general contractor.

After the project has been awarded, the construction documents may be updated to incorporate addenda or changes and they are issued for construction. The necessary

approvals (such as the building permit) must be achieved from all jurisdictional authorities for the construction process to begin. In most instances, almost every component of a project is supplied and installed by sub-contractors. The general contractor often provides work with its own forces, but it is not uncommon for a general contractor to limit its role to management of the construction process and daily activity on a construction site (see also construction management). The architect acts as the owner's agent to review the progress of the work and to issue site instructions, change orders or other documentation necessary to the construction process.

2.2.1.1.1 Advantages of Traditional Procurement System

This method has a number of benefits and this include:

1. The design team is impartial and looks out for the interests of the owner.
2. The design team prepares documents on which all general contractors place bids. With this in mind, the "cheaper is better" argument is rendered invalid since the bids are based on complete documents. Incomplete, incorrect or missed items are usually discovered and addressed during the bid process.
3. Ensures fairness to potential bidders and improves decision making by the owner by providing a range of potential options. It also identifies new potential contractors.
4. Assists the owner in establishing reasonable prices for the project.
5. Uses competition to improve the efficiency and quality for owners.

2.2.1.1.2 Disadvantages of Traditional Procurement System

However, the traditional procurement is bedeviled with a number of problems such as:

1. Failure of the design team to be current with construction costs, and any potential cost increases during the design phase could cause project delays if the construction documents must be redone to reduce costs.
2. Redesign expense can be disputed should the architect's contract not specifically address the issue of revisions required to reduce costs.
3. Development of a "cheaper is better" mentality amongst the general contractors bidding the project so there is the tendency to seek out the lowest cost sub-contractors in a given market. In strong markets, general contractors will be able to be selective about which projects to bid, but in lean times, the desire for work usually forces the low bidder of each trade to be selected. This usually results in increased risk (for the general contractor) but can also compromise the quality of construction. In the extreme, it can lead to serious disputes involving quality of the final product, or bankruptcy of a sub-contractor who was on the brink of insolvency desperate for work.
4. As the general contractor is brought to the team post design, there is little opportunity for input on effective alternates being presented.
5. Pressures may be exerted on the design and construction teams, which may lead to disputes between the architect and the general contractor.

2.2.2 Integrated Procurement Systems

This system, as the name implies, integrates or combines the responsibilities of design and construction of the project (Ashworth, 2001). Both responsibilities are contracted out to a single contracting organisation. It is also called a parallel or single responsibility procurement system whereby the client will only need to deal with a single organisation for both the designing and constructing the proposed project. In this case, the contractor will have to be engaged and be responsible for

design and construction. *Design and build system* falls under this category of project procurement system. Under this system, the client together with his/her consultants will prepare a tender or bidding document that include the project brief and client's requirements and invite a number of contractors to bid. For the purpose of submitting tenders, the invited contractors will produce their own design, construction and cost proposal. Very often the successful contractor will enter into a contract based on lump sum price and a fixed duration (Ashworth, 2001; Edmond, 2003)

The variation or innovation to this mode of project delivery systems includes (1) Package deal (2) Turnkey (3) Develop and construct. These systems that entail the contractor to be responsible for both the design and construction of the project, allow for the early start of construction through the reduction of the pre-tender activities as such they reduce process time.

Package deal or commonly called the "all in" contracting is a type of procurement method where a contractor is given the responsibility for everything that is required and necessary for the design, construction and delivery of the project. Under this system, the services of the contractor will include the preparation of project brief, sketch and final working drawings, getting all the approval from authorities, project financing, construction, furnishing and commissioning of all equipments and accessories and handing over the project to the client.

Turnkey contract is an American term for "all in" or package contract. Under this arrangement, a contractor is commissioned to undertake the responsibilities for everything necessary and required for the construction, completion, commissioning and hand over the project. The word "turnkey" is meant to be a situation where the client is given the key and he can then enter the project by "turning the key" upon completion. The contractor has the task to do everything from preparing project

brief, getting approval, designing, financing, construction, furnishing, painting and decorating to commissioning and handing over completed work, cleaned and ready for use project

Develop and construct is another of the integrated procurement approach which is very much similar to design and build. In this case, the contractor is still given the responsibility for both the design and construction of the project. The difference is that, under this method the client's design consultants prepare the concept sketches or designs and passes them to the contractor who will develop them and produce the detailed working drawings. The contractor will then construct and complete the project based on what has developed and produced.

2.2.2.1 Design and Build Procurement System

Design–build (or design/build, and abbreviated D–B or D/B accordingly) is a project delivery system used in the construction industry. It is a method to deliver a project in which the design and construction services are contracted by a single entity known as the design–builder or design–build contractor. The owner produces a list of requirements for a project, giving an overall view of the project's goals. Several D&B contractors present different ideas about how to accomplish these goals. The owner selects the ideas he or she likes best and hires the appropriate contractor. Often, it is not just one contractor, but a consortium of several contractors working together. Once a contractor (or consortium/consortia) has been hired, they begin building the first phase of the project. As they build phase 1, they design phase 2.

2.2.2.1.1Advantages of Design and Build Procurement System

The review of the literature indicated that several studies examined the performance of the design-build delivery method. These studies point out that this delivery

approach outperforms other delivery methods with regards to several measures of project performance. Design-build delivery method is the possibility for the owner to contract with a single entity. The design-build team is responsible for providing the owner with all aspects required to deliver the facility, starting from design services to construction, and including equipment selection and procurement (Beard et al., 2001). In this method, the risks associated with design management and controls are transferred to the design-build entity. Moreover, the owner relies on the design-build team for coordination, quality and cost control, in addition to schedule monitoring. Design-build, as a project delivery system, emerged to satisfy the owners' recent requirements to complete projects faster and at lower costs (Tulacz, 2003).

Moreover, design–build saves time and money for the owner, while providing the opportunity to achieve innovation in the delivered facility. The cost and schedule reduction and decreased litigation associated with design–build project delivery have been demonstrated repeatedly. Researches on *Selecting Project Delivery Systems* by Sanvido and Konchar (1997) of Pennsylvania State University found that design–build projects are delivered 33.5% faster than projects that are designed and built under separate contracts (design-bid-build). Sanvido and Konchar, (1997) also showed that design–build projects are constructed 12% faster and have a unit cost that is 6.1% lower than design-bid-build projects. Similar cost and time savings were found in a comparison study of design–build, and design-bid-build for the water/wastewater construction industry, a peer-reviewed paper authored by Smith Culp Consulting that will be published in July 2011 by the American Society of Civil Engineers. A benchmarking and claims study by Victor O. Schinnerer, one of the world's largest firms underwriting professional liability and specialty insurance programs, found that, from 1995–2004, only 1.3% of claims against Architectural

and Engineering (A/E) firms were made by design–build contractors. They also noted that design–build allows owners to avoid being placed directly between the architect/engineer and the contractor. Design–build places the responsibility for design errors and omissions on the design–builder, relieving the owner of major legal and managerial responsibilities. The burden for these costs and associated risks are transferred to the design–build team.

2.2.2.1.2 Disadvantages of Design and Build Procurement System

This method has however been criticized. The critics of the design–build approach claim that design–build limit the clients' involvements in the design and allege that contractors often make design decisions outside their area of expertise. They also suggest that a designer rather than a construction professional is a better advocate for the client or project owner and/or that by representing different perspectives and remaining in their separate spheres, designers and builders ultimately create better buildings.

Moreover, during the design–build procedure, the contractor is deciding on design issues as well as issues related to cost, profits and time exigencies. Whilst the traditional method of construction procurement dissociates the designers from the contractors' interests, design–build does not. On these grounds it is considered that the design–build procedure is poorly adapted to projects that require a complex and elaborated design for aesthetical or technical purposes.

A notable design–build project that received significant criticism, not only for excessive cost but for environmental issues, was the Belmont Learning Center. The scandal involved alleged contaminated soil that caused significant delays and massive cost overruns. In Los Angeles, District Attorney Steve Cooley, who

investigated the Los Angeles Unified School District's Belmont project, produced a final investigative report, released March, 2003. This report concluded that the design–build process caused a number of issues relating to the Belmont scandal:

1. Design–build does not make use of competitive bidding where prospective builders bid on the same design.
2. Criteria to select contractor is subjective and difficult to evaluate and to justify later.
3. The design and price selected arouses public suspicion, true or not.
4. This can lead to loss of public confidence.

2.3 The Processes and procedures within the Procurement Systems (Traditional and Design & Build)

It is appropriate at this juncture to view the process or flow of activities of the different procurement systems. They have, to a certain extent, indicated the effect of the different procurement system on the project performance, specifically on the duration of the project development and the starting point of the construction. They also show the allocation of duties and responsibilities between the client, design and construction consultants and contractor/s. For comparison purposes, please refer to **Figures 2.2 and 2.3**

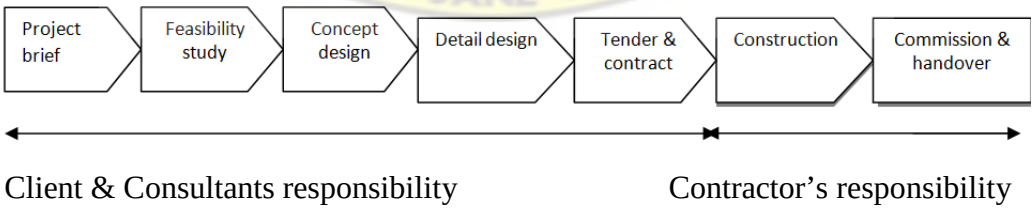

Figure 2.2 – Sequential Process of the Traditional Procurement System

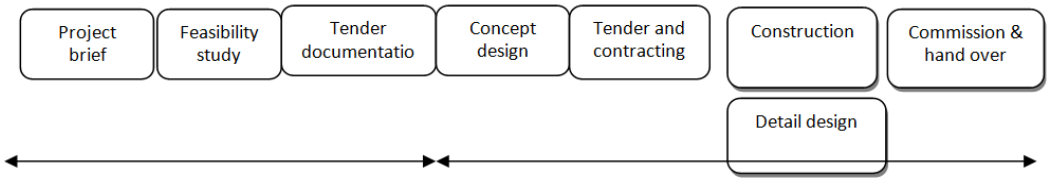

Figure 2.3 – Integrated Process of Design and Build Procurement System

2.4 Composition of the Project Team

A construction project team is a group of people who are responsible for the planning, designing and construction of a project. The team usually consists of the Architect, Engineers, Surveyors, and Quantity Surveyors.

