UNIVERSITY OF NAIROBI

THE IMPACT OF THE TYPE OF CONSTRUCTION CONTRACT ON PROJECT TIME AND COST PERFORMANCE IN KENYA: A CASE STUDY OF TRADITIONAL AND INTEGRATED CONTRACTS

MAINA, GEORGE M.
B50/7815/06

RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF ARTS IN CONTRUCTION MANAGEMENT OF THE UNIVERSITY OF NAIROBI

JULY, 2012

DECLARATION

I hereby declare that this research project is my original work and has not been presented for a degree in any other university

----

Maina, George M.

BA (Bldg Econ), QS

B50/7815/06

DECLARATION BY THE SUPERVISOR

This research project has been presented for examination with my approval as University Supervisor in the Department of Real Estate & Construction Management

----

Mr. Nyagah B. Kithinji

BA (Bldg Econ), MA (Bldg Mgt), QS

ACKNOWLEGEMENT

First, my heartfelt thanks to God for blessing me with good health.

Grateful thanks are due to my supervisor Mr. Nyagah B. Kithinji for his expert and wise guidance in this research, which has taken a great deal of his valuable time.

I appreciate the support of the academic staff of the department of Real Estate and Construction Management, and fellow classmates.

I would also like to thank all the design, management and construction firms that responded to my questionnaires.

Finally, special thanks to my family and the firm of Master-Cost (K), Quantity Surveyors, for encouragement and support.

ABSTRACT

Many construction projects suffer time and cost overruns. In addition to impairing the economic feasibility of projects, this also provides a fertile ground for costly disputes and claims. This study, thus sought to investigate the impact of the type of construction contract on project time and cost performance in Kenya.

This study categorized the various contracting methods into two major groups. The two categories are traditional contracts (where design and construction is separate), and integrated (single source) contracts (where design and construction are combined). While it is noted that there were shortcomings that led the construction industry to explore new methods of contracting, there are no concrete figures on the extent to which the new types of contracts have been able to improve project performance. Based on the contractors and design consultants' experiences and perceptions, quantitative data was collected through questionnaires, and analyzed.

The results of the analysis revealed majority of projects were carried out using traditional contracts and not integrated contracts. However, the projects that used integrated contracts had a lower mean time and cost overrun compared to those that used traditional contracts. Integrated contracts can give better time and cost performance, implying that they are more effective than traditional contracts. The study further established that the acceptance of possibility of good performance in use of integrated contracts is wide even among the people who have been using traditional contracts, and lack of use of the integrated contracts can mainly be attributed to lack of opportunity or knowledge to use them.

The study recommends that the stakeholders in the construction industry should be encouraged to use appropriate 'contracts for construction projects, in an attempt to improve projects time and cost performance. In particular that integrated contracts be encouraged to all stakeholders for public and private projects and professional and educational institutions, so as to improve efficiency in the industry.

TABLE OF CONTENTS

Item & Description

LIST OF TABLES

LIST OF FIGURES

<

CHAPTER 1: INTRODUCTION

This chapter covers the research background, the problem and its setting, and the scope and significance of the study. It also outlines the objectives of the study and states the hypotheses.

1.1 Background of the study

This section discusses the relationship between concepts of type of construction contract and project performance.

According to Hendrickson (2000), in law, a contract is an agreement between two or more parties that if it contains the elements of a valid legal agreement, is enforceable by law. That is to say, a contract is an exchange of promises with a specific remedy for breach. Agreement is said to be reached when an offer capable of immediate acceptance is met with a "mirror image" acceptance (i.e., an unqualified acceptance).

According to legal scholars Salmond and William (1945), a contract is an agreement creating and defining the obligations between two or more parties. A contract is therefore an agreement that creates legally binding rights and obligations among parties. It can also be defined as an agreement intended by the parties to it to have legal consequences and to be legally enforceable (Hendrickson, 2000).

A construction contract has been defined by Peters (1990), as an arrangement that deals with determination of the contract sum, and amounts subsequently due to the contractor from the employer for work done. Ramus (1996) also defines a construction contract as variants of the traditional contracts considered under lump sum contracts, schedule of rates contracts, serial contracts and cost plus contracts.

A contractual procedure is the framework of relationships and procedures within which construction is brought about. It establishes the roles and relationships which make up the project organization and the overall contractual and managerial relationship. Managerial relationships recognize contractual ones but they are not determined by contractual relationships. While the overall managerial objective is performance, it is appreciated that **this** can be hindered by inefficient or conflicting contractual relationships. Contractual procedure also helps to shape overall values and style of the project. Contractual procedure is significant because it determines the efficiency with which the whole process of producing a building from design through construction can be carried out (Morton and Jagger, 1995). Contractual procedure is aimed at establishing an applicable agreement, which incorporates, among other things, the mode of effecting payment. It follows then that it is a concluding but formal agreement with a contractor who has already been selected (Onwusonye, 2002). The contractual and managerial relationship of the various types of construction contracts in use is included in the discussion of the types of contracts, in the literature review.

On the other hand, project performance can be defined as the degree to which a project achieves the implementation objectives and stake holder's requirements, primarily to do with the programmed cost, time, specifications and quality targets (Pheng and Chuan, 2006). Pheng and Chuan (2006) also defined project success as the completion of a project within acceptable time, cost and quality and achieving client's satisfaction and indicated that project success can be achieved through the good performance of indicators of the project. Al-Momani (2000) stated that the complete lack of attention devoted to owner's satisfaction contributes to poor performance.

Among the factors that affect a project's performance, is the type of contract chosen. According to Flanagan & Norman (1993), a contract plays crucial roles in project performance, in that:

- It defines the scope of works.

- It establishes the rights, duties, obligations and responsibilities of parties.

Fundamental to all contract strategies is the development of framework that clearly brings together and establishes the boundaries of roles, responsibilities and relationships between the parties to the construction project, who may include clients, design consultants, contractors, sub-contractors, suppliers, project management consultants, financiers etc. and

- It allocates risks between parties.

The acceptance of a contractual obligation or duty brings with it the acceptance of a commensurate risk, which is the risk of being unable to perform/ fulfill the obligation or duty cause of one's own inadequacy, incapacity, inadvertence, or error, or because of interference from outside sources or events. A building contract is a trade off between the contractor's price for undertaking the work, and his willingness to accept the associated risks. The price of doing the work partly reflects the contractor's perception of the risk involved. The fundamental risks inherent in any construction project are apportioned between the client, the design team, the general contractor, the specialist contractors, and the materials and components suppliers within the various contractual relationships. Contract types therefore determine the allocation of those risks inherent in a construction project including those relating and affecting performance in terms of time, cost and quality (Flanagan & Norman, 1993). Lam et al (2007) stated that the allocation of risk among the contracting parties in a construction contract is an important decision leading to the project success.

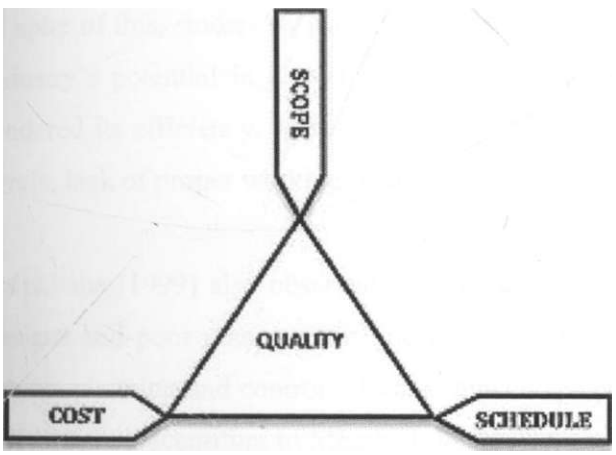
According to Walker (1989), the contracts have a role in ensuring that non-performance factors do not occur and if they do, ensure that they have minimal negative effect on the project success. Good planning, communication and co-ordination envisaged in a good contract should for example ensure that the contract chosen takes care of the measures that can mitigate losses arising from contractual issues, among others.

The dimensions and measurement of project performance and the practices that assist the project team in achieving required performance are explained as follows:

Construction Management as a field of applied science has been defined by Clough and Sears (1994) as "The judicious allocation of resources to complete a project at budget, on time, and at desired quality". This definition captures the essence of what inspired, drove, and guided practice and research in the Construction Management field. However, Abdeilhamid (2004) points out that the failure and inability of the conceptual models of Construction Management (time-cost-quality trade-off, work breakdown structure, critical path methods, and earned value) to deliver a project 'on-time, at budget, and at desired quality' is evident to construction participants. For example, recurring negative experiences on projects, as manifested by endemic quality problems and rising litigation, indicate that construction projects are low efficiency systems (Koskela, 2000).

According to Chatfield and Johnson (2007), projects need to be performed and delivered under certain constraints. Traditionally, these constraints have been listed as scope, time, and cost. This is also referred to as the Projects Management Triangle, where each side represents a constraint. One side of the triangle cannot be changed without impacting on the others. He explains that the time constraint refers to the amount of time available to complete a project. The cost constraint refers to the budgeted amount available for the project. The scope constraint refers to what must be done to produce the project's end result. These three constraints are often competing constraints: increased scope typically means increased time and increased cost, a tight time constraint could mean increased costs and reduced scope, and a tight budget could mean increased time and reduced scope. A further refinement of the constraints separates product "quality" or "performance" from scope, and turns quality into a fourth constraint.

Figure 1.1 Project Management Triangle



Source: (Chatfield and Johnson, 2007)

An initial plan has these time, cost and scope constraints. If the project scope is increased, the plan would require increased project duration and or increase project cost. A tight budget could mean increased time and reduced scope (Chatfield and Johnson, 2007).

Arising trom difficulties in measurement of quality due to its subjective nature, and despite there being other performance criteria, this study will measure performance using the criteria of cost and time, in exclusion of the other criteria.

According to Norton (1995), the impact of reviewing the client's needs at the briefing stage (or contract selection stage) for instance, may have greater impact on cost and time than efforts during production stage. Therefore, the earlier the right decision is taken, e.g. selection of the most suitable contract for a project, the higher its positive impact on project performance.

According to Chatfield and Johnson (2007), the discipline of project management is therefore about providing the tools and techniques that enable the project team to organize their work to meet these constraints, and achieve required performance. Such tools and techniques would include selection of efficient types of contracts. This activity is called contract strategizing.

In spite of this, studies by Talukhaba (1988) and Mbatha (1986) reveal that the construction industry's potential in Kenya has not been fully exploited, in that various problems have hindered its efficiency. These include cost and time overruns poor quality and functionality levels, lack of proper working relationships and adversarial relations between participants.

Talukhaba (1999) also observed that project delays were occasioned by clients' inadequate designs and poor management of the construction process which can be attributed to poor project planning and control, of which the choice of construction contracts play a significant role. Further, according to Mbatha (1986), poor cost and time performance characterize both the public and private sectors of the industry. The problem is however more serious in the public sector where according to Talukhaba (1988), public projects were found to have mean cost and time overrun of 51% and 112% respectively while private projects had 12% and 30% respectively. Most of the analyzed projects had used design-bid-build contracts. Despite this, the design-bid-build contract procedure continues to dominate Kenyan Construction Industry (Mbaya, 2004); (Katani, 2001); (Talukhaba, 1999); and (Michael, 1991).

The main types of construction contracts normally used are traditional contracts, management oriented contracts and integrated contracts.

Traditional Contracts are referred to as the lump sum contracts (Seeley, 1997). The unique **characteristic of** these types of contracts is the separation of the responsibility for design of **the project from** that of its construction. Even where variants of the basic system allow co-operation between the contractor and the client or his consultants, these two fundamental elements remain as two separate entities.

According to Rwelamila (1995), citing Carpenter (1981), in practice, most participants of the construction industry have fallen into the trap of adopting or using standard contracts. He suggests that this leads to the situation where projects go wrong because the actual tasks peculiar to the project are not identified. It is appreciated that standard contracts if not carefully amended may in some cases not meet all the requirements of a particular project, or may be biased in favor of one party. He argues that such failure prevents appropriate contracts being developed for a particular project. While this may not be entirely right, because standard contracts foresee most of the envisaged conditions, instances and risks envisaged in the industry, it suggests that the question of appropriateness of building project contracts needs to be addressed, thus the need to strike out or ammend any irrelevant clauses.

The traditional structure of the construction sector has become outmoded. This is in spite of a huge increase in the adoption of modern project management systems- **e.g.** management oriented contracts, which have developed without adequate concomitant changes to the organization of the traditional building process. Although the construction industry is responding to change, with new management strategies emerging, these new forms of management oriented contracts contain insignificant modifications to a system which has become fairly inappropriate, and this has negatively affected the clients (Rwelamila, 1996). Arising from this, there is need to continuously check the appropriateness of the construction contracts in use in order to ensure that their provisions are in line with the changes in the construction industry.

According to Fenn et al (1997), conflicts can also be managed by contracts, among other management techniques, possibly to a point of preventing them from leading to disputes, and that even dispute resolution is best managed when contracts are properly drafted. In addition, Sidwell (1984) argues that though traditional contracts are good, alternative forms (non-traditional contracts) such as management contracts and integrated contracts can produce better performance.

The non-traditional forms of contract are distinguished by the emphasis put on the following aspects of project organization and management: project organization structure, liability and risk allocation structure, design and construction organization structure, tendering procedure and price determination process used, the nature of contract with client i.e. with whom he assigns a contract or contracts and purpose for which contract is made. Non-traditional contracts developed out of client's dissatisfaction with the fragmented structure, and the adversarial culture that dominates the relationship between contracting parties in the traditional contracts, and client's need for single source contracts in an attempt to simplify procedures of construction and to centralize point of responsibility (Mbaya, 2004).

Management oriented contracts are contracts that embody the application of management principles with the separation of functions of management from those of design and construction. One entity is responsible for the general coordination of all aspects of a construction project to ensure the objectives are met within resource constraints (Ritz, 1994).

A major objective of Project Integrating Contract Systems is to enable an optimal integration of the planning and design on the one hand and construction on the other. Traditionally, the separation of design and construction is characterized by the tendering event, the representation of the client by the architect/engineer in his relations with the contractors, the non-involvement of the contractor or contractor- based professional in planning and design, the works contract between the client and the construction firm and by the management of the project by architect/engineer on behalf of the owner (Mbatha, 1993).

Management oriented contracts include: Management Contracting (MC), Professional Construction Management (PCM), and Project Management, They are considered to be both contract and as well management systems; contract systems because they involve the contractor as a management consultant, a designer or a specialized contractor; management systems because they are designed to specifically identify and fulfill the management role (Mbatha, 1993). Others are Design and Manage and Construction Manager at risk (Mastermann, 1996); **(Seeley,** 1997).

hile this system may also be considered to belong to the design-construction integration **system,** in fact the client's representative role in this project management contract is a pure ' management one (Mbatha, 1993). For this reason, the author shall in this study group management contracts together with traditional contracts, because their variant is purely in the management structure.

Integrated contracts on the other hand are used where the contractor is responsible for both the design and construction phases and commissioning of a project. The main characteristic of integrated contracts is that the contractor is responsible for both the design and construction phases and commissioning of a project. In these contracts, the main objective is to enable the owner (client) transfer most of the risk to the contractor. These risks include: design risk, construction risk and in some cases, also total economic risk. They are considered more of "types or forms of contract" than management systems.

According to Mbaya (2004), Mastermann (1996), Mbatha (1993), and Hovet (1994), integrated contracts (non-traditional forms of contracts) that have for a long time been in use include: Design and build, Plant and Design - build - package deal and turnkey and Build-own-operate-transfer (BOOT), and its variants.

Hendrickson (2000) explains that a common trend in industrial construction, particularly for large projects, is to engage the services of a design and build firm. The design and build contracts variants are however differentiated by the degree to which the builder or contractor is involved in the pre-contract and post-contract activities of the project (Mbaya, 2004); (Hovet, 1994).

Although Talukhaba (1999) created a formula to predict contract time on the premise that the time overruns are more of a reflection of the setting of the wrong contract time for the projects at the beginning, the researcher's opinion is that this premise would affect both traditional and integrated types of contracts.

From the above scenario, it is not surprising that contracts in construction industry continue to be developed. According to Mtiaya (2004), Seeley (1997), Rhamus (1996), the main types of construction contracts in use today, to be considered in detail in the literature review, can broadly be grouped into the following:

i) **Traditional Contracts (Design-Bid-Build Contracts)**

- Lump Sum Contracts
  - Bills of Quantities (firm)
  - Bills of Quantities (approximate)
  - Drawings and Specifications
- Schedule of Rates (unit price) Contracts
  - Standard schedule
  - Adhoc schedule
  - BOQ for previous project

- Fee contracts
  - Cost Plus Fixed Percentage Contract
  - Cost Plus Fixed Fee Contract
  - Target Estimate Contract

- Management Oriented Contracts
  - Management Contracting
  - Professional Construction Management
  - Design and Manage
  - Construction Manager- at- risk
  - Project Management

ii) **Integrated (single source) contracts**

- Design and build
- Design and build - package deal and turnkey
- Build-own-operate-transfer (BOOT) and its variants

In this study, and as shown above, all the types of contracts shall be grouped in these two broad categories. That is:

- Traditional contracts (Contracts for works designed by the employer and built by the contractor).
- Integrated contracts (Contracts for works designed and built by the contractor).

Despite there being other important factors affecting performance as pointed above, this study will focus on the role of the type of contract in exclusion of the other equally important factors.

1.2 The problem

The essential roles of a construction contract are to define the scope of works, to establish the rights, duties, obligations and responsibilities of parties and to allocate risks between parties. Fundamental to all types of contracts therefore is the development of a framework that clearly brings together and establishes the boundaries of roles, responsibilities and relationships between the parties to the construction. The acceptance of a contractual obligation or duty therefore brings with it the acceptance of a commensurate risk, which is the risk of being unable to perform/ fulfill the obligation or duty, which affects performance in terms of cost, time and quality (Flanagan & Norman, 1993).

According to Chatfield and Johnson (2007), the first challenge of project management is to ensure that a project is delivered within defined constraints. The second, more ambitious challenge is the optimized allocation and integration of inputs needed to meet pre-defined objectives.

A construction contract is an important part of the project implementation process as it guides the performance of the parties and therefore affects the performance of a project. Despite this, the problem and challenge that Kenya's construction industry is facing is high level of non-performance in terms of cost, time and quality. The construction scenery across Kenyan institutions reveals either abandonment of building projects under construction, delayed completion or high cost of construction, or both. Good examples are various government projects that have been affected. Talukhaba (1988) and Mbatha (1986) demonstrate a poor performance record for the Kenyan construction industry, pointing to luck of appropriate overall organization and management of projects.

Findings by researchers have revealed the industry's tendency to measure performance in terms of the following; completion on time, completion within budget, and meeting construction quality standards. According to Mbatha (1986), 73% of public sector projects took a longer contract period than originally anticipated notwithstanding size, location or type. He further noted that 38% of projects ended up incurring additional costs mainly attributed to variations by clients.

Some of the failures that indicate inefficiency in the construction industry as identified by among others Mbaya (2004) and Talukhaba (1988) include, poor performance in terms of time, cost and quality and adversarial attitudes between participants leading to poor communication, claims and disputes etc.

Talukhaba (1988) also demonstrates the problem in his findings that about 70% of projects initiated have a chance of overrunning in time by about 53.3% while 53.7% of projects overrun in cost by about 20.7%. He points an accusing finger at the predominant traditional procurement method, and recommends research on the improvement of construction projects performance.

Hellard (1993) mentions that any attempt to resolve conflicts in construction projects, economically and effectively should start as early as possible in the drafting and choice of contracts. This suggests that there is need for selection and use of good contracts.

According to Mcdermott (2005) and Sidwall (1984), the manner in which a building team and process are organized has an influence on project cost and time performance, and management is therefore a crucial element in a project success. In spite of this, procurement and contract methods widely used in Kenya are categorized as sequential interdependency, whose characteristic is the separation of the responsibilities for design and construction of projects (Mastermann, 1992).

Sidwall (1984) argues that though traditional contracts are good, alternative forms such as design and build and management contracts can produce better performance. In view of this, Construction contracts which set out the relationship and communication channels of participants in construction projects should be treated as potentially high ranking and convincing performance contributors.

Respite the use of various types of construction contracts in the management of contracts and e studies carried out demonstrating poor performance record for the Kenyan construction industry in regard to time, cost and quality, little has been done to analyze the impact of the types of construction contracts on project performance in Kenya.

This research proposes that the selection of an appropriate type of contract can determine the success of a project, and seeks to examine the extent to which the choice of a construction contract affects the success of a project. It further seeks to determine whether the type of construction contracts utilized in Kenyan institutions may be causing this high level of non performance.

The purpose of this study is to compare the impact of two types of contracts, integrated and traditional contracts on building projects time and cost performance. The study shall also evaluate the perception of Architects, Quantity surveyors, Project managers and Contractors in regard to the impact of contracts on building projects time and cost performance. The study further seeks to establish the relationship between the said types of construction contracts and project performance. This is what has inspired this study.

1.3 Objectives of study

The study examines the impact of the type of contract on time and cost performance.

The study objectives are:-

1.31 To examine the extent of the use of various types of construction contracts in the Kenyan building industry.

1.32 To identify the impact of traditional and integrated construction contracts on project time and cost performance.

I -33 To investigate the extent to which integrated contracts can improve project time and **cost** performance.

Hypotheses

Ho: **Use of** integrated contracts improves building project time and cost performance

H,: Use of integrated contracts does not improve building project time and cost performance

H2: The type of contract chosen does not predict project performance

I.4.1 Research Questions

This research seeks to answer the following questions

1.4.2 What is the effect of the type of construction contract on project overruns?

1.4.3 What is the relationship between different types of construction contracts and cost and time of a project?

1.5 Significance of the study

Project cost and time overruns occur in the construction industry and this study is useful to consulting and construction firms, who need to be aware of the impact of contracts on project cost and time overruns, while undertaking building projects in Kenya. This is because a construction contract is drawn at a very early stage of a project life cycle and should be an important performance management tool. In addition, once production (construction) starts, it quickly becomes obvious that factors that have not been considered in contract selection are of major significance. Careful attention to contract selection would eliminate or minimize risks that often dramatically overrun budgets and schedules. This should include the need to break away from the tradition of treating project contracting and project performance as separate functions.

The results of the study can assist construction professionals and stakeholders to improve **contractual** procedures in design and construction phases. It is therefore expected that the **project will** shed light on the impact of types of construction contracts on project performance **in Kenya.**

1.6 Scope of the study

The target projects study area is Kenya. However, the study concentrates on project participants in Nairobi due to the fact that most of the project participants who undertake building projects are found in Nairobi (Gichunge, 2000), and for logistical reasons, time saving and convenience purposes.

It has also concentrated on Architects, Quantity Surveyors, Project Managers and Contractors as they have most of the information relating to contracts and administration of contracts. Developers are excluded from the study for the reasons that the consultants are developer's agents and because most developers are one-off, undertaking one project in their lifetime.

1.7 Operational definitions of terms

For the purpose of this study the following terms are used in the context indicated.

Contract Price: is the price agreed by the contracting Parties for the construction of the works or adjusted in accordance with the contract (PPOAK, 2006; JBCK, 1999).

Contract Period: is the period agreed by the contracting parties for the construction of the works or adjusted in accordance with the contract (PPOAK, 2006; JBCK, 1999).

Construction Contract: Arrangement that deals with determination of the contract sum and amounts subsequently due to the contractor from the employer for work done (Peters ,1991) or variants of the traditional contracts considered under lump sum contracts, schedule of rates contracts, serial contracts and cost plus contracts (Ramus, 1996).

***Contractual** Procedure*: The framework of operational relationships and procedures within **which** construction is carried out (Morton and Jagger, 1995).

***ontract** Type:* A kind of an agreement that defines the scope of the works establishes the **"ghts and** obligations of the parties to a contract and allocates risk between the parties. > <. **(Flanagan** & Norman, 1993), *Project performance*: The degree to which a project achieves the implementation objectives and stake holder's requirements, primarily to do with the programmed cost, time, specifications and quality targets (Pheng and Chuan, 2006).

Performance measurement: A comparison between the desired and the actual performances (Navon, 2005).

Project: A temporary and one-time endeavor undertaken to create a unique product or service that brings about beneficial change or added value. This property of being a temporary and one-time undertaking contrasts with processes, or operations, which are permanent or semi-permanent ongoing functional work to create the same product or service over and over again. A project is also a carefully defined set of activities that use resources (money, people, materials, energy, space, provisions, communication, quality, risk, etc.) to meet pre-defined objectives (Hendrickson, 2000).

Construction Project: A project for carrying out construction operation/s (Hendrickson, **2000).**

Project Management: Project management is the art of directing and coordinating human and material resources throughout the life of a project by using modern management techniques to achieve predetermined objectives of scope, cost, time, quality and participation satisfaction (Hendrickson, 2000).

Project Management Methodology: The planning, monitoring and control of all aspects of the project and the motivation of all those involved in it to achieve the project objectives on time and to the specified cost, quality and performance (Hendrickson, 2000).

***Construction** Management:* The judicious allocation of resources to complete a project at budget, on time, and at desired quality (Clough and Sears, 1994).

1-8 Summary

This chapter has outlined the research background and problem, and the fundamental issues **that lead** to the research objectives. The concepts of the type of construction contract and **Project** performance and their relationships are also highlighted. Next, the dimensions of ' < **roject** performance and the practices that assist the project team in achieving required performance are described. Finally, it shows that despite the importance of the construction industry to the economy, the industry continues to perform poorly especially with respect to cost and time management arising from deficient contracts, and thus there is need to find ways of improving that performance related to or associated with construction contracts selection.

The next chapter reviews the literature relevant to the problem area.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter discusses the existing literature on the subject of construction contracts and their impact on project performance. The concept of project performance is also explained highlighting performance challenges in construction projects. In addition, the dimensions and meaning of project performance to stakeholders/project participants are explored. Further, the chapter explores how performance is achieved through a project life cycle. Finally it identifies and discusses how parties need to safeguard their part of risk of non-performance through contracts. This is done by identifying and discussing different types of construction contracts, their strengths and weaknesses as well as circumstances in which they are appropriately used.

2.2 The concept of Project Performance

Project performance was defined in chapter 1, page 12 paragraph 4 as the degree to which a project achieves the implementation objectives and stakeholder's requirements, primarily to do with the programmed cost, time, specifications and quality targets.

2.2.1 Performance Challenges in Construction Projects

The development of contracts management in construction requires an adequate understanding of the main characteristics of the sector and the implications of these characteristics in production practices (Santos, 1999; Koskela, 2000). In this sense, some of the most common factors used to characterize construction are:

- Spatial fixity of buildings: unlike any other industry the end product of construction is generally spatially fixed, large and immobile. This physical characteristic influences fundamentally the structure of all construction organizations (Ball, 1988);
  One of a kind product: construction is, in general, a "make-to-order" industry where the majority of projects are "one-off and tailor-made" to a particular client's requirements (Fellows et al., 1983);

- Long life expectancy required; a building is usually more expensive than most manufactured goods and, because of that, it has to be more durable. Moreover, many clients may also prefer not to change their living/working place throughout their life, which confers to the life expectancy of a building an extra psychological and social dimension (Gann, 1996);
- Non-experienced clients: typically, the construction client normally has little or no experience in construction (Santos, 1999). This situation contributes to their inability to clarify their requirements and poor discernment with respect to the level of quality, time and cost expected. In short, it is only during construction that they realize inadequacies arising from these requirements;
- Long periods of design and construction: in general, there is a long period between the decision to implement a construction project and actual completion of the works on site. In major jobs the entire project may take several years (Ball, 1998);
- High cost of the projects: the cost of a construction project confers a structural rigidity to the business process. Cancellation may be prohibitively expensive once contracts have started, or when extensive pre-planning and design has been done, or when the project is semi-completed (Ball, 1998);
- High proportion of subcontractors: construction companies subcontract works. Subcontracting adds considerable flexibility in terms of adjusting workloads and the ability to undertake different types of work, as a risk management strategy, but what is distinctive in the construction industry is the extent of rights and liabilities in subcontracts , as will be seen later in this chapter (Ball, 1998);
- Fragmented: construction is essentially a large and fragmented industry, with significant difference between firms in terms of size and scope, capacity, specialization, right structure, and contracting capacity.

These traits of construction projects are summarized by Ritz (1994) as follows.

- Projects uniqueness and not repetitive.
- Project team works against schedules and budgets.
- Project involves various departments in a company.
- Projects come in various shapes, sizes and complexities.

C un,c1ue ar>d complex environment represented by the combination of these, and other ' <
cteristics represents a challenge for contracts management.

2.2.2 Meaning/ Dimensions of Performance to Stakeholders/ Project Participants

Norton (1995) notes that the production function has an important role within all business processes since throughout its activities pass most of the company resources. However, it is clear that the earlier a decision is taken in any business process, the higher its impact on the overall project performance. Therefore, impact of reviewing the clients need at the briefing stage' (or contract selection stage) for instance, may have greater impact on cost and time than efforts during production stage. Indeed a good contract would be very effective in correcting future mistakes. In addition, another approach to project management is to consider the three constraints as finance, time and human resources. If you need to finish a job in a shorter time, you can throw more people at the problem, which in turn will raise the cost of the project, unless by doing this task quicker we will reduce costs elsewhere in the project by an equal amount.

The dimensions of performance to stakeholders can be explained as follows:

- **The Developer**

The developer is the potential owner of the construction project and therefore develops the need for a facility and initiates the project process. He sponsors the construction works and ultimately utilizes them. A client may be an individual, the central government, government agency, the local government authorities and private enterprises. Client's create demand for constructed facilities and finance that construction hence they are the construction business promoters.

Construction works can be executed through the developer's own organization for those that have a construction department e.g. the government and major companies but in most cases, construction operations for most clients are outsourced to outside consultants and contractors.

