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CHANGE MANAGEMENT PRACTICES IN THE GHANAIAN CONSTRUCTION INDUSTRY

BY

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DECLARATION

I hereby declare that this submission is my own work towards the Master of Science (MSc.) and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the University, except where due acknowledgement has been made in the text.

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DEDICATION

I dedicate this work to the Almighty God, and my lovely family, who inspired me to learn hard.

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It has been a difficult task to come up with this research, and therefore, it is right to give recognition is due, that the tireless efforts of those who made it possible for the success of this research are acknowledged. In the first place, I am thankful to Almighty God for granting me the strength, wisdom, knowledge, importantly energy and physique, the good health and the mind to stay on course for the entire duration of this research.

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ABSTRACT

Changes are inevitable in any construction project. Needs of the owner may change in the course of design or construction, market conditions may impose changes to the parameters of the project, and technological developments may alter the design and the choice of the engineer. The engineer‟s review of the design may bring about changes to improve or optimize the design and hence the operation of the project. Further, errors and omissions in engineering or construction may force a change. All these factors and many others necessitate changes that are costly and generally un-welcomed by all parties, Al-Dubaisi (2000). Change management process is the sequence of steps or activities that a change management team or project leader would follow to apply change management to a project. In Ghana like other countries change management is the responsibility of change management team (CMT) or consultants. Over the years, parallel streams of experts in the form of Architect, Engineers, and consultant have operated concurrently with the public agencies in Construction industry (CI). These agencies are Ghana Highway Authority, Department of Urban Roads and Department of Feeder Roads. The prime purpose of this research was exploring the change management processes used in Ghanaian construction industry. Data was also gathered using closed and open-ended questionnaires. The results were analyzed using descriptive techniques. The study shows that all the four models listed in literature review are applicable in Ghanaian construction industry but Flowchart model is the most useful model. The findings shows that corrections and

unforeseen site conditions are the major causes of change in construction project, also inadequate funding, inflation fluctuation and Change or increase mark up for contractor are the three main difficulties that are always encounter during change implementation.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Construction project has being described by authors and researchers as one of the dynamic industries because several changes are involved. Project modifications and alterations are unavoidable because they are included in the design and construction. Construction projects are prone to various changes until the finally completion of the project. Resolutions happens virtually every day in the course of construction from the client, consultants or the contractor when the need arises (Sun *et al*, 2004; Anees *et al*, 2012).The changes usually involve a change in project specification as well as redraft. The modification and redraft happens by inclusion, rejection and extra. According to Anees *et al*, 2012, change direction is the name given to the changes made in construction. They further observed that, though a certain amount of alteration is to be projected in every project because consumers cannot easily envisage the completion item for consumption, however, critical change or too much changes may double the cost of the project. Some modifications can have severe implication on the implementation. The change can adversely affect the implementation and even bring about conflict among the key stakeholders. A study by Al-Dubaisi (2000), publicized that refining the managerial course of modification orders is advantageous in plummeting the charge and threat for all the plan members and reassuring a more trustful bond.

In a report by the EPSRC cited in Sun *et al* (2004), „about third of key stakeholders in a construction get displeased with project implementers‟ work in actually working in the agreed contract modalities. It is key to know that this displeasure is actually brought about by the modification order. Handling construction project changes has therefore become an integral

part of project management. Most firms‟ starts change management process with a team of expect in change. To effect a change to a project or construction, the team of expect in change will have to submit a plan to the management of the project for it to be reviewed. The management of the project will then have to give the approval for the implementation of the change.

1.2 PROBLEM STATEMENT

Managing project changes is a key challenge associated with construction globally is seeking to address. The efficiency of the change management procedures or processes adopted is critical for the success of projects (Anees *et al* 2012). Change orders if not properly implemented by the stakeholders will have adverse effects on the project. Poor implementation of approves changes may lead to misunderstanding and conflict between clients and contractors while as contractors blame the consultant for poor communication. It is obvious that sometimes change implementation result in deviation due to poor integrated change control.

Over the years, various scholars have written publication and articles which even talks about the legal aspect of discussing claims and settling dispute on modification, modification orders in construction as well as how to implement these modification orders. All the studies were carried outside the local Ghanaian construction industry. Thus, the current state of the problem in the Ghanaian construction industry is yet unknown. It is in line with this that the current study is being carried out to explore the management processes/procedures adopted by the local firms in managing design and construction changes.

1.3 AIM AND OBJECTIVES

Aim

The project seeks to explore how change management processes are used on the Ghanaian construction industry

Objectives

The specific objectives are as follows:

1. To ascertain the predominant reasons of modification in construction works
2. To find out the modification management models used in construction project
3. To identify the challenges associated with implementing project changes

1.4 METHODOLOGY

Data or information collected for this study would be carried out by means of observation and self-administered questionnaires in the form of close and open ended questions. Descriptive and comparative analyses would be used to analyze data collected from the study.

1.5 SCOPE OF STUDY

The study was confined to change management processes and the challenges involved in the implementation of the change. The study was carried out in the Kumasi Metropolis.

Background information was obtained from project managers‟ consultants, civil engineers and Architects through site visit of ongoing three tier interchange at Kwame Nkrumah Circle in Accra.

1.6 SIGNIFICANCE OF THIS STUDY

The significance of this study is to provide us with an insight into the project change management processes adopted by firms in the Ghanaian construction industry. In other words, it will serve as change management guide to Engineers, consultants, project managers and clients in the construction industry. Finally, it will also serves as a source of reference for policy makers, researchers and all training institutions in the construction industry.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

The drive of contemporary project managing is to conduct a successful project, (Shenhar 1993). This modern project management includes project change management. Alterations in construction work are very usual and happens at diverse sources and in the course of the

project life. The research is about the changes, process of change management taken stakeholders into consideration. Project modification can occur even after bidding or accepting bids. Poor implementation of the change measures can increase the cost of implementing the project and even delay the time of implementation. Basically, these modification are caused by some errors in the design and some are contingent in nature. This chapter explores definitions of alteration management, alteration management procedure models, change management processes and challenges or the difficulties in implementing the approved changes.

2.2 CHANGE MANAGEMENT

Modification controlling (Change Management) is the process of reviewing all activities to identify, analyze, evaluate, and making proposal of the change until changes are accepted and approved by the authorities involved in the project. In another Wikipedia context, change managing is the way of devising a planned method to make modification in project management. According to Wikipedia (2008), alteration management is the step by step approach to ascertain in information to effect change in the course of project implementation.

2.3 CAUSES OF CHANGES IN PROJECT

Studies by Anees *et al* (2012), revealed that among the building team, clients are the key basis of alterations in enormous construction developments. Owners and experts of project are sometimes the cause of change in project implementation. Consultants are the second major contributor to changes.

Five important causes among all parties are lack of coordination between contractor and consultant, error and lapses in proposal, value engineering, adjustment in design and change of plans by the consultants Al-Dubaisi (2000).

Table 2.1: Causes of project changes

Source of change	**Cause of change**
Client	Change of mind or requirement
	Client dissatisfaction
	Inadequate funding
	Unclear requirement
Consultants	Poor Communication
	Corrections
	Unforeseen site condition
	Lack of understanding
Contractor	Poor workmanship
	Procurement approach
	Construction methods
	Remedial works
	Forecast method

Source: Anees *et al* (2012)

Apart from the table above, several other causes of change in construction project have been outlined and explain by authors and researchers as well. The change in construction work like building can sometimes be attribute to the alteration in design , errors or omission in design, change in functional requirement, poor scope definition and budget constraints, Al-Dubaisi (2000).

2.3.1 DESIGN ERROR AND OMISSION

According to Al-Dubaisi (2000), it is not possible to produce a 100% mistake free proposal. Some construction documents do sometime have some vital information deleted or misinterpreted as well wrong specification of the details of the work. Such incidence affect the implementation since the contractor will want minimize cost and therefore will implement the project even when there is mistake.

2.3.2 UNFORESEEN SITE CONDITION

The nature of the soil is in the category of unforeseen site problems. Condition of Soil can affect decision if care is not taking because taking just a visual sample of the soil will not be right. It is wrong for a project team to assume that the topsoil is good and the soil is good for any type of project. Clay is difficult of all subsoil when dealing with. Down to a depth of about 1m clay are subject to seasonal movement which occurs when the clay dries and shrinks in the summer and conversely swells in the winter with heavier rainfall. This movement occurs whenever a clay soil is exposed to the atmosphere and special foundation may be necessary.

2.3.3 ADJUSTMENT IN DESIGN

Ibbs and Allen (1995) views changes in the project as the situation whereby the project is commenced before the design document is accepted or finalized. Owners of project resist to any change at the beginning of the project as they make time as the driven factor for the implementation of the project. However, the consultant of the project can also the cause of a change in a project implementation after reviewing the design document

2.3.4 SITE LOCATION AND CONDITIONS

Ambiguous documents which details the location of a project may be misinterpreted or represented and this can actually affect the project by bringing about change in the implementation.

Every construction site has its own characteristics which have an important influence on its suitability for development. The size of the site required will generally be determined by the type of project to be constructed. The cost and the characteristics of every project will be affected by its location. It may be situated on a congested city site with all the problems of access, materials material delivery problems and close proximity to adjacent structures, Ashworth, (2010)

2.3.5 CHANGE IN FUNCTIONAL REQUIREMENTS

Change in functional requirement is a leading causes in changes in project managing. In practice, change in functional requirement is usually shown in a form of change of design or materials to meet what the item of work is expected to do. Functional requirements are information about expected quality or standards provided by clients or consultants in other to meet patrons‟ requirements and anticipations.