2.4.1 Architect

An architect is a person trained to plan and design buildings, and oversees their construction. To *practice architecture* means to provide services in connection with the design and construction of buildings and the space within the site surrounding the buildings that have as their principal purpose human occupancy or use. Etymologically, *architect* derives from the Latin *architectus*, which derives from the Greek *arkhitekton* (*arkhi-*, chief + *tekton*, builder), i.e., **chief builder**.

Professionally, an architect's decisions affect public safety, and thus an architect must undergo specialized training consisting of advanced education and a *practicum* (or *internship*) for practical experience to earn a license to practice architecture.

The architect has the responsibility to interpret and develop the Clients brief during the various stages of the project and many others. As a member of construction project team, an architect explains the client's requirements to other team members, establishes the preferred solution, advice on materials selection, and also make sure construction is done in accordance with drawings and specifications of the project.

Architects deal with local and federal jurisdictions about regulations and building codes. The architect might need to comply with local planning and zoning laws, such as required setbacks, height limitations, parking requirements, transparency requirements (windows) and land use.

The Architect acts as the leader of the project team and co-ordinates their specialist input with their own. The Architect will prepare and lodge the planning application and building warrants in co-ordination with the rest of the team. During the works on site, the Architect will assist the Clerk of Works in monitoring quality on site. At handover the Architect will assist in ensuring that the works are complete and that the client needs have been met, and will continue their involvement through the defects liability period, and the final resolution of defects. After novation (in the case of a design & build contract), the Architect will work for the contractor and will no longer be in the direct employment or control of the client.

Architects typically put projects to tender on behalf of their clients, advise on the award of the project to a general contractor, and review the progress of the work during construction. They typically review contractor shop and other submittals, prepare and issue site instructions, and provide construction contract administration and Certificates for Payment to the contractor. In many jurisdictions, mandatory certification or assurance of the work is required.

2.4.2 Quantity Surveyor (QS)

A QS is a professional working within the construction industry concerned with building costs. The QS roles are primarily in connection with providing cost advice to the Client throughout all stages of the project. During the pre-contract stage, the QS will assist the Project Manager in providing advice on procurement routes for the

main contractor, preparing the tender documentation, receiving and analysing tenders and preparing the tender report for the Client and recommendations for approval. The QS will prepare the contract documentation on behalf of the Client.

During the contract period the QS monitors the project spend, providing regular reports to the client, and will receive monthly valuations from the main contractor and will check these, before authorising the Architect to approve payment in the form of an Architect's Certificate. The QS also helps in negotiating with the Contractor should any variations or changes occur in the cause of execution of the project that may have a financial implications. After completion of the construction works, the QS has to work hand in hand with the contractor in agreeing the final account. This, normally take up to twelve months or more after completion depending on complexity of the project.

The QS may has other roles and responsibilities such as follows: life cycle cost analysis, preparing the elemental cost plan, preparing bills of quantities if required, assisting with selection of and interviewing of tendering contractors, and dealing with contractors queries.

2.4.3 Construction Engineers

Construction Engineers (made up of structural and services engineers) are individuals who design and direct a construction project. They will handle everything from the design of the construction project to being on hand during the daily construction activities to make sure that everything is going as planned. Depending on a particular project, the role of the construction engineers will vary. However, many construction engineers share the same tasks in various projects.

Construction engineers may design the plans for roads, bridges, pipelines, sewage systems, railroads and more.

In general, construction engineers are responsible for the planning of the construction project. This includes conducting surveys, engaging in research, analyzing results, planning the construction and overseeing it along the way. Construction engineers will also provide information to the pertinent parties and general public to keep them informed and in the case that any issues arise before, during and after the construction. Construction engineers are those who plan the project and advise the workers.

Construction engineers will have to fulfil a variety of specific duties on a daily basis. Prior to even thinking about starting a construction project, Construction engineers will have to survey the area. In conjunction with this they will need to produce reports and environmental statements detailing how the project will be done and what areas it will affect. During the pre-construction phase, the construction engineers will prepare diagrams, charts and surveys showing specific information about the area and the desired project. Once the reports, charts and data have been compiled, the construction engineers will then need to discuss such items with related parties such as builders, environmental agencies and local, state and federal entities. These items may also have to be made available to the general public for their objections to be heard.

The construction engineers must also inspect the site to ensure that the building which will be taken place can be accommodated by that area. Tests will be performed relating to the ground and water level. The construction engineers may also have to determine the grade and elevation levels of the area. Some construction

engineers must determine the costs of their construction projects. This is done by proposing bids and determining the costs of labour and materials to ensure that the project can be carried through in keeping with the budget that has been set aside. This will be an estimation on the part of the construction engineers but it must be as close to the true number as possible. Construction engineers must also provide technical advice to all parties involved with the project. This may relate to any number of topics including the construction of the site to abiding by certain laws, codes and regulations. Construction engineers are something of a jack of all trades in many respects and therefore will be consulted on a number of issues.

As for the engineers, construction engineers precisely, their scope of work involves planning and execution of the designs from transportation, site development, hydraulic environmental, structural and geotechnical engineers. Construction engineers have a lot of responsibilities in their job. Certain tasks have to be completed everyday in order to get the job done correctly. Analyzing reports is a main part of their job description. They must analyze maps, drawings, blueprints, aerial photography and other topographical information. Construction engineers also have to use computer software to design hydraulic systems and structures while following construction codes. They have to calculate load and grade requirements, liquid flow rates and material stress points to ensure that the structure can withstand stress. Keeping a safe workplace is crucial to having a successful construction company. It is construction engineers' job to make sure that everything is conducted correctly. In addition to safety, construction engineers have to make sure that the site stays clean. Surveying the land before construction begins is also a job of the sure that there are no impediments in the way of where the structure will be built and if there are any they must move them. They also must estimate costs and keep the

project under budget. Construction engineers have to test the soils and materials used for adequate strength.

Finally, construction engineers have to provide construction information, including repairs and cost changes, to the managers

2.5 Measuring Performance of Construction Project Team

Initially, researchers and other organisations have focused on the three project performance indicators of cost, time and quality (Dainty et al., 2003; Chan and Chan, 2004; Swan and Khalfan, 2007). In recent times, many studies have included other performance indicators, such as health and safety (Chan and Chan, 2004), environmental performance (Chan and Chan, 2004; Swan and Khalfan, 2007), innovation (Harty, 2008) and customer satisfaction (Chan and Chan, 2004; Collins and Baccarini, 2004). This section therefore reviews indicators for evaluating performance of project team and construction projects as a whole.

2.5.1 Cost / Economic Performance

Traditionally, cost has been seen as one of the most vital areas; because if the economy of the project is off, the project cannot be seen as a success. *Overall project cost*, (that is the overall cost) that a project incurs from inception to completion, is of major interest as it shows the use of resources in economical sense. Another important aspect regards cost predictability, that is, whether the final overall cost is in line with the initial cost estimate (Swan and Khalfan, 2007). *Cost overruns* can be a source of problems for an otherwise successful project as contractors are frequently criticized for the common occurrence of cost overruns (sometimes labelled cost growth) in construction projects (Chan and Chan, 2004).

2.5.2 Time Performance

Globally, there has been increasing importance of time in our societies. This, in no doubt has affected the construction industry positively by shortened project durations. Project duration is the number of days/weeks/months from start to completion of the project. Project duration is often of prime interest since time can be a critical issue for many clients.

Completing projects in a predictable manner on time (within schedule) is an important indicator of project success and the construction industry is frequently criticised for project delays (Chan and Kumaraswamy, 1997; Swan and Khalfan, 2007). Project is often as negative phenomenon since it hinders the client to start using the facility or product as planned.

2.5.3 Quality Performance

More satisfactory time and cost performance is of little value if the project delivered is of inferior quality or does not meet client need / expectation. The concept of quality is closely related to customer satisfaction, which has gradually been elevated in importance in the construction industry (Latham, 1994). Customer satisfaction is commonly described as a comparison between the customer's pre-purchase expectations and their post-purchase perceptions. Hence, it involves the customer's final feelings about whether the outcome provided a satisfying or dissatisfying experience. Since construction industry products are highly customised and co-created during the construction process, the concept of quality regards both the final product and the process during which is created. Therefore, we see two main aspects of quality. First, *quality of end product* has to do with the users' satisfaction with the finished construction and it is a critical success factor (Collins and Baccarini, 2004). It is also related to how the final product and its function meet the specification

(Chan and Chan; 2004, Collins and Baccarini, 2004). The second aspect of quality is the service quality during the construction process, which reflects the client's perception of the process during which project participants interact to create the end product (Maloney, 2002).

2.6 Factors Affecting Performance of Construction Project Team

This section concentrates on the review of factors affecting performance of project team. The review is based on Eriksson (2008) frame. In this study, collaboration and cooperation under procurement systems is reviewed.