In a developing country like Kenya, government and quasi government agencies account for more than half of the demand for construction (statistical abstract, 2008). This gives the government a major influence in the determination of the direction of the industry including the contractual process used and the general organization and management of the construction industry.

Critical to construction contracts provisions is the selection of consultants, contractors and suppliers. The primary considerations in the selection of the design and construction team should be suitability of the firms/companies for the specific project to be undertaken and their ability to work together as a team. Selection should be made on the basis of skill, reputation, rapport, past performance, technical competence, commitment to the developer's interest and delivering best value on the project as well as cost.

- **The consultants**

Consideration should be given to designers' approach and methodology directed to achieve the intended requirements and capacity and commitment of the designers to the project.

Most developers of the construction industry neither have the skills required to run the construction process nor have a specialized construction department in their organization. This is particularly the case with private individuals or institutional clients. They have to hire professionals to interpret their requirement for space, design the facility, cost the facility, select contractors to build the facilities and manage the construction process. Government and government agencies may have departments in them that have professionals to do this work. The professionals may include a number or all of the following;

- Project managers

The Project Manager takes the leading role in coordinating the project. He is normally the Link between consultants / contractors and the client.

Project management is a new discipline that aims at improving project performance through emphasis on better management and co-ordination. It involves the planning of the project activities and coordination of the various participants in a project to meet project goals within the project resource constraints. Unlike other consultancies, project management is not as widely used in Kenya. As early as 1993 at least five-project management firms were identified (Mbatha, 1993). A directory search now reveals about twenty eight firms that claims to practice project management.

- **Architects**

e ro,e 'he architect is to design and supervise construction, for the proper execution of C VJ0T^S- In traditional contracts, the architect has been the leader of the design team and so acts as the chief supervisor of the construction works in addition to his design role. He is responsible for receiving the brief from the client, interpreting it to produce drawings and supervision of the costing, building services and structural designs, tendering and construction. This dual role of the architect has been criticized by the promoters of project management who argue that the two roles are conflicting as one cannot supervise over their own work (Mbatha, 1993).

- Engineers

The main role of engineers is to design and supervise construction of engineering components of their respective disciplines for the proper execution of the works. In building projects, structural engineers design and supervise construction of structural elements, while service engineers do the same for electrical and mechanical services. However, in civil engineering projects, civil engineers take on a bigger role where they head the design and supervision team and architects have a very minor role, if any.

- Quantity Surveyors

The general obligation of the Quantity Surveyor is to provide the necessary advice, opinion, assessment, measurements, computations, or valuations as the case maybe. The Quantity Surveyor prepares the tender bills of quantities and tender documents which the contractor uses to quote for the works. They also advise on tendering methods and forms of contract. Quantity surveyors are responsible for costing and cost control in building projects, valuing work in progress and preparing final account.

- **The Contractor**/s

The contractor is required to carry out, superintend upon and complete the works and rectify **defects** appearing therein, in accordance with the contract. The selection of a contractor or **contractors** will have a major impact on the quality, timing and cost of the completed project **as well as** on the financial risk during the works period, health and safety, the immediate **environmental** impact of the project and the initial reputation of the works. All these issues **should be** taken into account in making an appropriate selection.

Involvement of the contractors in the early design stages of the project may also create °PP0rtunities for an integration of the design with the construction techniques and materials **liable,** resulting in improved efficiency, shorter construction periods and reduced wastes. ' *

Against this should be set the difficulties in establishing costs and contractual agreements before a design has been developed.

In the competitive construction business that requires special resources for different types of **construction** works, the contractors tend to specialize in a particular area of construction. From this functional angle, the contractors are classified by Chitkara (1998) into the following categories:-

- Building contractors.
- Civil engineering contractors.
- Specialist service contractor's e.g. electrical and mechanical services contractors.
- General contractors who engage in minor construction works of all types.

Depending on their resource capability to handle construction work and their financial **position** and past performance, the contractors are further categorized by various government **bodies** into work load capability depending on size in value of the project they can handle e.g. **category A-H** for the Ministry of Public Works, for purposes of awarding contracts.

*** Suppliers**

Suppliers will often be vital members of the construction team and should generally be **selected** on the same principals laid out above and this be specified in the contract. The **ability** to deliver products, whether standard or purpose designed and made, to an appropriate **quality** and on programme, will invariably be more important that a tendered price.
Some suppliers will frequently need to be included in the team very early in the life of a **project** and will need to be team players, willing to contribute their skills, creativity and **expertise** for the benefit of the project together with other members.

2-2.3 Project Performance Measurement

°**ject Performance** can be defined as the degree to which a project achieves the ,m**Plementation** objectives and stake holder's requirements, primarily to do with the med cost, time, specifications and quality targets. Project success is the completion **of** a fiiii . P*0-)60 within acceptable time, cost and quality and achieving client's satisfaction and **success** can be achieved through the good performance of indicators of the project performance (Pheng and Chuan, 2006). The complete lack of attention devoted to owner's satisfaction contributes to poor performance and that the success of any project is related to two important features, which are service quality in construction delivered by contractors and the project owner's expectations. Managing the construction so that all the participants perceive equity of benefits can be crucial to project success (Al-Momani, 2000)

Navon (2005) defined performance measurement as a comparison between the desired and **the actual** performances. Okuwoga (1998) stated that cost and time performance has been **identified** as general problems in the construction industry worldwide.

According to Chatfield and Johnson (2007), projects need to be performed and delivered under certain constraints. Traditionally, these constraints have been listed as scope, time, and cost. This is also referred to as the Projects Management Triangle, where each side represents a constraint. One side of the triangle cannot be changed without impacting the others. A further refinement of the constraints separates product 'quality of performance' from scope, and turns quality into a fourth constraint. Chatfield and Johnson (2007) explain these constraints as follows:

- Time

The time constraint refers to the amount of time available to complete a project. For analytical purposes, the time required to produce a deliverable is estimated using several techniques. One method is to identify tasks needed to produce the deliverables documented in a work breakdown structure (WBS). The work effort for each task is estimated and those estimates are rolled up into the final deliverable estimate.

The tasks are also prioritized, dependencies between tasks are identified, and this information is documented in a project schedule. The dependencies between the tasks can affect the length of the overall project (dependency constrained), as can the availability of resources (resource constrained). Time is not considered a cost nor a resource since the project manager cannot control the rate at which 'it is expended. This makes it different from all other resources and cost categories.

Cost

The cost constraint refers to the budgeted amount available for the project. Cost to develop a **project** depends on several variables including (chiefly): labor rates, material rates, risk management, plant (buildings, machines, etc.), equipment, and profit. When hiring an **independent** consultant for a project, cost will typically be determined by the consultant's or firms per diem rate multiplied by an estimated quantity for completion.

- Scope

The scope constraint refers to what must be done to produce the project's end result Requirements specified for the end result. The overall definition of what the project is supposed to accomplish, and a specific description of what the end result should be. A major component of scope is the quality of the final product. The amount of time put into individual tasks determines the overall quality of the project. Some tasks may require a given amount of time to complete adequately, but given more time could be completed exceptionally. Over the course of a large project, quality can have a significant impact on time and cost (or vice versa).

Together, these three constraints have given rise to the phrase "On Time, On Spec, On Buaget". In this case, the term "scope" is substituted with "specification".

These three constraints are often competing constraints: increased scope typically means increased time and increased cost, a tight time constraint could mean increased costs and reduced scope, and a tight budget could mean increased time and reduced scope.

According to Bryde et al (2004) and Collins et al (2004), the distinction between good and poor performance of construction projects has also been identified by the achievement of cost, time and quality (also referred to as budget, programme and product) related criteria, which researchers have described as the iron triangle of project management. This criterion °r project performance also recognized as the project objectives stem from the need to satisfy the requirements of the client in the shortest possible time while ensuring this is done within the ever present resource as possible.

production strategy must therefore be formulated in accordance with competitive criteria y business requirements. The most basic competitive criteria are cost, quality, time and flexibility since from their combination can be developed most of the others (Meyer, 1992; Ishirata, 1991 Porter 1980; Buffia, 1977; Skinur, 1969). In addition to these three, Mbatha (1986) identified other additional criteria of project performance such as productivity, rate of return, value for money, contractors' profit margin and participant's satisfaction.

Other additional project success criteria identified by Collins et al (2004) include:- owner satisfaction, cooperation between project teams, meeting organizational goals, stakeholder satisfaction, project management process and practices, profit gained by participants, construction team members satisfaction, high standards of work, achieving scope requirements, cost efficiency of project, risk management and mitigation, change management, repeat work - follow up business as a result of a particular project, meeting international and national standards, safety, project recognition - peers opinions and positive publicity, satisfaction of user needs, community acceptance, personal development and enjoyable product environment, continuing relationships among project participants after end of the project and environment compliance.

Thomas (2002) identified the main performance criteria of construction projects as financial stability, progress of work, standard of quality, health and safety, resources, relationship with clients, relationship with consultants, management capabilities, claim and contractual disputes, relationship with subcontractors, reputation and amount of subcontracting. Ling et al (2007) obtained that the most important of practices relating to scope, time and cost management are controlling the quality of the contract document, quality of response to perceived variations and extent of changes to the contract, thus the need to have appropriate contracts.

Bryde et al (2004) also argues that there has also been attempt to broaden the perspectives of project performance to include the impact on different groups of people involved in the project, long term financial returns from the project. However, the three components of the Projects Management Triangle (cost, time and quality) still remain the most understood criteria of project performance.

It is therefore appreciated that the discipline of project management is about providing the tools and techniques that enable the project team to organize their work to meet these constraints. Such tools and techniques would include selection of efficient types of contracts.

Arising from difficulties in measurement of quality due to its subjective nature, and despite there being other performance criteria, this study will measure performance using the criteria of cost and time, in exclusion of the other criteria.

2.2.4 How Performance is achieved through Construction Project Life Cycle

The Construction project life cycle process is often very complex; however, it can be decomposed into main stages. The solutions at various stages are then integrated to obtain the final outcome. Although each stage requires different expertise, it usually includes both technical and managerial activities in the knowledge domain of the specialist. The owner may choose to decompose the entire process into more or less stages based on the size and nature of the project, and thus obtain the most efficient result in implementation. Very often, the owner retains direct control of work in the planning and programming stages, but increasingly outside planners and financial experts are used as consultants because of the complexities of projects. Since operation and maintenance of a facility will go on long after the completion and acceptance of a project, it is usually treated as a separate problem except in the consideration of the life cycle cost of a facility. All stages from conceptual planning and feasibility studies to design, construction and the acceptance of a facility for occupancy may be broadly lumped together and referred to as the Design/Construct process. Owners must therefore recognize that there is no single best approach in organizing project management throughout a project's construction life cycle. All organizational approaches have advantages and disadvantages, so are types of contracts, depending on the knowledge of the owner in construction management as well as the type, size and location of the project. It 1S ,mPortant for the owner to be aware of the approach which is most appropriate and beneficial for a particular project. This calls for the need to select suitable contracts for every Particular project handled (Hendrickson, 1998).

piugh various construction projects differ in many ways, the life of a construction project follows a si -i blrnnar pattern with a definite beginning and an identifiable end. According to > <

Chitkara **(1998),** there are four main stages that a construction project passes through between its inception and completion.

- **Inception**

This is the stage in which the project construction life cycle is initiated. The client outlines his requirements in the form of a brief to the professional team. The professional team analyzes the needs of the client and develops the project's proposal. The proposal may include feasibility studies to evaluate the projects technical, economic, environmental and financial feasibility and the proposed solutions. The decisions made during this phase have a major impact during the remainder of the project, particularly on construction. That is why a decision on the type of contract to be used may also be done during this stage.

- **Design Stage**

At this stage, the design team will take the project to a level of design that defines all significant elements that will enable a more accurate estimate of the construction project costs to be prepared. The preliminary drawings and cost estimates are produced and discussed with the client. The approved schematic designs are then further developed into definitive plans and elevations by the design team. Detailed floor plans, sections, elevations and an outline specification defining materials, finishes and systems, as well as an updated construction cost estimate, is submitted for review and approval by the client. The drawings are then submitted for approval by local authorities before the production drawings are prepared. The production drawings show the intended final look of the facility and are the ones used to prepare the tender documents and to guide the contractor in his execution of the works.

The client's approval of the design and cost estimates is necessary to ensure that the client's brief has been properly interpreted.

- **Tendering stage**

After the construction documentation is done the client is ready to procure the contractor to undertake the works. This is the stage when tender documents are prepared. Tender documents are the documents issued to tenderers containing information on the nature and scope of works and the applicable conditions and these may include:-

Instructions to bidders, Forms of Bid, Qualification Information, Forms of Securities, Conditions of Contract, Specifications, Drawings, and Bill of Quantities.

Contractors are then invited to bid for the works. Tendering may involve the following steps:-

Invitation of contractors using open tendering, selective tendering or negotiated tendering as required by the procuring entity.

- Returning and opening of tenders.
- Evaluation of tenders.
- Tender award to the selected bidder.

- **Construction Stage**

It is during this stage that the project moves to site. The involvement of the consultancy team in the site work execution varies depending on the contract type. In the traditional contracts, the consultancy team makes regular visits to inspect the works and ensure that it conforms to the design and that the client interest is safeguarded.

In the management contracts where integration and management are emphasized, the consultancy teams including the project manager is more involved in site works where he manages the various specialist contractors and the entire construction process to achieve the project objectives and ensures smooth functioning at the site making prompt decisions when the site faces problems (Chitkara, 1998)

Integrated contracts actually involve only one organization being responsible for both design and construction in what may be seen as complete integration e.g. design and build and build-Own-Operate-Transfer (BOOT) contracts (FIDIC, 2006).
The ideal aim of the project team is to complete the project in time, within budget and to specification.

For a typical construction contract, the completion of the construction phase of the project deludes certain follow up actions necessary to ensure that the facility constructed functions satisfactorily. According to Chitkara (1998), these include ensuring the following are in place:-

- *Manuals and Training* - Confirmation of the completion and acceptability of Manuals and Training.
- *Beneficial Occupancy* -A contract is substantially complete when the client occupies and begins the use of the facility and equipment.
- *Guaranties and Warranties* -With beneficial occupancy, confirmation that the contractor has initiated the guaranties and warranties associated with the facility and equipment.
- *Record or As-built Drawings* -Confirmation that the contractor has submitted the record drawings that show the as-built condition of the constructed facility and installed equipment.
- *Final Inspection* -After defects liability period, final walk through inspection of the facility to confirm that the contractor has completed the open punch list items and all work is completed correctly and satisfactorily.
- *Resolve Outstanding Change/Claim Disputes* - Resolving any outstanding contract disputes so that they do not drag on past contract and project completion.
- *Final Payment* -With the above activities satisfactorily completed the approval of the final payment to the contractor and the Client can close the contract.
- *Commissioning* -Assurance that all other commissioning activities have been completed in a satisfactory manner.

To ensure performance is achieved through project construction cycle, project control is **necessary.**

- **Project control**

According to Burns and Stalker (1994), management of work, and particularly control, takes **place at** the boundary between the operating system and its environment. Project control is **therefore** that element of a project that keeps it on-track, on-time, and within budget. Project **control begins** early in the project with planning and ends late in the project with post-**•niplementation** review, having a thorough involvement of each step in the process. Each **Project should** be assessed for the appropriate level of control needed.

Any control system needs an objective against which performance can be measured, and these according to Burns and Stalker (1994), include:-

- **Cost control**

Cost control is the activity which compares cost performance against the cost plan, adjusting one or the other dynamically by reference to the changing circumstances in the project's financial environment. These are the basic tenets of systems theory, applied to objectives, control and feedback.

- **Time control**

The policy environment of the project is the major influence around the timing of the project. Timing is influenced by many environmental factors, but the client's attitude to the timing of the project is an issue of policy. Therefore, when considering time, the policy of the client needs to be unambiguous.

- **Functional control**

In terms of control system, it is functional control which forms the strongest link here. The function of the building, and its parts, is a direct result of the technological task environment. This environmental factor is concerned not only with the technology of construction, but also the technology of the client's organization. Therefore, the function of the building, and the way in which the client's requirements are achieved, are essential elements of functional control.

- **Conflict control**

The legal environment influences the development, or avoidance, of conflict. The control of conflict is an essential part of project management, but is often neglected. There seems to be unwillingness by many people to even consider conflict; almost as if they were being asked to contemplate divorce when planning a marriage! However, construction projects are not marriages, and the purpose of contracts and conditions of engagement is to make clear and unambiguous enforceable promises. A certain amount of conflict between the members of the team is a healthy source of new ideas. Therefore, just like cost, needs to be controlled, not eliminated.

- **Quality control**

Quality control during construction consists largely of ensuring conformance to these original designs and planning decisions. While conformance to existing designs decisions is the primary focus of quality control, there expectations to this rule. First, unforeseen circumstances, incorrect design decisions or changes desired by an owner in the facility function may require re-evaluation of design decisions during the course of construction. While these changes may be motivated by the concern for quality, they represent occasions for redesign with all the attendant objectives and constraints.

- **Characteristics of a good control system**

According to Burns and Stalker (1996), for a control system to be effective, it must have the following characteristics;

- Controls should conform to the structure of the project organization and be related to decision centre responsible for performance.
- For a control system to be meaningful, it must be understood by those involved in its operation
- The system should report deviation from the desired standard as quickly as possible. A control system which reports deviations when they are so great as to affect significantly the cost, time and quality performance of the project not worth operating.
- The control system should draw attention to the critical activities which are important to the success of the project. The more important control points should be identified and understood by all concerned so that time and money are not wasted on trivial activities.

2.2.5 Causes of poor cost and time performance

According to Gichunge (2000), while quoting Aniekwu and Okpala (1988), the following factors cause cost and time overruns:-

- Unexpected underground conditions such as hard rock, underground water or poor soils leading to requirements for more time to put up mitigating procedures which increase costs.

  Incremental weather leading to stoppage of work, loss of expensive man hours and sometimes the destruction of works.

- Delays in architects instructions, engineers instructions and details and work material approvals
- Introduction of extra or additional work to the project leading to requirements for more financial and time resource.
- Changes in design sometimes necessitating demolition of finishes work and reconstruction to fit new designs
- Delay in payment leading to suspension or slowing down to work and claims for interest.
- Shortage of materials and plant required for incorporation in the works
- Industrial and contractual disputes

According to Walker (1989), good planning, communication and co-ordination envisaged in a good contract should for example ensure that the contract chosen takes care of the following measures, among others:

- That enough site investigation is done to eliminate unexpected site conditions,
- That there are no delays in instructions, approvals and payments.
- That design changes and variations are minimized through well executed design
- That contractual and industrial disputes are minimized through effective communication
- That accidents are be minimized through proper site layout, good activity planning and use of protective gear, etc.

2.3 Impact of contracts on performance (How parties need to safeguard their part of risk of non-performance through contracts)

2.3.1 Roles of a contract

According to The Federation International Des Ingenieurs - Conseils FIDIC (2006, 1999, 1992), better known in English as the International Federation of Consulting Engineers **contracts,** projects are constructed'at particular places at designated prices and delivered **within a** designated time horizon. They may also be required to be constructed and handed over within a particular procedure and or sequence. Quantity, size and quality of the works need to be defined in the Construction Contract as is the manner and procedure in which price is to be paid to the Contractor. All these various aspects of the contract and how they relate to the parties to the contract are described and defined in the Conditions of Contract.

The Conditions of Contract are therefore necessary to unambiguously define the rights and obligations of the parties to a contract so that the Employer receives a project precisely as required and anticipated by him and the Contractor receives a satisfactory commercial return for his work. The management of a construction contract revolves around the interpretation and application of the Conditions of contract. The role is paramount and forms an integral part of the contract which must be understandable by the parties and as precise as possible. Further, the objective of any conditions of Contract is to describe the various components **and**/or aspects of the contract and/or the project. The description of the parties and their roles is particularly important. Also important is the role of the Consultants/Professionals. The responsibilities, obligations and rights of the three participants are defined including the consequences that may arise from the default of any parties. The quality of works, its measurement and the method of payment thereof, must also be clearly spelt out as well as the description of quality control tests to be carried out. Finally, the dispute resolution mechanism is also defined in the Conditions of Contract (FIDIC, 1999).

According to FIDIC (1999), good contracts should apply a number of principles, as explained below.

- A contract should be effective; that is, it should give a result that meets the objectives of a project; getting what is needed, when and where it is needed, something that reliably provides the intended long term benefits sought.

- A contract should be efficient, that is there should be a favorable relation between the outputs and the inputs, both for the project at large and for the contract itself.

  The entities and parties have to have the necessary authority and must also have suitably defined responsibilities.

According to FIDIC contracts, there are risks in projects. Problems encountered include **getting** the wrong works, or services, getting bad value for money, either by prices being PPropriately high or quality being deficient, getting installations which do not work properly or which are not even used. Most of these risks can be addressed by using good contracts.

The main roles of a contract include:

2.3.1.1 To define the scope of works

It is of the utmost importance that the scope of the work is clearly defined and that there is no ambiguity. Contractors should tender on the same basis of the contract documents and the **contract** price agreed on the same basis (Hendrickson, 2000).

2.3.1.2 To establish the rights, duties, obligations and responsibilities of parties:

Fundamental to all contract strategies is the development of framework that clearly brings together and establishes the boundaries of roles, responsibilities and relationships between the parties to the construction project, who may include clients, design consultants, contractors, **sub-**contractors, suppliers, project management consultants, financiers etc. This includes the conditions under which a contract is to operate (Flanagan & Norman, 1993)

According to the doctrine of "privity of contract," in general, only the parties who enter into the agreement are bound by it and a person who is not a party to the agreement cannot normally enforce the rights and liabilities created by a contract entered into by others; although the contract may have reference to the interest of that person. Third parties may however, acquire rights and liabilities by way of collateral contracts.

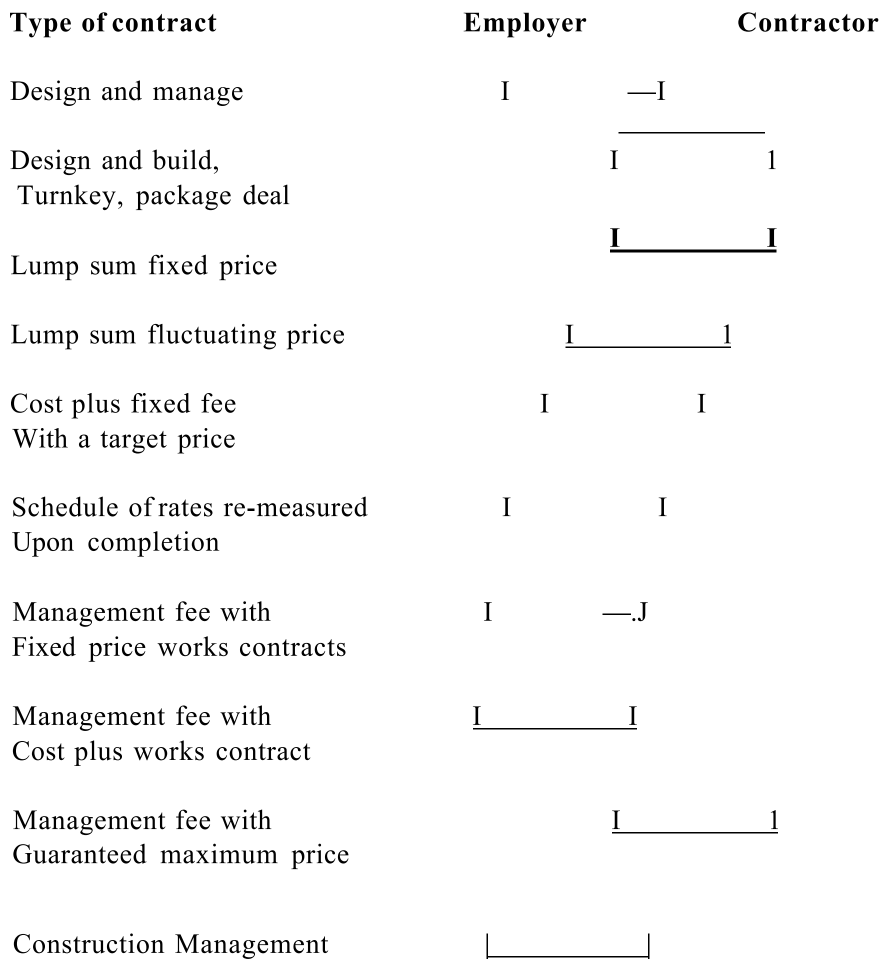
2.3.1.3 To allocate risks between parties:

Construction projects can be subject to various risks, many unforeseen. A contract should provide mechanism to deal with the possible occurrence of the various types of risks. The **acceptance** of an obligation or duty brings with it the acceptance of a commensurate risk, **which is** the risk of being unable to fulfill the obligation or duty because of ones' own **inadequacy,** incapacity, inadvertence, or error, or because of interference from outside **sources** or events. Contract strategies determine the allocation of those risks inherent in a **construction** project including those relating to time, cost and quality (Flanagan & Norman, 1993).

According to According to Flanagan & Norman (1993), on large value commercial projects there has been a trend towards the management fee arrangements where the general contractor plays an active role as a member of the design team. In management contracting, the general contractor carries very little financial risk as his fees are fluctuating, based upon a target price, with some employers demanding a guaranteed maximum price from the management contractor. Under the management fee, contract guarantees that the project will be constructed in accordance with the drawings and specification and the cost will not exceed a total maximum price; sometimes referred to as the upset price. If the cost exceeds the assured maximum, the contractor pays the excess. An incentive for the contractor to keep costs below the maximum is sometimes provided by a bonus clause stating that the contractor and the employer will share the savings. Further, the move towards requesting a guarantee maximum price on management fee contracts puts the contractor back into the position of lump sum bidding without some degree of control. Risks and reward go hand in hand but the contractor has a high financial risk exposure and a relatively low return with the guaranteed maximum price contract. However, the fee arrangement contracts do have advantages where work can start on site before the design is complete. Figure 2.1 shows Risk allocation in the various types of contracts.

A building contract is a trade off between the contractor's price for undertaking the work, and his willingness to accept both controllable and uncontrollable risks. The price of doing the work partly reflects the contractor's perception of the risk involved. Both controllable and uncontrollable risks are important on construction projects. Controllable risks reflect, for example, variations in human performance, such as management and operative performance. Uncontrollable risks include such factors as inclement weather, the effects of inflation on costs, or ground conditions on a particular site.

Figure 2.1: Risk allocation in the various types of contracts



Source: (Flanagan & Norman, 1993)

According to According to Flanagan & Norman (1993), the following are important in management of risks:

The fundamental risks inherent in any construction project are apportioned between the client, the design team, the general contractor, the specialist contractors, and the material and component suppliers within the various contractual relationships. Contracts allocate risks between the parties by express and implied terms. The sources of risks could originate either the contract or from the environment. Environment includes both project environment external environment. The risks associated with the contracts include adequacy of design, st of construction, variations and price increases, liability for defects, injury to persons and property and works safety and indemnification thereof, and completion time and associated extension of time and/or damages-etc. Underlying all the above items is some form of liability and responsibility for the parties.

The risks can also be classified as:

- Risk of external non performance (risk of not meeting the time, quality and contract amount)
- Risk of internal non-performance (risk of failing to attain level of anticipated profits on the project, risk of management target, operations of the supply chain etc.

The parties should therefore be aware at all times of the extent of their risk exposure. For instance, a general contractor on a lump sum contract should be able to claim for any disruption caused on progress of the work. However, at the tender stage he will have identified that risk and he can absorb it by adding a risk premium to the prices or he can include special conditions, thus taking care of risks or even transferring some of the risk to the specialist contractors (Flanagan & Norman, 1993).

According to Hendrickson (2000), provisions for the allocation of risk among parties to a contract can appear in numerous areas. Typically, these provisions assign responsibility for covering the costs of possible or unforeseen occurrences. A partial list of responsibilities with concomitant risk that can be assigned to different parties would include:

- Force majeure (i.e., this provision absolves an owner or a contractor for payment for costs due to "Acts of God" and other external events such as war or labor strikes)
- Indemnification (i.e., this provision absolves the indemnified party from any payment for losses and damages incurred by a third party such as adjacent property owners.)
- Liens (i.e., assurances that third party claims are settled such as "mechanics liens" for worker wages),
- Labor laws (i.e., payments for any violation of labor laws and regulations on the job site),
- **Differing site conditions (i.e., responsibility for extra costs due to unexpected site conditions),**
- **Delays and extensions of time,**

- Liquidated damages (i.e., payments for any facility defects with payment amounts agreed to in advance)
- Consequential damages (i.e., payments for actual damage costs assessed upon impact of facility defects),
- Occupational safety and health of workers,
- Permits, licenses, laws, and regulations,
- Termination for default by contractor,
- Suspension of work,
- Warranties and guarantees.

Hendrickson (2000) advises that contract experts are required to advise the parties to an agreement about their respective risks.

2.3.1.4 To provide for dispute resolution:

According Hendrickson (2000), once a contract is reached; a variety of problems may emerge during the course of work. Disputes may arise over quality of work, over responsibility for delays, over appropriate payments due to changed conditions, or a multitude of other considerations. Resolution of contract disputes is an important task for contracts. The mechanism for contract dispute resolution should be specified in the contract. It is also important to note that the most important mechanism for reducing costs and problems in dispute resolution is the reasonableness of the initial contract among the parties.

- **Contract Administration**

Another important part of a contract is the administration of the contract itself. This is done during the execution phase of a project, but the details must have been well thought out and prepared in advance. The function of contract administration concerns itself with the direction of the affairs of a contract. The affairs of the contract have to do with the performance of the contract - that is, minimizing the risk of non-performance. A construction contract should therefore lay out all the core terms that are necessary for a good construction contract, including showing where the risks of non-performance are in a project. The F1D1C contracts give guidance on this in that it is necessary to have knowledgeable and experienced staffs on contracts that are familiar with the tasks, who have access to the necessary 9uipment, documentation, IT systems and other tools and resources, and who work diligently (FIDIC , 1999).