According to Badu and Owusu-Manu (2010), functional specifications has to do with what items are being used and the results the items are supposed to produce. These are closely snarled to the excellence of the artefact or, quality as used here centres on the idea of user specification. For construction products it is the responsibility of the contractor to meet standard. It also important to consider the purchasing of material because to avoid changes in project, there is the need to provide products to the required quality. Functional requirement

requirements should define the quality level needed. Most often functional specifications are achieved via the description of features and materials.

2.3.6 POOR SCOPE DEFINITION

Scope definition is as important as project objectives. Scope definition requires integration of client or stakeholders requirement, but in a situation where stakeholders requirements are not fully considered or understood by consultants in defining the scope, client dissatisfaction would be the order of the day. One of the causes of change in project is poor or wrong scope definition.

Scope definition involves requirement documentation and project scope statement, (Project management Institute, 2008).

2.3.7 COMMUNICATION

Butler (1988) explains that communication is as old as time itself; man has always wished to talk and join with others. As the world has developed and in fact been made „smaller" through the means of communication, so the systems used have become more sophisticated and complex. We have only to consider today the fantastic step forward made possible by satellite, television and such. Communication is of vital importance in the controlling, coordinating and motivating of people, and all through history it has played its part; for example: Churchill"s memorable speeches during the second great war, when millions received hope and encouragement through the medium of radio.

Just as important as communication is that the person or people receiving it should be able to understand, for errors can be costly, as we can again see from history when we consider the Charge of the Light Brigade, a famous battle but a disaster, due to a misunderstanding in communications. The importance of good communication can readily be seen and is just as important for the survival of a company as it is nationally. Communication in the building industry generally takes one of three forms: Oral Instructions Written Instructions Drawn Details

Whichever method is adopted, certain considerations relate to all. They should be Precise, Not too long and definite. Project Communications Management processes includes the following:

- **Identity interested party**: The means of classifying all people or organizations to be affected by the project in order to know their stake in the project.
- **Plan Interactions means:** There is the need to determine the mode and means of provide the needed information to the interested parties of the project.
- **Dispense Information:** The means of making the require information available to the interested parties.
- **Manage interested party Anticipations**: The means and ways of coping with the parties of the project in a way to reflect their needs.
- **Performance dissemination:** There is the need to make available the performance of the project to the stakeholders.

2.4 CHANGE PROCESS MODEL FOR CONSTRUCTION PROJECTS

DEFINITION

Change process model is a framework of knowledge or approach that represents the key decisions required by project team to make and to implement changes. In practice, the knowledge framework for a particular model is to be specified by the client organization taking into consideration the organization‟s process assets or experiential learning.

Matawa, (2003b) stated that variables in a construction project that requires changes must be efficiently assessed, diagnose and defined.

2.5 TYPES OF CHANGE MANAGEMENT PROCESS MODELS

Projects with multiples causes or systems of changes should have a modelled that can evaluate the change effects more accurately. Alteration management of a project should occur at all level thus internal and external. These factors are to be taking into consideration when there is the need to manage change in a project. Scholars have coin various method or model for change process. According to CII, 1994, (construction industry institute) change is to be considered as an alteration to a contract between project stakeholders.

An example change procedure was suggested and comprised a set of 27 best applies for project changes. Cox *et al*, (1999). Stocks and Singh (1999) coined a technique to help owners and designers to come together during the designing of the project thus drawings and planning in order to minimize the rate of change orders. CIRIA in 2001, presented the some key means of run through commendations for the operative managing of change on projects. In the manual, it presents three change procedures which should be done at the design state and other stages of the project. Scholars have mainly tried to identify the change process as well as establishing the reasons or factors that affect the change process.

Voropajev (1998), recorded that there are three change management process models and decision support systems available for construction industry, these are the decision making process or linear model, financial model and multi- attribute utility model etc.

In this research document, the researcher wants to highlight flowchart process as a change management model that can be used as substitute for linear or decision process model. In other for project team to manage well of changes in the project life, project team need to know the change process model suitable for the change.

2.5.1 LINEAR MODEL

This is where a decision criterion is subjectively weighted and rated by the change management team or a decision-maker into a single measure as illustrated by (Robbins and Coulter 1991).

Linear Models also includes multiple rating which adds the conforming likelihoods for the manifold of a stated criterion and measure impression as well as insecurity connected to the process.

2.5.2 FINANCIAL MODEL

The model incorporate all the financial parameters that constitutes the project budget and also to control the operations or the exercise of changes in project management. The parameters vary among projects depending upon on constituents of the project budget as defined in the cost planning.

2.5.3 MULTI-ATTRIBUTE EFFICACY MODEL

This model put together the qualitative and quantifiable assessment standards that are accumulated to reach at an anticipated efficacy. The model takes into consideration the basic objectives such as schedule, budget and performance that determine the success of construction project based on project objectives

According to Hester *et al*., 1991, there exist an all-purpose change course model that can be adopted at all stages of the project. According to them, this model are;

Before Change: At this stage there are some defined standards to be followed for implementation effectiveness in managing change.

After Change: After implementing the change, there is the need to record the case for future purposes. It is necessary to record all the knowledge and experience acquired from the change.

Recognize and Appraise Change*:* identifying changes to the maximum level helps in the evaluation process and even the implementation stage of the project. Change identification has been classified into some headings by some researchers.

i. Deviation monitoring ii.

Analyzing identified deviation iii.

Find mitigating measures iv. Inform

change administration source

It is important to know that the type of change could be minor or major and this identified by using various criteria.

2.5.4 FLOWCHART MODEL

This is a chart depicting the steps or the process to follow in identifying and solving a change. Various shapes of the chart exist but they all have the same features like decision point and the processing order. It has the advantage of helping a team to forecast a possible change that might occur in the course of implementing a project. Figure 2.1 indicates the flowchart.

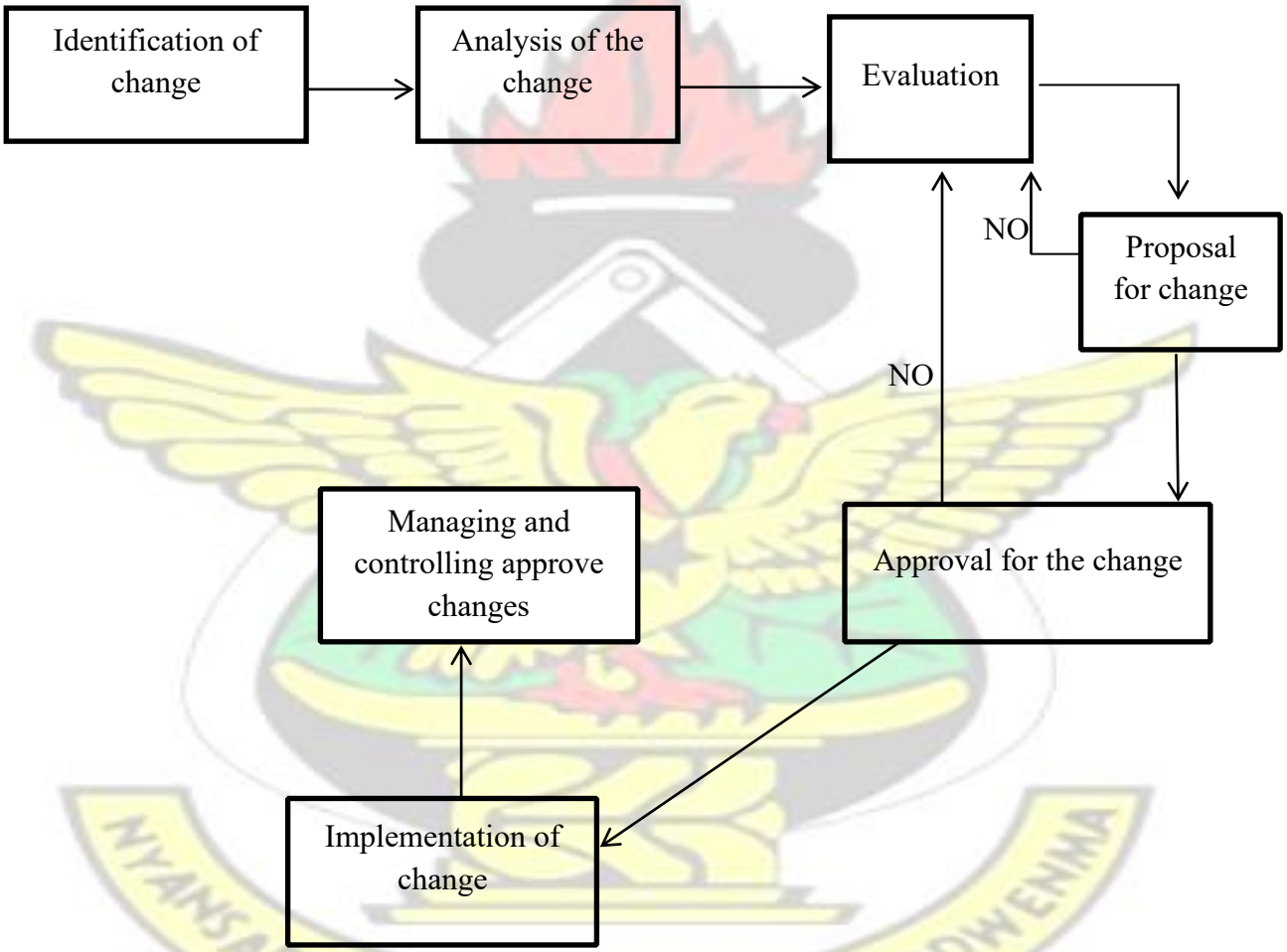

Fig 2.1: Process Flowchart by (Project Management Institute 2008)

2.6 CHANGE MANAGEMENT PROCESS

This is a process which should be followed sequentially whenever change is desired by any stakeholder in the construction project.