2.6.1 Collaboration/ Cooperation as Key Factor

In traditional construction procurement system contracts, contractors are procured after the design work has been done by the client through his/her consultants in order to ensure competitive bidding. This calls for greater collaboration and cooperation between the client, the consultant and the contractor. In Design & Build contracts, contractors are procured very early based on the project brief or sketchy drawings, after which the contractor performs detailed design and proceed to construct the project. Tan (2000) cited in Tam at al, (2006a) states that, collaboration facilitates solutions with high constructability, due to contractor focused design.

The literature shows some positive results for both Design & Build and Traditional procurement systems. Design & Build contracts have shown to provide better value for money and reduced project duration, compared to Traditional (design-bid-build) contracts (Tam, 2000 cited in Tam et al, 2006a). Other studies show that design-bid-build contacts have ensured quality better than Design & Build contracts (Cheung et al., 2001). A complete design before construction also improves budget performance (Chua et al., 1997). The risk for defective design can be decreased by increasing

coordination among the project team. Early involvement of contractors in concurrent engineering facilitates cost saving and shortened project duration due to increased buildability (Rahman and Kumaraswamy, 2004) and reduced rework, increased client satisfaction since the client maintains the possibilities to influence and control the design work and improved environmental performance, work environment, and innovation (Eriksson, 2008).

2.7 The Effect of Procurement Systems on Project Team Performance

After having considered the concept and the working process and procedure of the different project procurement systems, as well as the composition of the project team, general effect of the different system on project team performance is the next in line. As highlighted earlier, the focus of this paper was on the two procurement systems; Traditional system and Design & Build Procurement Systems. The discussion is limited to the main project performance parameters – time, cost and quality.

2.7.1 Traditional Procurement System

2.7.1.1 Time Performance

Due to its linear or sequential approach, the traditional procurement system has been identified as the slowest project delivery approach. However, this approach is more preferable because it provides clear accountability and better design and construction control by the client. Since the pre-contract stage of this system is longer, more time is available for the client and the project team to scrutinize and review the design before construction.

2.7.1.2 Cost Performance

This system provides more price certainty to the client at the very early stage of the project. It also gives the client firmer and more competitive price because the design plus the complete working drawings have been fully developed and detailed out prior to tendering. It eliminates any design or construction ambiguity or uncertainty which often causes the contractors to unnecessarily inflate the price. In the case where bill of quantities is used, the bidding tend to be more fair as such the project cost is also lower. The system also better cost control as such cost increase due to variations is minimized, but works are often disrupted when there are too many variations (due to unforeseeable problems) and it tend to cause the cost to inflate (Masterman, 1996).

2.7.1.3 Quality Performance

The traditional procurement system also provides a high degree of quality certainty and functional standards. It is also a system that provides an opportunity for the building owner to combine the best design, management and construction expertise between consultants and contractor. It also provide more time for client and consultants to review and fully develop the design and specification thus allowing better documentation preparation. However, this system does not provide opportunities for contractor to contribute his construction technology and management expertise because they only come into the scene after the design has been fully developed and approved.

2.7.2 Design and Build Procurement Systems

2.7.2.1 Time Performance

Design and build project procurement system is also called “fast-tracking” or “build-it-fast” project delivery system where the design and construction are integrated. The

design free pre-tender process allow for earlier construction date. It also allows the process of detail design and construction to run almost in parallel and concurrently to each other, thus reducing the overall project development period considerably. As a single entity responsible for both the design and construction, the contractor is able to control not only the construction time but also the time reserved for the design of the project, thus reducing the overall contract duration. In this type of procurement system, the contractor has always been selected based on its vast experience, knowledge and competency in construction, as such by giving it the design responsibility, the contractor very often able to reduce construction time. This is done by him rationalizing the design and construction process and site activities.

2.7.2.2 Cost Performance

Although the cost is fixed at the tender stage and is subject to design changes, it is often higher than the traditional contracting system. Apart from the fact that very limited contractors are invited to submit tenders, the lack of design and specification detailing during tender, has made the contractors to jack up the price to allow for many uncertainties. This is because once accepted, the tender price will be the final contract sum. It is not subject to change, unless there are variations required or instructed by the client. Such additional cost cannot be avoided because under this procurement system the contractor will have to take much of the financial risk.

However, as many have claimed, the significant cost saving in this type of procurement system is made through the reduction of the overall development period. The cost of contractor's uncertainty can be set-off by the reduction in loan interest and early financial return or benefits.

Cost saving may also be made when the contractor applies his construction knowledge and experience to simplify design and work. At the same further cost

saving can be made when the client offer the contractor some form of incentive if he is able to save a significant amount of cost.

2.7.2.3 Quality Performance

The integration of design and construction allows the contractor to utilize his knowledge and experience to develop much compacted and coherent work program and to develop more efficient design and project control programme. At the same time it allows the contractor to be innovative to further improve the construction process and techniques thus allowing for better work and process quality.

However, it is more often found that the quality of work under this contracting system tend to be questionable. The assigning of the designing and construction to a contractor has caused the client to loose control of the design and supervision of the work. This is especially so when the client does have his own team of consultants. As far the contractor is concerned, they tend to cut corners in order to maximize their profit, especially when they feel that they have under price their quotation during tendering for the work.

2.8 The Reasons for Choice of Design & Build over Traditional, Empirical Evidence

Several studies have researched the continuously growing trend towards the use of the design-build delivery method and the shift from other traditional delivery methods. The reasons and factors promoting this trend have been outlined.

Sanvido and Konchar (1997) conducted an empirical study whose goal was to compare the different delivery systems that are widely used in the United States. Construction management at risk, design-build, and design-bid-build were the three main delivery approaches compared, consisted of identifying the performance

metrics for comparison purposes, data collection through a survey, and data analysis. Seven performance metrics were defined to provide criteria for evaluating the projects and the systems used to deliver them. These seven metrics were defined in cost, schedule and quality categories. The data collection phase was achieved using a survey that gathered data for 351 projects. The survey consisted of questions regarding the project delivery methods, the performance metrics, contract types, project team characteristics, and other project specific information. Finally, the project data was analyzed using several statistical methods, including univariate and multivariate regression analysis.

The median scores reported through the results of the research concluded that projects delivered using the design-build approach performed better than those delivered through the construction management at risk or the design-bid-build delivery systems regarding several performance metrics. Specifically, the univariate analysis revealed that design-build projects experienced less cost and schedule growth.

Also, the univariate analysis conducted for the quality metrics indicated that the design-build approach resulted in better start-up quality, fewer call backs, in addition to improved operation and maintenance quality. Moreover, design-build projects performed better than the design-bid-build projects with regards to the envelope, roof, structure and foundation metric. Interior space and layout, together with process equipment and layout metrics had higher mean scores in the case of design-build projects. In conclusion, the study revealed that the design-build delivery system often resulted in time and cost savings. With regard to quality performance and owner satisfaction, the design-build delivery led to a higher or equal quality product than construction management at risk and design-bid-build systems.

In another study that emphasized the importance of the design-build delivery system, Songer and Molenaar (1996) pointed out the rapid growth of this delivery approach and the need to examine the owners' attitudes towards it. The research also aimed at determining a number of selection criteria that lead owners to select the design-build delivery method. These criteria were related to the project duration; budget; number of claims; project size and complexity; and project constructability and innovation. Data was collected through a survey questionnaire that targeted 209 owners with experience in design-build projects. Owners were asked to determine how they rank each of the selection criteria.

Based on means and medians calculations, each selection criterion was assigned an overall ranking. The scores indicated that the primary reason that owners select the design-build delivery method is the possibility of reducing the project duration. The factors that received the least ranking were the large project size and the high level of complexity. Frequency histograms confirmed the owners' attitudes regarding the highest and lowest ranking factors. The research also concluded that the other lower-score criteria could serve as a basis for selecting the design-build delivery method, depending on specific project requirements (Songer and Molenaar 1996).

The Songer and Molenaar (1996) study results were also verified by Tookey et al. (2001) study, which indicated that the owner's requirements with regard to cost, time and quality often impact the delivery system selection decision. For design-build projects, time and budget were the main drivers for the selection of the design-build delivery method. Also, the owners' requirements were mostly directed towards benefiting from contracting with a single entity. These findings were established

through studying several projects and interviewing owners to help formulate a general conclusion.

Another goal of Songer and Molenaar's (1996) research was to compare private and public owners' attitudes toward the design-build approach. The study showed that private and public owners' rankings for the different factors did not significantly differ. Only the criterion of reducing claims ranked significantly differently for both owner types. Public owners were more concerned with reducing the number of claims and thus were more inclined to choose the design build delivery method to mitigate the effects of claims. The study attributed this to the likelihood that claims occur more frequently on public projects and handling them could significantly hinder the project performance.

A research study performed for The National Institute of Standards and Technology (NIST), aimed at assessing and documenting the economic impacts of adopting the design-build delivery method (Thomas et al., 2002). The study methodology relied on comparing the performance of projects, submitted by either owners or contractors, present in the CII Benchmarking and Metrics database. The research focused only on design-build and design-bid-build projects that were evaluated based on two categories: performance metrics and practice use metrics. The performance category consisted of cost, schedule, safety, changes, and rework metrics. The practice use category consisted of the pre-project planning, constructability, team building, zero accident techniques, project change management, design/information technology, materials management, planning for startup, and quality management metrics. The results of the performance and practice use comparisons revealed that the design-build delivery approach performed better regarding cost in the case of

owner submitted projects (Thomas et al., 2002). Regarding contractor-submitted projects, although no significant differences were detected between design-build and design-bid-build delivery systems, design-build projects showed better performance in rework and practice use. Statistical tests also concluded that design-build projects were performing significantly better with respect to the changes in project scope measure.

2.9 Chapter Summary

The literature review considered both published and unpublished literature and was organised around the following issues procurement systems (traditional and design & build) and project team: advantages and disadvantages of the two procurement systems and their processes, composition of project team and measurement of its performance as well as factors affecting its performance.