According to Norton (1995), the earlier a decision is taken in any business process, the higher its impact on the overall project performance. The impact of reviewing the clients need at the briefing stage (or contract selection stage) for instance, may have greater impact on cost and time than arduous efforts during production (construction) stage. This explains why a good contract would be very effective in correcting mistakes during construction.

2.3.2 Essentials of a valid contract

The essentials of a valid contract according to Hudson (1946) include:

2.3.2.1. Agreement: The following are essential in agreement.

- Consensus (agreement about the same thing,) i.e. genuine agreement (on the same thing, at the same time) or in other words meeting of the minds
- Desire to create juristic (legally binding) relationship
- Awareness of parties that they are 'ad idem' (of their unanimity)
- Agreement as to the parties (persons between whom the legal ties are being created)
- Offer by one party and acceptance by the other. The most important feature of a contract is that one party makes an offer for an arrangement that another accepts. This can be called a 'concurrence of wills' or 'ad idem' (meeting of the minds) of two or more parties.
- Consideration, i.e. some right, interest, profit, or benefit accruing to one party or some forbearance, detriment, loss of responsibility given, suffered or undertaken by the other.

According to Hendrickson (2000), the idea behind consideration is that both parties to a contract must bring something to the bargain. A consideration is known as 'the price of a promise'. The principal rules governing consideration are that:

Consideration must be "sufficient" (i.e., recognizable by the law), but need not be adequate" For instance, agreeing to buy a car for a penny may constitute a binding contract.

Consideration must not be from the past.

Consideration must move from the promisee. For instance, it is good consideration for rson A to pay person C in return for services rendered by person B.

The promise to do something one is already contractually obliged to do is not, traditionally, regarded as good consideration.

- The promise must not be to do something one is already obliged by the general law to do - e.g., to give refrain from crime or to give evidence in court

2.3.2.2. Capacity of the parties: Capacity refers to age, mental and financial status. Construction contracts entered with minors, persons of unsound minds and bankrupt persons are voidable at the option of the said parties

2.3.2.3. Possibility of performance: Parties must consider possibility of performance in the light of the following:

Who to perform - can him/she perform?

To whom to perform - is it possible to receive performances?

What must be performed - legal and technical possibility

Manner of performance - legal and technical possibility

Place of performance - legal and technical possibility

Time of performance - Is it technically or physically possible?

According to Mead (1946), excuses for non-performance may include:

Inadequacy of Price: Inadequacy of Price, however gross, will afford no defense for bad work. The adequacy of the consideration is for the parties to consider at the time of making an agreement.

Difficulty: Difficulty of the work is not a valid excuse for non performance of a contract to execute it, and the builder is not entitled to abandon the work because it proves unexpectedly difficult:

Impossibility: Where a person contracts to do something which is impossible of performance, and nothing occurs to frustrate the contract, he will be liable to damages for non-performance if his covenant amounts to a warranty of the possibility of doing the thing contracted for: "Where there is a positive contract to do a thing, not in itself unlawful, the contractor must perform it or pay damages for not doing it, although, in consequence of unforeseen accidents, the performance of his contract has become unexpectedly burdensome or even impossible". The difference between physical impossibility and illegality must be carefully distinguished. (See legality).

Prevention by not affording Possession of Site: In the absence of express conditions there is an implied contract that the employer shall be in a position to hand over the site to the contractor as soon as the agreement is entered into. If by the default of the employer the premises are rendered totally unfit to receive the work, or if the employer wrongfully expels the contractor from the works or prevents him from doing the work, that is total prevention.

Prevention by Wrongful Forfeiture: Prevention may occur by a wrongful exercise of the powers of forfeiture contained in the contract. In such a case the exclusion of the builder from the site would put an end to the contract and entitle the builder to sue at once for the consequential damages:

Prevention by not supplying Plans or Instructions: An employer, who either expressly or impliedly has contracted to supply the drawings, without which the work cannot be completed, prevents performance if he or his architect does not do so within a reasonable time. If such plans are not supplied, however, the contractor should apply for them, and not merely idly wait, and then seek to complain of delay.

Prevention by the Architect: In the case of a prevention of performance by the architect, questions may arise as to whether the default of the architect in any, and which of his duties, constitutes a default of the employer.

Prevention by not supplying Materials: When the employer undertakes to supply the contractor with materials and does not do so, the employer will be liable for the breach; but, unless those materials form a substantial part of the contract, their non-supply does not release the builder from the contract, but only entitles him to recover damages for the breach of contract.

Prevention by Specialists and Sub-contractors: The employer is responsible to the contractor for the due performance by other contractors of all works which the employer has agreed to perform.

Prevention by Fraud: Performance of the contract may be prevented by the fraud of the building owner. The remedy in such a case is not by an independent action for deceit, but by an action for damages for prevention of performance of the contract where the fraud takes place before the works are complete; or by an action for the contract price where the work is completed, and the builder is prevented from obtaining a certificate by the fraud or collusion of the building owner.

Interference by Third Parties: The employment of a contractor implies no warranty that he will not be delayed by the wrongful interference of third parties, e.g., in preventing access to the site.

If the building owner prevents performance, a contract to pay what is reasonable is implied by the law, and the contractor may recover the contract price and damages for the prevention. The same rules as to prevention by the building owner apply to prevention by the contractor of performance by his sub-contractor (Mead, 1946).

2.3.2.4. Legality (intention to create legal relations). For legality to be enforced, the following needs to be fulfilled.

- Object must be legal
- Conclusion must be legal
- Performance must be legal

According to Mead (1946), building contracts, in common with contracts in general, cannot be enforced by or against either party if they are tainted with illegality. That is, anyone who contributes to the performance of an illegal act by supplying a thing, with knowledge that it is going to be used for that purpose, cannot recover the price of the thing so supplied. Nor can any distinction be made between an illegal and an immoral purpose. As a general rule, when what is stipulated to be done is either originally unlawful or becomes illegal, the contract to do it is void. Besides contracts rendered unlawful by statute, building contracts may be unlawful as involving the commission of an indictable offence, such as a contract to build upon a highway. And no agreement for building operations that would create a public nuisance, nor any compromise of proceedings in respect of such nuisance, can be specifically enforced. If the contract is void for illegality, nothing already done under it can found any rights; installments paid under it are irrecoverable, just as work done under it can found no claim for payment.

2.3.2.5. Constitutive formalities: Mead (1946) further explains that formalities must be adhered to and these include formalities as stipulated by the law, for instance, in writing if required, evidenced in writing if required or registration if required etc. It can also include formalities as stipulated by the parties, that are, in writing if agreed, non-variation if agreed etc.

All these essentials are necessary and relate to various/ all types of construction contracts be they standard, bespoke or verbal because non- fulfillment of any may render a contract void. These essentials relate to construction performance and risk allocation in that performance is a **subject** of completion in terms of the accepted time, cost and quality.

- The consequence of deficient contracts:

According to Mead (1946), the importance of careful construction of contracts is that even dispute resolution mechanisms must construe the contracts, and the documents forming the contracts, even if ambiguous, and cannot go outside the documents, though they may consider subsequent and agreed acts of the parties, but not their declarations. It is therefore necessary to follow these steps to ensure that all the essentials are fulfilled in a construction project, for the validity and efficient performance of a construction contract.

2.3.3 Formation of a construction contract

(Interpretation, construction and forms of construction contracts)

According to Mead (1946), the builder not having any right in the land, but merely a revocable license to enter and build, a building contract need not be in writing. And even assuming that the building contract is one which has to be in writing, it need not be in any formal document; in fact it may consist of a series of letters or different papers referring to one another.

Further, Mead (1946) explains that it is necessary in construing contracts that each provision should be carefully considered, not in its ordinary meaning alone, but in the meaning to be gathered from construction of the whole document, and in particular, words are to be construed according to their strict and primary acceptation unless from the intention of the parties they appear to be used in a different sense, or unless in their strict and primary sense, they are incapable of being carried into effect.

Mead (1946) cites the general principles of construction of contracts as:

- That the contract instrument is to be interpreted according to the intention of the parties.
- **That the construction should be reasonable, liberal and favorable.**

- That the ordinary sense of words is to be adopted, unless they bear a technical meaning.
- That the whole contract is to be looked at, so that words may be construed by the contract and that all documents referred to and identified in the contract must be construed together.
- That the parties who draw up the contracts must be conversant with the contractual matters relating to the contracts in question.

Forms of construction contracts include standard contracts, bespoke contracts and simple contracts.

2.3.3.1 Standard contracts:

These are contracts prepared by organizations for use in certain envisaged situations. Many projects in a particular geographical area are very similar in nature. It follows the Conditions of Contract for such typical projects should be the same. Rather than repeating the tedious task of preparing Conditions of Contract for each and every project from scratch each time, it is sensible to adopt a standard form of Conditions of Contract.

Standard Contracts are refined as a result of the experience of the members of the Professions in using the contracts on numerous projects throughout the years and therefore avoid the possible anomalies of a newly drafted contract. Standard Conditions of Contract have been developed by numerous organizations over the years. There are as many Standards Conditions of Contract as there are typical works, owners and professional organizations.

Kenyan construction industry like in other countries has developed Standard Forms of Contract over many years. The following are a few examples of General Conditions of Contracts used in Kenya by various organizations.

- The Agreement and Conditions of Contract for Building Works Published By the Joint Building Council (1999).
- The Agreement and Conditions of Contract for Building Works Published by the Joint Building Council (1977), and Revised (1986).
- Public Procurement Oversight Authority Standard Bid Documents (2006)

Standard Tender Document for Procurement of Works (Building And Civil Engineering Works) Prepared by Public Procurement Directorate, Ministry of Finance and Planning (2000).
- The Ministry of Works Contract Agreement (1970).
- Various FIDIC Forms of Contract (2006, 1999, 1992).

Standard forms for contracts can therefore be obtained from numerous sources, and can be categorized in the following groups.

2.3.3.1.1. Contracts for works designed by the employer (traditional contracts).

These include:
- The Agreement and Conditions of Contract for Building Works Published By the Joint Building Council (1999).
- The Agreement and Conditions of Contract for Building Works Published by the Joint Building Council (1977), and Revised (1986).
- Public Procurement Oversight Authority Standard Bid Documents (2006).
- Standard Tender Document for Procurement of Works (Building And Civil Engineering Works) Prepared by Public Procurement Directorate, Ministry of Finance and Planning (2000).
- The Ministry of Works Contract Agreement (1970).
- FIDIC forms of contract for construction (2006, 1999, 1992).
- FIDIC short form of contract (2006, 1999, 1992).
- Management oriented contracts - These are similar to traditional contracts with only a slight variation in the management structure.

2.3.3.1.2 Contracts for works designed and built by the contractor (integrated contracts):

These include:
- Public Procurement Oversight Authority Standard bid documents for Design-build & Turnkey contracts (2006).
- The FIDIC Conditions of Contract for Plant and Design- Build and Turnkey projects (2006, 1999, 1992).

The strengths of standard contracts include:-

- Time and cost savings are made in the writing and drafting of contracts.

  By being prepared when there is no pressure of an imminent project the drafting is done with care leaving little room for mistakes.
- They are well tried, that is, with some expectations; their provisions have been used for a long time.
- They are well accepted, that is, they are widely known, and recognized, and used for international contracts.
- They enjoy the support of the development banks and other international and governmental authorities
- They foresee most of the envisaged conditions, instances and risks envisaged in the industry.
- One can strike out the irrelevant clauses.
- Standard Conditions of Contract which have been in use for a long period of time have been assessed and evaluated with the result that in the course of time, ambiguities of some statements and phrases have been given undisputed meaning and interpretation by renowned researchers and users. In addition, where ambiguities have led to disputes, eminent courts of law and Arbitrators have given their interpretations of the relevant clauses, which have been amended in subsequent editions to take these interpretations into account.

Therefore parties to a contract where standard conditions have been adopted are confident that they include all the clauses to deal reasonably well with most of the eventualities which parties to a contract may expect to experience.

Their **Weaknesses include:**

They may include irrelevant conditions not applicable to a project and care needs to be taken not to adopt them as they are.

These standard forms may include risk and responsibility allocations which are unacceptable to one or more of the contracting parties.

^andard forms may be biased to reduce the risk and responsibility of the originating Organization or group.

Parties to a contract should therefore read and review all standard contract documents carefully. FIDIC recommends that while using standard contracts, it is important to note that they should correspond to the type of project and to the abilities and objectives of the employer. This should be decided rather early in the project contract preparation phase.

Another important point recommended by FIDIC is that preparation of the contract should be done by a professional. This applies especially to the requirements of the employer, to any bills of quantities (if applicable) and to the preparation of the particular conditions. Further, general conditions have been very carefully drafted to be coherent and complete, and any modification should be made only by adding suitable particular conditions, but not by directly rewriting the general conditions.

2.3.3.2 Special conditions of contract (bespoke) contracts

These are contracts specially drafted and tailored to meet specific parties' requirements.

The "Standard" also called "General" Conditions of Contract discussed above avoid unnecessary drafting work and because of their frequent use are normally familiar to the parties to the contract. They are drafted to cover matters of a general nature. They do not however cover nor negate responsibility to cover particular conditions relating to a specific project. When preparing a contract document the author must add to the Standard Conditions Specific or Special Conditions of Contract appropriate to which they apply.

Large organizations such as Government Ministries adopt Particular Conditions of Contract, which qualify, modify or replace certain aspects of the Standard clauses to suit the requirements of the specific projects undertaken by them. To avoid confusion and to ensure consistency, the altered clause in the Particular Conditions of Contract is cross-referenced to the original clause in the Standard Conditions of Contract. Simple modifications can be made by inserting brief descriptions, definitions and figures in the Appendix to the Form of Tender also called the Contract Data Sheet.

The strengths of bespoke contracts include:-

They are precise and specific to the intention of the parties

They are suitable for small contracts

Their weaknesses include:-

- Parties can omit crucial conditions
- They are time consuming to prepare.

2.3.3.3 Simple contracts

A Simple contract is an agreement, express or implied, which give rise to legal obligations. Generally such a contract need not have any special form. It may be in writing, or agreed orally or implied from the conduct of the parties. As long as the good or service provided is legal, any oral agreement between two parties can constitute a binding legal contract. Sometimes written contracts are required by either of the parties, or by statutory law within various jurisdictions for certain types of agreement, for example when buying a house or land (Hendrickson, 2000).

When not in writing, their weaknesses are in the presentation of evidence, which must also be adduced orally.

2.3.4 Objectives of a good construction contract

A good construction contract should achieve the three basic project objectives of time, cost and quality. Developers are increasingly demanding that all three of these aims are achieved. The goals and objectives of a contract must indeed be the goals of the project to which it owes its existence (Collins et al, 2004; Neal, 1995). Ritz (1994) emphasizes that the primary goal of the construction team is to finish the project as specified, on schedule and within budget (i.e. meet cost, time and quality targets), and that the whole system of construction management exists to ensure these goals are met. Peck (2005) cites six key considerations in developing a construction program that affect the choice of contract and these include:-

2.3.4.1 Design and Scope: The designed facility and program should successfully fulfill the needs of the owners and user's. Since the design of the property must be buildable and properly communicated in order tb be useful, the owner requires that the design documents are constructible, complete and coordinated. The contract documents should properly 'ncorporate unique features of the site including sub surface conditions, interface with adjoining properties, access and characteristics.

2.3.4.2 The budget: There is an obvious need to determine a realistic budget before a design is developed, to evaluate project feasibility, to secure financing and as a tool to choose from among alternative designs or site locations. Once the budget is determined, the other requirement is that the project be completed at or a near the established figure without **excessive** overruns.

2.3.4.3 Schedule: Usually the date of completion of the new facility is critical, either in terms of generating revenue from the facility or in terms of providing needed functional space by a particular deadline. Therefore a realistic assessment of project duration and sequencing needs to be decided early in the contract selection stage. The schedule should then be monitored throughout design and construction.

2.3.4.4 Risk assessment: Projects involve risks. In construction, issues of risk are closely tied to schedule and budget issues. There should be clear understanding of the risks involved in construction, and the owner should make a decision regarding allocation of these risks among project participants. In considering risk allocation, risks should be assigned to those parties that exercise control over various aspects. For example, it would not be possible to expect that the contractor correct problems due to design errors at no extra cost where a contractor generally has little or no control over the cause or magnitude of such errors, in traditional contracts.

Quite logically, any project where the costs exceed the expected benefits from its use or the revenue from its sale or lease should not have been undertaken. It therefore follows that an acceptable level of cost must be established and met for every project.

According to Mastermann (1996), different categories of clients may have different sub - goals within the overall cost objective and treatment of variations, for example, public clients will require that the project is tendered openly often on a fixed lump sum price basis and the lowest tender be selected. The price is then expected to be subject to minimal change over the life of the project. Other devetopers may be prepared to accept an indicative cost at the beginning of the construction period provided they are kept informed by means of accurate forecasts of the likely final cost at regular intervals during the currency of the works. While a" clients want value for money, some may be prepared to authorize additional expenditure during the construction period if it guarantees them enhanced performance of the project.

2.3.4.5 Owners level of expertise: Achieving adequate functional performance and the right level of quality is usually the primary objective in most construction projects. Unless the project is suitable for its purposes and intended use, the developer needs will not have been satisfied and value for money will not have been achieved. The developer must therefore establish a minimum acceptable level of functional performance and quality for his project at the contract selection stage and ensure that it accurately reflects his needs.

The owner's knowledge of construction will have a large influence over the amount of outside assistance required during the construction process. It will also guide the owner in determining the appropriate type of contract (Mastermann, 1996),

2.3.4.6 Secondary objectives: According to Masterman (1996), some of the secondary objectives that clients may require for their construction projects includes the transfer of maximum risk to parties other than the client, the incorporation within the design and construction period for the new building of separate operations being carried out by designers and/or contractors directly employed by the client, and the need for single point responsibility.

The primary objective of time can therefore have a number of variants for example, reduction of project duration from inception to completion to the minimum in order to ensure rapid return on investment funds, shorter construction period to minimize disruption for existing operating facility, commencement of construction process quickly can facilitate the needs of the clients expenditure programme and carrying out the design and construction of the project in such a way as to enable a specific construction completion date to be met (Peck, 2005).

These objectives can be used to select the most appropriate contract for a project.

2 3.5 Criteria for selection of a construction contract

The majority of available methods and aids that can be used to select the most appropriate contract for a particular project are based upon the matching of the developer's requirements **and** the characteristics of the various contracts.

Yakowenko (1994) explains that the **appropriate** use of a particular contract will depend on **many** factors. The choice should depend on the extent to which the rights and responsibilities **of** parties and the allocation of risks between parties are to be defined. He says that key factors to consider include:

- **Time considerations:** Possibility of fast tracking construction should, if considered be weighed against the increased cost and risk of fast tracking.

- **Variations:** Evaluation of possible changes/variations should be done against the potential cost of such changes.

- **Risk allocation:** Appropriate allocation of risk associated with all phases of the project development process and the costs associated with this allocation should be assessed.

- **Project size and complexity:** The more complex and costly a project is, the greater the need for careful selection of contract.

- **In-house capabilities:** It is important to assess in house capabilities in evaluating a project contract.

Mastermann (1996) **cites more guidelines that may be used in the selection of a contract and these are;**

a) **Traditional contracts are suitable for projects where:-**

Time is of essence.

Competitive bids are required to ensure accountability and minimize costs.

High standards of quality and functionality are required.

Design changes may be needed during the currency of the project.

Complex and/or prestigious projects where design needs to be under the control of the client.

>) Management oriented contracts are suitable for use in projects where:-

Client wishes to have flexibility to incorporate design amendments during the construction period.

Certainty of achieving completion dates is required and takes priority over construction costs.

- Client wishes to be objectively involved in overall management.
- Project is of high value and complexity and thus requires the use of sophisticated construction and management techniques in order to ensure success.
- Commencement of construction needs to be accelerated in order to evoke speedy completion.

  Early advice is needed from a management contractor or construction manager on design, buildability programming, construction methods, procurement of plant and materials.
- Where the developer in the case of design and manage, wishes to appoint a single organization to be responsible for the design and management of the works, whilst at the same time, acting in a consultant role.

c) Integrated contracts are suitable for projects where:-

- The client is able to accurately define his requirements at tender stage and is unlikely to wish to amend them during the currency of the project.
- Total project costs need to be ascertained.
- The client requires one organization to accept responsibility for both design and construction and, if necessary for all other aspects of contract such as funding, land purchase, training of management and workforce etc.

  Developer needs to be aware of his financial commitment at tender stage.

(1997), Mastermann (1996) and Turner (1997) further identify the following as Infracts assessment criteria developed by Bennet and Grice (1995), for Business Round

- **Cost (Price) certainty:** The ability of a contract to offer a fixed price before the client can commit to the project and an assurance that this price is unlikely to change significantly during the currency of the project. Most clients consider cost performance to be critical and is one of the three project objectives that form the iron triangle.

- **Time:** Deals with how important early completion is to the success of the project. Time performance is also one of the three basic project objectives forming the iron triangle of project performance. Another aspect of time is the degree of certainty or otherwise.

- **Controllable variations:** Refers to the ability to control alteration of the design during the currency of the project. Variations or change orders are recognized as a source of conflict and often have the effect of increasing the overall cost and time required for projects.

- **Quality Level:** Refers to the level of quality required in the design and construction. Different types of contract under similar circumstances may offer different levels of quality/ specification. Quality performance is also one of the three critical objectives that form the iron triangle.

- **Risk Allocation:** Deals with the allocation of time and cost risks and/or their transfer of the same from the client to other parties. A developer will require a contract that allows him to deal with risks in the following ways, as each case may require.

- Identify risk that should be avoided if possible or transferred.
- Identify his ability to take risk and assess the effects that the occurrence of each risk would have on him.
- Formulate a policy of managing risks that cannot be avoided or transferred.

Indeed, from the above assessment, risk allocation is identified as a fundamental requirement for contracts.

Difference between types of contracts/ and the way they relate to Performance (i.e. contract provisions that affect performance)

There are various types of contracts for use in construction projects, differing mainly on the parties' requirements in terms of allocation of levels of rights and responsibilities, and risks. The responsibility for design constitutes the significant distinction between the contracts.

According to the Federation International des Ingenieurs - Conseils (FIDIC, 2006, 1999, 1992), better known in English as the International Federation of Consulting Engineers contracts, if the Employer is responsible for design, then the FIDIC Conditions of Contract for Construction should be used. If the Contractor is responsible for design, then one of the two other FIDIC contracts would normally be appropriate. The main difference is therefore between the contracts that vests the responsibility for design with the employer (traditional contracts), and the contracts where the responsibility for design and construction is vested with the contractor (integrated contracts).

According to Hendrickson (1998), in the past three decades, traditional contracts have become less popular for a number of reasons and disadvantages cited in section 2.4.1.1 page 55.

In Kenya, integrated contracts are fairly recent compared to the traditional contracts and their emergence has mainly been driven by the perceived shortcomings of the traditional contracts, in their performance (Mbaya, 2004; Nisbett, 2004).

According FIDIC (2006, 1999, 1992), the contract to be used is one of the first questions to address when documenting a project. If the project is simple and straight forward, the Short Form FIDIC Conditions of contract is often sufficient. It is simple, yet flexible, and easy to use.

The responsibility for design constitutes the significant distinction between the other contracts. If the Employer is responsible for design, then the FIDIC Conditions of Contract for Construction should be used. If the Contractor is responsible for design, then one of the two other FIDIC contracts would normally be appropriate. If the contract is for construction Plant, or has relatively important unforeseen risks, or both, then the FIDIC Conditions of Contract for Plant and Design-Build would be used. If the contract is for a fixed-price, lump-

sum project, with little employer involvement and no major unforeseen risks, then the FIDIC Conditions of Contract for EPC/Turnkey Projects would be used.

Thus FIDIC contract documents used internationally are as follows:

The 'Red Book' for Building and Civil Engineering Works designed by the Employer - Conditions of Contract - This is the most common form used in Kenya.

The "Yellow Book"- Plant and Design-Build Contract Conditions. This is for Electrical, Mechanical, Building and Civil Engineering for Works Designed and Built by contractors. These Conditions are currently being used in Uganda and Tanzania and they are also being tested in Kenya. They are suitable for urgent works where the employer has funding but does not have adequate design capacity.

The "Silver Book" EPC (Turnkey) Contract Conditions - These are designed, constructed and commissioned for the employer. The conditions are hardly used in Kenya

The" Green Book" short form of contract. These are for works designed by the employer and built by a contractor. These conditions are sometimes used in Kenya for Rural Roads Works where contracts are generally less than Kshs. 10 million in value.

FIDIC (2006) 4^{th} Edition conditions are for projects funded by the employer through multilateral financing organizations. FIDIC (2006) 4^{th} Edition is a typical case in which FIDIC has produced contract conditions for a specific group of projects/clients. In this case, for multilateral financiers (Donors) and Developing Countries (Borrowers). In view of the fact that major Civil Engineering and Infrastructural Works are mostly Multilaterally Financed, the FIDIC (2006) 4^{th} Edition conditions might soon be widely used in Kenya and other developing countries of Africa.

FIDIC "4" (1992) edition Conditions of Contract for Works of Civil Engineering **Construction** is generally used in Kenya at the moment for large Building and civil **engineering** construction projects.

Building and Civil Engineering projects of a smaller scale adopt the Conditions of Contract known as the FIDIC Short Form of Contract published in 1999. This document has been **used** by the African Development Bank with some alterations for a number of their projects in the region. Its main departure from the other FIDIC Contracts is the incorporation of defined compensation events leading to claims.

These conditions of contract have been adopted by Governments and Donor Agencies in Eastern Africa as the basis for their contract documents for a number of years and they continue to do so.

The basis of these contracts is therefore similar but Conditions of Particular Application i.e. the Conditions of Contract Part II drafted by the individual Employers often substantially alter the standard conditions drafted by FIDIC. It was for this reason that the Multilateral Development Banks (i.e. African Development Bank, Asian Development Bank, Black sea Trade and Development Bank, Caribbean Development Bank, European Bank for Reconstruction and Development (The World Bank), Islamic Bank for Development, and Nordic Development Fund) commissioned FIDIC to prepare a Harmonized Edition of the Conditions of Contract for Construction for Building and Engineering Works Designed by the Employers, for countries receiving funding from.

FIDIC contracts are used mainly for International and donor funded projects and are on the increase especially in the public sector.
In Kenya, the most commonly used contracts are:

a) Contracts for works designed by the employer and built by the contractor (traditional contracts).

These include:

- The Agreement and Conditions of Contract for Building Works Published By the Joint Building Council (1999).
- The Agreement and Conditions of Contract for Building Works Published by the Joint Building Council (1977), and Revised (1986).
- Public Procurement Oversight Authority Standard Bid Documents (2006).

Building and Civil Engineering projects of a smaller scale adopt the Conditions of Contract **known** as the FIDIC Short Form of Contract published in 1999. This document has been **used** by the African Development Bank with some alterations for a number of their projects in the region. Its main departure from the other FIDIC Contracts is the incorporation of defined compensation events leading to claims.

These conditions of contract have been adopted by Governments and Donor Agencies in Eastern Africa as the basis for their contract documents for a number of years and they continue to do so.

The basis of these contracts is therefore similar but Conditions of Particular Application i.e. the Conditions of Contract Part II drafted by the individual Employers often substantially alter the standard conditions drafted by FIDIC. It was for this reason that the Multilateral Development Banks (i.e. African Development Bank, Asian Development Bank, Black sea Trade and Development Bank, Caribbean Development Bank, European Bank for Reconstruction and Development (The World Bank), Islamic Bank for Development, and Nordic Development Fund) commissioned FIDIC to prepare a Harmonized Edition of the Conditions of Contract for Construction for Building and Engineering Works Designed by the Employers, for countries receiving funding from.

FIDIC contracts are used mainly for International and donor funded projects and are on the increase especially in the public sector.
In Kenya, the most commonly used contracts are:

a) Contracts for works designed by the employer and built by the contractor (traditional contracts).

These include:

- The Agreement and Conditions of Contract for Building Works Published By the Joint Building Council (1999).
- The Agreement and Conditions of Contract for Building Works Published by the Joint Building Council (1977), and Revised (1986).
- Public Procurement Oversight Authority Standard Bid Documents (2006).

- Standard Tender Document for Procurement of Works (Building And Civil Engineering Works) Prepared by Public Procurement Directorate, Ministry of Finance and Planning (2000).
- The Ministry of Works Contract Agreement (1970).
- FIDIC forms of contract for construction (2006, 1999, 1992).
- FIDIC short form of contract (2006, 1999, 1992).
- Management oriented contracts - These are similar to traditional contracts with only a slight variation in the management structure

b) Contracts for works designed and built by the contractor (Integrated contracts).

These include:

- Public Procurement Oversight Authority Standard bid documents for Design-build & Turnkey contracts (2006), used for procurement of all types of Turnkey projects. With necessary modifications the document may also be used for Projects involving Financing, Construction, Operation and Maintenance of infrastructure (e.g. Build and Transfer (BT), Build-Lease and Transfer (BLT), Build Operate and Transfer (BOT), Build-Own and Operate (BOO), Build Transfer and Operate (BTO) Rehabilitate Operate and Transfer (ROT) Rehabilitate Own and Operate (ROO), subject to other necessary Government approvals.
- The FIDIC Conditions of Contract for Plant and Design- Build and Turnkey projects (2006, 1999, 1992).

In this study, all the types of contracts shall be grouped in these two broad categories:-That is Traditional Contracts and Integrated Contracts.

2.4.1 The Traditional Contracts

2.4.1.1 Characteristics

These types of contracts are referred to as the lump sum contracts (Seeley, 1997). The unique characteristic of these types of contracts is the separation of the responsibility for design of the project from that of its construction. Even where variants of the basic system allow co-operation between the contractor and the client or his consultants, these two fundamental elements remain as two separate entities.