Robbins and Coulter (1991), illustrates change management as a way of making decision by following a set of steps (eight steps) by identifying the problem. This concept in construction is a perplexing undertaking since it needs an assimilated explanation for synchronizing everything for the drive of the alteration management in question by (Robbins and Coulter, 1991).

The illustration below shows the concept. But for the purpose of this dissertation work, the researcher would illustrate and explain the following steps in details these are identification and evaluation of the change, approval and propagation for the change.

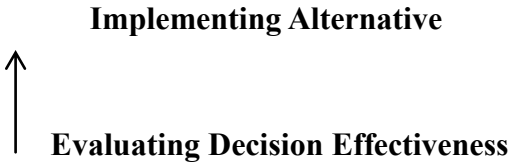

Fig. 2.2 Decision making process, (Robbins and Coulter, 1991.)

2.7 CHANGE MANAGEMENT PROCESS IN GHANA (FIDIC fourth edition, 1987)

Observation made in Ghanaian construction industry shows that usually changes are initiated or requested by either the client or consultant. Condition of particular application in the contract of the case study under consideration of this research work states that the client can make any changes as he or she desires within 10% additions or reductions in excess of construction project cost. Again, the engineer can make necessary changes to the designs and the scope of the project by seeking approval from the client.

In this case study changes were initiated and proposed to the client through the engineer or the consultant. With reference to the illustration above change identification was made by the contractor in high opinion of the design inaccuracies and exclusions.

.In view of this a team was put together by the contractor to study the designs, data and documents of the designs. Some of the findings of team were about incomplete designs, poor structural designs, omission and errors in some aspect of the designs

Analyze change: A team of experts after the award of the contract from China Geo Engineering Corporation analyze the design and stated their various comment and recommendations based on Geotechnical report, capacity in terms of structural analysis and traffic flow, elimination of bottleneck, and aesthetics with reference to the location of the project.

Evaluate the change: Based on the criteria, options and evaluation model used by the contractors‟ team of experts and it possible impacts that an identified problems can have on entire project in terms of risk, cost increase and schedule increase without achieving the overall objective.

Change proposal: As already stated the contractor proposes to the client (DUR) through ABP Consult Limited for their study and to change the design of the interchange from partial cloverleaf to a full or complete cloverleaf interchange.

Approval of the change: it is necessary for change identified to be vetted through an approved process. There is a set of ways for the approval procedures in the course of different changes. Firstly and foremost, the parties involved must accept the changes proposed by the team in the all Propose Change Order (PCO) in order for it be finalized for implementation. The change will eventually modify the project if accepted or rejected. According to Project Management Institute (2008), an approved change can affect the entire scope of work of contract. In Ghana all alterations are documented in ink and accepted by the client in this case the Government of Ghana in consultation with appropriate or agency or department before being approved.

2.8 CHANGE MANAGEMENT TEAM

According to Chudlly (1987), the construction experts to discuss issue regarding change, are the architect, engineer and quantity surveyor. This is a team put together by the owner or promoter to handle the design, engineering and cost aspect of the project once the decision to embark on change is made. It is important to ensure that the whole process is a team work.

The natural leader of the team according to project management institute (2008), is the project manager.

In small projects, some of the members who make up the change management team are the project manager architect, engineer, quantity surveyor. On the other hand, large/bigger projects require the services of contract manager, mechanical and electrical engineers as part of the team but in this case study team put together to manage the change were the resident engineer, an architect, quantity surveyor and electrical engineer and the civil engineer was the leader of the of the team.

2.9 CHANGE REQUEST

For assessment purpose, there is the need to juxtapose the planned results to the actual result of the project to see the extent of effect of the alteration. Changes have both negative and positive implication on a project either by reducing the cost or increasing cost as well as deliverables. PMI (2008).

Counteractive action: this is a directional document to enable the execution of a project to achieve the intended purpose or prevent deviation.

Defensive action: this document is aimed at helping to reduce the possibility negative occurrences in the implementation course.

Fault repair: there is the need for a document to help identify defect in the project deliverables or components backed with some concrete recommendation for repairing or replace.

All stakeholders of a project have the right to ask for a change in the implementation as well as the components of a project. However, they can only do this by formally written to the management the kind of change they want. The document must be approved by the authority

in charge of effecting changes to the project which includes the project manager. In some cases, customers are allowed to be the approval authority in order to effect changes to a project based on the contract agreement. In effect, alterations in a project increases the cost estimate, the kind of activity to do, the date of completion of the project and even had on new materials for the construction.

2.9.1 DIFFERENT BETWEEN CHANGE ORDER AND VARIATION ORDER

Change Order

A change order is defined as the legal document to effect some changes to a project. It must be noted that owners of project can effect to their project anytime without necessary following any stringent process. Fisk (1988).

Bruce Pruitt (1999), have it that this change order document must be adhered to by a course of action to make sure that the changes are sufficiently acknowledged".

Variation order

An employer or architect may require, during the course of project, to alter such items as an error or omission of item in a bill, the alteration of work, goods or materials and alteration due to legislation. These variations will be measured by the quantity surveyor, price being based on similar price or day work. A variation order is therefore an instruction from the architect requesting the contractor to substitute new work or material for those originally incorporated in the contract, Butler (1988).

According to Calvert, *et al* (1995), a variation order is the official document that is used to change the main predetermined arrangement given to the service provider by the client. In the construction industry, variation orders are created when changes occur; it is an official

document that states the changes made into the original agreement between the client and the contractor. Whenever a variation order is created, it brings several negative effects on the project. Clearly, in construction terms, variability is referred to as variation orders.

2.10 IMPLEMENTATION OF THE CHANGE

The stakeholders of a project are required to keep records of all changes effected to the project for future reference. There is the need to put in measures to ensure that all aspects of the project as well as the change are updated and the relevant stakeholders notified. The activities of change should be done in right manner. Robbins and Coulter (1991), stated that it is essential to implement the changes process properly in order to avoid failure in the process.

2.11 INTEGRATED CHANGE CONTROL

It is obvious that changes to original scope of works need to be controlled in order to avoid scope creep, project failure, cost overrun and schedule overrun.

Performing combined change control means studying all requests, approve and manage the deliverables, assets, documents and the project management plan, (PMI,2008).

Change control should be conducted from the beginning through completion of the project. It must be done to all aspects of the project. To Perform Integrated Change Control one must follow the steps below;

i. Influence the factors that by-pass integrated change control ii. Revising, scrutinizing and appreciating change requests; iii. Management of the approved changes; iv. Retaining the veracity of standard;

v. Revising, accepting or rejecting commended remedial and precautionary actions;

vi. Directing alterations through the whole project; vii. Authenticating the whole influence of change needs.

All stakeholders of a project have the right to request for Changes but the requisition must follow the agreed lay down rules.

2.12 IMPLEMENTATION CHALLENGES

There are several difficulties or challenges which occurred during the implementation of the change management process adopted for this case study. Some of these difficulties or challenges are classified into technical challenges, economic challenges, project management challenges and contractual challenges.

2.12.1 TECHNICAL CHALLENGES

Technical factors comprises of change in specifications, standards or requirement, drawing errors and or omissions, incomplete drawings, substitution and unforeseen site condition.

(i) **Specification**

Specifications are writing instruction concerning project requirements regarding the quality of the built product and its components. While drawings show what is be built, specification describes how the project is being constructed and what results is to be achieved. Specifications complement design drawings, the design team can convey most of the information about a proposed building to other members of the building team such as the

quantity surveyor and the contractor by means of drawings. However, there is information which by its nature cannot be drawn and must be by written description.

Specification must be read, and unusual points noted. References to codes of practice should be looked up and relevant abstract from the specification include in material requisitions or enquires. If copies of specifications for nominated specialist, e.g. Heating Engineer, are not forthcoming, they should be requested so that the full story is known. A list of materials to be approved can be drafted, to act as a reminder and a progress record. (Calvert *et al*, 1995). Specifications are the expression in words of those design requirements that cannot be drawn. Specifications are developed to complement drawings so that together they can convey fully the design decisions. Construction specification is primarily a design document and represents design decisions that cannot be found in the form of drawing.

The purpose of specification is to complement, without duplication, the information in the drawings or the general conditions of contract. Drawings are graphic descriptions which primarily define quantity, position and sometimes quality. Specifications, on the other hand are written descriptions which define quality.

(ii) Drawing error and or omission

It is not possible to craft a 100% mistake free design. In view of this, some documents are then added to the original document indicating a flaw in it. The most situation which allows for change orders are insufficient detail and distortion.

(iii) Replacements

This actually happens on the side of the service provider (contractor) in the course of not getting the required materials. Some owners also ask for replacement or the substitution of some the materials which brings about additional cost.

(iv) **Site Considerations**

Every construction site has its own characteristics which have an important influence on its suitability for development. The size of the site required will generally be determined by the type of project to be constructed. The cost of the project will be affected by its location. It may be situated on a congested city site with all the problems of access with materials, Ashworth, (2010).