Procurement systems reviewed in this literature were traditional and design & build. Their advantages and disadvantages in terms of performance measures (thus cost, quality and time) were considered under each of the systems. The test of project team performance on project as far this study is concerned is whether the team is able to execute the project within the estimated cost, at right quality of specification and within the schedule of time. The degree of achievement of this will depend on the type of procurement system selected.

Composition of project team focuses on the individuals and body of professionals and the experts to be recruited as well as their roles and their responsibilities as team members. Project team performance is measured regarding their roles and how effective they perform them.

Through the review, no substantive information was found which relates to the following important issues for performance of project team under Traditional and Design & Build procurement systems:

1. the critical roles of project team under the procurement systems
2. the effectiveness of performance of roles of project team under the procurement systems
3. the impact of the procurement systems on project team performance

These identified gaps in knowledge guided the setting of the key research questions for this study

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter highlights on the research method employed by examining the techniques and procedures used in carrying out the study. The chapter covers research approach, population, sampling technique, data collection approach, and data analysis and presentation techniques adopted for the study.

3.2 Research Approach

This research took the form of literature review and survey using questionnaire approach from construction professionals in the construction industry in Kumasi Metropolis who have worked or currently working on projects procured through traditional and design & build procurement systems.

3.3 Population of the Study

The population of this study is construction professionals working in formal and informal sector in Kumasi Metropolis of Ashanti region who undertake projects under both Traditional and Design & Build procurement systems. Thus the size of the population for the study was not definite.

3.3.1 Sampling and Sample Size

The difficulty of collecting data from the whole population due to financial, time and other constraints make sampling inevitable element in research work. The process of sampling makes it possible to limit a study to a relatively small portion of the population. A sample can be said to be a representative selection of a population that is investigated into in acquiring statistical information of the whole.

In this study, snow ball sampling technique was employed in the identification and selection of the respondents. This special non-probability sampling method was used because the desired sample characteristic is rare and it was extremely difficult to locate respondents in this situation. Thus the sampling for the study relied on referrals from initial subjects to generate additional subjects. In other words few respondents were initially contacted who led the researcher to other respondents with similar characteristic that were looking for in the research.

The population size or the sample frame for the study could not be determined, the reason been that the population is not definite and there was no statistical data on the population. According to Patton, (1990), non-probability is what is needed in a study in which the population is clearly defined and relatively limited group and helps to identify most suitable respondents. Lisa, (2008) also said non-probability sampling such as snowball sampling can be applied to research in a number of ways such as, sampling informants with a specific type of knowledge or skill.

From Table 3.1 below, twenty-eight (28) questionnaires were returned completed. However, one (1) of the questionnaires was discarded because most of the questions were having more than two answers while some were not completely answered. The reason for this was not known to the researcher. Twenty-seven (27) were therefore usable for the analysis, representing a response rate of 90 percent. The response rate is the proportion of completed questionnaires in the total number of eligible respondents and according Coffey, et al, (1996) cited in Asare, (2008) the higher response rate demonstrates validity of the study findings. This influenced the researcher's effort to ensure considerable high response rate from the survey questionnaires.

Table 3.1 Response Rate of Respondents

Types of Respondents	Number of Questionnaire Sent	Number Returned	Number Responsive	Percentage Responsive
Architects	6	5	5	83.3
Quantity Surveyors	9	8	8	88.9
Engineers	10	10	10	100.0
Land Surveyors	5	5	4	80.0
Total	**30**	**28**	**27**	**90.0**

Source: Researcher's Field Survey, 2013

3.4 Collection and Processing of Data

This looks at the data collection instrument employed and how the data collected was processed. The data required for the research included the key roles and effective performance of project team roles under Traditional and Design & Build procurement systems, and the impact the procurement systems on the project team performance.

The study used both secondary and primary sources of data. The secondary sources included both published and unpublished reports on the subject under investigation. The primary data was gathered using structured questionnaires.

3.4.1 Data Collection Instruments and Method

The selection of data collection tools and methods is very significant in every research. This is due to the fact that the choice of an appropriate tool offers adequate flexibility in addressing respondents differently while investigating into the phenomenon understudy. The data collection instruments employed for the research

was questionnaire. In this, a number of close ended questions were posed and administered, targeting only project team members. The questions were made up of;

1. the determination of critical roles performed by the project team under the two procurement systems
2. The impact of procurement systems on the performance of the identified roles

3.4.2 Processing of Data and Analysis

The data collected were processed and edited. The data were presented in tables such as frequency means and standard deviation tables. The analyses of data was done using descriptive statistics with each research question analyzed and discussed and data on each research question presented in tabular form. Based on the information provided by the respondents, mean scores of the data were computed to deduce their rankings. The data was analyzed by ranking the various roles that the project team perform as well as the levels of effectiveness of the roles under the Traditional and Design & Build procurement systems. The ratings of identified roles made by respondents against the five-point scale were combined and converted to deduce the mean score.

A role with the highest mean is taken to be the most performed roles and ranked 1 followed by the next highest mean in that order. Any role that scored below the cut off mean of three (3) was considered a role not key to their work under the respective procurement system. Such roles were thus drop during the second stage of the analysis which was to determine the effectiveness of the key roles performed by the construction project team under the two selected procurement systems.

3.6 Profile of the Study Area (Kumasi Metropolis)

The city of Kumasi was founded in the 1680's by King Osei Tutu I to serve as the capital of the Asante State (Fynn, 1971 from google on September 17, 2013). The Kumasi Metropolis is centrally located in the Ashanti Region of Ghana. Its unique central position makes it accessible from all corners of the country. Kumasi is the second city of Ghana in terms of land area, population size, social life and economic activity and the administrative capital of Ashanti. It is a fast growing Metropolis with an estimated population of 1,468,609 or more according to the growth rate of 5.47% per annum and this accounts for just under a third (32.4%) of the Ashanti region's population, and about 7% of Ghana population (Ghana Statistical Service, 2010). The Metropolis covers about 254 km² land area; its physical structure is basically circular with a central located commercial area.

There are concentrations of economic activities in the city. The first and most important location is the Central Business District (CBD), which embraces the Kejetia Lorry Park, the Central Market and the Adum Shopping Centre. The other economics nodes include the Suame Magazine (Vehicle repair centre) the Kaase/Asokwa Industrial Area and the Anloga Wood Market. Most industries which deal in Timber processing, logging, Food processing and Soap making are concentrated at the Kaase/Asokwa Industrial Area. There is also number of satellite markets in the metropolis. These include Asafo Market, Bantama Market, Oforikrom Market and Atonsu Markets.

The strategic location of Kumasi has also endowed it with the status of the principal transport terminal and has assured its pivotal role in the vast and profitable distribution of goods in the country and beyond.

Kumasi is located in the transitional forest zone with the following weather conditions: 24°C, wind north east (NE) at 3 km/h, 88% humidity and is about 270km north of the national capital, Accra. It is between latitude 6.35o – 6.40o and longitude 1.30o – 1.35o, an elevation which ranges between 250 – 300 metres above sea level with an area of about 254 square kilometres. The unique centrality of the city as a traversing point from all parts of the country makes it a special place for many to migrate to. The metropolitan area shares boundaries with Kwabre East District to the north, Atwima District to the west, Ejisu-Juaben Municipal to the east and Bosomtwe to the south. See figure 3.1

It's beautiful layout and greenery has accorded it the accolade of being the "Garden City of West Africa". From the three communities of Adum, Krobo and Bompata, it has grown in a concentric form to cover an area of approximately ten (10) kilometers in radius. The direction of growth was originally along the arterial roads due to the accessibility they offered resulting in a radial pattern of development. The city is a rapidly growing one with an annual growth rate of 5.47 per cent (Regional Statistical Office, Kumasi). It encompasses about 90 suburbs, many of which were absorbed into it as a result of the process of growth and physical expansion.

3.6.1 Kumasi Metropolitan Assembly (KMA)

Kumasi Metropolitan Assembly is a body mandated by law to steer the affairs of the Kumasi Metropolis.

3.6.1.1 Functions of KMA

The detailed functions of this Assembly are set out in the **LI 1614** of **1995**. The execution of these laudable functions such as provision of socio-economic services

requires efficient and effective mobilization and utilization of material, human and financial resources to improve the lives of the residents of the metropolis.

3.6.2 Mission & Vision Statement of KMA

3.6.2.1 Mission:

The Kumasi Metropolitan Assembly is committed to improving the quality of life of the people in the metropolis though the provision of essential service and creation of an enabling environment to ensure the total and sustainable development of the city.

The mission of the Assembly is in tandem with the prime functions of District Assemblies as stated in the Local Government Act of 1993, Act 462, section 10, thus the District 'Shall be responsible for the overall development of the district and shall formulate and execute plans, programmes and strategies for the effective mobilization of the resources necessary for the overall development of the district.

3.6.2.2 Vision:

To develop Kumasi into a safe and vibrant city by improving city management through good governance, local economic development, tourism promotion improved sanitation, improved environmental and social services as well as spatial and infrastructure development.