The other basic characteristics advanced by Seeley (1997) include:

- Design of the project is usually completed before work commences on site.
- Project is therefore a sequential process.
- A longer period of overall design and construction may make the total project price higher because of increased period of interim financing charges and interim payments to consultants and contractors.
- The responsibility for managing the project is divided between the clients consultants and the contractor and there is therefore little scope for involvement of either of the parties in the other's activities
- Drawings and bills of quantities (mainly used for most lump sum contracts) provide a common basis of tendering and tender evaluation is relatively easy.
- Reimbursement of the consultants is normally a fee and expenses basis whilst the contractor is paid for the work completed based on measurements or lump sum basis.
- As design is fully developed at tender stage, clients are able to know their financial commitment before entering into the construction contract.
- The overall period of design and construction, with design being completed before construction tenders are invited, generally requires being longer than is necessary for project integrating and management contract options.
- **Separation of design teams and construction teams during development of the project until tender stage may lead to the establishment of adversarial attitudes.**

Advantages of the traditional contracts according to Peck (2005) **are:**

- **Drawings and bills of quantities provide a common basis for tendering and allow for objective evaluation of tenders**

. Clients are able to know their financial commitment before entering into a construction contract.

- The method is widely applicable and well understood with clearly defined roles for parties involved.

Their disadvantages according to Hendrickson (1998) include:

- The consultant firms, which are engaged by the owner as the professionals for design and inspection, have become more isolated from the construction process. This has occurred because of pressures to reduce fees to consultant firms, the threat of litigation regarding construction defects, and lack of knowledge of new construction techniques on the part of architect and engineering professionals. Design is not integrated with construction in that the art of design has become separated from the science of construction, and the practitioners of one have little opportunity to positively influence the other.
- Instead of preparing a construction plan along with the design, many firms are no longer responsible for the details of construction nor do they provide periodic field inspection in many cases. As a matter of fact, such firms will place a prominent disclaimer of responsibilities on any shop drawings they may check. Thus, the consultant firm and the contractor on a project often become antagonists who are looking after their own competing interests
- The absence of the contractor input into the project design may limit the effectiveness and constructability of the design. Indeed, important design decisions affecting both the types of materials specified and the means of construction may be made without full consideration perspective and consultation with the builder.

Others cited by Hovet (1994) include:

- The traditional contracts tend to promote more adversarial relationships rather than co-operation or coordination among the contractor, designers and client

  In addition, this strategy removes incentives for co-operation between the design and the construction professions. This in turn causes the participants to focus on short-term costs of construction and largely ignore the long term consequences and costs of design and construction decisions

- The owner generally faces exposure to contractor claims over design and constructability issues since the owner accepts liability for design in his contract with the contractor.
- The Architect/Engineer may have limited ability to assess scheduling and cost ramifications as the design is developed which can lead to a more costly final product.
- The contractor pursues a least approach to completing the project, requiring increased oversight and quality review by the client and his consultants.
- Given the amount of time necessary to develop plans, specifications, and bid documents, and the required time to bid a project, all carried out sequentially, a lot of time may be consumed from the invitation of a project to the beginning of construction. The contracts are time consuming since all design work must be completed prior to solicitation of the construction contract. This may also increase cost.
- The traditional contracts also eliminate contractor incentives, to effect value - engineering on the project. Value engineering is a systematic evaluation of a project design to obtain the most value for the money spent. An example is if a contractor knows of a substitute for a specified item that is equally good but substantially less expensive, he is not encouraged to change specifications to the less expensive alternative.

According to Hovet (1994), the traditional contracts assume that the designers in the process of completing the plans and specifications, have designed the project with all life cycle factors in mind and have arrived at a balance of the factors in keeping with the desires of the client, lowest initial cost ignores the lowest on-going maintenance, operating and life cycle costs. An experienced general contractor with cumulative experience has been excluded from sharing knowledge.

Further, the contractor is obligated to construct the project in accordance with the plans and specifications (i.e. quality) and complete the project within specified time frame. The **contractor has no incentive to suggest cost saving alternatives and even if the incentive did ex'st, he has no right or legal standing to suggest the cost saving alternative.**

The contractor also has no incentive to identify the cost effective alternative before or after **winning** the tender since the selection is mainly based upon competitive bidding with the sole **criteria** for selection primarily being the lowest bid.

Although responsibilities and liabilities are initially quite clear, in that the designer is **responsible** for design and the contractor for construction, for problems arising after **construction** is complete, it is extremely difficult and expensive to ascertain liability. For **example,** if a structural element fails several years after construction is completed, it would have to be ascertained if the failure was caused by improper design/specification in which case liability would rest with the designer, or if it was due to workmanship in which case liability would rest with the contractor, subject to liability limitation period as it provided in the contract (Hovet, 1994).

According to JBC (1999) edition (a traditional contract), the obligations, responsibilities and liabilities ofthe parties are as follows:

- **Developer**
- To identify the site upon which the works will be carried out and the access thereto.
- To ascertain and confirm to the contractor that the proposed works comply with all statutory requirements, local authority planning and design bylaws or regulations.

- **Architect**

As the design responsibility lies with the employer, the architect is expected to:

- Issue comprehensive approved drawings and all necessary details and other information required by the contractor for the proper carrying out of the works. This includes Compliance with statutory requirements, local authority, and design laws.
- **Expeditiously supply information, instructions and interpretations required or requested by the contractor to ensure the timely carrying out of the works.**
- Issue all the necessary approvals and certificates and take other required action as soon as practicable.
- Be responsible for design defects.
- In addition he is expected to participate in the appointment of nominated subcontractors and suppliers.

Where the Architect is required under the contract to exercise his discretion by giving his decision, opinion, consent or approval or by taking any other action which may affect the rights and obligations of the employer or the contractor, he is expected to exercise such discretion impartially within the terms of the contract.

- **Contractor**

- To tender and construct as per clients designs, documents and specifications.
- To carry out, superintend upon and complete the works and rectify any defects appearing therein in accordance with the contract and to the reasonable satisfaction of the Architect, unless it is legally or physically impossible to do so.

The Ministry of Public Works (Building) Contract and the Public Procurement Oversight Authority Standard bid documents for building and civil engineering works (2006), mainly used for public projects has similar provisions.

In the FIDIC (2006, 1999 and 1992) Conditions of Contract for Construction, and the Short Form FIDIC Conditions of contract, (types of traditional contracts), the key points are as follows:

The design responsibility may lie with any of the parties; but, of course, it has to be clearly stated who is in charge of which aspects of the design. In Kenya, in most cases the design responsibility lies with the employer. He can do this either by using his own specialists (this is what we call 'in-house engineering'), or an external consultant engaged for the purpose, which entails the advantage of using the skills and experience and independence of mind of a consulting consultant for this task.

There is typically a Bill of Quantities, established by the Employer before tendering, which contains descriptions of items of work, their quantities, and the principles for measurement.

Payments to the contractor are then based on measurements of the work actually carried out, and the price per unit of such work, based on valuations and certificates as certified by the ^eloper's consultant.

basically, according to Hendrickson (2000), traditional contracts have four sequential phases in a Project construction life cycle.

- **Inception Stage**

This is the stage at which a client establishes the need to build, sets out his requirements and then appoints a design team comprising of architectural, engineering and Quantity surveying firms, or a consortium, as technical consultants for the project.

- **Design and Documentation Stage**

In traditional contracts, the technical consultants develop a preliminary design. The design team takes the project from the conceptual design to a level of design that defines all significant elements that enables an estimate of the construction project cost to be done. Once the design team completes the preliminary designs, the project can move to detailed or final design. In addition, any environmental-related permits not yet obtained are pursued.At the conclusion of this design phase, the architect and structural engineers submit the drawings to the local authority for approval, the Quantity Surveyor and engineers prepare the tender documents and give a pre-tender cost estimate for review and approval by client. Selection of contractors is also done at this stage.

- **Tendering Stage**

After the designs, estimates and financing arrangements for the project are completed, the construction team is selected usually through price and time competition, mostly through competitive bidding. The tender documents are given to contractors who prepare bids and the most 'bonafide' tender is chosen to construct the project. The owner then enters into a construction contract with the selected contractor.

- **Construction Stage**

The general contractor will act as a contractor and/or a coordinator of a large number of subcontractors who perform various specialties for the completion of the project. The consulting team also provides on site quality inspection during construction. Thus, the consulting team acts as the professionals on behalf of the owner and supervises the construction to ensure satisfactory results. The' construction works are therefore executed by the contractor under supervision of the clients consulting team.

This practice is common in all traditional contracts. >

Under the traditional contracts, the above stages follow each other sequentially. However some variants of the traditional contracts have evolved that allow partial integration of the project life cycle usually through overlapping of the stages. Examples of these are composite contracts. Composite contracts are contracts that combine characteristics of two or more types. Mc Canlis (1967) has pointed out that, for example, a lump sum contract based on bills of firm quantities often contains items with provisional quantities requiring remeasurement and therefore such items bear the characteristics of schedule of rates contracts. Also, the provisional sums included in the bills for day work and expended on work which is not readily measurable or not reasonably priceable as measured work, form a prime cost plus percentage fee **contract within the main lump sum contract.**

2.4.1.2 Variants of traditional contracts

The traditional type of contract is as a result of economic specialization. However, Ramus (1996), says the traditional contracts have evolved during the twentieth century to meet changing circumstances and technological development, introducing variants, as a means of mitigating the shortcomings of the basic system (mainly seen to be dependent on the type of contract), but the essential principles still apply. These variants are:-

a) **Lump sum, where a specific sum of money is stated in the contract as payment for the construction works.**

b) Schedule of rates, where there is no prescribed total sum but a schedule of unit rates is included in the contract documents to be used as the basis for calculating the payment to the contractor, and

c) **Prime cost, where the contractor is reimbursed to the total costs incurred plus a fee for his services to cover overheads and profit.**

According **to Ramus (1996), whether a contract is to be regarded as a "lump sum" or a** schedule **or a "prime cost" contract would appear to depend on the method provided for v'n8 at the sum to be paid. If the sum named in the contract is the basis, being increased inished by taking into consideration the extras and omissions, then it is a lump sum Ir^Qct' *f u ,1 the whole of the work is to be measured and priced, then it is a schedule contract;**

if the sum is reimbursement of total costs incurred plus a fee to cover overheads and profit, then it is a prime cost contract.

Ramus (1996), further gives three variants of each of the above types of contracts, their characteristics, advantages and disadvantages, as detailed below.

a) Lump sum (Sometimes called fixed price) contracts because a price is fixed beforehand for **a** defined amount of work.

(i) Based on bills of firm quantities

The essential characteristics are that both the quantities and the unit rates in the bills form part of the contract and that virtual completion of the design preceded the signing of the contract.

Their advantages include:

- Both parties have a clear picture of the extent of their respective commitments.
- The unit rates in the bills provide a sound basis for the valuation of any variations to the design.
- A detailed breakdown of the tender sum is readily available

Their disadvantages include:

- The time taken in the design of the project and in the preparation of the bills of quantities is longer than in integrated contracts where both design and construction can be intermarried.

  There is a problem of dealing with those variations which are as fundamental or extensive as to change the character of the remainder of the work or the conditions under which it has to be carried out as the contractor is rarely allowed to propose change of the design.

U Based on bi,ls of approximate quantities

Here th#»

' ,e essen'ial characteristics are that the unit rates in the bills form part of the contract not the quantities being subject to re-measurement)

^vantages include:

- The signing of the contract and the commencement of construction on site may proceed before the design is complete thus saving time.
- The extra expense of preparing firm quantities is avoided (although this is offset by the cost of fully measuring the work as actually carried out).

Their disadvantages include:

- The bills of quantities cannot be relied upon as giving a realistic total cost at tender stage and in consequence, the parties to the contract are less certain of the extent of their commitment which is important in cost and time performance.
- The construction works have to be measured completely as actually carried out, which may prove more costly eventually than to have prepared bills of quantities initially.
- The architect may feel less pressure to make design decisions which ought to be taken at an early stage thus creating uncertainty in projected time and cost performance.

iii) Based on drawings and specifications

The essential characteristics are that tenderers are supplied with complete working drawings and a full specification only, also that virtual completion of the design must therefore precede the signing of the contract. In addition, no bills of quantities are supplied to tenderers who are obliged to prepare their own quantities from the drawings.

Their advantages include

- The time required for the preparation of tender documents is reduced, as the time-consuming process of preparing bills of quantities is eliminated.
- Both parties can have a clear picture of their respective commitments at the time of signing the contract.

Their disadvantages include:

No breakdown of the tender sum is immediately available (although the tenderers may be asked to provide one, either as a part of their tender submission or subsequently).

There is little, if any, control over the percentage rates for additions for overheads and Profit to the prime cost of labour, materials and plant elements in day works. Tenderers are normally asked to state percentage rates to be used in the event of day-works arising. Where such rates have no effect on the tender sum, there is little I * •ncentive to the tenderer to moderate them.

. A particular problem arising under this variant of the lump sum type of contract is that of valuing variations. In order to reduce the problem, tenderers are usually required to provide a schedule of the principal unit rates used in the compilation of the tenders. Those rates are then used for pricing items in the measured variation accounts.

All these if not adequately addressed can create a lot of uncertainty in regard to projected final cost for the project, which is crucial for performance.

b) Schedule of rates (sometimes known as measurement contracts.)

A schedule of rates is similar to a bill of quantities but without the quantities. In other words, it consists of a list of items with full descriptions, units of measurement and unit rates. The latter may be either predetermined or inserted by the contractor's estimator, as explained under (i) and (ii) below.

The total cost of a project is only ascertained by measuring the work as it proceeds on site and pricing the measured items at the appropriate rates based on the schedule used.

(i) Standard schedule

A standard schedule lists under appropriate trade headings all the items likely to arise in any construction project, with a unit rate against each item. Tenderers are asked to tender percentage additions (or deductions) to the listed rates, usually by sections or sub-sections, thus allowing for variations in construction costs since the date of the preparation of the schedule used.

Their advantages include:

- Tenderers using a particular schedule often, soon become familiar both with the item descriptions and the rates and are able to assess percentage adjustments relatively easily.
- A particular advantage in the use of this type of contract is that work on site can commence well before completion of the design.

Their disadvantages include:

" In comparing and assessing a range of tenders, the client task of gauging the overall effect of a series of variables make the choice of the most favorable tender difficult.

The parties are unable to have a precise indication of their respective commitments. This creates a lot of uncertainty in regard to projected final cost for the project, which is crucial for performance.

(ii) 'Adhoc' schedule

This is a schedule specially prepared for a particular project and lists only those items which are appropriate to that project, including any special unusual items.

Their advantages include:

- Tenderers are only required to concern themselves with a restricted range of items, thus enabling them to assess rates or percentages more accurately.
- Tenderers are able to obtain a clearer picture of the scope of the work from the items listed in the schedule.

(iii) Bills of quantities from previous contract

The bill of quantities used will normally be for a comparable type of building of similar constructional form to the proposed project. It is, in effect, a pre-priced 'ad-hoc' schedule **and** will be used in the same way. This is the method of tendering normally used in serial tendering,

Their advantages include:

- The time required to prepare tender documents is reduced to the minimum.
- Tenderers have to consider only a restricted range of items.

Their disadvantages include:

- The parties are unable to have a precise indication of their respective commitments.
- There may be a considerable discrepancy between the successful tender and the real cost of the work due to the approximate nature of the quantities.

jThese disadvantages create a lot of uncertainty in regard to projected final cost for the project, which is crucial for performance.

Prime cost (also known as cost reimbursement or cost plus because the method of payment p by reimbursement of the contractor's prime costs, plus a management fee). There are three Plants of this type of contract, distinguished by the way in which the fee is calculated, as |*lt with separately below. 'Prime cost' means the total cost to the contractor of buying materials, goods and components, of using or hiring plant and of employing labour, in order to carry out construction works.

Their advantages include:

- The time required for preparation of tender documents and for obtaining tenders is minimized, thus enabling an early start on site to be made.
- Work on site may proceed before the detailed design is complete. There may be circumstances where, to the developer, cost is a less important factor than time. Consequently a start on the site at the earliest possible time may be financially more advantageous in the long run, than lower final cost of construction, which might have resulted from the use of another type of contract.

Their disadvantages include:

- The parties have the least precise indication of their respective commitments, which is crucial in projecting final cost for the project, which is crucial for performance.
- The cost of construction to the client is likely to be greater than if other types of contract were to be used. It is widely recognized as the most uneconomical type of contract and therefore is one which normally should be used only in circumstances where none of the other types is appropriate.
- The computation and verification of the total prime cost is a long and tedious process.

The variants described below differ in the way in which the fee for the contractor's services is determined. Variants (ii) and (iii) are the consequences of a general acknowledgement that it is desirable to provide an incentive to economize in the use of resources on the part of the contractor.

(') Cost plus percentage fee

contractor is paid a fee equal to an agreed percentage of the prime costs of labour, Materials and plant used in carrying out the work.

Tta outstanding disadvantage (to the client) is that the more inefficient the contractor's operations are and the greater the waSte of resources, the higher the fee paid to the contractor tyjll I

I To counter this, the percentage is sometimes made to vary inversely as the prime cost.

(ii) Cost plus fixed fee

Under this variant, the fee paid to the contractor is a fixed sum which normally does not vary **with** the total prime cost, but is based on an estimate of the likely total. The only ground on **which** the fee might be varied is if either the scope of the work or the conditions of carrying it **out** were to be materially altered after the contractor tendered. It should be noted that the fee, **if considered** in percentage terms, is lower when the prime cost is higher.

(iii) **Target cost**

This variant is really one or other of the two preceding ones with another factor added. As an incentive to reducing the total prime cost, the agreement provides for a bonus to be paid to the contractor if the total cost is less than an agreed sum (the 'target') and also a penalty to be paid by him if the total cost exceeds that sum. This is an incentive for the contractor to reduce cost.

This shows from the advantages and disadvantages given that the employers risk of non-performance with respect to time and cost variant of traditional contracts appears to be highest in prime cost contracts followed by schedule contracts and is lowest in lump sum contracts. This appears to be in line with Flanagan & Norman (1993) argument on risk allocation.

2.4.1.3 Historical perspective

According to Mastermann (1996), traditional contracts have been in use in the building industry for the past 150 years. He points out that by the 1850s' the system of'contracting in '^ross,' as was then known, widely prevailed upon clients to secure the economic benefits of competition, knowledge of the final cost before work began, better control of subsequent expenditure and the ability to enter into a single contractual relationship with a builder instead less co-coordinated tradesmen. This included use of surveyors by clients, to prepare quantities of materials required for estimating purposes, and relieving the tenderers of the responsibility for their accuracy and sufficiency.

2.4.1.4 Trends that necessitated change

According to Hendrickson (2000), in the past three decades, traditional contracts have become less popular, particularly for large scale projects, due to the disadvantages given in section 2.4.1.1 page 55.

In order to reduce the cost of construction, some owners introduce ***value engineering***, which seeks to reduce the cost of construction by soliciting a second design that might cost less than the original design produced by the consultant firm. In practice, the second design is submitted by the contractor after receiving a construction contract at a stipulated sum, and the saving in cost resulting from the redesign is shared by the contractor and the owner. The contractor is able to absorb the cost of redesign from the profit in construction or to reduce the construction cost as a result of the re-design. If the owner had been willing to pay a higher fee to the consultant firm or to better direct the design process, the consultant firm might have produced an improved design which would cost less in the first place. Regardless of the merit of value engineering, this practice has undermined the role of the consultant firm as the prime professional acting on behalf of the owner to supervise the contractor.

According to Mastermann (1996), traditional contracts continued being used predominantly until the early 1960s when the Emmerson and Banwell reports concluded that ways needed to be found of improving coordination and co-operation between the building owner, consultants, contractors and sub-contractors and suggested that the system for placing contracts and managing projects should be comprehensively reviewed. This led to increase in the uses of non-conventional contracting methods from the mid 1960s and the growth of integrated methods such as design and build, management contracting and a general acceptance amongst the larger and more far-sighted clients and consultants that the involvement of the contractor at an early stage (i.e. more integration between design and construction) could be of benefit to the Project as a whole.

trend has continued up to the present time with clients increasingly using integrated contracts in lieu of the traditional Contracts.

Wording to Mc Dermott et al, (2005), alternative construction contracts have been of increasing interest to the UK industry since the late 1960s. The number of different, construction contracts has increased steadily and the most recent of the RICS surveys of contracts in use also showed a substantial growth and dramatic acceptance of management forms of contracting over more traditional on conventional approaches. The use of management forms of contracting has advantages over conventional, design team led approaches in that they allow clients to work more closely with contractors than would normally be acceptable in traditional forms where design and construction elements of a project are deliberately divorced. This may be seen as the industries response to a change in the demands of clients. However, even in UK, the conventional approach to construction contracting remains the most widely used, with many clients preferring the cost advantages offered by such contracts.

According to Ramus (1996), various alternative contract strategies have been devised since the early 1960s. He advances the following reasons why the building industry considered the traditional contracts no longer satisfactory:-

- Clients were becoming more knowledgeable on construction matters and were demanding better value for money and an earlier return on their investment.
- High technology installations required a high quality of construction.
- The rapidly spiraling costs of construction meant that large sums of money had to be borrowed to finance projects.
- High interest rates meant that the time occupied by the traditional procedures resulted in substantial additions to the construction cost.

In addition, their was focus on reducing the time traditionally spent on designing and preparing tender documents so as to enable construction works to start sooner and the need to bring a contractor in at an early stage in order to use his vast amount of knowledge and practical experience in the design process.

In Kenya too, the construction industry has witnessed rapid awareness of alternative contracts. The introduction of the position of a project manager for government projects (PPOAK, 2006) and the growth of the number of firms offering project management services either exclusively 0r m combination with other consultancy or construction service is testimony to the acceptance a ^e non traditional contracts. In addition, promotion of integrated contracts like design and have also been witnessed in some tenders adverts for some government projects recently.

2.4.1.5 Management Oriented Contracts

Management oriented contracts are contracts that embody the application of management principles with the separation of functions of management from those of design and construction. One entity is responsible for the general coordination of all aspects of a construction project to ensure the objectives are met within resource constraints (Ritz, 1994). According to Hendrickson (2000), in recent years, a new breed of construction project managers offers professional services from the inception to the completion of a construction project.

They developed out of client's dissatisfaction with the fragmented structure, and the adversarial culture that dominates the relationship between contracting parties in the traditional contracts, and client's need for single source contracts in an attempt to simplify procedures of construction and to centralize point of responsibility. The attractive feature of the systems is their pre-dominant allocation of risk to the contractor and ability to eliminate the problem of "buck passing" between the architect or design consultants and the builder, a common feature in traditional contracts (Mbaya, 2004).

The non-traditional forms of contract are distinguished by the emphasis put on the following aspects of project organization and management: project organization structure, liability and risk allocation structure, design and construction organization structure, tendering procedure and price determination process used and the nature of contract with client i.e. with whom he assigns a contract or contracts and purpose for which contract is made (Mbaya, 2004).

Management oriented contracts can be discussed under Project Integrating Contract Systems. A major objective of these systems is to enable an optimal integration of the planning and design 0,1 the one hand and construction on the other. Traditionally, the separation of design and instruction is characterized by the tendering event, the representation of the client by the ^hitect/engineer in his relations with the contractors, the non-involvement of the contractor or ^tractor- based professional in planning and design, the works contract between the client 1 C construction firm and by the management of the project by architect/engineer on behalf wner (Mbatha, 1993). Management oriented contracts include: Management jS^ing (MC), Professional Construction Management (PCM), and Project Management, . are °nsidered to be both contract and as well management systems; contract systems because they involve the contractor as a management consultant, a designer or a specialized **contractor;** management systems because they are designed to specifically identify and fulfill **the** management role (Mbatha, 1993). Others are Construction Management (CM), Design and **Manage** and Construction Manager at risk (Mastermann, 1996); (seeley, 1997).

- **Management Contracting**

According to Mbatha (1993), also citing McKinney (1983) and Barrier et al (1976), the **Management** Contractor by definition provides a professional management service. As the **construction** professional on the construction team, he works **with** the designers and the client from the brief through to completion of construction, providing leadership of the construction team and on all matters relating to the production of the building with particular regard to time and cost. This approach links the management expertise of the contractor with that of the **professional** design team; construction oriented knowledge can in this manner, be supplied for the benefit of the client at the design stage, without client having to enter into a construction contract or negotiate on his position. The UK Management Contractor in relation to a Construction Manager in the US is appointed much later. He holds all the subcontracts and can thus be regarded as having greater control over them than his counterpart in the US. Management Contracting does not therefore represent the client's management function. This is performed by architect/engineer, project manager of client representative. It is important that the consultants are aware and committed to the contract so that they can accommodate suggestions from the Management Contractor. According to Mastermann (1996), the management contractor employs and manages works contractors who carry out the construction of the project, and he is reimbursed for his management services, payment being based on the **actual** prime cost of construction.

- **Professional Construction Management (PCM)**

In this contract, the management service is provided by a fee based professional and all construction contracts are directly between the client and the trade (package) contractors. The fundamental difference between this contract and management contracting is that with this aPproach, the client enters into a direct contract with the individual works contracts. The nstruction manager then acts as the employer's agent when dealing with each of the ^Parate contractors. The construction manager should be appointed as a consultant during 'nitial stages of the project and have direct responsibility to the client for the overall > <

management of the construction of the project including liaising with design consultants to **meet** agreed objectives. The construction manager is reimbursed by means of a professional fee and all construction is carried out by means of work package contracts that are contracted directly to the client but co-ordinated, supervised and administered by the construction **manager** (Mastermann, 1996).

According to Mbatha (1993), also quoting Nahapiet et al (1985), Management Contracting is considered the UK version of Construction Management as developed and practiced in the US. Both systems are very similar. However, several differences exist. The PCM initiates more and earlier. He tends to be the leader of the design team and provides the entire main cost, planning and construction advice He administers but does not hold the sub-contracts. This is generally the responsibility of the client. By way of contrast, the UK Management Contractor is not the leader of the team. In terms of cost advice and control he acts in a secondary role to the quantity surveyor. Under this system the client engages an architect for design and a management contractor for managing the construction phases. The client is contracted to the architect, construction manager and individual packaged trade sub-contractors through separate contracts. The construction manager is usually an agent engaged **by '.he** client on a fee for services offered. Under this arrangement, construction manager does not contract directly with the trade contractors but will arrange individual contracts between client and trade contractors and administer and co-ordinate them on behalf of the client. A modification to this system is where the construction manager may be required to contract directly with individual trade sub-contractors and contractors.

During **the** pre-construction stage, the construction manager is involved in preparation of the project cost budget and the forecasting of the clients cash flow requirements together with the preparation of the tender documents, the selection of potential package contractors, managing toe tendering procedures and reviewing, evaluating, making recommendations for tenders and frng contracts. During construction, the manager controls the cost of the project against he agreed budget, estimates the cost of design and construction proposals, monitors tender and adjusts the content of future work packages to ensure adherence to the approved **estimate vi i**

- ie also manages the programme to ensure time compliance, including assessing application for payment together with the appropriate member of the design team and l,sh'ng the validity of variations (Seeley, 1997).

management of the construction of the project including liaising with design consultants to meet agreed objectives. The construction manager is reimbursed by means of a professional fee and all construction is carried out by means of work package contracts that are contracted directly to the client but co-ordinated, supervised and administered by the construction manager (Mastermann, 1996).

According to Mbatha (1993), also quoting Nahapiet et al (1985), Management Contracting is considered the UK version of Construction Management as developed and practiced in the US. Both systems are very similar. However, several differences exist. The PCM initiates more and earlier. He tends to be the leader of the design team and provides the entire main cost, planning and construction advice He administers but does not hold the sub-contracts. This is generally the responsibility of the client. By way of contrast, the UK Management Contractor is not the leader of the team. In terms of cost advice and control he acts in a secondary role to the quantity surveyor. Under this system the client engages an architect for design and a management contractor for managing the construction phases. The client is contracted to the architect, construction manager and individual packaged trade sub-contractors through separate contracts. The construction manager is usually an agent engaged by the client on a fee for services offered. Under this arrangement, construction manager does not contact directly with the trade contractors but will arrange individual contracts between client and trade contractors and administer and co-ordinate them on behalf of the client. A modification to this system is where the construction manager may be required to contract directly with individual trade sub-contractors and contractors.

During the pre-construction stage, the construction manager is involved in preparation of the project cost budget and the forecasting of the clients cash flow requirements together with the preparation of the tender documents, the selection of potential package contractors, managing the tendering procedures and reviewing, evaluating, making recommendations for tenders and drafting contracts. During construction, the manager controls the cost of the project against "greed budget, estimates the cost of design and construction proposals, monitors tender 8 and adjusts the content of future work packages to ensure adherence to the approved estimate [v • i

e aiso manages the programme to ensure time compliance, including assessing ^Plication tor payment together with the appropriate member of the design team and 1,Sh,ng the validity of variations (Seeley, 1997).

management of the construction of the project including liaising with design consultants to meet agreed objectives. The construction manager is reimbursed by means of a professional fee and all construction is carried out by means of work package contracts that are contracted directly to the client but co-ordinated, supervised and administered by the construction manager (Mastermann, 1996).

According to Mbatha (1993), also quoting Nahapiet et al (1985), Management Contracting is considered the UK version of Construction Management as developed and practiced in the US. Both systems are very similar. However, several differences exist. The PCM initiates more and earlier. He tends to be the leader of the design team and provides the entire main cost, planning and construction advice He administers but does not hold the sub-contracts. This is generally the responsibility of the client. By way of contrast, the UK Management Contractor is not the leader of the team. In terms of cost advice and control he acts in a secondary role to the quantity surveyor. Under this system the client engages an architect for design and a management contractor for managing the construction phases. The client is contracted to the architect, construction manager and individual packaged trade sub-contractors through separate contracts. The construction manager is usually an agent engaged by the client on a fee for services offered. Under this arrangement, construction manager does not contract directly with the trade contractors but will arrange individual contracts between client and trade contractors and administer and co-ordinate them on behalf of the client. A modification to this system is where the construction manager may be required to contract directly with individual trade sub-contractors and contractors.