2.12.2 ECONOMIC FACTORS OR CHALLENGES

Economic factors which are related to every project vary from country to country depending upon the scale of the national economy and Government Fiscal Policy, inflation, fluctuation, depreciation, currency and exchange rate.

Inflation: according to Hanson (1973), inflation is the situation whereby prices of the goods and services does not much with volume of the goods. Due to inflation there were number of changes in rate of work items for various bill of quantities in a contract, this is because at a point in time the price adjustment formula method (indices) provided by the statistical service and Building and Road Research Institute were not able to cater for the contractor‟s production cost for those work items.

This came to light after careful comparative analysis of cost of production as at the time the contract was signed and the cost of production after design change, particularly cost of production for one cubic meter of concrete. The contractor realized that, the cost records of tracking expenditure on those items in the bill of quantities and the production cost of those items were even high than that of the unit rate which includes fifteen percent (15%) of contractor‟s mark up. The contractor wrote to inform the consultant about the situation and

the consultant accepted and informs the client after a detail analysis and consideration of those items were jointly done by the Consultant Quantity Surveyor and the Contractors Quantity Surveyor. The contractor identifies this loss by the use of internal system of cost control known as unit cost. Unit Costing, according to Harris and McCaffer (2001) as quoted in Ahadzie (2003), explains that unit cost is when the tracking of expenditure is done by considering item by item in the Bill of Quantity and Monitoring the expenditure on these items as against the unit rate in the Bill of Quantity.

2.12.3 PROJECT MANAGEMENT CHALLENGES

PROJECT INEGRATION MANAGEMENT

This is the process of incorporating all the needed activities in the implementation process of a project. In the project administration perspective, integration includes features of amalgamation, merging, delivery, and integrative actions are fundamental to project accomplishment, managing stakeholder anticipations, and meeting prerequisite.

POOR PROJECT COST MANAGEMENT

According to PMI (2008), this includes the ways and means of projecting, budgeting and controlling the cost so as to implement the project in the approved contract sum.

Estimating costs: The method of creating a guesstimate of the financial capitals desirable to complete project undertakings.

Determination of budget – The manner of combining the projected cost of separate undertakings.

Controlling of costs – The monitoring process of cost involved in the execution of the project. The cost of implementing the project needs to be updated at all times.

DELAY PAYMENT OF INTERIM CERTIFICATE

Delay payment according Harris and McCaffer (2001), the time between interim measurement, issuing the certificate and receiving payment is an important variable in the calculation of cash flows. Although ‘monies out‘ goes to many destinations, e.g. labor, plant hirers, material suppliers and subcontractors, the ‘monies in‘ comes from only one source – the client. Thus, any increase in the delay in receiving this money delay all the income for the contract with a resulting increase in the capital lock – up.

PROJECT TIME MANAGEMENT

The process of managing time involve in the project execution that is from the start to the completion of the project. Various activities are undertaken as far this process is concerned. The activities includes defining activities, sequencing activities, estimating activity resources, estimating activity durations, developing a schedule and controlling the schedule, PMI (2008).

2.12.4 CONTRACTUAL CHALLENGES

Delays: Clause 44.1 of part 1 of general condition of contract state that in “the event of the amount or nature of extra or additional work or any cause of delay referred to in these conditions or any delay impediment of prevention by the employer or other special circumstances which may occur, other than through a default of or breach of contract by the

contractor or for which he is responsible, being such as fairly to entitle the contractor to an extension of the time or completion of the work or any section or part thereof, the engineer shall after due consultation with the employer and the contractor, determine the amount of such extension and shall notify the contractor with a copy to the employer, (Fidic,1987).

Barry and Callahan (1980) stated that, the event for which a contractor may be entitled to a time extension include an action or inaction of the owner or action or inaction of the owner‟s agent or action or inaction of the owner‟s separate contractors or abnormally severe weather or labor disputes or unavoidable calamities such as fire or flood or changes in the work required under the contract.

Cost of Delay: Delay in a project implementation has adverse implication on the project in terms of time and cost. It actually add to the cost of implementing the project in the sense that the cost of materials for implementing the project increases with time and hence can affect the project. CII Conference (1996).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter talks about the process carried out in doing the study. It highlights the steps and process used in gathering information. The chapter has been grouped under main and subheadings.

3.2 RESEARCH DESIGN

Research design can be defined as the means of pursuing the fundamental subject of a research problem. Basically, it gives the guidelines that the researcher must follow in order to get the research done.

Again research design is of crucial importance because it determines the success or failure of research. According to Luck and Rubin (2010), "A research design is the will power and report of the approach accepted for a specific project. Research design involves electing a section of concern for, gathering information in order to assess supposition and analyzing the outcomes.

3.3 DATA COLLECTION TECHNIQUES

Questionnaires and interviews from a number of structural Engineers, Architects civil Engineers consultants, Quantity surveyors in the Ghanaian construction industry.

3.3.1 QUESTIONNAIRE

Leedy and Ormrod (2000), refer to a questionnaire as a formalized list of questions that are used to solicit information from respondents. For this research, both structured and unstructured questions were used to gather necessary data. Structured or closed questions are meant to save the respondent‟ time and get definite answers and unstructured or open-ended questions are meant to ensure that respondents‟ ideas or feelings are not disregarded and further explanations are made. The questionnaires were delivered in person. Questionnaires were distributed in after initial communication with the respondents to seek consent. The questionnaire was consisted of five sections including the general information.

3.4 SAMPLING

The object of sampling is to deliver a real-world means of allowing the data assemblage and dispensation component of study to be passed out while certifying that the section provide a good depiction of the populace. (Richard and Anita, 2008). Where it is impracticable to collect data from an entire population for a study, a researcher needs to select a sample (Saunders *et al*, 2009). Sampling as argued by Saunders *et al* (2009) also saves time, and is also an important consideration when the researcher is confronted with tight deadlines (Dawson, 2002).

3.4.1 SAMPLE SIZE

Participants were therefore selected from the list of construction professional bodies such as Ghana Institute of Engineers, Ghana Institute of Architects and quantity surveying division of Ghana Institute of Surveyors. Sixty (60) numbers of professionals who are in good standing as at December 2013 and September 2014 were selected for the study. It is imperative to state that all respondents were chosen from professional bodies, others were chosen from construction entities including consultancy organizations. Consequently, as argued by Bryman (2004), respondents were approached because they are easily available and accessible.

3.4.2 SAMPLING TECHNIQUE

Non-probability purposive sampling was used for the study due to limited time and resources. A purposive sample is done subjectively. The sample is taken based on the convenience of the researcher. (This involved participants in this case engineers, architects, designers who are knowledgeable and experienced as a representation of the population.

3.4.3 POPULATION

Eisenhardt (1989) as cited in (Richard and Anita 2008), stresses that the conception of the population is critical, since the set of entities for the study sample is determined by the population. Assortment of a suitable populace controls the peripheral disparity and help to describe the limit of make a sweeping statement the findings. Construction entities in Ghana can be broadly categorized into three main compartments. They are;

1. Government ministries, departments and agencies
2. Institutions established by government for the general development and welfare of the public or community
3. Private owned enterprises

Per the 2013 annual report, the total number of professionals in quantity surveying division of Ghana Institute of surveyors who are in good standing are three hundred and twenty (320), and that of Ghana institute of engineers are two thousand three hundred and eighty (2,380) these numbers includes fellows, associates fellows, graduate members and technician members.

3.5 RELIABILITY AND VALIDITY

Reliability; this has to do with the data to be collected from the field in terms of one relying on the accuracy of the gathered data. Also if another person wants to embark on the same project the methods adopt should be reliable. Accurate and careful phrasing of interview questions helped to avoid ambiguity and leading designers to particular answers which ensured reliability.

Again, reliability was ensured through repetition of questions which were not understood by the respondents (designers) in order to draw a fairer analysis of the research. Recording of the interviews enhanced evidence and this eschew any form of bias in an attempt to remember the discourse by the researcher.

Validity; it defines if the data gathered and examined meets the necessities or expectations of the research carried out. This could include the type of professionals interviewed, their experience, age and whether they are qualified enough to represent and cover all aspects of the analysis (Denscombe, 2010). The validity was ensured since all the interview guide questions were relates to the objectives and aim of the research. In addition, experienced design team members and professionals who are well versed in their installation and preparation of estimates were interviewed and this ensured the validity of the research

3.6 DATA ANALYSIS

The data were collated using the Statistical Package for Social Scientist (SPSS v.16). The results were presented in graphs, charts and tables. The ordinal data were analyzed using Relative Importance Index (RII).The RII value for each variable gives an indication of the importance of such variable as compared to the others in the same group. The formula is given by:

$$\text{Relative Importance Index (RII)} = \frac{\sum W}{AN}$$

Where, W = the weights given to each variable by the respondents, ranging from 1 to 4;

A = the highest weight (i.e. 5 in the study)

N = the total number of samples (45 from the respondents). The results of the analyses are presented in Chapter 4 together with the discussions.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 INTRODUCTION

The chapter talks about the presentation of data is systematically linked to the format of developed questions attached in the appendix. The chapter is organized into four such that each is treating one aspect of the study.