Location of study area within the map of Ghana and Ashanti Region

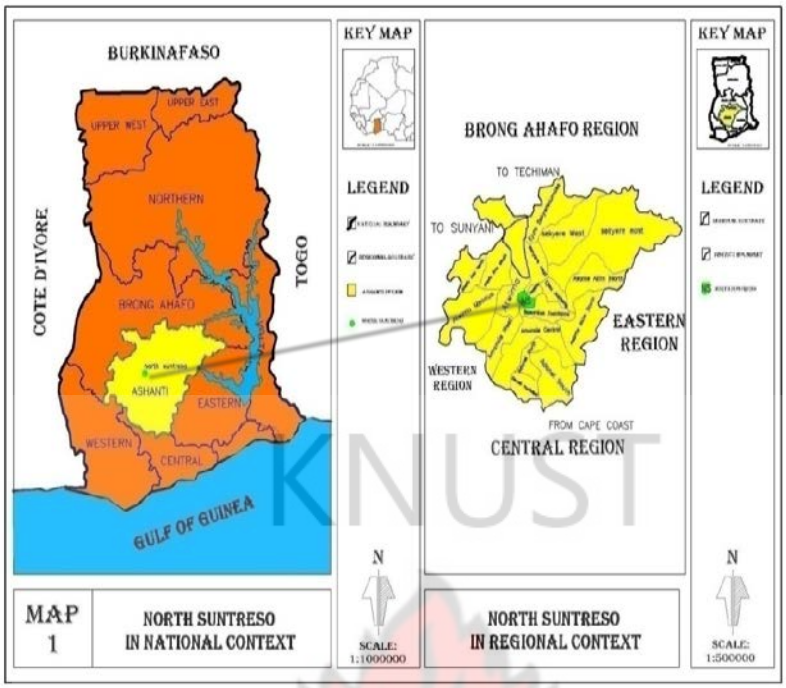

Figure 3.1 Location of Study Area

3.7 Summary of Chapter Three

The research methodology adopted for the study was introduced at the early stage of this chapter. Survey was identified as the most appropriate approach for collecting the relevant data. The survey characteristics including the sample size and techniques for collecting the relevant data have also been explained. The analytical tool employed has been given mentioned. Analysis of data, which is mainly descriptive analysis is been addressed in the next two chapters.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

The aim of this study has been to determine the effect of procurement systems (traditional and design & build) on project team performance. The information gathered from the questionnaire survey issued to the respondents is analyzed in this chapter. In order to achieve the objectives of the study as was presented in section 1.3, the presentation and discussion of data was done in accordance with the arrangement of objectives of the study.

4.2 Characteristics of Respondents (Personal Data)

Personal data of the respondents who were all construction project team professionals working in Kumasi Metropolis were composed of four items, namely: age, highest level of education, years of experience and professional body affiliation.

Table 4.1: Cross Tabulation of Characteristics of Respondents

	Variable	Architect	Quantity Surveyor	Engineer	Land Surveyor	Total
(Age)	18-24yrs	0 (0%)	0(0%)	0(0%)	0(0%)	0(0%)
	25-34yrs	0 (0%)	2 (50%)	2 (50%)	0 (0%)	4 (100%)
	35-44yrs	3 (19%)	4 (25%)	6 (38%)	3 (19%)	16 (100%)
	45-54yrs	2 (33%)	1 (17%)	2 (33%)	1 (17%)	6 (100%)
	55& above	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)
(Experi-ence)	1-5yrs	0 (0%)	0 (0%)	4 (100%)	0(0%)	4 (100%)
	6-10yrs	1 (7%)	6 (43%)	4 (29%)	3(21%)	14 (100%)
	11-15yrs	3 (50%)	1 (17%)	2 (33%)	0(0%)	6 (100%)
	16 & above	1 (33.3%)	1 (33.3%)	0 (0%)	1 (33.3%)	3 (100%)
(Highest Educati-onal Level)	HND / CTC	0 (0%)	1 (33.3%)	1 (33.3%)	1 (33.3%)	3 (100%)
	BSc./BA	1 (6%)	5 (31%)	7 (44%)	3 (19%)	16 (100%)
	MSc./MBA / MPhil	4 (50%)	2 (25%)	2 (25)	0 (0%)	8 (100%)

Professi-onal Qualific-ation)	GhIE	0 (42%)	0 (0%)	7 (58%)	0 (0%)	7 (100%)
	IIE	0 (0%)	2 (29%)	5 (71%)	0 (0%)	7 (100%)
	GhIS	0 (0%)	4 (44.4%)	1 (1.1)	4 (44.4%)	9 (100%)
	GhIA	5 (100%)	0 (0%)	0 (0%)	0 (0%)	5 (100%)
	CIB	0 (0%)	3 (60%)	2 (40%)	0 (0%)	5 (100%)

Source: Field Data, 2013

More than half of the respondents (59.3%) fall between age brackets of 35 to 44 years, this is followed by the age bracket of 45 to 54 years which is 22.2%, 1.1% were from ages of 25 to 34 years and finally the age brackets of 18 to 24 years and above 55 years having a common percentage point of 3.7. This findings means that construction project team requires professionals with high level of experience which could not be easily obtained at the early ages of 18 to 24 years. Professionals from ages of 35 to 44 years are people at their peak in terms of strength and experience therefore makes it productive for their recruitment to work as construction project team members. This may be said to be the reason why this age bracket has the highest number of respondents falling within it

It can further be seen from Table 4.1, that out of four (4) respondents who fell within the age group of 25-34 years, 50% were Quantity Surveyors and the other 50% were Engineers; none was an Architect or Land Surveyor. Only one (1) respondent fell within the age of 55 years and above, and the fellow was a Quantity Surveyor. At

least a Quantity Surveyor respondent (construction project team member) fell within the age brackets of 35-44 years and 45-54 years.

This suggests that quantity surveying profession in Ashanti Region has uniform age distribution compared with other professionals; the old with a lot of experience and the young with more energy and strength.

Table 4.1 shows the years of experience of the respondents in the construction industry. 14 out of 27 and 6 out of 27of the respondents have experience of 6 to 10 years and 11 to 15 years respectively in the construction industry. This gives an indication that the respondents had enough experience in the profession and high level of experience that makes the answers from the them more reliable for the study. From table 4.1, it can be seen that 16 out of 27 of the respondents are BSc/BA graduates and 8 out of 27 holds post graduates certificates. The remaining 11.1% are technicians and diploma holders. It goes on to affirm the fact that respondents were people with required educational qualification to give right answers to the questions posed to them in the structured questionnaire.

Table 4.1 shows that, some of the professionals of the construction project team belong to more than one professional body. This is notwithstanding the fact that few of the team members belong to none of the professional bodies. This gives an indication that the respondent were made up of purely professionals.

4.3 Roles of Construction Project Team and Procurement Systems

A question in the questionnaire was aimed at determining the respondents' key roles under the two procurement systems. Respondents were asked how often/frequent they performed roles as was taken from the literature. The rating of "1 = not at all, 2 = not often, 3 = quite often, 4 = often and 5 = very often" was used to determine the respondents roles. A role with the highest mean is taken to be the most performed roles and ranked number one followed by the next higher mean in that order. Any role that scored below the cut off mean of 3 was considered a role not key to their work under the respective procurement systems. Such roles were thus drop during the second stage of the analysis which was to determine the effectiveness of the key roles performed by the construction project team under the two selected procurement systems.

This section discusses the rate at which the Architects, Quantity Surveyors, Engineers and Land Surveyors perform their roles under the two procurement systems.

4.3.1 Key Roles of Architects

Table 4.2a shows the mean, standard deviation and the ranking of the listed roles. From table 4.2a the key roles perform by Architects under both procurement systems are the same, because in both cases they all have mean score of equal or above three (3). However, from Table 4.2b, with the exception of "ensuring that project cost is within estimated cost and ensuring that project is complete work as scheduled", all other roles have different order of importance under the two systems according to their respective mean values.

Critically, it could be said that the order of importance of roles of Architects differ under the two procurement systems. Therefore the performance of roles of Architects is influenced by the procurement system used.

Table 4.2a: Roles of Architects

Roles	Traditional System			Design & Build System		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Preparation of design/drawings	3.6	0.548	4	3.6	0.548	6
Developing and interpreting drawings	3.0	0.000	8	4.2	0.447	2
Advice on material/equipment selection	4.0	0.000	2	4.0	0.000	5
Manage health and safety issues	3.4	0.548	6	4.2	0.447	3
Leading project team	3.8	0.447	3	4.6	0.548	1
Ensuring coordination between project team and stakeholders	3.6	0.548	5	3.2	0.447	8
Ensuring that project team complete work as scheduled	3.0	0.707	9	3.2	0.447	9
Ensuring that project cost is within estimated cost	3.2	0.447	7	3.6	0.548	7
Ensuring that client expectations are met (in terms of quality)	4.6	0.548	1	4.2	0.447	4

Source: Field Data, 2013

Table 4.2b: Roles of Architects Ranked in Order of Importance

Traditional		Design & Build	
Roles	**Rank**	**Roles**	**Rank**
Ensuring that client expectations are met (in terms of quality)	1	Leading project team	1
Advice on material/equipment selection	2	Developing and interpreting drawings	2
Leading project team	3	Manage health and safety issues	3
Preparation of design/drawings	4	Ensuring that client expectations are met (in terms of quality)	4
Ensuring coordination between project team and stakeholders	5	Advice on material/equipment selection	5
Manage health and safety issues	6	Preparation of design/drawings	6
Ensuring that project cost is within estimated cost	7	Ensuring that project cost is within estimated cost	7
Developing and interpreting drawings	8	Ensuring coordination between project team and stakeholders	8
Ensuring that project team complete work as scheduled	9	Ensuring that project team complete work as scheduled	9

Source: Field Data, 2013

4.3.2 Key Roles of Quantity Surveyors

As can be seen from table 4.3a, that similar key roles are performed by QSs under both procurement systems, against the background of each of the roles having a mean score of equal or above 3. Notwithstanding this Table 4.3b, explains that apart from the following four roles: “ensuring that client expectations are met (in terms of quality), ensuring that project cost is within estimated cost, ensuring coordination

between project team and stakeholders, and ensuring that project team complete work as scheduled", all other roles have different order of importance according to their respective mean values.

As a result of the above, it could be deduced that, QSs rules in order of importance differ under the two procurement systems. Therefore the performance of roles of QSs depends heavily on the procurement system used.