During the pre-construction stage, the construction manager is involved in preparation of the project cost budget and the forecasting of the clients cash flow requirements together with the reparation of the tender documents, the selection of potential package contractors, managing the tendering procedures and reviewing, evaluating, making recommendations for tenders and drafting contracts. During construction, the manager controls the cost of the project against the agreed budget, estimates the cost of design and construction proposals, monitors tender and adjusts the content of future work packages to ensure adherence to the approved estimate u • • ne also manages the programme to ensure time compliance, including assessing m aPP''cation for payment together with the appropriate member of the design team and bl,shmg the validity of variations (Seeley, 1997).

The contract promotes team approach to design and construction teams and it is credited with savings on time and cost attributable to the ability of the system to "fast track" the design. In addition to allowing construction to start as design proceeds, the contract incorporates the contractor's input into planning and design decisions thus improving buildability. According to the construction manager also fosters teamwork between the design and construction teams. The method is credited with ability to reduce the risks of spurious claims for additional costs (Yokowenko, 2004).

This contract saves on time due to the ability to overlap design and construction as some packages can start immediately they are designed and the improve buildability brought about by the construction manager's input in the design process. Cost savings will also rise as the work packages ensure competition on a major part of any project and the fact that the employer enters into direct contracts with the work package contractors ensures a greater measure of control over costs and the overall financial state of the project. It is also possible during the construction phase of the projects to adjust the scope or the specification (and thus the cost) of the uncommitted work should the contracts already awarded have exceeded their estimated cost. The reduction in time may also mean cost savings on finance charges. This method however has a shortcoming in that the client enters into the first works contracts and is irrevocably committed without a guarantee as to what the final cost will be (Seeley, 1997); (Mastermann, 1996).

- **Design and Manage**

In this contract, a single organization is appointed to carry out both the design of the project and management of the construction operation. The single organization can either be a consultancy practice or a contracting organization. The later may be elevated to a consultant uPon appointment, although the client may decide to appoint an in-house consultant to supervise the project.

1 construction is carried out by means of work packages, which are either the subject of 'feet contract between the client and the package contractors (consultant variant), or contract ^n the design and management organization (contractor variant). In the consultant ^ ^robursement is by means of a professional fee, and in the later, by means of a fee r with the actual cost of common services and work packages. The system requires the

presence on site on semi-permanent basis of the personnel responsible for the design of the project whose duties while resident on site include further detailed design, clarification of design details, liaison with works contractors to ensure buildability and working with the client representatives to ensure that the projects functional and other requirements are achieved (Seeley, 1997); (Mastermann, 1996).

This contract saves time by enabling work to commence on site before the total design is completed. The shortened lines of communication between the various parties, closer understanding of design by the works contractors and rapid decision making engendered by this characteristic of the system is also beneficial in the improvement that is achieved in the relationships between the client and the design manager (Seeley, 1997); (Mastermann, 1996).

- **Construction manager at risk**

According to Yakowenko (2004), this contract provides the client with the services of a construction management firm to provide recommendations for a project schedule, budget and constructability during design. Unlike in management contracting, the client and the construction manager agree on a guaranteed maximum price. Then the construction manager becomes responsible for managing the construction including subcontracts.

Further, during design stage, the construction manager represents the interests of the client, including providing recommendations on constructability, and cost reduction. Before the design is complete, the construction manager commits himself to a guaranteed maximum price for the project, which will not be exceeded, and he assumes the risk of meeting that price.

According to Yakowenko (2004), ultimately construction manager being at risk has to foster teamwork between design and construction teams.

- **Project Management**

This contract is similar to traditional contract only modified by appointment of a project manager, who represents the client's interests, taking the place of the lead consultant, among other responsibilities.

Locally, an example is the PPOAK (2006). This defines the Clients' Representative (Project Manager) as the person named in the Conditions of Contract who is responsible for supervising the execution of the Works and administering the Contract and shall be an "Architect" or a "Quantity Surveyor" registered under the Architects and Quantity Surveyors Act Cap 525 or an "Engineer" registered under Engineers Registration Act Cap 530. The private sector Client's Representative (Project Manager) role as practiced locally, though it has no specific published regulations is similar to that in the public sector. The use of this contract in construction projects is reported to be on the increase in Kenya.

According to Mbatha (1993), the British Property Federation (BPF) Project Management contract system is similar. It may be classified as belonging to the client representation-based systems. The BPF manual defines the clients' representative as the person or firm responsible for managing the project on behalf of and in the interest of the client. The clients' representative may be an employee of the client or an architect, chartered surveyor, engineer or Project Manager. He is not involved in as designer or contractor. He provides single-point responsibility and by virtue of his non-involvement in details, he is able to concentrate on management.

It is the system's philosophy to decentralize cost management and to make parties who make decisions with cost implications to be individually responsible for ensuring that the costs meet the budget requirements. The CR is assisted in the maintenance of the cost plan by the contractual requirement for all parties to provide regular, detailed cost reports. This system also •dentifies {'our major roles in addition to that of the client. They are: the client representative, ^P^visor, the design leader and the contractor. It is a major objective of this system to Cise,y and in details allocate' responsibilities. Such an organizational structure highly ces the management function which this system emphasizes.

Whil e m "agement contract system may also be considered to belong to the design-IB*ruction integration system, in fact the Client's Representative role in this project

management contract is a pure management one (Mbatha, 1993). For this reason, the author shall in this study group Management contracts together with traditional contracts, because their variant is purely in the management structure.

According to Hendrickson (2000), in recent years, a new breed of construction project managers offers professional services from the inception to the completion of a construction project. These construction project managers mostly come from the ranks of consultancy firms who may or may not retain dual roles in the service of the owners. In any case, the **owner** can rely on the service of a single prime professional to manage the entire process of a **construction** project. However, like the consultancy firms, the construction project managers are appreciated by some owners but not by others. Before long, some owners find that the **construction** managers too may try to protect their own interest instead of that of the owners when the stakes are high.

Mastermann (1996) cites the following advantages and disadvantages of management contracts.

Their advantages include:

- Early advice can be obtained from the contractor/manager on design, buildability, programming, and materials availability together with general construction expertise. The system makes provision for the design team and contractor to negotiate upon and alter the pre-tender design before entering into a building contract. This should reduce variations once the works are in progress. It provides financial incentives which encourage contractors to undertake design detailing economical to construct. It creates a design leader with overall responsibility for the pre-tender design and sanctioning the contractor's design. However, the contractor's contribution to constructability is not realizable until the tendering stage, and therefore it has a limited effect on the project. For this contract to realize full benefits in management contracting it requires that the management contractor be appointed before decisions are taken regarding detailed designs of a facility

  The use of this category of systems enables commencement of the project to be started on site while design is being finalized, and accelerated, which in turn enables earlier completion to be achieved.

  The use of individual work packages to carry out all the construction work ensures that competition can be achieved on up to 90% of the construction cost of the project and makes it possible to adjust the cost, or scope, of uncommitted work should the packages already awarded have exceeded their estimated cost.

- Since the financial structure of the project is usually fragmented, the monetary failure of any works contractor will only have a limited effect on the total process.
- According to Mbatha (1993), citing Barnes and White (1987), the brief for designing the new system as given to the consultant Project Managers included redressing the balance in what the client saw as inadequate forms of agreement and contract, allocating risks to those best equipped to handle them, and spreading responsibilities more evenly
- They aim at unifying the professionals' and the contractors" activities. It may be said that it is a fundamental objective of these systems to create operative project teams.
- In this system, uncertainty is reduced mainly by the ability of the system to make each party responsible for their activity schedules and cost plans, and by the contractual requirement that each party must participate in updating the overall time and cost plan. Also the possibility for the contractors to complete design reduces uncertainty in technical complexity since both design and performance risks are transferred to the executing contractor.

Their disadvantages include:

- Although the contractor/manager is responsible for supervising construction and ensuring that work is built to the standards identified by the design team, the fact that his obligations are limited to his management performance means that the client is liable for the cost of remedying any defects resulting from the substandard performance of any works contractor who is unwilling, or unable, to rectify his own faults.
- The client does not have a firm price tender available before commencing work although both private and public accountability can be partially satisfied as the majority of the construction cost can be subject to competitive tender.
- The whole question of maintaining quality control is problematic when using this category and the client may therefore need to appoint additional site supervision to avoid difficulties in .determining the responsibility for defects and to ensure that the specified quality standard is achieved.

  One of the fundamental aims of this category of contract is the elevation of the contractor to the status of client advisor/consultant with the result that the contractor's contractual liabilities are limited in the same way as other members of the professional team, to accepting responsibility for any negligence in the performance of his management function. Majority of the project risks are allocated to the client and this can be particularly onerous where work package contractor fail to perform and affect subsequent parallel operations.

Given that their variant is purely in the management structure, management contracts shall in this study be grouped together with traditional contracts.

According to the JBC Contract (1999), one of the most commonly used traditional contract, the following factors adversely affect time and cost performance.

a) **Force majeure,**

b) **Exceptionally adverse weather conditions,**

c) Loss or damage occasioned for which insurance is required to be effected

d) Commotion, strike or lockout affecting any of the trades employed upon the Works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materials required for the Works

e) Architect's instructions issued under clauses 22.0 (architects instructions), 28.1 (suspension) and 30.0 (variations) of these conditions

0 Contractor not having received in due time necessary instructions, drawings, details or levels from the Architect for which he specifically applied in writing on a date which having regard to the date for practical completion stated in the appendix to these conditions or to any extension of time then fixed under this clause was neither unreasonably distant from nor unreasonably close to the date on which it was necessary for him to receive the same,

8) Delay on the part of artists, tradesmen or other engaged by the Employer in executing work not forming part of this contract

h) Statutory or other services providers or similar bodies engaged directly by the Employer

i) Opening up for inspection of may work covered up or of the testing of any of the work, materials or goods in accordance with sub-clause 23.6 of the conditions (including making good in consequence of such opening up or testing), unless the inspection or test showed that the work, materials or goods were not in accordance with this contract,

j) Contractor's inability for reasons beyond his control and which he could not reasonably have foreseen at the date of this contract, to obtain delivery upon the Works of such goods or materials as are essential to the proper carrying out of the Works,

k) Carrying out the Works having been suspended by the Contractor in accordance with clause 29.0,

1) Delay in appointing a replacement Architect, Quantity Surveyor or Engineers,

m) Delay caused by the late supply of goods or materials or in executing work for which the Employer or his agents are contractually obliged to supply or to execute as the case may be,

n) Delay caused by nominated subcontractors or nominated suppliers which delay the Contractor has taken all reasonable measures to avoid or reduce the effects of,

°) Contractor's inability, for reasons beyond his control, to secure such skilled labor and other workmen essential to the proper carrying out of the Works,

P) Nomination or renominatitfn of a sub-contractor or supplier, or

9) Delay in receiving possession of or access to the site.

2.4.2 Integrated Contracts

2.4.2.1 Characteristics

The main characteristic of integrated contracts is that the contractor is responsible for both the design and construction phases and commissioning of a project.

According to Hendrickson (2000), a common trend in industrial construction, particularly for larae projects, is to engage the services of a design/construct firm. By integrating design and construction management in a single organization, many of the conflicts between designers and contractors might be avoided. In particular, designs can be closely scrutinized for their constructability and value engineering. The review of designs with regard to their constructability can be carried out as the project progresses from planning to design. Value engineering may be broadly defined as an organized approach in identifying unnecessary costs in design and construction and in soliciting or proposing alternative design or construction technology to reduce costs without sacrificing quality or performance requirements. It usually involves the steps of gathering pertinent information, searching for creative ideas, evaluating the promising alternatives, and proposing a more cost effective alternative. This approach is usually applied at the beginning of the construction phase of the project life cycle. In an integrated contract, planning for both design and construction can proceed almost simultaneously, examining various alternatives which are desirable from both viewpoints. Integrated contracts are particularly suitable for phased construction and turn-key approaches.

1 , • „ v „ „ „ „

^According to Mbaya (2004), Mastermann (1996) and Hovet (1994), integrated contracts may r considered under the following main variants.

- Design and build.
- Plant and Design - build - package deal and turnkey.
- Build-own-operate-transfer (BOOT) and its variants.

The contracts variants are however differentiated by the degree to which the builder or **contractor** is involved in the pre-planning and post construction activities of the project as discussed hereunder.

Where integrated contracts are used, the client will normally provide to potential consortia **detailed** performance criteria including design construction and operational requirements. The **client** will **then** invite consortia to bid for the right to enter into negotiations for the works. The consortia bids are normally required to include information that sets out the **fundamentals** of the project including the design concept, contract form etc. For BOOT **contracts,** it will also include the transfer period, ability of the operation, financial security to **complete** and operate the facility and the operational costs of the facility upon transfer. For this reason, in the use of integrated contracts, the client must be well advised that selection of the appropriate contractor is absolutely critical.

- **Plant and Design - Build**

According to FIDIC (1999), if the contract is for construction of plant, or has relatively important unforeseen risks, or both, then the Conditions of Contract for Plant and Design-Build would be used. Under the FIDIC (1999) Plant and Design - Build contract, it is the contractor who shall carry out and be responsible for the design of the works. There is a contractual obligation for the designs to be prepared by qualified designers who are engineers or other professionals with all necessary experiences and capability.

Also here, there is an Engineer, working for the Employer, who is in charge of administering the contract. In design and build, the concept or preliminary designs and or performance specification for the project are thoroughly prepared

There is a contract price, agreed in advance, although subject to adjustments according to the "tract. The price may be paid in installments, according to how much of the work has been ^ecuted. The applications for payment have to be certified by the Engineer.

^ contractor's roles in design and build contracts will vary depending on the degree to Preliminary design work is undertaken by the client. The client may attempt to retain 'gn control through the inclusion of certain contract conditions to protect his

interest. In this method, the contractor adopts a major portion of the project risk through the design development of initial concept.

- **Turn-key**

According to Hendrickson (1998), in a turn-key contract, a contractor agrees to provide the completed facility on the basis of performance specifications set forth by the owner. The contractor may even assume the responsibility of operating the project if the owner so desires. In order for a turnkey operation to succeed, the owner must be able to provide a set of unambiguous performance specifications to the contractor and must have complete confidence in the capability of the contractor to carry out the mission.

According to FIDIC (1999), if the contract is for a fixed-price, lump-sum project, with little employer involvement and no major unforeseen risks, then the Conditions of Contract for EPCATurnkey Project would be used. Also under the FIDIC Turn-key contract, it is the contractor who shall carry out and be responsible for the design of the works. Here, this responsibility is much larger than in the Plant and Design-Build contract, because it is essentially the contractor who carries the risk of initial data being incomplete or inaccurate. He is required to verify all the employer's requirements and the physical conditions and, he/she, take responsibility for their accuracy.

There is no Engineer in the contract. The Employer may appoint a representative for the j purpose of administering the contract, but he is not obliged to.

I The contract price is fixed in advance. It is likely to be higher than in the case of a Plant and I Design-Build contract, because the contractor takes on more risks. When the work is being scarried out, the price may be paid in installments according to the progress of the works.

for these reasons, this contract is typically used when the Employer (the client) is not able or fifing to become involved in the details of the works or to take any risk, but on the other 1^d is willing to pay a higher price for getting the work done properly and on time.

key" the builder therefore undertakes all the components of a project. It places all ' <
8n construction and performance responsibilities to the single entity contractor. Turnkey

projects are done by a lead company, which sub-contracts the different aspects or components of project design and construction to others or the main participants joining as consortium or a joint venture arrangement. Turnkey contracts includc most of all the fixtures, fittings and equipments required for the provision of a fully-equipped-facility, **ready** for operation (at the turn of the key)". In a turnkey contract, contractor may be required to find and purchase a site on behalf of the client and sometimes even provide finance.

- **Build Own Operate Transfer (BOOT)**

These contracts are a development or expansion of the design and construction and the turnkey contracts.

The modification is that BOOT contracts generally include a period of ownership and or operation of the facility by the contracting organization. The operation period is referred to as the Transfer Period.

In this contract, one organization builds, owns, operates and then tranters its ownership to the commissioning authority. In the intervening period it operates the fa^l'ty under license. The operate part is achieved by giving the BOOT organization a license to operate the facility for a given period in exchange and to make charges by way of toll, or £ rent or a toe use of the facility that has been provided. The transfer will come abo^t when the BOOT organizations term of operation comes to an end and ownership of the facility is then transferred.

When the method is used on public project, it will be necessary for the government to monitor the perfonriance of the facility with respect to social obligations and the quality of services being provided, during the period of operation by the consortia.

The standard BOOT arrangements have a number of variations as:

BOOT = Build Own Operate Transfer

= Build Operate Transfer

00 = Build Own Operate

BIT -

r - Build Lease Transfer

ROT = Rehabilitate Operate Transfer

Locally, according to the standard tender document for procurement of works/plant for design build & (turnkey projects prepared by the public procurement oversight authority **(PPOA)** of Kenya, the said standard tender document may be used for procurement of all types of Turnkey projects. With necessary modifications the document may also be used for projects involving Financing, Construction, Operation **and** Maintenance of infrastructure (e.g. **Build and** Transfer (BT), Build-Lease **and** Transfer (BLT), Build Operate **and** Transfer **(BOT),** Build-Own **and** Operate (BOO), Build Transfer **and** Operate (BTO) Rehabilitate **Operate and** Transfer (ROT) Rehabilitate Own **and** Operate (ROO), subject **to** other necessary Government approvals.

It further states that the standard tender document should remain unchanged and any necessary changes by a procuring entity should be introduced only through the Appendix to instructions to tenderers and the special conditions of contract.

This type of contract cites the basic process and parties requirements during a project life cycle as follows:

- **Design stage requirements**

- Intent of the Contract Documents:

The intent of the contract documents is to provide the Employer with a project that is complete in all respects. All items necessary or reasonably required are to be provided to produce a complete and operational project. Contract documents are interpreted as being complementary, requiring a complete project.

- Scope of Work:

The Design-Builder has to provide a complete set of all architectural and engineering drawings, bills of quantities and detailed specifications necessary to complete the project in accordance with the requirements of the contract documents. The Design-Builder has to furnish ªN labour, materials, equipment, services and transportation necessary for the complete instruction of the project.

- Laws and Codes:

The Design-Builder complies with the requirements of the latest edition of the Kenya Building **Code,** Codes and specifications incorporated by reference

Drawings and Specifications and approvals:

- Quality Requirements:

The Design-Builder is responsible for production of the plans and specifications, which must include a quality control program and an implementation plan to ensure that the completed project complies in all respects to the project requirements. It is required that these drawings and specifications be prepared by Registered professionals under the law in Kenya.

- Plan Review and Testing/Inspection Services:

The Employer reviews the plans and specifications for adherence to applicable **codes** and standards.

- Layout of the Work:

The Design-Builder prepares surveys and design required for the project and assures compliance with all state and local regulations.

In addition, the Design-Builder is responsible for payment of applicable approval fees.

- **Construction stage**

- Contract Time:

AH time limits specified in this contract are of the essence of the contract. The **design**-Builder a^ees to complete the work on the date specified for completion of the **Design**-Guilder's Performance in the contract unless such time is adjusted in writing by change order by the Employer.

* Laws:

Design-Builder has to observe all Government ,aWs that affect the work under this , ^ r^et and is required to hold harmless, defend ar^ ,ndemnify the Employer against any claim arising from the violation of any law, whether by itself or its agents, employees or subcontractors.

- Design-Builder's Responsibility for the Work:

- Generally:

The Design-Builder is fully responsible for all work performed under this contract and no subcontractor is recognized as such. For purposes of assessing responsibility to the Design-Builder, all persons engaged in the work are considered as employees of the Design-Builder.

- Quality Control:
- The Design-Builder is fully responsible for the quality of materials and workers skill in the project.

- Burden for Damage:

The Design-Builder has the charge and care of and bears the risk of damage to the project and materials and equipment for the project.

- **Guarantee**

The design-Builder has to unconditionally guarantee the work under this contract to be in conformance with the contract requirements and to be and remain free of defects in workmanship and materials for a period of one year from the date of acceptance of the project, unless a longer guarantee period is agreed between the parties.

According to the by the public procurement oversight authority (PPOA) of Kenya document, the Conditions of contract contained in this standard document for Procurement of Works or Plant (design build/Turnkey Projects) are those suitable for procurement of Buildings and Associated Civil Engineering Works. It further states that the said Conditions of Contract should be substituted with the suitable Conditions of Contract to suit the relevant contracts as follows:

I **U)** "For procurement of Mechanical and Electrical Installations, the applicable Conditions of Contract shall be the General conditions forming part 1 of the "Conditions of Contract for Electrical and Mechanical Works - including erection on site, (Latest Edition) prepared by the FIDIC". The conditions are subject to variations and additions set out in Part II thereof entitled special conditions.

(b) For Procurement of Roads, Bridges, Water and other Civil Engineering Works, the applicable General Conditions of Contract shall be those forming Part 1 of the "Conditions of Contract for Works of Civil Engineering Constructions (Latest Edition) prepared by FIDIC". The conditions are subject to variations and additions set out in Part II thereof entitled "Conditions of Contract, Part II - Conditions of Particulars application."

FIDIC (2006, 1999) design and build contract have similar provisions in that the Contractor designs, executes and completes the works, including providing construction documents, within the Time of Completion, and remedies any defects within the Contract period. In addition, the contractor provides all superintendence.

The contractor is responsible for the interpretation of the Site data, and for obtaining other information, so far as was practicable. The practicability of obtaining information depends on the time allowed for the preparation of the proposal, and aspects such as the accessibility of the site.

The contract price covers all his obligations under the contract and all things necessary for the proper design, execution and completion of the works and remedying of any defects.

The principle of this contract is that design responsibility falls on the contractor, who must therefore check the employer's requirements. The contractor carries out, and is responsible for, the design of the works. Design must be prepared by qualified designers who are engineers or other professionals who comply with criteria (if any) stated in the employer's requirements, each part of the works, the prior consent of the employer's representative must be obtained, othing contained in the contract creates any contractual relationship or professional ligations between any designer, of a design subcontractor, and the employer.

r e contractor holds himself, his designers and design subcontractors as having the CxPerience and capability necessary for the design. The contractor undertakes that the designers shall be available to attend discussions with the employer's representative at all reasonable times during the contract period.

- Specific provisions that govern quality include:

. Construction Documents:

The contractor must prepare construction documents in sufficient detail to satisfy all **regulatory** approvals, to provide suppliers and construction personnel sufficient instruction to **execute** the works, and to describe the operation of the completed works. The employer's **representative** must have the right to review and inspect the preparation of construction **documents** wherever they are being prepared.

- Contractor's undertaking:

The contractor undertakes that, if legally and physically possible, the design, the construction **documents,** the execution and the completed works will be in accordance with the law in the **country,** and the documents forming the contract, as altered or modified by variations.

- Technical Standards and Regulations:

The design, the construction documents, the execution and the completed works must comply **with the** country's national specifications, technical standards, building, constructions and environmental regulations, regulations applicable to the product being produced from the **works,** and the standard specified in the Employer's Requirements, applicable to the **contractor**'s proposal and schedules, or defined by law.

- Operation and Maintenance Manuals:

Prior to commencement of the tests on completion, the contractor must prepare, and submit tQthe Employer's Representative operation and Maintenance Manuals.

Error by contractor:

If are found in the construction documents, they and the works must be corrected at the Actor's cost.

Patent Rights:

The contractor is required to indemnify the employer against all claims of

Infringement of any patent, registered design, copyright, trade mark or trade name, or other intellectual property right, if the claim or proceedings arise out of the design, construction, manufacturer or use.

As noted above, the FIDIC and the PPOAK conditions of design build/Turnkey contracts therefore have similar provisions.

According to Hendrickson (1998), the following are advantages of integrated contracts.

- By integrating design and construction management in a single organization, many of the conflicts between designers and constructors might be avoided. They aim at unifying the professionals' and the contractors" activities-that is achieving more of a team spirit and less adversarial situation for a building contract. The method is credited with the ability to reduce substantially clients' risks on various aspects of the project. It may be said that it is a fundamental objective of these systems to create operative project teams. In particular, designs will be closely scrutinized for their constructability. The review of designs with regard to their constructability can be carried out as the project progresses from planning to design.
- Also, one of the most obvious advantages of the integrated design/construct contract is the use of phased construction for a large project. In this contract, the project is divided up into several phases, each of which can be designed and constructed in a staggered manner. After the completion of the design of the first phase, construction can begin without waiting for the completion of the design of the second phase, etc. If proper coordination is exercised, the total project duration can be greatly reduced.
- Another advantage is to exploit the possibility of using the *turnkey* approach whereby an owner can delegate all responsibility to the design/construct firm which will deliver to the owner a completed facility that meets the performance specifications.

  In an integrated contract, planning for both design and construction can proceed almost simultaneously, examining various alternatives which are desirable from both viewpoints

^advantages include:

e single point contract between the client and the contractor that is unique to this tegory means that the client has the advantage of dealing with one single organization. , at Is responsible for all aspects of the project.

- BOOT arrangements are reputed with providing a single point of responsibility for the client who can procure the design, construction and operation of a facility including all financing simply by creating an investment incentive for interested consortia.
- Provided that the client's requirements are accurately specified, certainty of final project cost can be achieved and this cost is usually less than when using other types of contracts.
- The use of integrated contracts enables design and construction to be overlapped and should result in improved communication being established between client and contractor. These two characteristics enable shorter overall project periods to be achieved and project management efficiency to be improved.
- BOOT contracts are reported to be particularly popular with public clients in the provision of infrastructure projects such as roads toll ways

The disadvantages of integrated contracts include:

- If the client brief is ambiguous and does not communicate his precise wishes, great difficulty can be experienced in evaluating tender submissions.
- The absence of a bill of quantities makes the valuation of variations extremely difficult and restricts the freedom of clients to make changes to the design of the project during post contract period.
- Although well designed and aesthetically pleasing buildings can be obtained when using this type of contract, the client's control is less than when using other types of contracts.
- Cost pressures on builder's side can lead to short cuts to design and designing only to meet minimum performance requirements.
- The quality of the constructed facility might be sacrificed by the desire to reduce the time or the cost for completing the project. Also, it is difficult to make use of competitive bidding in this type of design/construct contract. As a result, owners must be relatively sophisticated in negotiating realistic and cost-effective construction contracts (Hendrickson, 2000).

flDlC (1999) for Plant (design build/Turnkey Projects) contracts and the PPOA of Kenya r^nient Conditions of contract for Procurement of Works or Plant (design build/Turnkey **pects)** 2000 edition, (examples of integrated contracts), gives the following factors that f^erse,y affect time and cost performance.

a) Variations caused by the employer

b) A force majeure event

c) Cause of delay giving an entitlement to extension of time

d) Physical conditions or circumstances on the site, which are exceptionally adverse and were not (by the base date) foreseeable by an experienced contractor

e) Any delay, impediment or prevention by the Employer.

f) Delays caused by Authorities not (by the base date) foreseeable by an experienced contractor

g) Suspension by employer not for a cause attributable to the Contractor and not necessitated by Contractor's risk (his risks are all risks other than the Employer's risk listed below)

h) Employer's risks that include:

- War, hostilities, invasion, act of foreign enemies

- Rebellion, revolution, insurrection, or military or usurped power, or civil war.

- Ionizing radiations, or contamination by radio-activity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component of such assembly.

  Pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds.

- Riot, commotion or disorder, unless solely restricted to employees of the Contractor or of his Sub-contractors and arising from the conduct of the Works.

. Loss of damage due to the use or occupation by the Employer of any Section or part of the Works, except as may be provided for in the Contract, and

- loss or damage to the extent that it is due to the design of the works, other than any part of the design provided by the contractor or for which the contractor is responsible,

- Any operation of the forces of nature against which an experienced contractor could not reasonably have been expected to take precautions.

Others include:

i) Variations arising from inaccurate and or ambiguous brief/employers requirements.

j) Client's inability to make changes during construction arising from the fact that contractor is responsible for both design and construction.

k) Lack of privity of contract between the employer and designers and sub-contractors thus not allowing direct control by employer.

l) Failure of employer to obtain accurate and adequate professional advice on preparation of accurate contract documents.

m) Lack of competent and or experienced design and built/turnkey contractors.

n) Cost pressures on contractor leading to shortcuts and subsequent demolitions.

2.5 Construction Contracts verses performance in Kenya

2.5.1 Discussion

According to Rwelamilla (1995), in practice, the construction industry participants have fallen into the trap of using standard traditional contracts which they stick to. This leads to the situation where projects can go wrong because the actual tasks peculiar projects are not identified. It is not unusual to find architects, quantity surveyors and project manages who continue using same types of contracts, without addressing requirements for a particular project. Consequently, many clients in construction industry in Kenya have become dissatisfied with the performance and level of services they are receiving from the construction industry and they have come to increasingly associate this failure with the traditional contracts.

According to studies carried out, traditional contracting in Kenya is still the method widely used, selected by default for most projects Talukhaba (1988) and Michael (1991), and borrowed from the British, our colonial masters. Katani (2001) in his study of 30 projects (both private and public) also found that 29 projects were handled using traditional contracting method and its variants. Although Talukhaba (1999) created a formula to predict contract time on the premise that the time overruns are more of a reflection of the setting of the wrong contract time for the projects at the beginning, the researcher's opinion is that this premise would affect both types of contracts.

According to Mbaya (2004), preliminary survey of construction industry in Kenya shows that the dissatisfaction has been contributed by:-

- Poor performance in terms of time, cost and quality. Newspapers reports and research project undertaken at University of Nairobi are replete with findings that construction projects in Kenya experience time and cost over-runs, falling quality standards and increased incidences of contractual claims and cases of litigation.

  Poor constructability - complaints about poor detailing and workmanship specification by the architects.

  Adversarial attitudes resulting in claims and disputes. Recent upsurge of popularity such dispute resolution methods-adjudication, mediation and arbitration is a clear estimony of increased claims and litigation in the industry.