4.2 BACKGROUND OF RESPONDENTS

With reference to Table 4, 53.3% of the respondents indicated that they are working for private consultancy, follow by 33.33% who are also working for private contractors and that of 13.33% of the respondents are employed in public institutions or agency. Among the respondents 40% were Project Managers, 16% Civil or Structural Engineers with 22.22% being Architects. The other professional formed the remaining 20%. It can be seen that the above professional are those who are usually linked with design changes and are in a good position to give us credible information.

Table 4.1: Background details of Respondents

	Item Description	**Frequency**	**Percent**
1	**Type of organization respondents work for**		
a	Private contractor	24	53.33
b	Private consultancy	15	33.33
c	Public Agency	6	13.33
	Total	45	99.99
2	**Position of respondents in their organization**		

a	Project managers	18	40
b	Civil Engineer/Structural engineer	8	16
c	Architecture	10	22.22
d	Other	9	20
	Total	45	100
3	**Academic qualification of respondent**		
a	Bachelor degree	40	32
b	Master degree	35	28
c	Higher national diploma	30	24
d	PhD	20	16
	Total	125	100
4	**Knowledge background of respondent about project change management**		
a	Financial aspect/impact	10	22.22
b	Technical aspect/impact	30	66.67
c	Economics aspect/impact	3	6.67
d	Project management aspect	2	4.44
	Total	45	100
5	**The person who usually initiate/request for change**	**∑W**	**Rank**
a	Client	165	1st
b	Consultant	100	2nd
c	Contractor	85	3rd
d	Funding agent	50	4th
	Total	400	
6	**Experience background of respondent**	**Frequency**	**Percent**
a	Eleven to fifteen years	38	31.667
b	Sixteen to twenty years and above	35	29.167
c	One to five years	20	16.667
d	Six to ten years	27	22.5
	Total	120	100

The results in Fig. 4.1 point to the fact that majority of the respondents are bachelor degree holders which represent 32% of the entire response rate, followed by those with Master of Science Degree with representation of 28%. Higher national diploma holders and Doctor of philosophy holders represent 24% and 16% respectively. Bachelor of Science degree holders

had the highest percentage because they constitute larger population in the Ghanaian construction management job market.

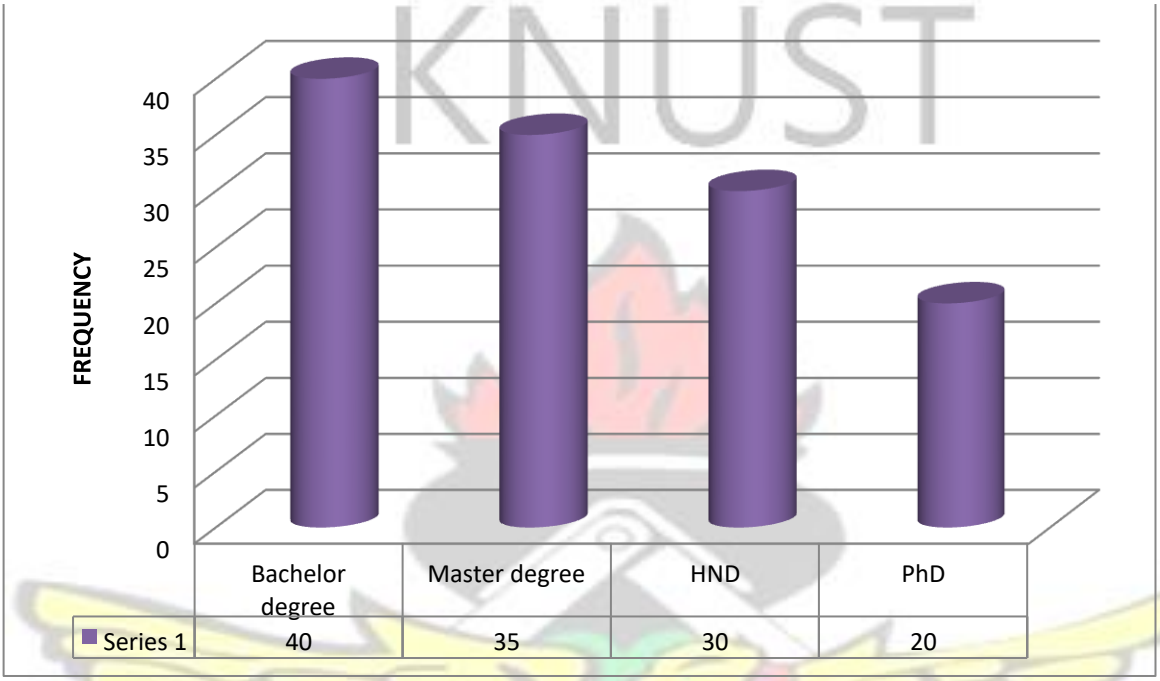

Fig. 4.1: Academic qualification of respondents

In connection with the above it was realized that technical aspect/impact (i.e. 66.67% of the cases) followed by 22.22% which is financial aspect/impact. The above results thoroughly reflect what usually the case on most construction site is. However, it is very worrying when changes are made, the professionals in the construction industry do not take key interest in economics and project management impact that the change may bring about They have cost and time effect on the project, (See Fig 4.2).

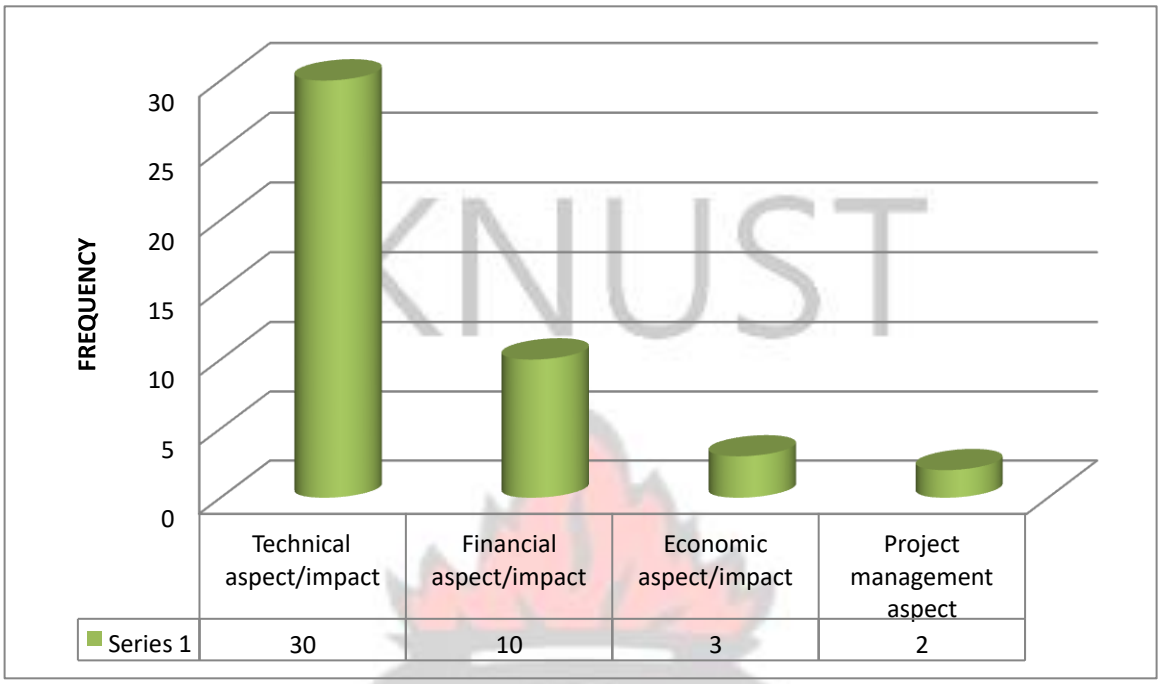

Fig 4.2: Knowledge background of respondent about project change management

From the outcome of Fig. 4.3, all the stakeholders enumerated in the questionnaire are sources of change (i.e. the client, contractor, consultant and funding agents). The Client was found to be the first among the stakeholders who usually request for change; follow by the consultant and the contractor with the funding agent being the last among the stakeholders. This is so because as the owner of the project, the client usually request for change to suit her new taste of design or meet her budget constructs. Consultants also make change when there is the need to made change in the design. The contractor who usually worked under the instructions of the client and consultant make changes at the request of the project owner. The funding agent on the other hand rarely request for change. The above findings agrees with the study by Anees *et al* (2012)