Table 4.3a: Roles of Quantity Surveyors

Roles	Traditional System			Design & Build System		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Advice on preparation and submission of tender	4.00	0.756	3	3.75	0.463	6
Monitoring construction budget	3.88	0.641	4	4.25	0.707	2
Evaluation of variation in contract	3.88	0.641	5	4.00	0.535	3
Checking valuation report before sending it for payment	3.62	0.518	6	3.88	0.744	4
Regular report on project to management of the firm	4.25	0.707	2	3.88	0.641	5
Ensuring coordination between project team and stakeholders	3.25	0.463	8	3.50	0.535	8
Ensuring that project team complete work as scheduled	3.12	0.354	9	3.50	0.535	9
Ensuring that project cost is within estimated cost	4.62	0.518	1	4.88	0.354	1
Ensuring that client expectations are met (in terms of quality)	3.50	0.535	7	3.75	0.463	7

Source: Field Data, 2013

Table 4.3b: Roles of QSs Ranked in Order of Importance

Traditional		Design & Build	
Roles	**Rank**	**Roles**	**Rank**
Ensuring that project cost is within estimated cost	1	Ensuring that project cost is within estimated cost	1
Regular report on project to management of the firm	2	Monitoring construction budget	2
Advice on preparation and submission of tender	3	Evaluation of variation in contract	3
Monitoring construction budget	4	Checking valuation report before sending it for payment	4
Evaluation of variation in contract	5	Regular report on project to management of the firm	5
Checking valuation report before sending it for payment	6	Advice on preparation and submission of tender	6
Ensuring that client expectations are met (in terms of quality)	7	Ensuring that client expectations are met (in terms of quality)	7
Ensuring coordination between project team and stakeholders	8	Ensuring coordination between project team and stakeholders	8
Ensuring that project team complete work as scheduled	9	Ensuring that project team complete work as scheduled	9

Source: Field Data, 2013

4.3.3 Key Roles of Engineers

Table 4.4a shows the key roles perform by Engineers under both procurement systems as the same; arguing from the point that in both systems, the roles have mean score of equal or above 3. Interestingly, from Table 4.4b, the first four (4)

ranked in order of importance roles are the same in both systems. The rest of the ranking however, differ under the two systems.

Once again, it is quite obvious that the key roles of Engineers differ in order of importance hence the performance of key roles of Engineers is influenced by the procurement systems.

Table 4.4a: Roles of Engineers

Roles	Traditional System			Design & Build System		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Interpretation of charts, diagrams and transfer/ convey needed information on paper to the ground	3.20	0.422	7	3.10	0.316	8
Preparation of engineering design/drawings	3.20	0.422	8	3.30	0.483	6
Developing and interpreting drawings	3.30	0.483	6	3.40	0.516	5
Manage health and safety issues	3.50	0.527	5	3.20	0.789	7
Ensuring coordination between project team and stakeholders	3.90	0.738	1	4.10	0.738	1
Ensuring that project team complete work as scheduled	3.80	0.632	3	4.00	0.667	3
Ensuring that project cost is within estimated cost	3.60	0.699	4	3.70	0.483	4
Ensuring that client expectations are met (in terms of quality)	3.90	0.568	2	4.10	0.738	2

Source: Field Data, 2013

Table 4.4b: Roles of Engineers Ranked in Order of Importance

Traditional		Design & Build	
Roles	**Rank**	**Roles**	**Rank**
Ensuring coordination between project team and stakeholders	1	Ensuring coordination between project team and stakeholders	1
Ensuring that client expectations are met (in terms of quality)	2	Ensuring that client expectations are met (in terms of quality)	2
Ensuring that project team complete work as scheduled	3	Ensuring that project team complete work as scheduled	3
Ensuring that project cost is within estimated cost	4	Ensuring that project cost is within estimated cost	4
Manage health and safety issues	5	Developing and interpreting drawings	5
Developing and interpreting drawings	6	Preparation of engineering design/drawings	6
Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	7	Manage health and safety issues	7
Preparation of engineering design/drawings	8	Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	8

Source: Field Data, 2013

4.3.4 Land Surveyors

Judging from Table 4.5a, one can say the key roles perform by Land Surveyors under both Traditional and Design & Build procurement systems are the same or similar due to their mean score of key roles been equal or above three. Additionally,

Table 4.5b demonstrates that 7 out of 9 key roles are ranked differently in order of importance under both systems.

Finally, it is found that key roles of Land Surveyors differ in order of importance, meaning the performance of key roles of Surveyors is influenced by the procurement systems.

Table4.5a: Roles of Land Surveyor

Roles	Traditional System			Design & Build System		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Interpretation of charts, diagrams and transfer/ convey needed information on paper to the ground	3.50	0.577	3	3.25	0.500	7
Conducting environmental impact analysis on project	3.50	0.577	4	3.75	0.500	3
Give technical advice on building laws, codes and regulations	4.25	0.500	1	4.50	0.577	1
Engaging stakeholder of a project on discussion of survey report	4.25	0.500	2	4.50	0.577	2
Advice to workers on a project	3.25	0.500	5	3.75	0.500	4
Ensuring coordination between project team and stakeholders	3.25	0.500	6	3.50	0.577	6
Ensuring that project team complete work as scheduled	3.25	0.500	7	3.75	0.500	5
Ensuring that project cost is within estimated cost	3.25	0.500	8	3.25	0.500	8
Ensuring that client expectations are met (in terms of quality)	3.00	0.000	9	3.25	0.500	9

Source: Field Data, 2013

Table 4.5b: Roles of Land Surveyors Ranked in Order of Importance

Traditional		Design & Build	
Roles	**Rank**	**Roles**	**Rank**
Give technical advice on building laws, codes and regulations	1	Give technical advice on building laws, codes and regulations	1
Engaging stakeholder of a project on discussion of survey report	2	Engaging stakeholder of a project on discussion of survey report	2
Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	3	Conducting environmental impact analysis on project	3
Conducting environmental impact analysis on project	4	Advice to workers on a project	4
Advice to workers on a project	5	Ensuring that project team complete work as scheduled	5
Ensuring coordination between project team and stakeholders	6	Ensuring coordination between project team and stakeholders	6
Ensuring that project team complete work as scheduled	7	Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	7
Ensuring that project cost is within estimated cost	8	Ensuring that project cost is within estimated cost	8
Ensuring that client expectations are met (in terms of quality)	9	Ensuring that client expectations are met (in terms of quality)	9

Source: Field Data, 2013

From the discussion in this section, the following have been found:

1. The key roles of the construction project team under the two procurement systems do not vary.

2. However, the level of importance attached to the identified key roles varies with the two systems i.e. Traditional procurement system and Design & Build procurement system.
3. Leadership role with regards to team members changes under the two procurement systems.

4.4. Effectiveness of Performance of Roles of Project Team

In order to achieve objective two, a question in the questionnaire was aimed at determining the effectiveness of performance of respondents' roles under the two procurement systems. Respondents were asked how effective they perform roles as was listed in the questionnaire. The rating of "1 = not effective, 2 = quite effective, 3 = effective, 4 = very effective and 5 = most effective" was used to determine the effectiveness of performance of project team roles under Traditional and Design & Build procurement systems. A role with the highest mean is taken to be the most effectively performed roles and ranked number one followed by the next higher mean in that order. Any role that scored a mean of less than 3 pointed is considered as not effectively performed under the respective procurement system.

This section discusses how effectively Architects, QSs, Engineers and Land Surveyors perform their roles as identified in section 4.4 under the two procurement systems as follows.

4.4.1 Effectiveness of Architects Roles

Table 4.6a shows the mean, standard deviation and the ranking of the effectiveness of the listed roles performed by Architects. From the Tables 4.6a and 4.6b, with the exception of "Ensuring that project cost is within estimated cost" (which is considered not effective under Traditional system), all the rest of roles perform by

Architects were effective. However, the ranking of the level of effectiveness varies under the two procurement systems. Although few are ranked the same, it could be argued that the mean scores differ hence changes in effective performance of Architects roles under the two procurements systems.

Table 4.6a: Effectiveness of Performance of Architects roles

Performance of Roles	Traditional System			Design & Build System		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Preparation of design/drawings	4.20	0.447	1	4.00	0.707	3
Developing and interpreting drawings	4.00	0.707	2	4.20	0.447	1
Advice on material/equipment selection	4.00	0.000	3	4.20	0.447	2
Manage health and safety issues	3.40	0.548	5	3.60	0.548	5
Leading construction project team	3.80	0.447	4	4.00	0.548	4
Ensuring coordination between project team and stakeholders	3.40	0.548	6	3.60	0.548	6
Ensuring that project team complete work as scheduled	3.20	0.447	7	3.40	0.894	8
Ensuring that project cost is within estimated cost	2.80	0.447	9	3.00	0.707	9
Ensuring that client expectations are met (in terms of quality)	3.20	0.837	8	3.60	0.548	7

Source: Field Data, 2013

Table 4.6b: Ranking of Effectiveness of Performance of Architects roles

Traditional		Design & Build	
Roles	**Rank**	**Roles**	**Rank**
Preparation of design/drawings	1	Developing and interpreting drawings	1
Developing and interpreting drawings	2	Advice on material/equipment selection	2
Advice on material/equipment selection	3	Preparation of design/drawings	3
Leading construction project team	4	Leading construction project team	4
Manage health and safety issues	5	Manage health and safety issues	5
Ensuring coordination between project team and stakeholders	6	Ensuring coordination between project team and stakeholders	6
Ensuring that project team complete work as scheduled	7	Ensuring that client expectations are met (in terms of quality)	7
Ensuring that client expectations are met (in terms of quality)	8	Ensuring that project team complete work as scheduled	8
		Ensuring that project cost is within estimated cost	9

Source: Field Data, 2013

4.4.2 Effectiveness of Quantity Surveyor's Roles

Only one of the roles (ensuring that client expectations are met) is considered not effective because its mean score is less than 3, the rest are all effective roles perform by QSs under the two procurement systems. On the other hand, level of effectiveness of the roles varies under the two systems; although they were all ranked same they

have different respective mean scores under each system. This affirms the fact that the performance of QSs roles varies under each procurement system.