- Perceived lack of customer focus. Rarely do the consultants and builders in construction consider the plight of the user of the end facility or customer.
- Construction industry has also been credited with very low levels of innovation in construction materials and methods.

These concerns are directed not only towards the contractors, but also towards professionals acting as consultants and advisers during construction process.

Given the shortcomings of the traditional contracts in Kenyan construction industry, it is evident that these other methods will also be the methods of the future in the industry. Indeed, there is evidence to show that some contracting agencies in the construction industry especially in the government sector are recognizing the integrated contracts as an acceptable alternative type of contract and a standard general condition of contracts for design build and turn-key have already been prepared for use (PPOAK, 2006). There is need for construction contracts to meet particular building project needs (Barrei and Panlson, 1978; Burges, 1979; Walker, 1984; Bennet, 1985; Rwelamila and Hall, 1994 and 1995).

According to Titmus (1990), the way ahead lies in close liaison between professional and contractors to reduce incidences of misunderstanding, improve communication, and commitment through team work and identification with project and make contractors use of project construction and organizations which can be applied/realized using alternative contracting methods.

The studies reviewed prove the availability of both the traditional and integrated types of contracts in both public and private sectors. The advantages and disadvantages of both types °f contracts and the circumstances where they are appropriately used have also been shown, ^hile it is shown that the extent of use of the various types of traditional contracts is wide, ^ere is no concrete information as to the extent of use of integrated contracts.

^s f

as the second objective is concerned, the studies reviewed were able to identify that ** advantages and shortcomings of both types of contracts. Although the review has that there is a trend towards encouragement of use of integrated contracts through govern)ment introduction of PPOAK design, build and turnkey document (2006), no concrete information or figures as to the extent in which each of the two types of contract has impacted on project time and cost performance.

Similarly, the studies reviewed have not been able to show that there is any information available on the extent to which integrated contracts improve time and cost performance.

2.5.2 Summary

The study seeks to examine the impact of types of construction contracts on project performance. The study reviewed discussed the existing literature on the subject of construction contracts and their impact on project performance. In addition, the concept and dimensions of project performance to stakeholders were explored highlighting performance challenges in construction projects. Further, the chapter explored how performance is achieved through a project life cycle. Finally it discussed how parties need to safeguard their part of risk of non-performance through contracts. This was done by discussing different types of construction contracts, their characteristics, strengths and weaknesses as well as circumstances in which they are appropriately used.

The studies reviewed however have not been able to prove the extent of the use of various types of construction contracts, or identify the impact of traditional and integrated construction contracts on project performance, or prove the extent to which integrated contracts improve performance, in the Kenyan building industry, which were the research objectives.

In an attempt to do this, this study categorizes the various contracting methods into two major ^oups depending on the emphasis of organization structures and the integration of project Phases. The two categories are Traditional contracts (Contracts for works designed by the eroployer) and Integrated contracts (Contracts for works designed and built by the ^tactor). This broad grouping minimizes the variables especially considering that many of contract variants have very little real difference in the general organization.

116x1 chapter considers fieldwork data collection for the two broad contract types Elected.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Research design and methodology

The research design that was adopted in this research is a survey design. Survey research is the method of gathering data from respondents thought to be representative of the same **population.** Survey research seeks to obtain information that describes phenomena by asking **people** about their perception, attitudes, behaviors or values. Data is collected on what is **actually** happening in the field of interest by asking people who have had experience in it to reconstruct their experiences (Mugenda and Mugenda, 1999). This provides the efficient **collection** of data over broad populations amenable to administration in person, by telephone, **over the** internet etc. A structured survey was used to gather data and the format of questions **followed** a logical sequence in gathering data.

The methodology involved data collection using the research questionnaire administered to **the** sample population. Then data were analyzed using frequency and mean scores and **preliminary** conclusions discussed with the research supervisor to assist in understanding the **relevance** of the findings.

3.2 Target Population

The target population comprises Architectural, Quantity Surveying, and Project Management firms and Building Contractors (category D and above as per the Ministry of Public Works contractors register). Architects, Quantity Surveyors, and Project Managers are selected because they are the professionals who are mainly in charge of contracts administration in building projects. Contractors in Category D and above are selected because they are considered to have experience of formal contracts. Project management firms were selected fr°m the few that practice as there is no formal body that currently registers project roanagement firms. A total of 28 Project management firms have been selected mainly from nstruction review and Architectural Association of Kenya magazines, yellow pages [^ty (2010), and enquiries from firms that practice. A list of consultants obtained from Qs (2010) indicates that there were 264 Architectural and 152 Quantity Surveying

Hhk a ..

' * list of Contractors held by the Ministry of Public works obtained in October 2010, that there are 4,073 registered building/general contractors and 568 are in category p **and** above. Out of those in category D and above, 347 i.e. 61% have Nairobi addresses and are considered to be based in Nairobi. For logistical reasons, time saving and convenience **purposes,** the target respondents are based in Nairobi but the target projects study area is **Kenya.** A summary of the list is shown below.

Table 3.1: Building /General Contractors registered by ministry of public works (2010).

"Category of contractor as per MOPW register	Total No.	Total cumulative: No.	Nairobi based: No.	Nairobi based: cumulative: No.	Nairobi based: percentage: %
	110	110	97	97	88
B	86	196	70	167	85
C	139	335	58	225	67
D	233	568	122	347	61
E	487	1,055	265	612	58
F	803	1,858	384	996	54
G	1,100	2,958	523	1,519	51
H	1,115	4,073	346	1,865	46
TOTAL	4,073	4,073	1,865	1,865	46

Source: Ministry' of public works (2010).

^he study covers the project cost and time performance in construction phase and how they relate to the type of contract used.

Sample size and selection

ording to Hinkle *et al* (1998), the minimum sample size that allows normal distribution Ptions to be used rather than using a't' distribution is 30 cases/units.

According to Gay and Airasian (2003), for small populations of less than 100 units the whole population should be surveyed, but Alreck & Settle (1995) are of the opinion that a sample size of about 10% of the population is adequate to obtain the desired confidence, provided the resulting sample is less than 1000 and larger than 30 units.

Sample size depends on number of variables in the study, the type of research design, the method of data analysis and the size of the accessible population (Mugenda and Mugenda, 1999).

Analysis of data is by percentage cost and time overruns. Gay (1981) suggests that for descriptive studies like this one, 10% of the accessible population is enough.

The target population (sampling frame) consists of a total of 791 firms: 444 consultants and 347 contractors as broken down in sub-groups shown below.

The required sample size is 10% of the target population.

The general stratification criterion was 10% for contractors and 10% for combined consultants. Stratified simple random sampling was used for each group of the population to guarantee that the resulting sample is proportionate to the perceived participation in contract selection. Because Quantity Surveyors are mainly in charge of drawing up contracts, stratified random sampling was used making sure they are oversampled. The advantage of this method is that one is able to represent not only the overall population but also key subgroups of the population. This method will generally have more statistical precision than simple random sampling (Kombo and Tromp, 2006).

Table 3.2: Sample stratification

Category	Firm	Target population (sampling frame): No.	Total sample size: %	Stratified random samples: No.
1	Contractors category D and above	347	10%	35
	Architects	264	5%	14
	Quantity Surveyors	152	17%	26
4	Project Managers	28	15%	5
	Total	791	10%	80

Source: Constructed from MOPW & BORAQS data

Next, followed a selection of appropriate firms for each category, using random numbers. The target population frame was randomized using alphabetical order of the firms in each category.

The sampling interval was then found by dividing the target population by the sample size, and this gave the interval at which the firms to be studied are selected, as shown below.

Table 3.3: Sampling Interval

Firm	Target population: (No.)	Sample size: (No.)	Sampling interval: (No.)
Contractors	347	35	10
Architects	264	14	19
Quantity Surveyors	152	26	6
Project Managers	28	5	6

So wce: Constructed from MOPW & BORAQS data

p rotn the above, every 10th Contractor in the population frame was selected, while every 19th hitect, 6th Quantity Surveyor and 6th Project Manager respectively, was selected.

The * ected firms were asked to provide data on projects that met the stated criteria.

This research considered projects that were completed in the last 10 years (2000-2010) **regardless** of when they were started (i.e. no base year was chosen), because completion time is **considered** crucial in the study. It also considered projects that had contract sums in excess of Kshs. 10 million. This is because these are the projects that are likely to have formal **written** contracts. Use of Kshs. 10 million as the lower limit for contract sums also widens the **scope** of the projects considered.

The sample population selected was 80 professionals and construction firms randomly sampled. Although a total of 80 questionnaires were sent out, the research considered only **questionnaires** that were returned completed. Incomplete questionnaires were excluded. This **followed** data collection on type of project, cost and time overruns and the priorities that determine selection of contract type.

3.4 Identification of Variables and Questionnaire Design

Various variables were identified as follows:

The independent (predictor) variable as identified in literature review is the type of contract which is categorized into two, i.e.

(i) Traditional contracts and
(ii) Integrated contracts

The dependent variable is the project performance in terms of adherence to time and budget. Although performance encompasses many aspects as seen in the literature review, this research limits performance to time and budget in line with the research hypotheses. Adherence to time is measured in terms of deviation from the contract time while adherence to budget is measured in terms of deviation from the contract sum.

dependent variable (project'performance) is expected to vary as a function of the "^Pendent variable (type of contract).

H^&riables are measured using a rating scale of 1 to5. Rating scales consist of numbers and Ptions which are used to rank the subjective and intangible components in research. The numerical scale helps to minimize subjectivity. The numbers in the scale are ordered such that they indicate the presence or absence of the characteristic being measured (Mugenda and Mugenda, 1999).

3 5 Research Instruments

The most commonly used data collection instruments are: questionnaires, interview schedules, observational forms and standardized tests.

After considering the available data collection instruments, the information required from respondents, the time and funds available, the questionnaire was found to be the most appropriate data collection instrument. Each item in the questionnaire was developed to address a specific objective, research question or hypotheses of the study.
The structured (closed-ended) system of a questionnaire was used. It is appropriate as it allows data to be collected quickly, cheaply and to be easily analyzed. It is also easier to administer and is economical in terms of time and money. A copy of the questionnaire is shown in appendix 1. The questionnaire was administered to all the firms selected where they were requested to fill in the required information for the purposes of the study. The questionnaires were to the selected firms in the construction industry comprising Architects, Quantity Surveyors, Project Managers and Contractors.

3.6 Data Collection Technique/procedure

A structured survey was used to gather data and the format of questions follow a logical ^quence in gathering data. The structure ensures consistency of approach in the way questions are asked.

questionnaires were administered in March, 2011. Questionnaires were hand-delivered y the assistant to the sample population i.e. the firms selected. Telephone follow up was io avoid delay. A letter of transmittal accompanied every questionnaire detailing the Synopsis of the study (see appendix 1).

I ^Uestionnaire addressed the following main issues:

i. Frequency of utilization of each of the types of contracts (i.e. traditional and integrated).

jj. The number of building projects that were completed at higher cost than initially agreed and vise versa

iii. The number of building projects that were completed at a period greater than the original required and vise versa

iv. Other contract factors that affected project performance

Data obtained from executed building projects regarding the above issues formed the basis of the analysis.

3.7 Hypotheses testing

Hypotheses were tested statistically, and were aimed at establishing whether projects that used integrated contracts performed better than those that used traditional contracts.

In order to decide that a result has not occurred by chance alone and make a decision whether to accept or reject the null hypothesis, a significance level was established. In brief, the significance level permits a narrow margin of data variation which is deemed to be natural and as a result of pure chance or due to an unlucky sample, meaning that if another sample is taken, we might find nothing. One cut off is a 1-in-20 probability that any result that would occur, only 5% of the time probably is not due to chance (Paul and Jean, 2005). This survey used a significance level of 0.05 i.e. there is a 5% or less chance that a relationship between the identified variables is due to chance, then the relationship is real (reject the null hypothesis that the strength of the relationship is not different from zero). If we reject the null hypothesis, we look into the alternative (research) hypothesis as being more probable.

Since confidence levels are directly related to coefficient of significance, assuming a normal distribution for each of the variables under consideration in the sample, standard errors when computed, have a 95% confidence interval of plus or minus 1.96 times the standard error. (Walpole, Myers, Ye, (2002); (Fisher, 1925).

The assumption for the above is that the population is normally distributed. In testing the hypotheses, the test is aimed at testing if there is a significant difference among the means of the identified variables.

3,8 Data Analysis

Quantitative data was collected, summarized and analyzed using both descriptive and inferential statistical methods. The mean time and cost overruns and their respective standard deviations were calculated to show whether there is any relationship between the types of contract chosen and building construction project cost and time performance.

This study collected data on the cost performance (in terms of percentage cost overrun) and time performance (in terms of percentage time overruns). A percentage is defined as the proportion of a sample and ranges from 0% to 100%

The percentage time and cost overrun are calculated as follows;

$$\text{Percentage time overrun} = \frac{\text{Actual project time-Original contract period}}{\text{Original contract period}} \times 100$$

$$\text{Percentage cost overrun} = \frac{\text{Final project cost - Original contract sum}}{\text{Original contract sum}} \times 100$$

3-9 Hypotheses formulation

In chapter 1, hypotheses were stated as follows:

Use of integrated contracts improves building project time and cost performance.

Use of integrated contracts does not improve building project time and cost Performance.

The type of contract chosen does not predict project performance.

Hypotheses were tested statistically for projects that used traditional and integrated contracts by working out frequency of cases cited as having contributed to time and cost overruns.

Time performance

The null hypothesis (Ho) states that use of integrated contracts improves building project time performance and this can be represented by the following symbols:-

$$Ho: u\ 1_1 < u\ 2t$$

Where

U_u=Mean percentage time overrun for projects that used traditional contracts, and

U_{2t} =Mean percentage time overrun for projects that used integrated contracts

The research hypothesis (Hi) states that use of integrated contracts does not improve building project time performance and this can be represented by the following symbols:-

$$H1: u\ it > U2t$$

Cost performance

The null hypothesis (Ho) states that use of integrated contracts improves building project cost performance and this can be represented by the following symbols:-

$$Ho: u\ i_c < U2c$$

Where

ic-Mean percentage cost overrun for projects that used traditional contracts, and

^2c -Mean percentage cost overrun for projects that used integrated contracts

A re**search** hypothesis (Hi) states that use of integrated contracts does not improve building

t cost Performance and this can be represented by the following symbols:-

$$Hi: u\ i_c > u2c$$

If the null hypothesis is rejected, the research (alternative) hypothesis is supported.

Since the whole population of projects is not being tested, the procedures of statistical inference are required to determine whether the sample results obtained fall within a range that can occur by chance i.e. if they fall within the region of rejection of a sampling distribution when a certain level of significance has been set.

Using inferential statistics, we can use a small sample of the population and then estimate **characteristics** of the larger population from which the sample has been drawn. In the testing of **the** null hypothesis, the study used the difference-between-means test. This determines **whether** a statistically significant difference exists between the means.
A **left** tailed test was used to test the null hypothesis that proposes lower cost and time overruns for projects using integrated contracts, using the test statistic. The test statistic is a value that is computed from the sample data that is used in making the decision about the rejection or otherwise of the null hypothesis.

According to Student's /-distribution, Walpole & Myers & Ye (2002) and Fisher (1925), the /-distribution forms the basis for significance tests. It is designed to address the differences in observed scores in a set of samples by testing the null hypothesis. If we find the mean of a set of observations that we can reasonably expect to have a normal distribution, we can use the /-distribution to examine whether the confidence limit intervals on that mean include some theoretically predicted value - such as the value predicted on a null hypothesis. It is this result that is used in the Student's /-tests: since the difference between the means of samples from two normal distributions is itself distributed normally, the /-distribution can be used to examine whether that difference can reasonably be supposed to be zero. The /-distribution can also be used to construct a prediction interval for an unobserved sample from a normal distribution with unknown mean and variance.

A 11
-lest can be conducted to assess the statistical significance of the difference between the ^P1e means. According to Walpole & Myers & Ye (2002) and Fisher (1925), the tlleses can be tested using the following two-sample z-test formula.

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - d_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

For normal populations $n_1 + n_2 > 40$

Where:

n_1 = sample 1 size

n_2 = sample 2 size

$\bar{X}$ = sample mean

σ = population standard deviation

s_1 = sample 1 standard deviation

s_2 = sample 2 standard deviation

t = test statistic

d_0 = hypothesized population mean difference.

The means and standard deviations for time and cost overruns for the two types of contracts are then calculated. The test statistic is then obtained for both cost overruns and time overruns. The obtained test statistic is compared with the appropriate values in the sampling distribution. We do this by setting the level of significance and calculating the degrees of freedom. The level of significance is set at 0.05 (or 5%) while the combined degrees of freedom (df) for both samples is 80 (Student's /-distribution table (Walpole, Myers, Ye, 2002); (Fisher, 1925)).

According to student's /-distribution table Walpole & Myers & Ye (2002) and Fisher (1925), 'FPWMIX 11), the t for the samples in table 3.3 is 1.664. The obtained test statistic / is then " P^ed with the sampling distribution t at 0.05 level of significance with a left tailed test.

To determine whether the second research hypothesis is true, the respondents were asked to indicate their perception of the client priorities on the five point client priority checklist identified by Bennet and Grice (1995). These priorities are evaluated to check which type of contract gets the highest performance score, and therefore determine whether the type of contract used for the project in question was the most suitable or another type of contract should have been used.

3.10 Summary

This chapter outlines the research design and the methodology adopted for the research. The research design adopted is a survey design. Survey research seeks to obtain information that describes phenomena by asking people about their perceptions, attitudes, behaviors or values. Data is collected on what is actually happening in the field of interest by asking people who have had experience in it to reconstruct their experiences (Mugenda and Mugenda, 1999). The methodology includes identifying sample population, sample size, questionnaire design and identification of variables.

The next chapter considers analysis of the data received from the field.

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

4,1.1 Field Response

This chapter discusses the findings of the study based on the data collected from the field. 80 questionnaires were sent out representing 10% of the sample population and the response rate was as shown in table 4.1

Table 4.1 Response rate

Firm	Sample size (No)	Response rate (No)	Response Rate (%)
Contractors	35	18	51
Architects	14	10	71
Quantity surveyors	26	26	100
Project managers	5	4	80
TOTAL	80	58	72.5

Source: Field Survey (2011)

The challenges encountered in trying to increase the response rate included some firms especially contractors advising that they will not be able to respond, and some failing to give definite time frame in which they will be able to respond. But what is important is to ensure that the analysis sample is representative of the population in which the researcher is interested in.

Hie impact of non-response depends on the extent to which those not responding are somatically different from the whole population (Floyd et al, 1993). Nevertheless after Bering the geographical area and the projects targeted the researcher considered there Was no reason to conclude that the non-respondents were systematically different from the Elation.

According to Mugenda and Mugenda (1999), a response rate of 50% is adequate for analysis and reporting, while a response rate of 70% is considered to be very good. Based on this, the overall response rate of 72.5% obtained was therefore considered good for analysis and reporting as detailed below. In addition, each sample category attained the 50% response criterion as shown in table 4.1 and therefore the data is good for analysis.

4.1.3 Type of Developer and Contract used

Majority of the respondents (64%) indicated that the type of project they had handled was private while 36% revealed that the project that they had handled was public. Table 4.2 shows that the use of integrated contracts is still low both in public and private projects.

Table 4.2 Type of developer / project and type of contract used

	Traditional Contracts		Integrated Contracts		Total	No response
	No.	%	No	%	No	No
Public Project	15	79	4	21	19	2
Private Project	30	88	4	12	34	3

Source: Field Survey (2011)

4.2 Type of contract used and time and cost performance

^•2.1 Time Performance

Table 4.3 Completion time assessment

	Traditional contracts	Integrated contracts
s completed on Time	56%	44%
s that suffered Time Overrun	87.5%	12.5%

Source: Field Survey (2011)

prom the above analysis, it can be shown that integrated contracts gave better time performance in that majority of the projects (87.5%) that suffered time overruns used traditional contracts, while only 12.5% of projects that used integrated contracts suffered time overruns.

4 2.2 Cost Performance

Table 4.4 Completion cost assessment

	Traditional contracts	Integrated contracts
rp^jects completed on Budget	79%	21%
-pSjStethat suffered Cost Overrun	89%	11%

Source: Field Survey (2011)

From the above analysis, it can be shown that integrated contracts gave better cost performance in that majority of projects (89%) that suffered cost overruns used traditional contracts, while only 11% of projects that used integrated contracts suffered cost overruns.

The above findings identify integrated contracts as having had a greater positive impact on project time and cost performance, than traditional contracts. It can therefore be suggested that integrated contracts perform better in regard to control of cost and time overruns than traditional contracts. The findings also seem to be supported by the literature review that suggested integrated contracts can perform better than traditional contracts in regard to C01tro l of cost and time overruns, by accurately defining the scope of works, establishing the * duties, obligations and responsibilities of parties, and allocating risks between parties (Franagan & Norman, 1993).

4.2.3 Factors affecting Project Performance

Tables 4.5 and 4.6 show the reasons advanced for time and cost overruns and the magnitude jn which they affected project time and cost.

4.2.3.1 JBC Contract 1999 Edition -Traditional Contract

Table 4.5 Effects of the various factors on project performance (Traditional Contracts).

Key: F refers to frequency that a factor affected project performance.

	Minimum		Above Minimum		Neutral		Below Maximum		Maximum		Total
	F	%	F	%	F	%	F	%	F	%	%
Force majeure											
Project Cost	38	65.5	2	3.4	5	8.6	-	-	3	5.2	82.7
Project Time	37	63.8	3	5.2	3	5.2	-	-	2	3.4	77.6
Exceptionally adverse weather conditions											
Project cost	39	67.2	5	8.6	4	6.9	4	6.9	2	3.4	93.2
Project time	40	69.0	7	12.1	-	-	2	3.4	4	6.9	91.4
Loss or damage **occasioned** for which **insurance** is required to **be effected**											
Project cost	43	74.1	3	5.2	-	-	2	3.4	-	-	82.7
[Project time	45	77.6	2	3.4	-	-	2	3.4	1	1.7	86.1
Commotion ,strike or **'ockout** affecting any **1 of the traders** employed **upon the** works or any **ihe trades** engaged m **the** preparation , **manufacture** or transportation of any of the **goods** or materials [^Hiredjorthe works											
<5iiectcost_	42	72.4	1	1.7	3	5.2	1	1.7	2	3.4	84.4
	31	53.4	7	12.1	4	6.9	3	5.2	5	8.6	86.2

	Minimum		Above Minimum		Neutral		Below Maximum		Maximum		Total
	F	%	F	%	F	%	F	%	F	%	%
Architects instructions issued under clauses 22.0(architects),28.1 (su spension) and 30.0(variations) of the conditions											
"project cost	14	24.1	7	12.1	8	13.8	10	17.2	17	29.3	96.5
Project time	20	34.5	10	17.2	6	10.3	4	6.9	16	27.6	96.5
Contractor not having received in due time necessary instructions, drawings ,details or levels from architect for which he applied in accordance with the contract											
Project cost	24	41.4	14	24.1	7	12.1	5	8.6	5	8.6	94.8
Project time	19	32.8	15	25.9	8	13.8	3	5.2	8	13.8	91.5
Delay on the part of artists, tradesmen or other engaged by the employer in executing work not forming part or the contract											
Project Cost	26	44.8	12	20.7	7	12.1	3	5.2	2	3.4	86.2
Project Time	24	41.1	9	15.5	9	15.5	5	8.6	4	6.9	88.0
Statutory or other services providers or similar bodies engaged directly by the 35£!oyer_ _											
^ecUost^	38	65.5	6	10.3	5	8.6	4	6.9	2	3.4	94.9
^jecrtime	29	50.0	11	19.0	5	8.6	6	10.3	3	5.2	93.2

	Minimum		Above Minimum		Neutral		Below Maximum		Maximum		Total
	F	%	F	%	F	%	F	%	F	%	%
Opening up for inspection of work covered up or of the testing of any work, materials or goods											
project cost	39	67.2	4	6.9	3	5.2	1	1.7	-	-	81.1
"project time	34	58.6	6	10.3	2	3.4	2	3.4	3	5.2	81.1
Contractors inability for reasons beyond his control and which he could reasonably have foreseen at the date of the contract, to obtain delivery upon the works of such goods or materials as are essential to the proper carrying out of the works											
Project cost	28	48.3	11	19.0	6	10.3	2	3.4	5	8.6	89.7
Project time	24	41.4	14	24.1	7	12.1	4	6.9	3	5.2	89.7
Carrying out works having been suspended by the contractor as a result of employers default											
Project cost	35	60.3	6	10.3	6	10.3	3	5.2	2	3.4	89.7
Project time	34	58.6	9	15.5	3	5.2	2	3.4	4	6.9	89.7

	Minimum		Above Minimum		Neutral		Below Maximum		Maximum		Total
	F	%	F	%	F	%	F	%	F	%	%
Delay in appointing a replacement architect, quantity surveyor or engineers											
"project cost	44	75.9	-	-	3	5.2	-	-	-	-	81.1
project time	40	69.0	4	6.9	1	1.7	2	3.4	-	-	81.1
Delay caused by the late supply of goods or materials or in executing work for which the employer or his agents are contractually obliged to supply or to execute as the case may be											
Project cost	32	55.2	9	15.5	5	8.6	4	6.9	3	5.2	91.4
Project time	25	43.1	13	22.4	8	13.8	2	3.4	5	8.6	86.3
Delay caused by nominated subcontractors or nominated suppliers which delay the Contractor has taken reasonable measures to avoid or reduce the effects of											
Project cost	32	55.2	13	22.4	3	5.2	4	6.9	1	1.7	91.4
jS^ecUime	25	43.1	8	13.8	10	17.2	5	8.6	5	8.6	91.4
Contractor inability, reasons beyond his control ,to secure such ! skl'led labor and other *°*men essential to Jgjrcarrying out			..								
^J^ucost^	30	51.7	9	15.5	7	12.1	2	3.4	2	3.4	86.3
	33	56.9	3	5.2	6	10.3	5	8.6	3	5.2	86.3

	Minimum		Above Minimum	Neutral	Below Maximum	Maximum	Total
		%	%	%	%	%	
Momination or renomination of a sub contractor or supplier							
Project cost	37	63.8	8.6	6.9	1.7		
Project time	34	58.6	10.3	8.6	3.4	1.7	
Delay in receiving possession of or access **to the** site							
Project cost	38	65.5	6.9	6.9		1.7	
Project time	28	48.3	6.9	6.9		3.4	

Source: Field Survey (2011)

4.2.3.2 FIDIC Contract and the PPOAK Contract for Procurement of Works or Plant for Design and Build (Integrated Contracts).

Table 4.6: Effects of various factors on project performance (Integrated Contracts)

Key: F refers to frequency that a factor affected project performance.

	Minimum		Above Minimum		Neutral		Below Maximum		Maximum		Total
	F	%	F	%	F	%	F	%	F	%	%
A Variation											
project cost	10	17.2	10	17.2	4	6.9	3	5.2	7	12.1	58.6
_^[oject time	10	17.2	8	13.8	4	6.9	4	6.9	5	8.6	53.5
lAjorcejnajeure event											
J^ojecUos^	23	39.7	4	6.9	3	5.2	-	-	1	1.7	53.5
ioiecuime_	20	34.5	3	5.2	1	1.7	2	3.4	4	6.9	51.8
A ^use of delay ^ rise to an Yemeni to -§&Hionoftime		..									
^Ject cost	17	29.3	6	10.3	3	5.2	3	5.2	4	6.9	56.9
	11	19.0	5	8.6	9	15.5	2	3.4	5	8.6	55.2 «

	Minimum		Above Minimum		Neutral		Below Maximum		Maximum		Total
	F	%	F	%	F	%	F	%	F	%	%
physical conditions or circumstances on the **site,** which are exceptionally adverse and were not (by the **base** date) foreseeable **by** an experienced contractor											
Project cost	17	29.3	4	6.9	3	5.2	3	5.2	4	6.9	53.5
^**Project time**	13	22.4	4	6.9	5	8.6	2	3.4	5	8.6	50.0
Any delay, impediment by the employer											
Project cost	19	32.8	3	5.2	5	8.6	2	3.4	1	1.7	51.8
Project time	14	24.1	3	5.2	7	12.1	1	1.7	3	5.2	48.3
Delays caused by authorities not(by the base date) foreseeable by an experienced contractor											
Project cost	15	25.9	4	6.9	2	3.4	4	6.9	2	3.4	46.6
Project time	17	29.3	2	3.4	3	5.2	4	6.9	2	3.4	48.3
Suspension by employer due to any of the Employer's risks i.e. not for a cause attributable to the contractor and not necessitated by contractors risks i.e. ^!Eihostilities etc											
inject cost	23	39.7	3	5.2	1	1.7	1	1.7	1	1.7	50
J-[ojecuime__	21	36.2	3	5.2	2	3.4	1	1.7	1	1.7	48.3

S°urce: Field Survey (2011)

ne ^dy established that for the projects that were carried out using integrated contracts, the

Dero

^^wntage of cases where risk factors were indicated as having contributed to cost overruns

which range between 81.1% - 96.6%. Similarly for the projects that were carried out using **integrated** contracts, the percentage of cases where risk factors were indicated as having **contributed** to time overruns were lower (ranging between 48.3% - 55.2%), than those **indicated** in traditional contracts, which range between 81.1%- 96.6%

It is also noted that in both types of contracts, most of the risk factors contributed to both projects cost and time mostly at a minimum rate and not at a maximum rate, showing that both contract's ways of managing risks only differ in magnitude . However in the same rating, integrated contracts were found to have been better in controlling cost and time **overruns,** as the percentage of cases where risk factors were indicated as having contributed to time overruns were lower than in traditional contracts. The magnitude in which risk factors in traditional contracts affected project time and cost overruns are higher than that in integrated contracts. It can therefore be concluded that integrated contracts are more able to control the risks of time and cost overruns than traditional contracts. The interpretation of these results is that integrated contracts are better able to control cost and time overruns than traditional contracts and thus can improve on project performance. The impact of traditional and integrated contracts on projects time and cost performance (second objective) is therefore established. These responses also support the theory that integrated contracts improve time and cost performance.