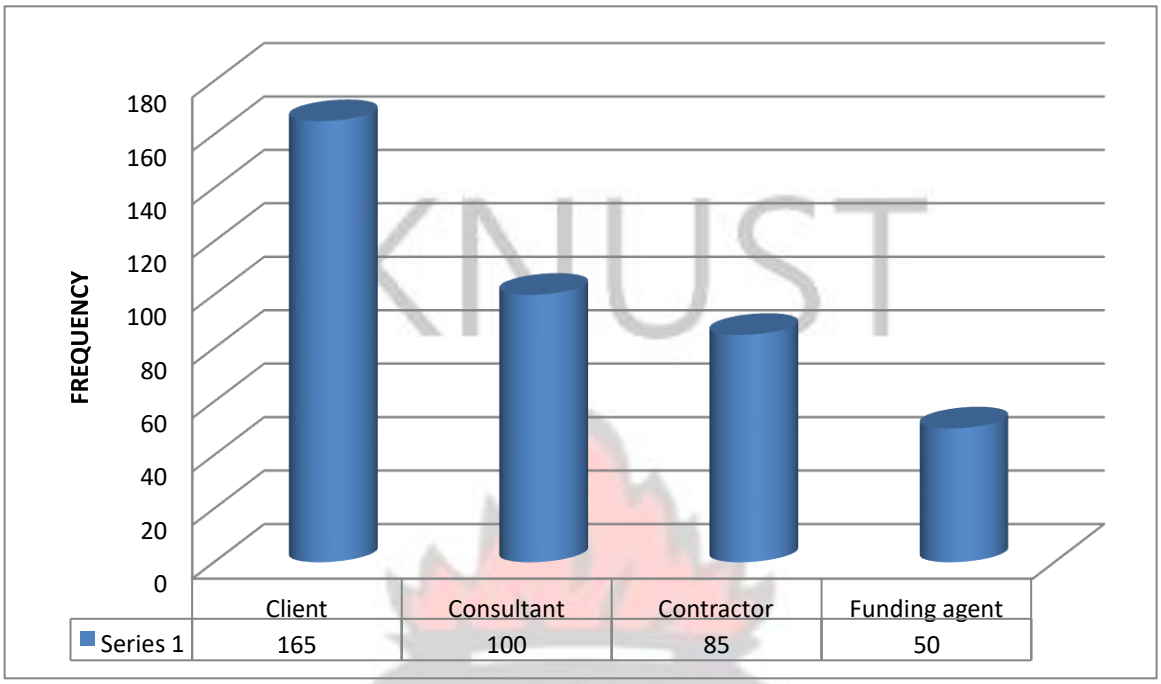

Fig 4.3: Persons who usually initiate/request for change

About respondents experience background, again four pieces of information were enlisted and the first to third ranking on the table 4.1 show that change management is as old as construction industry in Ghana because 31.667% of the entire respondents have eleven to fifteen years working experience. This is followed by those with sixteen to twenty years working experience and above who constitute 29.667% of the entire respondents.

4.3 CAUSES OF PROJECT CHANGES

Some causes of project changes were selected from literature from which the respondents were asked to rank them based on how often they lead to project changes. The factors were grouped into 3 main categories: Project management factors, technical factors and Financial and Economic issues.

4.3.1 PROJECT MANAGEMENT FACTORS (PMFs)

The result shown on Table 4.2a shows that all the PMFs cause changes in construction project in Ghana. With reference to the relative important index (RII) values, the respondents rank "*Corrections"* as the first (1st) course of change in construction project, followed by poor scope definition, change in functional requirement and poor project communication as the second (2nd) rank course of change in construction project. The ranking continues through remedial works as the fifth (5th) course of change through procurement method as sixth (6th), down to construction method being the last among all the project management issues. As noted in the literature (Anees *et al* 2012), most project start at a time that all the schemes are not complete. Corrections are then made in the cause of the project delivery. Moreover, when some parts of a project are poorly executed, the client or consultant may call for changes to be effected.

4.3.2 TECHNICAL FACTORS

The technical issues were also ranked by the respondent in their order of magnitude. The respondents again ranked unforeseen site condition as the first (1st) course of change among others, through change in design, modification or alteration as the next cause of change with lack of understanding being the fourth (4th) cause of change in construction project and the last being the error in setting out the design on site which is rank fifth (5th) among others. Construction as it is faces several challenges on site. In some cases, despite the initial site survey and soil investigation, one may encounter some challenges on the site which may call for changes to be made as noted by Anees *et al* (2012).

4.3.3 FINANCIAL AND ECONOMIC ISSUES

From Table 4.2a it can be observed that all the factors enlisted as inadequate funding, fluctuations and inflation are major cause of change. Among the three causes, inadequate funding was considered and ranked by the respondents as the first (1st) cause of change in projects; follow by fluctuations and down to inflation. Inadequate funding was ranked first because every project requires several resources of different kind but in a situation where resources or funding is inadequate change must be made in other to complete the project successfully within budget constrain.

Table 4.1a: Causes of change in construction

No	Causes of Change	Ratings								
		1	2	3	4	Total	∑W	Mean	RII	Rank
	(I) Project Management Issues									
1	Corrections	5	15	15	10	45	120	2.667	0.667	1st
2	Change in functional requirement	10	15	10	10	45	110	2.444	0.611	2nd
3	Poor scope definition	10	15	10	10	45	110	2.444	0.611	2nd
4	Poor project Communication	15	10	5	15	45	110	2.444	0.611	2nd
5	Remedial works	10	20	5	10	45	105	2.333	0.583	5th
6	Procurement method	15	20	0	10	45	95	2.111	0.528	6th
7	Construction method	20	15	0	10	45	90	2.000	0.500	7th
	(II) Technical issues									
1	Unforeseen site condition	0	20	20	5	45	120	2.667	0.667	1st
2	Poor workmanship	10	25	5	5	45	95	2.111	0.528	2nd
3	Change in design, modification or alteration	20	10	10	5	45	90	2.000	0.500	3rd
4	Lack of understanding	20	10	10	5	45	90	2.000	0.500	4th
5	Errors in setting out the design on site	20	15	5	5	45	85	1.889	0.472	5th
	(III)Financial and Economic issues									
1	Inadequate funding	5	20	15	5	45	110	2.444	0.611	1st
2	Fluctuations	10	20	10	5	45	100	2.222	0.556	2nd
3	Inflation	10	25	10	0	45	90	2.000	0.500	3rd

In an attempt to compare the causes of change in construction project, it was found (Table 4.2b) that the project management factors are the main causes of change followed by the technical factors (2nd) and Economic and financial issues (3rd)

Table 4.1b: Comparison of the factors that causes project changes

	∑W	Mean	Rank
Project Management issue	740	105.7	1st
Technical Factors	480	96	2nd
Economic and Financial Issues	300	100	3rd

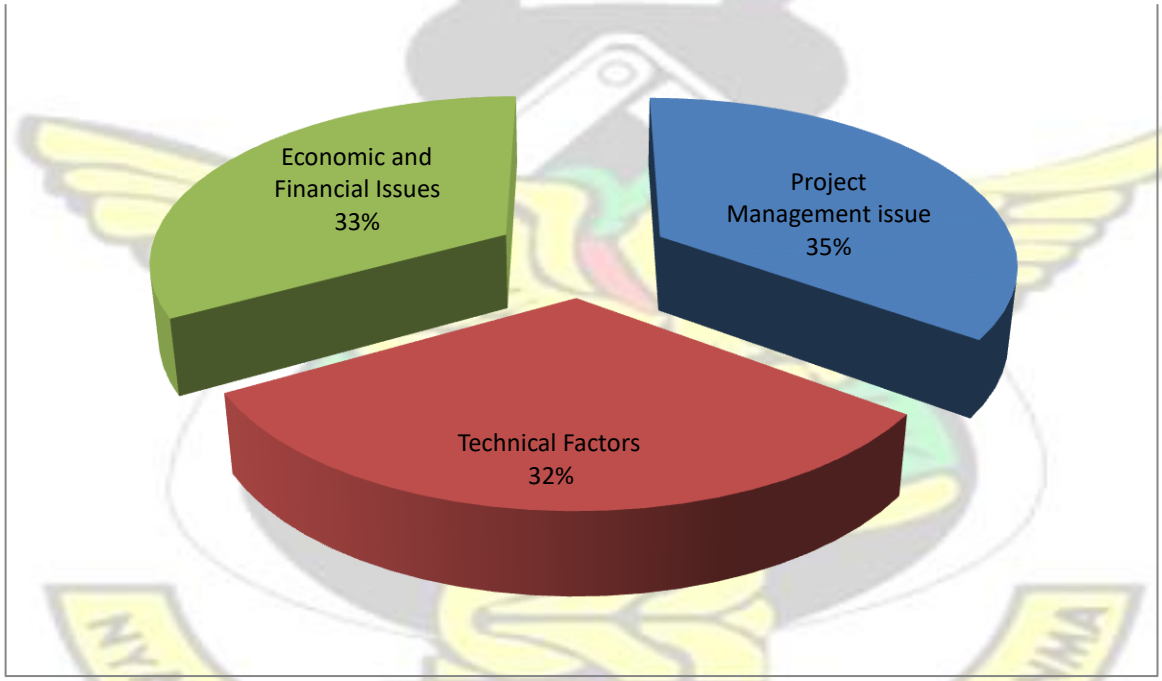

Fig 4.4: Comparison of the factors that causes project changes

4.4 CHANGE MANAGEMENT MODELS

The study among its objective sought to find out the change management models used by consultants and contracting firms for managing project changes. Per the results shown on Table 4.2 and Fig 4.4, all the four changes management models enlisted in the

questionnaires are used by the professionals or the players of the industry.

The RII values of all the models were above average (i.e. 0.5). However the flowchart process model was the one which is commonly used for change management process in the Ghanaian Construction industry. This is following by linear or decision process model and that of financial model as shown in the Table 4.2 below.

The multi-attribute utility model has the least frequency of usage among others. The flowchart model shown below is commonly used because the model provides opportunity for rejection and corrections to be made during the change process and is progressively elaborated. Again from the foregoing discussion the flowchart model is used for complex changes where accuracy and deviation are measures of performance for deviation are measure of performance for change. Thus findings of this study concur with that of Ibbs *et al* (2001) and Robbins and Coulter (1991).