Table 4.7a: Effectiveness of Performance of QSs

Performance of Roles	Traditional System			Design & Build System		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Advice on preparation and submission of tender	4.25	0.707	1	4.50	0.756	1
Monitoring construction budget	4.25	0.886	2	4.50	0.756	2
Evaluation of variation in contract	3.88	1.126	5	4.25	1.126	5
Checking valuation report before sending it for payment	4.00	1.069	4	4.50	0.756	3
Regular report on project to management of the firm	3.38	0.744	6	3.38	0.916	7
Ensuring coordination between project team and stakeholders	3.25	0.886	7	3.50	0.756	6
Ensuring that project team complete work as scheduled	3.12	0.354	8	3.25	0.463	8
Ensuring that project cost is within estimated cost	4.12	0.835	3	4.50	0.756	4
Ensuring that client expectations are met (in terms of quality)	2.88	0.354	9	3.12	0.641	9

Source: Field Data, 2013

Table 4.7b: Ranking of Effectiveness of Performance of QSs

Traditional		Design & Build	
Roles	**Rank**	**Roles**	**Rank**
Advice on preparation and submission of tender	1	Advice on preparation and submission of tender	1
Monitoring construction budget	2	Monitoring construction budget	2
Ensuring that project cost is within estimated cost	3	Checking valuation report before sending it for payment	3
Checking valuation report before sending it for payment	4	Ensuring that project cost is within estimated cost	4
Evaluation of variation in contract	5	Evaluation of variation in contract	5
Regular report on project to management of the firm	6	Ensuring coordination between project team and stakeholders	6
Ensuring coordination between project team and stakeholders	7	Regular report on project to management of the firm	7
Ensuring that project team complete work as scheduled	8	Ensuring that project team complete work as scheduled	8
		Ensuring that client expectations are met (in terms of quality)	9

Source: Field Data, 2013

4.4.3 Engineers

From Tables 4.8a and 4.8b, six of the Engineers roles are considered effective while two are not, under the two systems. However, the roles have varied mean scores (although some ranked the same) under the two systems, hence different level of effectiveness of performance under each system.

Table 4.8a: Effectiveness of Performance of Engineers

Performance of Roles	Traditional System			Design & Build System		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Interpretation of charts, diagrams and transfer/ convey needed information on paper to the ground	3.50	0.850	4	3.40	0.966	4
Preparation of engineering design/drawings	3.90	0.876	2	4.00	1.054	1
Developing and interpreting drawings	3.10	0.568	6	3.20	0.789	5
Manage health and safety issues	4.10	0.568	1	3.90	0.568	2
Ensuring coordination between project team and stakeholders	3.60	0.843	3	3.90	0.738	3
Ensuring that project team complete work as scheduled	2.70	0.483	8	2.90	0.568	7
Ensuring that project cost is within estimated cost	2.80	0.789	7	2.80	0.789	8
Ensuring that client expectations are met (in terms of quality)	3.20	0.789	5	3.20	0.632	6

Source: Field Data, 2013

Table 4.8b: Ranking of Effectiveness of Performance of Engineers

Traditional		Design & Build	
Roles	**Rank**	**Roles**	**Rank**
Manage health and safety issues	1	Preparation of engineering design/drawings	1
Preparation of engineering design/drawings	2	Manage health and safety issues	2
Ensuring coordination between project team and stakeholders	3	Ensuring coordination between project team and stakeholders	3
Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	4	Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	4
Ensuring that client expectations are met (in terms of quality)	5	Developing and interpreting drawings	5
Developing and interpreting drawings	6	Ensuring that client expectations are met (in terms of quality)	6

Source: Field Data, 2013

4.4.4 Land Surveyors

From Tables 4.9a and 4.9b, five effective roles are performed by Land Surveyors under Traditional procurement system while eight are under Design & Build. Some of the roles that are under both systems have varied rankings and mean scores. This demonstrates the effect of the procurement systems on the performance of roles of Land Surveyors.

Table 4.9a: Effectiveness of Performance of Land Surveyors

Performance of Roles	Traditional System			Design & Build System		
	Mean	Std. Dev.	Rank	Mean	Std. Dev.	Rank
Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	3.25	0.957	1	3.50	1.291	4
Conduct environmental impact analysis on project	3.25	0.957	2	3.50	0.577	5
Give technical advice on building laws, codes and regulations	3.25	0.500	3	3.75	0.500	2
Engage stakeholder of a project on discussion of survey report	3.25	0.957	4	4.00	0.816	1
Advice to workers on a project	3.00	0.816	5	3.75	0.500	3
Ensuring coordination between project team and stakeholders	2.75	0.500	6	3.25	0.500	6
Ensuring that project team complete work as scheduled	2.75	0.500	7	3.00	0.000	7
Ensuring that project cost is within estimated cost	2.75	0.500	8	3.00	0.000	8
Ensuring that client expectations are met (in terms of quality)	2.50	0.577	9	2.75	.0500	9

Source: Field Data, 2013

Table 4.9b: Ranking of Effectiveness of Performance of Land Surveyors

Traditional		Design & Build	
Roles	**Rank**	**Roles**	**Rank**
Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	1	Engage stakeholder of a project on discussion of survey report	1
Conduct environmental impact analysis on project	2	Give technical advice on building laws, codes and regulations	2
Give technical advice on building laws, codes and regulations	3	Advice to workers on a project	3
Engage stakeholder of a project on discussion of survey report	4	Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground	4
Advice to workers on a project	5	Conduct environmental impact analysis on project	5
		Ensuring coordination between project team and stakeholders	6
		Ensuring that project team complete work as scheduled	7
		Ensuring that project cost is within estimated cost	8

Source: Field Data, 2013

From the above discussion in this section, it has been found that, Traditional and Design &Build procurement system have different levels of effectiveness of performance for most of the roles of construction project team members.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this concluding chapter, major findings of the study are discussed as well as providing key recommendations to policy makers and implementers and also outlines recommendations for further research. Also contained in this chapter are the limitations of the study.

5.2 Summary of Findings

From the review of literature and analysis of the survey results, the findings are summarized as follows:

1. The key roles of the construction project team under the two procurement systems do not vary.
2. However, the levels of importance attached to the identified key roles vary with the two systems i.e. Traditional and Design and Build procurement systems.
3. Leadership role with regards to team members changes under the two procurement systems.
4. Traditional and Design &Build procurement systems have different levels of effectiveness of performance for most of the roles of construction project team members.
5. Procurement systems dose influences performance level of construction project team members.

5.3 Conclusions

Based on the above literature review and the analysis of the survey results it could be concluded that all the research objectives as stated in section 1.3 have been achieved (under the consideration of the research approach adopted and the limitations of the study).The choice of a building procurement system does influence the performance of construction project team.

5.4 Recommendations

The following recommendations can be made based on the findings of this research:

1. Key roles and responsibilities of the construction project team members (i.e. Architects, Quantity Surveyors Engineers and Surveyors) should be clearly defined under each building procurement systems.
2. In any building project, before selecting a particular procurement system, the performance priority (in terms of cost, quality and time) should be set.
3. In a circumstance where the Architect is the leader of the project team it is better to select the Design & Build system of procurement
4. Also when Design & Build happens to be a system chosen, it is better to choose the Architect as the leader of the project team.

5.5 Recommendation for further research

In order to add knowledge to construction procurement systems and construction team performance, this section gives a brief overview of carrying out research in different areas.

Further research is recommended to be done to explore the following areas:

1. Developing guidelines for choosing procurement systems for undertaking building construction projects in Ghana.

2. Determining strengths and weaknesses of the construction project team under different procurement systems in Ghana.
3. To develop this research to a higher level, another approach might be carrying out similar research in the whole of Ghana.

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APPENDICES

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLECGE OF ARCHITECTURE AND PLANNING
DEPARTMENT OF BUILDING TECHNOLOGY

PROJECT TEAM QUESTIONNAIRE (ARCHITECTS)

Sir/ Madam

My name is Moro Ibrahim, and I am a research student from Department of Building Technology, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI. I am pursuing MSC. PROCUREMENT MANAGEMENT and towards partial fulfillment of the requirement of Msc. Degree, I am writing a thesis on the topic: The Influence of Procurement systems on the Construction Project Team Performance. Your opinions are highly essential as they will help to determine the impact of different procurement systems on project team performance.Whatever you say will be treated confidential, so feel at ease to express your candid opinion. Be assured that your responses will not in any way be linked to your identity. You are kindly requested to answer the questions below by indicating a tick or writing the appropriate answer when needed.