While factors like delay caused by employer's employees, nomination and re-nomination of consultants and sub-contractors and suppliers, are expressly stated in traditional contracts as causes of cost and time overruns, and indicated by some respondents as having caused time and cost overruns, none of the respondents indicated these factors as having caused cost and time overruns in integrated contracts. This confirms that when certain risks are transferred from the developer to the contractor in integrated contracts, risks of non-performance are reauced.

nsidering that both types of contracts have factors causing time and cost overruns, the ^ s h o w that traditional contracts factors magnitudes ranged from 0-79% while integrated "tacts factors magnitudes ranged from 0-39%. This shows that integrated contracts 0r med better or had lesser risks than traditional contracts.

It is also interesting to note that the respondents indicated all factors listed as having caused **cost** and time overruns, though of different magnitudes. Of particular interest is that all the factors cited by Gichunge (2000), in the literature review, as causes of time and cost **overruns,** were indicated by the respondents among others, as having caused time and cost **overruns.** This tallied with the literature review. The interpretation behind this is that faced with the same conditions, integrated contracts are better suited to control risks of cost and time overruns than traditional contracts.

4.2.4 Choice of Contract Type

Questions in sections 4.2.4.2- 4.2.4.4 were asked to contractors only because in practice and in majority of cases, employers or the consultants on their behalf select the type of contract to be used.

4.2.4.1 Type of Contract used

The study established that traditional contracts are still the most widely used, with an overwhelming majority (77.6%) indicating that they had used traditional contracts (table 4.7). This is an indication of the conservative nature of the industry where the tested and tried contract forms continue to be used despite their shortcomings. It may also suggest lack of knowledge of new and more efficient types of contracts amongst the project teams.

Table 4.7 Type of Contract used

	Frequency	**Percent %**
Jiaditional Contract	45	77.6
Jwegrated contract	8	13.8
^response	5	8.6
	58	100.0

^oUrce: Field Survey (2011)

4.2.4.2 Choice of the Type of Contract used

The study shows that out of the eighteen contractors, 61.1% indicated that developer/consultants made the choice of the type of contract to be used while 5.6% indicated that the contractor made the choice of the type of contract to be used. This suggests that sensitizing the latter group on integrated contracts would have the greatest impact as they have the greatest say in the choice of contract. However 33.3% did not respond as shown in table 4.8 below. This is a significant percentage and suggests that either the non- respondents did not know or they were not sure and did not want to commit themselves.

Table 4.8 Party choosing the Type of Contract

	Frequency	**Percent %**
Developer/consultants	11	61.1
Contractor	1	5.6
No response	6	33.3
Total	**18**	**100.0**

Source: Field Survey (2011)

4.2.4.3 Whether the contractors would have preferred use of a different type of contract

Most of the contractors (38.9%) indicated that they would have preferred use of a different type of contract, as shown in table 4.9. This indicates that that there is need for parties to contract to consult on the appropriate type of contract to be used for a particular project. The high level of non- response could suggest that the non- respondents were not sure and therefore they did not want to commit themselves.

Table 4.9 Whether the contractors would have preferred use of a different type of contract.

	Frequency	**Percent**
Yes		38.9
No		27.8
ifeiesponse		33.3
Iptal	**18**	**100.0**

Source: Field Survey (2011)

It is noted that the no- response level in sections 4.2.4.2- 4.2.4.3 is quite significant. However the effects of non- response depends on the extent to which those not responding are **systematically** different from the whole population (Floyd et al, 1993). **In** these samples, after **considering** the study population, and the type of projects, the researcher had no reason to **believe** that the respondents were systematically different from the population. In addition **Mugenda** and Mugenda (2003) suggested that if the no response level is less than 50%, it is safe to assume that a sample is representative enough.

4.2.4.4 Contracts Preferred

The study found out that of the contractors (33.3%) revealed that they would have preferred use of integrated contracts while 5.6% indicated that they would have preferred traditional contracts. This indicates that majority of the contractors who responded to this question preferred integrated contracts to traditional contracts. This suggests that due consideration is not being given to the selection of appropriate contracts by the parties to contracts. However, 61.6% did not respond as shown in table 4.10. This would suggest lack of knowledge or information by the non-respondents, of the various types of contracts in use and therefore their decision to be non committal.

Table 4.10: Contracts Preferred

	Frequency	Percent
Traditional contracts	1	5.6
Integrated contracts	6	33.3
No response	11	61.6
Total	**18**	**100.0**

^rce: Field Survey (2011)

^ no- response level is 61.6% (table 4.8) and therefore quite significant. Although the non-respondents are not significantly different from those who responded, the researcher's ce on those who responded is acknowledged as a limitation in this section.

The results show that out of the total 50 sampled projects that used traditional contracts, the respondents of 30 of them indicated that they would have preferred use of integrated contracts while only 16 of them were indicated that the respondents would have preferred use of traditional contracts. Only two projects where respondents indicated that they would have preferred use of any of the two types of contracts. Incidentally out of the 8 projects that were **carried** out using integrated contracts, 7 of them indicated that given a choice, they would still have preferred use of integrated contracts. There was only 1 project where the respondent indicated that he would have preferred use of any of the two types of contracts.

This proves that integrated contracts are popular among contractors than traditional contracts, and lack of use of integrated contracts may therefore be attributed to lack of opportunity to use them.

4.2.4.5 Perceptions of the Client Priorities for the Project

Tables 4.11 Perception of the Client Priorities for the Project

Traditional contracts

	Crucial		Important		Not Important		No response	
	F	%	F	%	F	%	F	%
Time(was an early or fixed completion time of **essence** to the success of the project)	27	54	20	40	2	4	1	2
Quality level: (how was the need to change specifications/design during construction to improve on quality)	26	52	21	42	2	4	1	2
Price certainty: (how important was the need **for a fixed** price for the project and an **assurance** that the price is unlikely to change **significantly** during the currency of the £oject)_	29	58	16	32	4	8	1	2
Controllable Variations: (how was the need to **1 control** additional variations during	27	54	20	40	3	6	1	2
•sk avoidance/allocation: (how was the need ^££!i?5Ltotansfer risks of cost and time)	24	48	21	42	3	6	1	2

W Field Survey (2011)

Table 4.12 Perceptions of the Client Priorities for the Project

Integrated contracts

	Crucial		Important		Not Important		No response	
	F	%	F	%	F	%	F	%
Time(was an early or fixed completion time of essence to the success of the project)	5	62.5	2	25	1	12.5	-	-
Quality level: (how was the need to change specifications/design during construction to improve on quality)	4	50	1	12.5	3	37.5	-	-
"price certainty: (how important was the need for a fixed price for the project and an assurance that the price is unlikely to change significantly during the currency of the £oject)	4	50	4	50	-	-	-	-
Controllable Variations: (how was the need to control additional variations during construction)	3	37.5	4	50	-	-	-	-
Risk avoidance/allocation: (how was the need for client to transfer risks of cost and time)	4	50	4	50	1	12.5	-	-

Source: Field Survey (2011)

From tables 4.11 and 4.12, it is noted that there is a lot of similarity in the perception of respondents who used the different types of contracts. The result of this analysis shows that the respondents who used both types of contracts shared more or less the same view regarding the client priorities for the success of the projects. It can therefore be interpreted that the reason why integrated contracts performed better than traditional contracts could have been because they are better suited to control the risks of time and cost overruns, than traditional contracts.

4-2.4.6 Types of Contracts perceived to give Better Cost Performance

study found out that most of the respondents (54%) felt that integrated contracts could ^IVe tetter cost performance while 34% revealed that traditional contracts could give better Performance. Only 7% of the respondents felt that both integrated and traditional F^cts could give better cost performance. However 5% did not respond.

4.2.4.7 Types of Contracts perceived to give Better Time Performance

Majority of the respondents (57%) felt that integrated contracts could give better time performance while on the other hand 21% revealed that traditional contracts could give better time performance. Only 7% felt that traditional and integrated contracts could give better time performance. However 16% did not respond.

It was surprising to note that when the respondents were asked to give their perception of which type of contract (i.e. traditional and integrated) was more likely to give better cost and time performance, although majority had used traditional contracts, majority (53%) said that integrated contracts could give better cost performance, while 57% said integrated contracts could give better time performance. This shows that the acceptance of possibility of good performance in use of integrated contracts is wide even among the people who have been using traditional contracts. Lack of use of the integrated contracts can therefore be attributed to lack of opportunity to use them.

In confirming that integrated contracts would give better time and cost performance, all the respondents that had used integrated contracts stated that integrated contracts would give better cost and time performance.

4.3 Test of Hypotheses

According to Walpole & Myers and Ye (2002) & Fisher (1925), the hypotheses can be tested using the following formula, also discussed in chapter 3.

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - d_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

For normal populations $n_1, n_2 > 40$

Where:

ni = sample 1 size

ri2 = sample 2 size

X- sample mean

o = population standard deviation

51 = sample 1 standard deviation

52 = sample 2 standard deviation

t = test statistic

do = hypothesized population mean difference

n is sample size and it gives a representative sample. The impact of n in the hypotheses testing is that the larger the sample size, the better. However, as explained in data response section, the sample size was considered adequate for analysis.

The means and standard deviations for time and cost overruns for the two types of contracts have been calculated in the data entry sheets 1.5 shown in appendix 111 and the results are as shown in table 4.13 below.

Table 4.13: Mean and standard deviation Comparison (%)

Type of Contract		Time Overrun	Cost Overrun
Traditional Contract	Sample 1 size (nQ	50	50
	Mean (%)	70.25	11.60
	Std. Deviation (%)	128.83	**20.66**
Integrated Contract	Sample 2 size (n2)		
	Mean (%)	13.67	6.8
	Std. Deviation (%)	26.90	7.66

Source: Field Survey (2011)

4.3.1 Time Performance

Using the data presented above, the t for time performance is calculated as follows:-

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - d_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$\frac{(70.25 - 13.67) - 0}{\sqrt{\frac{V1ZU83^2}{50} + \frac{Z8.V0^2}{8}}}$$

$$t = \frac{56.58}{20.55}$$

$$t = 2.75$$

The *t* obtained is 2.75 and this is compared with the appropriate *t* value of 1.644 obtained in the sampling distribution of t at 0.05 level of significance and 80 degrees of freedom for a one tailed test (left tail) (See *t* table values) Statistical Hypothesis testing -appendix table 11) (Walpole & Myers & Ye, 2002) & (Fisher, 1925). A / higher than 1.664 is unlikely to occur if the null hypothesis is false. The / in this case is higher than 1.664 and outside the critical region thus we accept the null hypothesis and conclude that the difference between the two means is significant and cannot occur by chance, thus the null hypothesis (that integrated contracts improves time performance) is proved.

4.3.2 Cost Performance

Similarly, using the formulae and data presented above, *t* for cost performance is calculated ss follows:

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - d_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$\frac{(11.60-6.80)-0}{\sqrt{\frac{20.66^2}{50}+\frac{7.66^2}{8}}}$$

$t =$ 4^60

3.98

$t =$ 1.21

The t obtained is 1.21 which is again compared with the t of 1.644. This t of 1.21 is in the critical region but slightly lower than the t value of 1.664 obtained for the t at 0.05 level of significance at 80 degrees of freedom (appendix 11), thus necessitating need for further tests before a decision of rejection or confirmation of the null hypothesis is made.

4.3.3 Mean Comparison

The study sought to undertake mean comparison so as to determine which type of contract had high cost and time overrun. In the data entry sheets 1.5 shown in appendix 111, means and standard deviations for time and cost overruns for the two types of contracts were calculated and found to be as shown in table 4.9. This was used to test the following hypotheses:

Hypothesis one:

Ho:un<u$_{2t}$

Where

Uii=Mean percentage time overrun for projects that used traditional contracts, and

^2t=Mean percentage time overrun for projects that used integrated contracts

mean tests show that the projects that used integrated contracts had a lower mean time p ^ n of 13.67% compared to a higher mean time overrun of 70.25% for projects that used ^•onal contracts.

Hypothesis Two:

Ho: $u_{1c} < u_{2c}$

Where

U_{1c}=Mean percentage cost overrun for projects that used traditional contracts, and

U_{2c} =Mean percentage cost overrun for projects that used integrated contracts

The mean tests show that the projects that used integrated contracts had a lower mean cost overrun of 6.8% compared to a higher mean cost overrun of 11.8%, for projects that used traditional contracts.

From the above results, the two null hypotheses are proved that integrated contracts would lead to low time and cost overruns, hence better time and cost performance.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides the conclusions and the recommendations of the study. It also points out areas that deserve further investigation.

5.2 Conclusions

The study set out to accomplish the following objectives:

5.2.1 To examine the extent of the use of various types of construction contracts in the Kenyan building industry.

The results of the analysis revealed majority of projects (77.6%) were carried out using traditional contracts against 13.8% that used integrated contracts. Out of the total 19 public projects, 79% used traditional contracts while 21% used integrated contracts. Out of the 34 private projects, 88% used traditional contracts while 12% used integrated contracts. This concludes that the use of integrated contracts is still low both in public and private projects, compared with the use of traditional contracts.

5.2.2 To identify the impact of traditional and integrated contracts on project time and cost performance.

Tne null hypothesis states that integrated contracts improve projects time and cost Performance. Analysis of data shows that the projects that used integrated contracts had a lower mean time overrun of 13.67% compared to 70.25% for projects that used traditional contracts. Similarly, mean tests show that the projects that used integrated contracts had a 0vver mean cost overrun of 6.8% compared to a higher mean cost overrun of 11.8% for •r°jects that used traditional contracts. Although the test significance for cost performance ^'ed that the difference between the two types of contracts was not significant, all the H61* tests and indicators identified integrated contracts as having positive impact or f^nce on project time and cost performance. The survey reveals that traditional contracts 11^ higher time and cost overruns than integrated contracts.

The study established that for the projects that were carried out using integrated contracts, the percentage of cases where risk factors were indicated as having contributed to cost overruns were lower (ranging between 46.6% - 58.6%), than those indicated in traditional contracts, (which range between 81.1% - 96.6%). Similarly for the projects that were carried out using integrated contracts, the percentage of cases where risk factors were indicated as having contributed to time overruns were lower (ranging between 48.3% - 55.2%), than those indicated in traditional contracts, (which range between 81.1% - 96.6%).

It can therefore be concluded that traditional contracts perform poorly in regard to control of cost and time overruns than integrated contracts. It can also be concluded that integrated contracts perform better in regard to control of cost and time overruns than traditional contracts. Integrated contracts therefore have a greater impact of improving project time and cost performance than traditional contracts.

5.2.3 To investigate the extent to which integrated contracts can improve project time and cost performance.

Although the survey shows that majority (77.6%) of the respondents had used traditional contracts as opposed to 13.8% who had used integrated contracts, majority of the respondents (57%) were of the opinion that integrated contracts are likely to give better time performance against 21% who were of the view that of traditional contracts can give better time performance. Similarly, majority of the respondents (53%) felt that integrated contracts are likely to give better cost performance against 34% who were of the view that of traditional contracts can give better cost performance. The study further established that the acceptance of possibility of good performance in use of integrated contracts is wide even among the people who have been using traditional contracts and lack of use of the integrated contracts can mainly be attributed to lack of opportunity or knowledge to use them. It can therefore be deduced that use of integrated contracts can improve project time and cost Performance.

findings in 5.2.2 and 5.2.3 are supported by Franagan and Norman (1993) in the ture review, which provide that integrated contracts carry the least risk to the employer.

5.2.4 Perceptions of the Client Priorities for the Project.

It was also evident that all the respondents felt that time, quality level, price certainty, and risk allocation, was crucial priorities for any project success, since the respondents who used both types of contracts shared the same view regarding the client priorities for the success of the projects. It can therefore be concluded that the reason why integrated contracts performed better than traditional contracts could have been because they are better suited to control the risks of time and cost overruns, than traditional contracts.

5.3 Recommendations

The study recommends that the stakeholders in the construction industry should be encouraged to use appropriate contracts for construction projects, in an attempt to improve on projects time and cost performance. The decision on choice of contract should be based on appropriateness of contract for a particular project.

It is recommended that all stakeholders be sensitized about integrated contracts, through continuous education of their benefits to the overall project performance and that the choice of type of contract be more inclusive of all the parties.

5.4 Areas for further research

Research is necessary to determine why integrated contracts are not largely used yet the study shows that they can result in better time and cost performance for construction projects.

REFERENCES AND BIBLIOGRAPHY

Abdeilhamid, T.S. (2004). "*The self destruction and renewal of lean construction theory. A predication from Boyd's Theory*". Proceedings of the 19th Annual conference of the International Group for lean construction, Helsingor, Denmark.

Al-Momani Ayman, H. (2006). *Examining service quality within construction process,* technovation, vol.20, PP.643-651.

A1 reck, P.M. & Settle, R. B. (1995). *The survey research handbook,* 2nd edition. Richard, D. Irwin, Inc.

Aniekwu, A.N. & Okpala, D.C. (1998). *Causes of high cost of construction in Nigeria.* Journal of construction Engineering and Management vol.114No.2 June 1988 ASCE.USA.

Ball, M (1988). *Rebuilding construction: Economic change in British construction industry.* Routedge, London.

Barrei, D.S and Panlson, B.C. (1992). *Professional construction management.* 3rd edition McGraw-Hill International editions.

BORAQS (Board of Registration of Architects and Quantity Surveyors of Kenya) *Consultants register) (2011).*

Bennet **and** Grice (1995). *Procurement systems for /Building in Ed Brandon P.S. Quantity Purveying Techniques* -New directions Blackwell Science Limited. London.

Btyde, J. **and** Brown, D. (2004, September). *The influence of a project performance ^osurement system on the success of a contract for maintaining motorways and trunk roads.* **^oject Management** Journal.

u^a, E.S. (1977). *Modern production management.* Managing the operations function, 5th t<litl0n **Santa** Barbara; London, Wiley.

Burns, T. & Stalker, G.M. (1994). *The management of innovation, 3rd edition.* London Tavistock Publications.

Chitkara, K.K. (1998). *Construction Project Management.* New Delhi Mc Grawhill.

Clough, R.H & Sears, G.A. (1994). *Construction contracting*, Wiley, New York.

Collins, A. and Baccarini, D. (2004). *Project Success: A survey Journal construction* ***research*** vol. 5N0.2 2004. Singapore: World scientific publishing company.

De Meyer, N. (1992). *An empirical investigation for manufacturing strategies in European industry.* In (Voss, C. Manufacturing Strategy. Process and Content. Chapman and Hall).

Federation International des Ingenieurs - Conseils (FIDIC, 2006, 1999 and 1992), known in English as the International Federation of Consulting Engineers: *Conditions of contracts.*

Fellows, R., et al, (2002). *Construction Management in Practice.* London: Blackwell Science.

Fellows, R., Langford, D. Newcombe, R., & Urray, S. (1983): *Construction management in practice.* Longman Scientific & Technical.

Fisher; R.A (1925) "*Application of "students" distribution".* Merton 5: 90-100 http://digitallibrary.delaide.edu.au/coll/special/fisher/43 .

Fryer, B. (1990). *The Practice of Construction Management.* Victoria: Blackwell.

Franagan, R. & Norman, G. (1993). *Risk management and construction.* Blackwell Scientific **Publications.**

I ^n, D.M. (1996). *Construction as a manufacturing process. Similarities and differences t^een industrialized housing and car production in Japan.* Construction management and Comics, Vol.14.

Gichunge, H. (2000). *Risk Management in Building Industry in Kenya: An Analysis of Time and Cost Risks.* PhD Thesis. University of Nairobi.

Government of Kenya public procurement oversight authority (PPOAK, 2006, 2000). *Conditions of contracts.*

Grunberg, S., (1997). *Construction Economics: An introduction.* London: Macmillan Press Ltd.

Hellard, B. R. (1993), *Total quality in construction projects'.* Achieving productivity with customer satisfaction.

Hendrickson, C. (2000). *Project Management for construction, Second edition.* Available online - *http://www.ce.cmu.edu/pmbook/*

Howell, G.A. & Koskela (2000). *Reforming project management. The role of lean construction.*

Hovet, D., (1994). *Allowing the Design/Build Project Delivery Method in Procurement of Public Construction Contracts Online.* Available online www.cacadepolicy.org/bgc/build.htm (05/20/2005).

Hudson Walpole, R; Myers Ye, K. *Probability and statistics for Engineers and Scientists* Pearson's Education (2002), 7th edition, pg.237.

Ishirata, J.G. (1991). Cambridge, M.A: Production Press.

-'ames, F. (1998). *Building Procurement Systems:* A clients guide 3rd Edition.

Building Council, Kenya (1999). *Agreement and conditions of contract for building »orks.*

'nt Building Council, Kenya (1977, revised 1986). *Agreement and conditions of contract building works.*

Chartfield, C and Johnson, T. (2007): *A short course in project management.* Available online http://office.microsoft.com/en-us/projectIHA 102354821033.

Joy, P. (1991). *Handbook of Construction Management.* New Delhi: Macmillan.

Katani, E. (2001). *Study of the influence of Procurement System on Building Cost and Time Performance.* 4th year project. University of Nairobi.

Koskela, L. (2000). *Prevalent theory of construction is a hindrance of innovation.* Proceedings of 8th annual conference of international groups of lean construction, British UK.

Kothari, C.R. (2002). *Research methodology: Methods and Techniques.* New Delhi: Wishwa Prakashan.

Ling et al,; Ling, F.; Lows, S.;Wang, S.; Lim, H. (2007). *Key management practices affecting Singaporem firms' project performance in China.* International journal of project management. -

Mastermann, J. (1996). *An introduction to Building Procurement Systems.* London: E&FN Spoil.

Mbatha, M. (1993). Management of *Building Projects: - An analysis of Building Project management features and institutionalization of project management in Kenya*. Publisher: DVP Verlag, Wuppertal, Germany.

Mbatha, M. (1986). *Building contract performances. Case study of Government projects in Kenya. M.A. Thesis.* University of Nairobi.

Mbaya, J.S. (2004). *New construction procurement methods in Kenya.* Seminar paper (August 19th 2004 pp. 1-12).

Derrnott, P et al, (2005). *Construction Procurement Systems: What Way for the Third °rld?* Time research institute, Salford University, UK (online).

Mead, L. (1946). *law relating to Building and Engineering contracts* 7th edition.

Michael, G.M.N., (1991). *Evaluation of the Organization in Design and Production in the Construction Industry.* 4th year Project, University of Nairobi. Nairobi.
Ministry of Works, Kenya (1970). *Contract Agreement, for Building Works.*

Ministry of Works, Kenya (2010). *Contractors register.*

Morton, R. & Jaggar, D. (1995). *Design and Economics of Building.* E & Fn, and imprint of chapman's Hall, London, UK.

Mugenda, O.M. and Mugenda, A.G., (1999). *Research methods. Quantitative and Qualitative Techniques.* Acts Press.

Navon, R. (2005). *Antomated project performance control of construction projects.* Automation in construction, Vol.14 PP. 467-476.

Neale, R. (1995). *Managing informational construction projects.* Geneva International labor office.

Nisbett, J. (2004). *Construction Procurement: A momentous change. The Building Economist*; Journal of Australian Institute of Quantity Surveyors (September 2004).

Norton, B. (1995). *Value management in construction. A practical guide.* Macmillan building and surveying series.

Okuwoga, A. (1998). *Cost time and performance of public sector housing projects in Nigeria,* Habitual international, Vol.22 \, No.4, PP.389-395.

^Mvusonge, S.I.J. (2000). *Tendering and Estimating and Contractual Arrangement in Elding projects.* Principals and practice intercontinental Education Books and Publishers, ^ i Nigeria.

Peck, B. (2005). *Construction Management: Choosing the Best Project Delivery Method.* (Available online): http://ins/.opera.com/scripts/cms/xcms.asp (05/20/2005).

Peters, T. (1990). *Time obsessed competition management review.*

Pheng, L. and Chuan, Q. (2006). *Environmental factors and work performance of project managers in the construction industry.* International journal of project management, vol. 24, PP.24-37.

Portar, M.E. (1980). *Competitive strategy; techniques for analyzing industries and competitors.* New York. Free press.

Ramus, J. (1996). *Contract Practice for Quantity Surveyors.*

Ramus, J. W. (1981): *Contract practice for quantity surveyors.*

Republic of Kenya (2006). *Economic survey,* Central Bureau of Statistics, Ministry of Planning and National Development. Nairobi: Government Printer, Kenya.

Republic of Kenya (2006). *Public Procurement oversight authority contract document* Government Printer, Kenya.

Republic of Kenya (2006). *Statistical Abstract,* Central Bureau of Statistics, Ministry of Planning and National Development. Nairobi: Government Printer, Kenya.

L

Pubiic Procurement Directorate, Ministry of Finance and Planning (2000). *Standard Tender Document for Procurement of Works (Building And Civil Engineering Works).*

Bf2* G. (1994). *Total Construction Project Management. New York*: New York: Mc Graw Hill.

Ro r^er> F. and George, N. (1993). *Risk management and* com/nvcf/ort-Blackwell Scientific Plications.

Rwelamila, P.D. (1996). (Casle/Iqsk/Isk East Africa, Regional seminar paper- Mayfair Hotel in Nairobi 23rd - 26th July 1996 pg 71-77).

Salmond, J.W. and William, J. (1945). *Principals of the laws of contracts.* The carswell company Ltd London.

Santos, A. (1999). *Application of flow principles in production management of construction* sites. Phd Thesis -University of Scarford.

Seely, I. H. (1997). *Quantity surveying practice.* London.

Sidwall, A. (1984). *Time Performance of Construction Projects.* Adelaide: South Australian Institute of Technology.

Skinur, W. (1969). *Manufacturing - missing link in corporate strategy.* Havard Business Review.

Talukhaba, A. (1988). *Time and Cost Performance of Construction Projects.* M.A Thesis. University of Nairobi.

Talukhaba, A. (1999). *An investigation into factors causing project delays in Kenya. Case study of high-rise buildings.* Unpublished PhD Thesis, University of Nairobi.

The Aqua Group (1990) 2nd Edition: *Tenders and contracts for Building.*

Titmus, P. (1990). *Design and Build in practice.* Rush and Tomkins Ltd.

Thomas S. (2002). *A dynamic e-Reporting system for Contractor's performance appraisal,* advances in Engineering Software, Vol.33, PP.339-349.

Turner, A. (1997). *Building Procurement.* 2nd Edition, London: Macmillan Press Ltd.

Turner, W. (In Fenn, P. and Gameson, R. (eds)), (1992). *Construction Management integration: An analysis of the degree of integration between construction professional and Project performance.*

Vak

°wenko, G. (2004). *Mega Project Procurement: Breaking from Tradition.* (Online).
, iQSQ^%cj>ov/Durds/04iul/08.htm (05/20/2005).

APPENDIX 1- QUESTIONNAIRES

- **Cover letter**

GEORGE MIGWI MAINA

P.O. Box 13793-00800 Nairobi, Kenya,

Tel: 4447455; Fax: 4447198; Cel: 0722524255;

Email: info@master-cost.co.ke

Dear Sir/Madam,

RE: <u>MASTERS DEGREE RESEARCH PROJECT TITLED"THE IMPACT OF THE TYPE OF CONSTRUCTION CONTRACT ON PROJECT PERFORMANCE IN KENYA"</u>

I am conducting this study as a Postgraduate student working towards fulfilling the requirements for a Master of Arts degree in Construction Management of the Department of Real Estate and Construction Management, University of Nairobi.

The purpose of the study is to help better understand and evaluate the impact of the type of construction contract on project performance.

Your firm has been selected out of many involved in the construction industry to provide the information needed for the study. Your wide experience is a representation of the majority of actors participating in the industry in Kenya.

I kindly write to request you to provide the information required by completing the accompanying questionnaire.

The information will be used for research purposes only and your identity will remain confidential.

A copy of a research letter from the Chairman of the Department of Real Estate and Construction Management, University of Nairobi is attached.

Thank you in advance for your assistance and support.

Yours faithfully,

<u>GEORGE M. MAINA</u>

Research permit

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telegrams: "SCIENCETECH", Nairobi
Telephone: 254-020-24 I 349. 22 13 102
254-020-310S71.2213123.
Fax: 2S4-020-22132 IS. 318245,318249
When replying please quote

P.O.Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.jo.ke

Our Ref: NCST/RRI/12/1/ES-011/09/4

Date: 10th March 2011

George Migwi Maina
University of Nairobi
P. O. Box 30197
NAIROBI

RE; RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "The impact of the type of construction contract on project performance in Kenya" 1 am pleased to inform you that you have been authorized to undertake research in Nairobi Province for a period ending *31st June 2011.*

You are advised to report to the Permanent Secretary, Ministry of Lands, the Permanent Secretary, Ministry of Housing and the Permanent Secretary, Ministry of Roads before embarking on the research project.

On completion of the research, you are expected to submit one hard copies and one soft copy of the research report/thesis to our office.

P. N. NYAKUNDI
FOR: SECRETARY/CEO

Copy to:
The Permanent Secretary
Ministry of Lands
Ardhi House, Ngong Road
NAIROBI

Questionnaires

Questionnaire No. . . . . .Date

•QUESTIONNAIRE TO

ARCHITECTS,
QUANTITY SURVEYORS,
PROJECT MANAGERS

* Please tick whichever is applicable

Please choose 2 (two) projects that your firm handled as a Consultant, that were completed in the last 10 yrs, whose contract sum exceeded Kshs.10 million, and respond to the following section.