Table 4.2: Change management models

Sn	Change Management models	RATING								
		1	2	3	4	Total	∑W	%	RII	Rank
1	Flow chart process model	1	5	9	15	30	98	27.528	0.817	1st
2	Linear or decision process model	2	6	10	12	30	92	25.843	0.767	2nd

3	Financial model	3	7	11	9	30	86	24.157	0.717	3rd
4	Multi-attribute utility model	6	8	6	10	30	80	22.47	0.667	4th

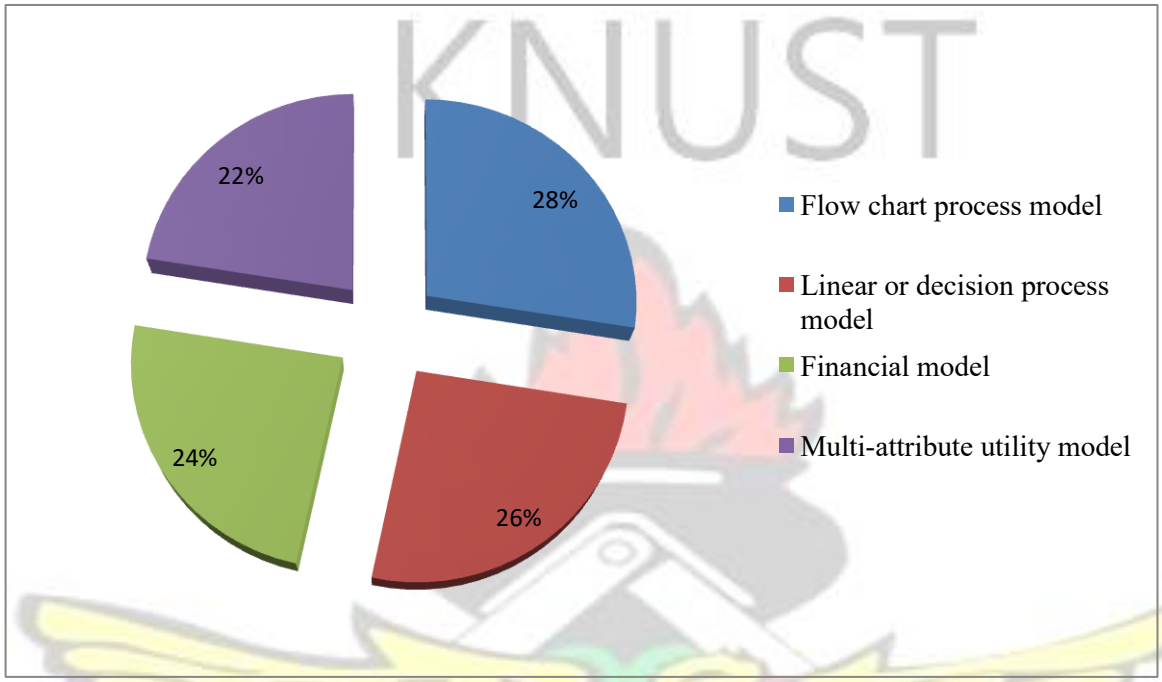

Fig 4.5: Change management models

4.5 CHALLENGES IN IMPLEMENTING APPROVED CHANGES

The last part of the questionnaire sought to draw information regarding the challenges which faces the implementation of approved changes**.** The challenges were also grouped under four heading as shown below:

4.5.1 PROJECT MANAGEMENT FACTORS

Under project management, eleven (11) issues were considered to be paramount challenges during implementation of approved changes as shown on Table 4.2. Among these factors, poor cost management/cost of delay was ranked first (1st) with a RII value of 0.861 with the time

overrun or schedule impact rank second (2nd) with RII value of 0.750. Poor project planning, delay payment and lack of executive management support rank (3rd) with RII value 0.667.

The ranking continues down through procurement method being tenth (10th) with RII value of 0.556 and the last being ranked twelfth (12th) with RII value of 0.472 which is inadequate contractor‟s plant and equipment. Poor cost management is ranked first, follow by time overrun because effective time and cost management are the critical success factors of every project while as inadequate contractor‟s plant and equipment is ranked the least among the eleven factor because new plant and equipment can be hire or purchase for the project. Again, the Table shows clearly that the RII values of the ten out of the eleven issues raised under project management are all critical challenges that must be considered or expected during implementation of the change because their RII values are greater than 0.5.

4.5.2 TECHNICAL CHALLENGES

Under technical challenges, four issues were enlisted; these are design error and omission substitution of materials, selection of inexperienced or unqualified contractor and change in specifications. Out of the four challenges, design error and omission rank first with RII value of 0.778. This is followed by substitution of material with RII value of 722. Change in specification is ranked third with RII value of 0.667 and fourth being selection of inexperienced or unqualified contractor with RII value of 0.639.

The Table shows that the RII values for four technical challenges enlisted are all critical challenges that must be considered or expected during change implementation, because their RII values are greater than 0.5 and have potential for causing delay.

4.5.3 CONTRACTUAL MANAGEMENT FACTORS

Under contract management, three issues were enumerated; these are Variation Order, Conflicts and Client Interference. Among the three, Variation Order is ranked the first with RII value of among the three is client interference with RII value of 0.444. According to the Table 4.3, variation order and conflict must always be considered or expected because their RII values are more than 0.5.

Table 4.3: Difficulties or Challenges in implementing approved changes

Sn		Ratings								
	(I)Project managerial Factors	1	2	3	4	Total	∑W	Mean	RII	Rank
1	Poor project cost management/cost overrun or cost of delay	0	5	15	25	45	155	3.444	0.861	1st
2	Poor project time management / time overrun / direct schedule impact	0	15	15	15	45	135	3.000	0.750	2nd
3	Poor project planning	10	10	10	15	45	120	2.667	0.667	3rd
4	Delay payment of interim certificate	10	0	30	5	45	120	2.667	0.667	3rd
5	Lack of executive management support and commitment	10	10	10	15	45	120	2.6667	0.67	3rd
6	Lack of project integration management	10	5	25	5	45	115	2.556	0.639	6th
7	Poor project communication	10	10	25	0	45	105	2.333	0.583	8th
8	Unqualified employees by the contractor	10	10	15	10	45	115	2.556	0.639	7th
9	Weak contractor‟s organization	10	15	15	5	45	105	2.333	0.583	8th
10	Weak client organization	10	20	10	5	45	100	2.222	0.556	10th
11	Procurement method	10	15	20	0	45	100	2.222	0.556	10th
12	Inadequate contractor‟s plant and equipment	20	10	15	0	45	85	1.889	0.472	12th
	(II) Technical Factors									
1	Design error and omissions	0	15	10	20	45	140	3.111	0.778	1st
2	Substitution of materials	0	15	20	10	45	130	2.889	0.722	2nd
3	Change in specifications	0	25	10	10	45	120	2.667	0.667	3rd

Table 4.3: Continues

4	Selection of inexperienced or unqualified contractor	5	20	10	10	45	115	2.556	0.639	4th
	(III) Contract Management Factors									
1	Variation orders	15	5	15	10	45	110	2.444	0.611	1st
2	Conflict / misunderstanding	10	20	15	0	45	95	2.111	0.528	2nd
3	Client interference	25	10	5	5	45	80	1.778	0.444	3rd
	(IV) Economic and Financial Factors									
1	Increase mark up for contractor	0	5	10	30	45	160	3.556	0.889	1st
2	Reduction of owners financial commitment	5	10	25	5	45	120	2.667	0.667	2nd
3	Inflation	0	20	20	5	45	120	2.667	0.667	2nd

The various implementation challenges were compared to each other as show in Table 4.5. The results indicate that Economic and financial issues are the main challenges (1st) followed by Technical factors (2nd), Management factors (3rd) and contract management factor being the last.

Table 4.4: Comparison of the challenges affecting the implementation of project changes

	∑W	Mean	Percent	Rank
Economic and Financial Issues	400	133.3	28.41	1st
Technical Factors	505	126.3	26.918	2nd
Project managerial Issues	1375	114.6	24.39	3rd
Contract M anagement Factors	285	95	21.01	4th

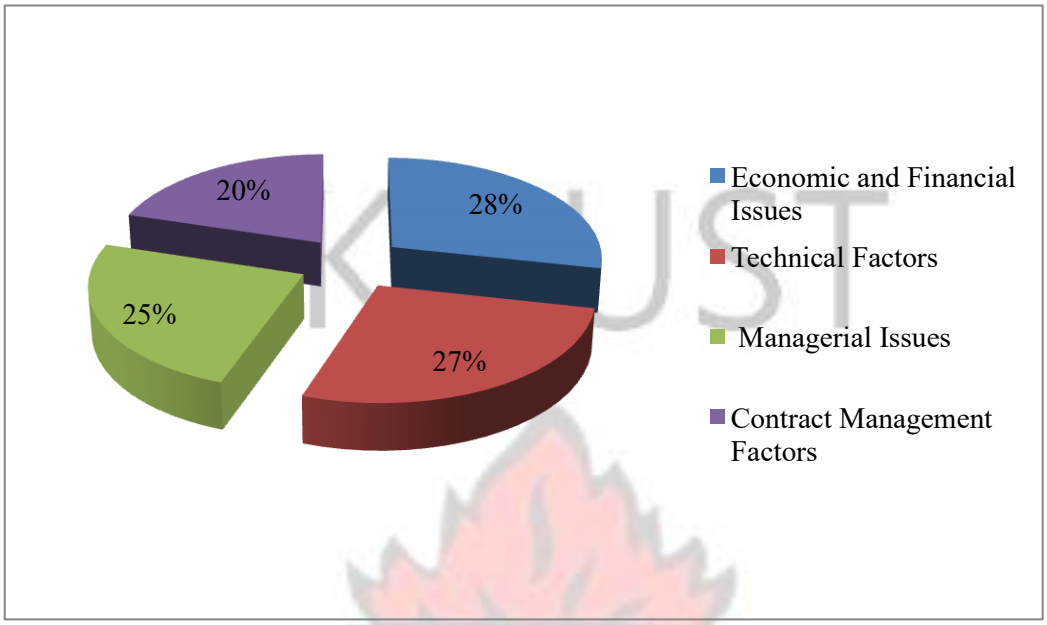

Fig 4.6: Comparison of the challenges affecting the implementation of project changes

CHAPTER FIVE

FINDINGS, CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

The purpose of the project was exploring into the change management processes used in the Ghanaian construction industry. Consequently questionnaire survey was used to draw information from 45 construction professionals ranging from Engineers, Project managers, Architects etc. The results of their responses lead to the conclusions presented in section 5.2

5.2 REVIEW OF BACKGROUND AND OBJECTIVES

Three main research objectives were set: (i) To ascertain the predominant reasons of alteration in construction work (ii) Find out the change management models used in construction project and (iii) To identify the challenges associated with implementing project changes. The following conclusions were found;

Background of respondent.