THANK YOU

Personal Data

1. Gender: Male [ ] Female [ ]
2. Age: 18-24 [ ] 25-34 [ ] 35-44 [ ] 45-54 [ ] 55 and above [ ]
3. What is the class of your firm? 1= D3K3 [ ] 2= D2K2 [ ] 3= D1K1 [ ]
4. How long have you engaged in construction industry?
   1= below one year [ ] 2= 1- 5 years [ ] 3= 6 – 10 years [ ]
   4= 11 -15 years [ ] 5= 16 years and above [ ]

Educational and Professional Qualification

1. What is your highest educational level? 1= HND or CTC III [ ] 2= Bsc. [ ] 3= Msc. [ ] 4= above Msc./Mphil [ ]

2. Which of the following professional bodies do you belong? Please tick as many as applies

1= Ghana Institution of Engineers [ ] 2= Institution of Incorporated Engineers [ ] 3= Ghana Institution of Surveyors [ ] 4= Ghana Institution of Architects [ ] 5= Chartered Institute of Builders [ ] 6= None[ ]

Roles/ Authority/ powers of construction team

1. How often do you exercise the following roles under each procurement system as an architect throughout in a given project?
   1=not at all 2= not often 3= quite often 4= often 5= very often

Roles	Traditional method	Design and build
Preparation of design/drawings		
Developing and interpreting drawings		
Advice on material/equipment selection		
Manage health and safety issues		
Leader of project team		
Ensure coordination between project team and stakeholders		
Ensure that project team complete work as scheduled		
Ensure that project cost is within estimated cost		
Ensure that client expectations are met (in terms of quality)		

2. How effective do you perceive the effectiveness of the following roles under each procurement system? Please indicate with: 1= not effective 2= quite effective 3= effective 4= more effective 5= most effective

Roles	Traditional method	Design and build
Preparation of design/drawings		
Developing and interpreting drawings		
Advice on material/equipment selection		
Manage health and safety issues		
Leader of project team		
Ensure coordination between project team and stakeholders		
Project team complete work as scheduled		
Ensure that project cost is within estimated cost		
Ensure that client expectations are met (in terms of quality)		

General comments ……....

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KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLECGE OF ARCHITECTURE AND PLANNING
DEPARTMENT OF BUILDING TECHNOLOGY

PROJECT TEAM QUESTIONNAIRE (QUANTITY SURVEYORS)

Sir/ Madam

My name is Moro Ibrahim, and I am a research student from Department of Building Technology, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI. I am pursuing MSC. PROCUREMENT MANAGEMENT and towards partial fulfillment of the requirement of Msc. Degree, I am writing a thesis on the topic: The Influence of Procurement systems on the Construction Project Team Performance. Your opinions are highly essential as they will help to determine the impact of different procurement systems on project team performance. Whatever you say will be treated confidential, so feel at ease to express your candid opinion. Be assured that your responses will not in any way be linked to your identity. You are kindly requested to answer the questions below by indicating a tick or writing the appropriate answer when needed.

THANK YOU

Personal Data

1. Gender: Male [ ] Female [ ]
   Age: 18-24 [ ] 25-34 [ ] 35-44 [ ] 45-54 [ ] 55 and above [ ]
2. What is the class of your firm? 1= D3K3 [ ] 2= D2K2 [ ] 3= D1K1 [ ]
3. How long have you engaged in construction industry? 1= below one year [ ] 2= 1- 5 yrs [ ] 3= 6 – 10 yrs [ ] 4= 11 -15 yrs [ ] 5= 16 yrs and above [ ]

Educational and Professional Qualification

1. What is your educational level? 1= HND or CTC III [ ] 2= Bsc. [ ] 3= Msc. [ ] 4= above Msc./Mphil [ ]
2. Which of the following professional bodies do you belong?

1= Ghana Institution of Engineers [ ] 2= Institution of Incorporated Engineers [ ] 3= Ghana Institution of Surveyors [ ] 4= Ghana Institution of Architects [ ] 5= Chartered Institute of Builders [ ] 6= None[ ]

Roles/ Authority/ powers of construction team

1. How often do you exercise the following roles under each procurement system as a Quantity Surveyor throughout in a given project?
   1= not at all 2= not often 3= quite often 4= often 5= very often

Roles	Traditional method	Design and build
Advice on preparation and submission of tender		
Monitoring construction budget		
Evaluation of variation in contract		
Checking valuation report before sending it for payment		
Regular report on project to management of the firm		
Ensure coordination between project team and stakeholders		
Ensure that project team complete work as scheduled		
Ensure that project cost is within estimated cost		
Ensure that client expectations are met (in terms of quality)		

1. How effective do you perceive the effectiveness of the following roles under each procurement system? Please indicate with: 1= not effective 2= quite effective 3= effective 4= more effective 5= most effective

Roles	Traditional method	Design and build
Advice on preparation and submission of tender		
Monitoring construction budget		
Evaluation of variation in contract		
Checking valuation report before sending it for payment		
Regular report on project to management of the firm		
Ensure coordination between project team stakeholders		
Ensure that project team complete work as scheduled		
Ensure that project cost is within estimated cost		
Ensure that client expectations are met (in terms of quality)		

General comments ……..

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KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLECGE OF ARCHITECTURE AND PLANNING
DEPARTMENT OF BUILDING TECHNOLOGY

PROJECT TEAM QUESTIONNAIRE (CONSTRUCTION ENGINEERS)

Sir/ Madam

My name is Moro Ibrahim, and I am a research student from Department of Building Technology, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI. I am pursuing MSC. PROCUREMENT MANAGEMENT and towards partial fulfillment of the requirement of Msc. Degree, I am writing a thesis on the topic: The Influence of Procurement systems on the Construction Project Team Performance. Your opinions are highly essential as they will help to determine the impact of different procurement systems on project team performance. Whatever you say will be treated confidential, so feel at ease to express your candid opinion. Be assured that your responses will not in any way be linked to your identity. You are kindly requested to answer the questions below by indicating a tick or writing the appropriate answer when needed.

THANK YOU

Personal Data

1. Gender: Male [ ] Female [ ]
2. Age: 18-24 [ ] 25-34 [ ] 35-44 [ ] 45-54 [ ] 55 and above [ ]
3. What is the class of your firm? 1= D3K3 [ ] 2= D2K2 [ ] 3= D1K1 [ ]
4. How long have you engaged in construction industry?

1= below one year [ ] 2= 1- 5 years [ ] 3= 6 – 10 years [ ]
4= 11 -15 years [ ] 5= 16 years and above [ ]

Educational and Professional Qualification

1. What is your educational level? 1= HND or CTC III [ ] 2= Bsc. [ ] 3= Msc. [ ] 4= above Msc./Mphil [ ]

2. Which of the following professional bodies do you belong?

1= Ghana Institution of Engineers [ ] 2= Institution of Incorporated Engineers [ ] 3= Ghana Institution of Surveyors [ ] 4= Ghana Institution of Architects [ ] 5= Chartered Institute of Builders [ ] 6= None [ ]

Roles/ Authority/ powers of construction team

2. How often do you exercise the following roles under each procurement system as a structural / services engineer throughout in a given project?

1= not at all 2= not often 3= quite often 4= often 5= very often

Roles	Traditional method	Design and build
Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground		
Preparation of engineering design/drawings		
Developing and interpreting drawings		
Manage health and safety issues		
Ensure coordination between project team and stakeholders		
Ensure that project team complete work as scheduled		
Ensure that project cost is within estimated cost		
Ensure that client expectations are met (in terms of quality)		

3. How effective do you perceive the effectiveness of the following roles under each procurement system? Please indicate with: 1= not effective 2= quite effective 3= effective 4= more effective 5= most effective

4.

Roles	Traditional method	Design and build

Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground		
Preparation of “as built” design/drawings		
Developing and interpreting drawings		
Manage health and safety issues		
Ensure coordination between project team and stakeholders		
Ensure that project team complete work as scheduled		
Ensure that project cost is within estimated cost		
Ensure that client expectations are met (in terms of quality)		

General comments ……....

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KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLECGE OF ARCHITECTURE AND PLANNING
DEPARTMENT OF BUILDING TECHNOLOGY

PROJECT TEAM QUESTIONNAIRE (LAND SURVEYORS)

Sir/ Madam

My name is Moro Ibrahim, and I am a research student from Department of Building Technology, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI. I am pursuing MSC. PROCUREMENT MANAGEMENT and towards partial fulfillment of the requirement of Msc. Degree, I am writing a thesis on the topic: The Influence of Procurement systems on the Construction Project Team Performance. Your opinions are highly essential as they will help to determine the impact of different procurement systems on project team performance. Whatever you say will be treated confidential, so feel at ease to express your candid opinion. Be assured that your responses will not in any way be linked to your identity. You are kindly requested to answer the questions below by indicating a tick or writing the appropriate answer when needed.

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3. How long have you engaged in construction industry? 1= below one year [ ] 2= 1- 5 yrs [ ] 3= 6 – 10 yrs [ ] 4= 11 -15 yrs [ ] 5= 16 yrs and above [ ]

Educational and Professional Qualification

1. What is your educational level? 1= HND or CTC III [ ] 2= Bsc. [ ] 3= Msc. [ ] 4= above Msc./Mphil [ ]

2. Which of the following professional bodies do you belong?

1= Ghana Institution of Engineers [ ] 2= Institution of Incorporated Engineers [ ] 3= Ghana Institution of Surveyors [ ] 4= Ghana Institution of Architects [ ] 5= Chartered Institute of Builders [ ] 6= None [ ]

Roles/ Authority/ powers of construction team

1. How often do you exercise the following roles under each procurement system as a Land Surveyor throughout in a given project?

   1= not at all 2= not often 3= quite often 4= often 5= very often

Roles	Traditional method	Design and build
Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground		
Conduct environmental impact analysis on project		
Give technical advice on building laws, codes and regulations		
Engage stakeholder of a project on discussion of survey report		
Advice to workers on a project		
Ensure coordination between project team and stakeholders		
Ensure that project team complete work as scheduled		
Ensure that project cost is within estimated cost		
Ensure that client expectations are met (in terms of quality)		

How effective do you perceive the effectiveness of the following roles under each procurement system? Please indicate with: 1= not effective 2= quite effective 3= effective 4= more effective 5= most effective

Roles	Traditional method	Design and build
Interpretation of charts, diagrams and transfer/convey needed information on paper to the ground		
Conduct environmental impact analysis on project		
Give technical advice on building laws, codes and regulations		
Engage stakeholder of a project on discussion of survey report		
Advice to workers on a project		
Ensure coordination between project team and stakeholders		
Ensure that project team complete work as scheduled		
Ensure that project cost is within estimated cost		
Ensure that client expectations are met (in terms of quality)		

General comments ……..

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