The experience background of the respondents shows clearly that change management processes and practices in construction projects are as old as construction industry in Ghana, because there are 29.167% respondents with twenty years and over working experience.

5.2.1 OBJECTIVE 1: ASCERTAIN THE PREDOMINANT REASONS OF ALTERATION IN CONSTRUCTION WORK

According to the analysis in chapter 4, clients are the key source of change in project in the Ghanaian construction industry. This is true because clients are project initiators and the main

stakeholder, and for that matter every aspect of the project must be constructed to their expectation or satisfaction. This is followed by consultants and that of contractors because consultants and contractors are considered as major stakeholders in construction projects.

(i) Among the causes of changes, project management factors (such as *poor definition of project scope, poor communication, correction, remedial works)* are the major causes of change. Again it is believed that planning takes about 70% of the project life cycle, PMI (2008).

(ii) Technical factors such as *unforeseen site condition, poor workmanship* and error in setting out the design on site are issues that are noticed during project execution and cannot be fully plan for especially issue about soil condition.

(iii) Economic and financial issues such as inflation and fluctuation cannot be fully predicted or considered in the project cost plan, though a percentage margin of increase can be included in cost plan but that cannot reflect the actual inflation and fluctuation index throughout the project duration. In the Ghanaian construction projects inflation and fluctuation index keep varying and are always high, these must be considered in the project cost plan.

5.2.2 FIND OUT THE CHANGE MANAGEMENT MODELS USED IN CONSTRUCTION PROJECT

(i) This section discusses the change management models used by consultants, contractors and public institutions for construction projects which the professionals use to determine the particular change process. The study shows that all the identified models as described in literature are used by professionals in Ghanaian construction industry. However, the flowchart model is the most commonly used because it

provides room for change proposal and approval to be accepted and rejected, it also help the project team to review activities at the change decision point, in other words it provides opportunity for additions and substitution of activities.

(ii) The Linear or decision process model is considered second by the professional because it allows weights to be allocated to every decision criteria which enables them to assess and determine risk and uncertainties involved in each of the decision alternatives.it also help to choose decision alternative with less risk impact on the project.

5.2.3 IDENTIFY THE CHALLENGES ASSOCIATED WITH IMPLEMENTING PROJECT CHANGES

(i) Fig 4.6 shows that the economic and financial factors are the main challenges during implementation of project changes and it is 28% of the entire views of the respondents. Under economic financial issues is rank first, because increase make up for contractor requires additional financial commitment from the client.

(ii) Technical factors were considered by respondent as next to economic and financial factors because the finding shows 27% of the total views of the respondents. Under technical factors, the respondents indicated that design error or omission is the dominant challenge during change implementation

(iii) Project management factors were given 25% from the respondent. Among the factors that were considered under project management issues, poor project cost management is ranked first on the table because poor project cost management

leads to demand for extra financial commitment from the clients who in most cases result in project abandonment. This is followed by poor project time management, poor time management result in time overrun and time overrun require extra financial commitment from client in terms of cost of delay or in terms of contractor‟s overheads and administration charges. The other dominant challenge is delay payment and delay payment is a general implementation challenge in Ghanaian construction industry because the Government of Ghana is the major play maker or client who depends on national revenue mobilization (taxes) and other donor funding for project. Delay payment is a challenge to contractors in the construction project because it usually brings financial difficulty or capital lock-up to contractors in the Ghanaian construction industry.

(iv) Contract management factor is given 20% by the respondents and under contract management factor is rank first among other factors. This is a clear indication as stated in literature that variation can be made by employer or architect during the course of project, to alter such items as an error or omission of item in a bill, the alteration of work, goods or materials and alteration due to legislation or a variation clause in the contract, as in this case study. Sun *et al*, (2004).

5.3 RECOMMENDATIONS

The study shown that making changes to construction project is a common occurrence which usually has some negative impact on construction projects. Again change management practices is as old as construction industry in Ghana and all the people involved have higher education background but they do not have complete knowledge about change management.

According to the analysis of the data collected as well as the findings, it is recommended that various designs and project schemes including the scope should be clearly defined and ascertained before the commencement of construction projects, also change management course is recommended to be included to various training background of the up and coming professionals, hence an upgrading course is also recommended to be organized for all the professionals involved in change management in the area of project management issues, technical issues, economics and financial issues and contract management issues. In this way, the various challenges encountered during implementation of approve changes will be minimized.

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APPENDIX

QUESTIONNNAIRE

SECTION A: Respondent"s background and Organization Profile

Please tick as appropriate

1. What type of organization do you work for?
   (a) Private / Contractor
   (b) Private / Consultancy
   (c) Public Agency
2. What is your position in your organization?
   (a) Project Manager
   (b) Civil Engineer

(c) Architecture / Structural Engineer

(d) Other, please specify …….

3. Which of these changes does your organization usually manage in construction project (you can tick more than one)

(a) Design changes (b) Change of specification (c) scope (d) Requirement

4. What academic qualification do you hold? [ ] HND [ ] Bachelor degree [ ] Master degree [ ] PhD

5. In your academic training, did you study change management as a course module, if yes what aspect of change management were you trained for?

[ ] Technical aspect/impact [ ] Financial aspect/impact [ ] Project management aspect [ ] Economics aspect/impact

6. How long have been involved in project change management.[ ] One to five yrs. [ ] Six to ten yrs. [ ] Eleven to fifteen yrs. [ ] Sixteen to twenty yrs

SECTION B: Causes of change in construction project

Please kindly rank on a scale of 1 -4 how often the following factors causes changes in construction project

(1) Not often (2) Often (3) Very Often (4) Very very often

No	**Source of change**	**Causes of change**	1	2	3	4
A		**Project Management Issues/ factors**				
1	**Client**	Change in functional requirements				
2		Inadequate funding				
3		Change of client organization				
4	**Consultant**	Poor scope definition				
5		Corrections				
6		Unforeseen site conditions				
7		Remedial works				

8	**Contractor**	Procurement method				
9		Construction method				
B		**Technical Issues**				
1	**Consultant**	Unforeseen site condition				
2		Change in design, modification or alteration				
3		Error or omission in deign				
5	**Contractor**	Unforeseen site condition				
6		Poor workmanship				
7		Remedial works				
C		**Financial and economic Issues**				
1	**Client**	Inadequate funding				
2		fluctuations				
3		Inflation				

Comment

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Recommendation

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SECTION C: Changes management process models.

Question: There are several models that can be adopted in order to complete a particular change management process, how frequent do you consider or apply the following change

management models in your organization? Please use the scale of 1 – 4 and rank them appropriately.

(1) Not useful

(2) Low frequent usage

(3) High frequent usage

(4) Very high frequent usage

	CHANGE MANAGEMENT PROCESS MODELS	1	2	3	4
1	Linear or decision process model				
2	Financial model				
3	Multi-attribute utility model				
4	Flowchart process model				

Comment

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Recommendation

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SECTION D: Difficulties or challenges in implementing approved changes.

Question: There are several difficulties or challenges during the implementation of the approved change which contribute to delay of projects, based on your experience, to what

extent the following related factors below contribute to delay of projects. Please rate or circle a figure as indicated below. Each scale represents the following rating:

(1) Low contributing factor

(2) Medium contributing factor

(3) High contributing factor

(4) Very high contributing factor

No	**Project Management Issues/ factors**	1	2	3	4
1	Lack of executive management support and commitment				
2	Delay payment of interim certificate				
4	Poor project time management / time overrun / direct schedule impact				
5	Poor project planning				
6	Poor project cost management/cost overrun or cost of delay				
7	Poor project communication				
8	Lack of project integration management				
9	Weak client organization				
10	Weak contractor‟s organization				
11	Inadequate contractor‟s plant and equipment				
12	Unqualified employees by the contractor				
13	Procurement method				
	Technical Issues				
1	Selection of inexperienced or unqualified contractor				
2	Substitution of materials				
3	Change in specifications				
4	Design error and omissions				
5	Error in design data				
	Contract Management Issues				
1	Conflict				

2	Client interference				
4	Variation orders				
	Economic and Financial Issues				
1	Reduction of owners financial commitment				
2	Change or increase mark up for contractor				
3	Inflation				

Comment

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Recommendation

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