PROJECT 1

1. Type of project.

a) Public

b) Private

2. Period of construction. .to

3. Project location_

4. Time performance

i) Original completion period

ii) Final completion period

5. Cost Performance

i) Original construction cost

'•) Final construction cost

6. On a rating scale of 1-5, where 1 is minimum and 5 is maximum; please tick as appropriate the magnitude by which the following factors affected project performance

Reasons according to JBC Contract 1999 edition (a traditional type of contract).

*orce majeure.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

b) Exceptionally ac verse weather conditions

Factors	1	2	3	4	5
Project cost					
Project time					

c) Loss or damage occasioned for which insurance is required to be effected

Factors	1	2	3	4	5
Project cost					
Project time					

d) Commotion, strike or lockout affecting any of the trades employed upon the Works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materia s required for the Works.

Factors	1	2	3	4	5
Project cost					
Project time					

e) Architect's instructions issued under clauses 22.0 (architects instructions), 28. (suspension) anc 30.0 (variations) of the conditions.

Factors	1	2	3	4	5
Project cost					
Project time					

f) Contractor not having received in due time necessary instructions, drawings, details or evels from the Architect for which he applied in accordance with the contract.

Factors	1	2	3	4	5
Project cost					
Project time					

g) Delay on the part of artists, tradesmen or other engaged by the Employer in executing work not forming part o the contract.

Factors	1	2	3	4	5
Project cost					
Project time					

h) Statutory or other services providers or similar bodies engaged directly by the Employer.

Factors	1	2	3	4	5
Project cost					
Project time					

0 Opening up for inspection of work covered up or of the testing of any of the work,

Factors	1	2	3	4	5
Project cost					
Project time					

j) Contractor's inability for reasons beyond his control and ^ ^ ^ ^ reasonably have foreseen at the date of the contract, t uul^jn delivery _ n Works of such goods or materials as are essential to the PF>^ carryjng Q J f ^ Works.

Factors	1	2	3	4	5
Project cost					
Project time					

k) Carrying out the Works having been suspended by the Coi^actor as a result of employers default.

Factors	1	2	3	4	5
Project cost					
Project time					

l) Delay in appointing a replacement tArchitect, Quantity Surveyor^ Engjneers

Factors	1	2	3	4	5
Project cost					
Project time					

m) Delay caused by the late supply of goods or materials or work for which the Employer or his agents are contractually obliged to suPP%r tQ execute as the

Factors	1	2	3	4	5
Project cost					
Project time					

n) Delay caused by nominated subcontractors or **nominated suPPlj**ers which ^ | ^ Contractor has taken all reasonable measures to avoid or reduce\effects of C ^

Factors	1	2	3	4	5
Project cost					
Project time					

o) Contractor's inability, for reasons ~~beyond his con~~trol, to s^cure^ skj||ed jabor and other workmen essentia or an to the ~~prop~~er carrying out of the Works.

Factors	1	2	3	4	5
Project cost					
Project time					

P) Nomination or renomination of a sub-contractor or supplier-

Factors	1	2	3	4	5
Project cost					
Project time					

q) or access to the site.

Factors	1	2	3	4	5
Project cost					
Project time					

r) Other: Please specify

Factors	1	2	3	4	5
Project cost					
Project time					

i. Reasons according to FIDIC contract condition and the public procurement oversight authority (PPOA) of Kenya Conditions of contract for Procurement of Works or Plant (design build/Turnkey Projects) 2000 edition (integrated types of contracts)

a) A Variation.

Factors	1	2	3	4	5
Project cost					
Project time					

b) A force majeure event.

Factors	1	2	3	4	5
Project cost					
Project time					

c) ement to extension of time.

Factors	1	2	3	4	5
Project cost					
Project time					

d) Physical conditions or circumstances on the Site, which are exceptionally adverse and

Factors	1	2	3	4	5
Project cost					
Project time					

e) Any delay, impediment or prevention by the Employer.

Factors	1	2	3	4	5
Project cost					
Project time					

0 Delays Caused by Authorities not (by the Base Date) foreseeable by an experienced contractor.

Factors	1	2	3	4	5
Project cost					
_Project time					

g) Suspension by employer due to any of the Employer's risks listed below) i.e. not for a cause attributable to the Contractor and not necessitated by Contractor's risks (contractors risks are all risks other than the Employer's risks listed below) i.e.
"(-War, hostilities, invasion, act of foreign enemies,
Rebellion, revolution, insurrection, or military or usurped power, or civil war,
Ionizing radiations, or contamination by radio-activity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component of such assembly,
Pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds,
Riot, commotion or disorder, unless solely restricted to employees of the Contractor or of his Sub-contractors and arising from the conduct of the Works,
- Loss of damage due to the use or occupation by the Employer of any Section or part of the Works, except as may be provided for in the Contract, or
- Any operation of the forces of nature against which an experienced contractor could

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

h) Other: Please specify

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

7. In your opinion, what type of contract was chosen for this project?

i	Traditional contract	
ii	Integrated contract	
iii	Other	

8. Please tick for item a-e the item that best describes your perception of the client priorities for that project.

a. Time: (Was an early or fixed completion time of essence to the success of the pro ect?)

i	Crucial	
ii	Important	
iii	Not important	

b. Quality level: (How was the heed to change specifications/design during Construction

i	Crucial	
ii	Important	
iii	Not important	

c. Price certainty: (How important was the need for a fixed price for the project before Contract and an assurance that the price is unlikely to change significantly during the currency of the project?)

i	Crucial	
ii	Important	
iii	Not important	

d. Controllable variations: (How was the need to control additional variations during construction?)

i	Crucial	
ii	Important	
iii	Not important	

e. Risk avoidance /Allocation: (How was the need for the client to transfer Risks of cost

i	Crucial	
ii	Important	
iii	Not important	

9. In your opinion, which of the following types of contracts can give better cost

i	Traditional contracts	
ii	Integrated contracts	

10. In your opinion, which of the following types of contracts can give better time perl|brmance?

i	Traditional contracts	
ii	Integrated contracts	

******

APPENDIX 1- QUESTIONNAIRE

Questionnaire No.............................. Date .

QUESTIONNAIRE TO

ARCHITECTS,
QUANTITY SURVEYORS,
PROJECT MANAGERS

* Please tick whichever is applicable

PROJECT 2

1. Type of project.

a) Public

b) Private

2. Period of construction..................... to

3. Project location...

4. Time performance

i) Original completion period

ii) Final completion period ...

5. Cost Performance

i) Original construction cost .

ii) Final construction cost

6. On a rating scale of 1-5, where 1 is minimum and 5 is maximum; please tick as appropriate the magnitude by which the following factors affected project performance

Reasons according to JBC Contract 1999 edition, (a traditional type of contract)

a) **:orce majeure.**

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

b) Exceptionally ac verse weat ler conc itions.

Factors	1	2	3	4	5
Project cost					
Project time					

c) Loss or damage occasioned for which insurance is required to be effected.

Factors	1	2	3	4	5
Project cost					
Project time					

d) Commotion, strike or lockout affecting any of the trades employed upon the Works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materia s required for the Works.

Factors	1	2	3	4	5
Project cost					
Project time					

e) Architect's instructions issued under clauses 22.0 (architects instructions), 28.1 suspension) anc 30.0 (variations) of the conditions.

Factors	1	2	3	4	5
Project cost					
Project time					

f) Contractor not having received in due time necessary instructions, drawings, details or

Factors	1	2	3	4	5
Project cost					
Project time					

g) Delay on the part of artists, tradesmen or other engaged by the Employer in executing work not forming part o the contract.

Factors	1	2	3	4	5
Project cost					
Project time					

h) Statutory or other services providers or similar bodies engaged directly by the

Factors	1	2	3	4	5
Project cost					
Project time					

0 Opening up for inspection of work covered up or of the testing of any of the work,

Factors	1	2	3	4	5
Project cost					
Project time					

j) Contractor's inability for reasons beyond his control and which he could not reasonably have foreseen at the date of the contract, to obtain delivery upon the Works of such goods or materials as are essential to the proper carrying out of the Works.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

k) Carrying out the Works having been suspended by the Contractor as a result of employers defau|t.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

1) Delay in appointing a replacement Architect, Quantity Surveyor or Engineers.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

m) Delay caused by the late supply of goods or materials or in executing work for which the Employer or his agents are contractually obliged to supply or to execute as the

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

n) Delay caused by nominated subcontractors or nominated suppliers which delay the Contractor has taken all reasonable measures to avoid or reduce the effects of.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

o) Contractor's inability, for reasons beyond his control, to secure such skilled labor and other workmen essentia to the proper carrying out of the Works.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

P) Nomination or renomination of a su

Factors	**1**	**2**	**3**	**4.**	**5**
Project cost					
Project time					

Delay in receiving possession of or access to the site.

Factors	1	2	3	4	5
Project cost					
Project time					

Other: Please speci

Factors	1	2	3	4	5
Project cost					
Project time					

Reasons according to FIDIC contract condition and the public procurement oversight authority (PPOA) of Kenya Conditions of contract for Procurement of Works or Plant (design build/Turnkey Projects) 2000 edition (integrated types of contracts)

a) A Variation.

Factors	1	2	3	4	5
Project cost					
Project time					

b) A force majeure event.

Factors	1	2	3	4	5
Project cost					
Project time					

c) A cause of delay giving an entit ement to extension of time.

Factors	1	2	3	4	5
Project cost					
Project time					

d) Physical conditions or circumstances on the site, which are exceptionally adverse and were not (by the base date) oreseeable by an experienced contractor.

Factors	1	2	3	4	5
Project cost					
Project time					

e) Any delay, impediment or prevention by the Employer.

Factors	1	2	3	4	5
Project cost					
Project time					

f) Delays Caused by Authorities not (by the Base Date) foreseeable by an experienced contractor.

Factors	1	2	3	4	5
Project cost					
Project time					

g) Suspension by employer due to any of the Employer's risks listed below) i.e. not for a cause attributable to the Contractor and not necessitated by Contractor's risks (contractors risks are all risks other than the Employer's risks listed below) i.e.

"•(-War, hostilities, invasion, act of foreign enemies,

Rebellion, revolution, insurrection, or military or usurped power, or civil war,

Ionizing radiations, or contamination by radio-activity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component of such assembly,

Pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds,

Riot, commotion or disorder, unless solely restricted to employees of the Contractor or of his Sub-contractors and arising from the conduct of the Works,

Loss of damage due to the use or occupation by the Employer of any Section or part of the Works, except as may be provided for in the Contract, or

- Any operation of the forces of nature against which an experienced contractor could

Factors	1	2	3	4	5
Project cost					
Project time					

h) Other: Please specify

Factors	1	2	3	4	5
Project cost					
Project time					

<u>In your opinion, what type of contract</u> was chosen for this project?

i	Traditional contract	
ii	Integrated contract	
iii	Other	

8. Please tick for item a-e the item that best describes your perception of the client priorities for that project.

a) Time: (Was an early or fixed completion time of essence to the success of the

i	Crucial	
ii	Important	
iii	Not important	

b) Quality level: (How was the need to change specifications/design during construction

i	Crucial	
ii	Important	
iii	Not important	

c) Price certainty: (How important was the need for a fixed price for the project before Contract and an assurance that the price is unlikely to change significantly during the currency of the project?)

i	Crucial	
ii	Important	
iii	Not important	

d) Controllable variations: (How was the need to control additional variations during construction?)

i	Crucial	
ii	Important	
iii	Not important	

e) Risk avoidance /Allocation: (How was the need for the client to transfer risks of cost and time?)

i	Crucial	
ii	Important	
iii	Not important	

9. In your opinion, which of the following types of contracts can give better cost

i	Traditional contracts	
ii	Integrated contracts	

10. In your opinion, which of the following types of contracts can give better time perlbrmance?

i	Traditional contracts	
ii	Integrated contracts	

****

Thank you for your contributions to the study

APPENDIX 1- QUESTIONNAIRE

Questionnaire No........................Date

QUESTIONNAIRE TO CONTRACTORS

Please choose 2 (two) projects that your firm handled as a Contractor, that were completed in the last 10 yrs, whose contract sum exceeded Kshs.10 million, and respond to the following section.

PROJECT 1

1) Type of project.

a) Public

b) Private

2) Period of construction....................to

3) Project location

4) Time performance

i) Original completion period

ii) Final completion period

5) Cost Performance

Please choose 2 (two) projects that your firm handled as a Contractor, that were completed in the last 10 yrs, whose contract sum exceeded Kshs.10 million, and respond to the following section.

i) Original construction cost

ii) Final construction cost

6) On a rating scale of 1-5, where 1 is minimum and 5 is maximum; please tick as appropriate the magnitude by which the following factors affected project performance

Reasons according to JBC Contract 1999 edition, (a traditional type of contract).

7orce majeure.

Factors	1	2	3	4	5
Project cost					
Project time					

b) Exceptionally adverse weather conditions

Factors	1	2	3	4	5
Project cost					
Project time					

c) Loss or damage occasioned for which insurance is required to be effected

Factors	1	2	3	4	5
Project cost					
Project time					

d) Commotion, strike or lockout affecting any of the trades employed upon the Works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materia s required for the Works.

Factors	1	2	3	4	5
Project cost					
Project time					

e) Architect's instructions issued under clauses 22.0 (architects instructions), 28.1

Factors	1	2	3	4	5
Project cost					
Project time					

f) Contractor not having received in due time necessary instructions, drawings, details or levels from the Architect for which he applied in accordance with the contract.

Factors	1	2	3	4	5
Project cost					
Project time					

g) Delay on the part of artists, tradesmen or other engaged by the Employer in executing work not forming part o the contract.

Factors	1	2	3	4	5
Project cost					
Project time					

h) Statutory or other services providers or similar bodies engaged directly by the

Factors	1	2	3	4	5
Project cost					
Project time					

i) Opening up for inspection of work covered up or of the testing of any of the work, materials or goods.

Factors	1	2	3	4	5
Project cost					
Project time					

j) Contractor's inability for reasons beyond his control and which he could not reasonably have foreseen at the date of the contract, to obtain delivery upon the Works of such goods or materials as are essential to the proper carrying out of the Works.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

k) Carrying out the Works having been suspended by the Contractor as a result of employers defau t.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

l) Delay in appointing a replacement Architect, Quantity Surveyor or Engineers.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

m) Delay caused by the late supply of goods or materials or in executing work for which the Employer or his agents are contractually obliged to supply or to execute as the case may be.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

n) Delay caused by nominated subcontractors or nominated suppliers which delay the Contractor has taken all reasonable measures to avoid or reduce the effects of.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

o) Contractor's inability, for reasons beyond his control, to secure such skilled labor and other workmen essentia to the proper carrying out of the Works.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

p) Nomination or renomination of a sub-contractor or supplier.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

q) Delay in receiving possession o or access to the site.

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

r) Other: Please specify

Factors	1	2	3	4	5
Project cost					
Project time					

Reasons according to FIDIC contract condition and the public procurement oversight authority (PPOA) of Kenya Conditions of contract for Procurement of Works or Plant (design build/Turnkey Projects), 2000 edition (integrated types of contracts).

a) A Variation.

Factors	1	2	3	4	5
Project cost					
Project time					

b) A force majeure event.

Factors	1	2	3	4	5
Project cost					
Project time					

A cause of delay giving an entitlement to extension of time.

Factors	1	2	3	4	5
Project cost					
Project time					

d) Physical conditions or circumstances on the Site, which are exceptionally adverse and were not (by the Base Date) foreseeable by an experienced contractor.

Factors	1	2	3	4	5
Project cost					
Project time					

e) Any delay, impediment or prevention by the Employer.

Factors	1	2	3	4	5
Project cost					
Project time					

f) Delays Caused by Authorities not (by the Base Date) foreseeable by an experienced contractor.

Factors	1	2	3	4	5
Project cost					
Project time					

g) Suspension by employer due to any of the Employer's risks listed below) i.e. not for a cause attributable to the Contractor and not necessitated by Contractor's risks (contractors risks are all risks other than the Employer's risks listed below) i.e.

"(-War, hostilities, invasion, act of foreign enemies,

- Rebellion, revolution, insurrection, or military or usurped power, or civil war, Ionizing radiations, or contamination by radio-activity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component of such assembly,

Pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds,

Riot, commotion or disorder, unless solely restricted to employees of the Contractor or of his Sub-contractors and arising from the conduct of the Works,

Loss of damage due to the use or occupation by the Employer of any Section or part of the Works, except as may be provided for in the Contract, or

Any operation of the forces of nature against which an experienced contractor could not reasonably have 3een expected to take precautions)'

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

Other: Please specify

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

7) In your opinion, what type of contract was chosen for this project?

i	Traditional contract	
ii	Integrated contract	
iii	Other	

8. Who made the choice of the type of contract to be used? You may tick more than one

i	Developer/Consultants	
iii	Contractor	

9. Given a choice, would you have preferred use of a different type of contract?

i	**Yes**	
ii	No	

10. If yes to 9, which one?

i	Traditional contracts	
ii	Integrated contracts	
iii	Other	

11. Please tick for item a-e the item that best describes your perception of the client priorities for that project.

a) Time: (Was an early or fixed completion time of essence to the success of the

i	Crucial	
ii	Important	
iii	Not important	

b) Quality level: (How was the need to change specifications/design during Construction

i	Crucial	
ii	Important	
iii	Not important	

c) Price certainty: (How important was the need for a fixed price for the project before Contract and an assurance that the price is unlikely to change significantly during the currency of the project?)

i	Crucial	
ii	Important	
iii	Not important	

d) Controllable variations: (How was the need to control additional variations during construction?)

i	Crucial	
ii	Important	
iii	Not important	

e) Risk avoidance /Allocation: (How was the need for the client to transfer Risks of cost and time?)

i	Crucial	
ii	Important	
iii	Not important	

f) In your opinion, which of the following types of contracts can give better cost

i	Traditional contracts	
ii	Integrated contracts	

g) In your opinion, which of the following types of contracts can give better time per brmance?

i	Traditional contracts	
ii	Integrated contracts	

****

APPENDIX 1- QUESTIONNAIRE

Questionnaire No.....................Date....

QUESTIONNAIRE TO CONTRACTORS

PROJECT 2

1) Type of project.

a) Public

b) Private

2) Period of construction....................to

3) Project location_

4) Time performance

i) Original completion period

ii) Final completion period

5) Cost Performance

i) Original construction cost

ii) Final construction cost....

6) On a rating scale of 1-5, where 1 is minimum and 5 is maximum; please tick as appropriate the magnitude by which the following factors affected project performance

Reasons according to JBC Contract 1999 edition, (a traditional type of contract)

a) Force majeure.

Factors	1	2	3	4	5
Project cost					
Project time					

b) Exceptionally adverse weather-conditions.

Factors	1	2	3	4	5
Project cost					
Project time					

c) Loss or damage occasioned for which insurance is required to be effected.

Factors	1	2	3	4	5
Project cost					
Project time					

d) Commotion, strike or lockout affecting any of the trades employed upon the Works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materia s required for the Works.

Factors	1	2	3	4	5
Project cost					
Project time					

e) Architect's instructions issued under clauses 22.0 (architects instructions), 28.1 (suspension) anc 30.0 (variations) of the conditions.

Factors	1	2	3	4	5
Project cost					
Project time					

f) Contractor not having received in due time necessary instructions, drawings, details or

Factors	1	2	3	4	5
Project cost					
Project time					

g) Delay on the part of artists, tradesmen or other engaged by the Employer in executing work not forming part o the contract.

Factors	1	2	3	4	5
Project cost					
Project time					

h) Statutory or other services providers or similar bodies engaged directly by the

Factors	1	2	3	4	5
Project cost					
Project time					

i) Opening up for inspection of work covered up or of the testing of any of the work, materials or goods.

Factors	1	2	3	4	5
Project cost					
Project time					

j) Contractor's inability for reasons beyond his control and which he could not reasonably have foreseen at the date of the contract, to obtain delivery upon the Works of.such goods or materials as are essential to the proper carrying out of the Works.

Factors	1	2	3	4	5
Project cost					
Project time					

Carrying out th<i Works having b employers defau t.

Factors	1	2	3	4	5
Project cost					
Project time					

1) Delay in appointing a replacement Architect, Quantity Surveyor or Engineers.

Factors	1	2	3	4	5
Project cost					
Project time					

m) Delay caused by the late supply of goods or materials or in executing work for which the Employer or his agents are contractually obliged to supply or to execute as the

Factors	1	2	3	4	5
Project cost					
Project time					

n) Delay caused by nominated subcontractors or nominated suppliers which delay the Contractor has taken all reasonable measures to avoid or reduce the effects of.

Factors	1	2	3	4	5
Project cost					
Project time					

o) Contractor's inability, for reasons beyond his control, to secure such skilled labor and other workmen essentia to the proper carrying out of the Works.

Factors	1	2	3	4	5
Project cost					
Project time					

p) Nomination or renomination of a sub-contractor or supplier.

Factors	1	2	3	4	5
Project cost					
Project time					

Delay in receiving possession of **or** access to the site.

Factors	1	2	3	4	5
Project cost					
Project time					

r) Other: Please specify

Factors	1	2	3	4	5
Project cost					
Project time					

Reasons according to FIDIC contract condition and the public procurement oversight authority (PPOA) of Kenya Conditions of contract for Procurement of Works or Plant (design build/Turnkey Projects), 2000 edition (integrated types of contracts).

a) A Variation.

Factors	1	2	3	4	5
Project cost					
Project time					

b) A force majeure event.

Factors	1	2	3	4	5
Project cost					
Project time					

c) A cause of delay giving an entitlement to extension of time.

Factors	1	2	3	4	5
Project cost					
Project time					

d) Physical conditions or circumstances on the Site, which are exceptionally adverse and

Factors	1	2	3	4	5
Project cost					
Project time					

e) Any delay, impediment or prevention by the Employer.

Factors	1	2	3	4	5
Project cost					
Project time					

f) Delays Caused by Authorities not (by the Base Date) foreseeable by an experienced contractor.

Factors	1	2	3	4	5
Project cost					.
Project time					

g) Suspension by employer due to any of the Employer's risks listed below) i.e. not for a cause attributable to the Contractor and not necessitated by Contractor's risks (contractors risks are all risks other than the Employer's risks listed below) i.e.

"(-War, hostilities, invasion, act of foreign enemies,

Rebellion, revolution, insurrection, or military or usurped power, or civil war,
Ionizing radiations, or contamination by radio-activity from any nuclear fuel, or from any nuclear waste from the combustion of nuclear fuel, radio-active toxic explosive, or other hazardous properties of any explosive nuclear assembly or nuclear component of such assembly,
Pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds,
Riot, commotion or disorder, unless solely restricted to employees of the Contractor or of his Sub-contractors and arising from the conduct of the Works,
Loss of damage due to the use or occupation by the Employer of any Section or part of the Works, except as may be provided for in the Contract, or
Any operation of the forces of nature against which an experienced contractor could not reasonably have ?een expected to take precautions)'

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

h) Other: Please specify

Factors	**1**	**2**	**3**	**4**	**5**
Project cost					
Project time					

7) In your opinion, what type of contract was chosen for this project?

i	Traditional contract	
ii	Integrated contract	
iii	Other	

8) Who made the choice of the type of contract to be used? You may tick more than one.

i	Developer/Consultants	
iii	Contractor	

9) Given a choice, would you have preferred use of a different type of contract?

i	**Yes**	
ii	No	

10) If yes to 9, which one?

i	Traditional contracts	
ii	Integrated contracts	
iii	Other	

11) Please tick for item a-e the item that best describes your perception of the client priorities for that project

a) Time: (Was an early or fixed completion time of essence to the success of the pro ect?)

i	Crucial	
u	Important	
iii	Not important	

b) Quality level: (How was the need to change specifications/design during Construction

i	Crucial	
ii	Important	
iii	Not important	

c) Price certainty: (How important was the need for a fixed price for the project before Contract and an assurance that the price is unlikely to change significantly during the currency of the project?)

i	Crucial	
ii	Important	
iii	Not important	

d) Controllable variations: (How was the need to control additional variations during construction?)

i	Crucial	
ii	Important	
iii	Not important	

e) Risk avoidance /Allocation: (How was the need for the client to transfer Risks of cost and time?)

i	Crucial	
ii	Important	
iii	Not important	

f) In your opinion, which of the following types of contracts can give better cost

1	Traditional contracts	
ii	Integrated contracts	

g) In your opinion, which of the following types of contracts can give better time performance?

i	Traditional contracts	
ii	Integrated contracts	

****

Thank you for your contributions to the study

APPENDIX II

Table of selected *t* values

The following table lists a few selected values for t-distributions with v degrees of freedom for a range of *one-sided* or *two-sided* critical regions.

One Sided	**75%**	**80%**	**85%**	**90%**	**95%**	**97.5%**	**99%**	**99.5%**	**99.75%**	**99.9%**	**99.95%**
Two Sided	**50%**	**60%**	**70%**	**80%**	**90%**	**95%**	**98%**	**99%**	**99.5%**	**99.8%**	**99.9%**
1	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	127.3	318.3	636.6
2	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	14.09	22.33	31.60
3	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	7.453	10.21	12.92
4	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767
24	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	f.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460

80	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	2.887	3.195	3.416
100	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	2.871	3.174	3.390
120	0.677	0.845	1.041	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
o c	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291

The number at the beginning of each row in the table above is (degrees of freedom-v) which is *n* - 1. The percentage along the top (confidence level) is 100 %(1 - a). The numbers in the main body of the table are /. If a quantity *T* is distributed as a Student's t distribution with v degrees of freedom, then there is a probability 1 - a that Twill be less than / (Calculated as for a one-tailed or one-sided test as opposed to a two-tailed test.

Note that the last row also gives critical points: a /-distribution with infinitely-many degrees of freedom is a normal distribution.

Source: Student's /-distribution - (Walpole, Myers, Ye, (2002); Fisher, (1925).

BELOVVFOR AUREVIATIUNS, CALCULATIONS AND **EXPLANATIONS**

PROJECTS THAT USED TRADITIONAL **CONTRACTS**

CODE	*PN*	OCP(Weeks)	FCP(Weeks)	%TOR	OCC(KSHS)	FCC(KSHS)	%COR	BPC©	BPC(T)
14 a	1	24	45	87.5	19,647,293.00	20,755,869.00	5.642385442		
14 b	2	52	68	30.769231	71,000,000.00	88,155,093.00	24.16210282		
2a	3	9	16	77.777778	10,486,274.00	10,355,347.00	-1.248555969	IC	IC
2 b	4	15	17	13.333333	10,469,242.00	10,469,242.00	0	IC	IC
20 a	5	60	112	86.666667	32,968,880.00	28,882,997.50	-12.39314924	IC	IC
20 b	6	58	112	93.103448	357,599,731.62	228,334,274.00	-36.14808575	IC	IC
21a	7	48	50	4.1666667	13,500,000.00	14,500,000.00	7.407407407	IC	IC
26a	8	26	92	253.84615	43,382,193.00	49,763,229.00	14.70888297	TC	TC
26b	9	32	37	15.625	20,000,000.00	18,551,699.00	-7.241505	TC	TC
la	10	15	21	40	35,236,298.56	33,976,642.10	-3.574883037	TC	TC
1 b	11	40	60	50	144,807,919.00	135,000,000.00	-6.773054311	TC	TC
10a	12	52	52	0	71,000,000.00	88,155,095.00	24.16210563	TC	TC
10 b	13	34	47	38.235294	19,800,000.00	20,887,561.00	5.492732323	TC	TC
11a	14	32	40	25	89,823,674.00	88,978,358.00	-0.94108375	TC	TC
11 b	15	152	176	15.789474	42,000,000.00	46,000,000.00	9.523809524	TC	TC
12a	16	54	75	38.888889	111,909,101.00	126,230,530.00	12.79737651	IC	IC
12 b	17	52	100	92.307692	70,500,000.00	77,898,458.00	10.49426667	IC	IC
13 a	18	104	130	25	32,000,000.00	32,000,000.00	0	TC	IC
13 b	19	102	102	0	1,580,000,000.00	1,580,000,000.00	0	TC	IC
15 a	20	34	38	11.764706	74,124,105.00	71,595,924.00	-3.410740676	TC	TC
15 b	21	24	39	62.5	39,751,288.00	48,850,494.00	22.89034257	TC	IC
16 a	22	88	125	42.045455	496,981,600.00	549,208,135.00	10.5087462	IC	IC
16 b	23	68	105	54.411765	15,000,000.00	15,600,000.00	4	IC	IC
19 a	24	104	136	30.769231	109,045,231.00	121,915,024.00	11.80225204	IC	TC
3a	25	60	76	26.666667	395,000,000.00	471,568,362.00	19.38439544	IC	IC
3 b	26	68	112	64.705882	188,033,000.00	212,437,213.00	12.97868619	IC	IC
4a	27	119	147	23.529412	215,745,841.00	236,041,714.00	9.407306721	IC	IC
4 b	28	36	48	33.333333	18,381,305.00	20,215,201.00	9.976963007	IC	IC
6a	29	52	120	130.76923	92,000,000.00	99,500,000.00	8.152173913	IC	TC

PROJECTS THAT USED TRADITIONAL CONTRACTS

CODE	PN	OCP(Weeks)	FCP(Weeks)	%TOR
6b	30	52	64	23.076923
8a	31	68		
8 b	32	72	104	44.444444
5a	33	52	68	30.769231
5 b	34	78	95	21.794872
27a	35	34	36	5.8823529
27b	36	52	49	-5.769231
17 a	37	140	436	211.42857
18 a	38	30	168	460
18 b	39	40	62	55
7a	40	17	27	58.823529
7 b	41	19 •	21	10.526316
23a	42	60	232	286.66667
23b	43	12	97	708.33333
24a	44	65	71	9.2307692
25a	45	41	37	-9.756098
25b	46	60	85	41.666667
28a	47	52	65	25
28b	48	6	8	33.333333
29a	49	6	8	33.333333
29b	50	12	12	0
			MTOR(%)	70.245806

OCC(KSHS)	FCC(KSHS)	%COR	BPC©	BPC(T)
76,500,000.00	102,000,000.00	33.33333333	IC	IC
27,500,000.00			TC	TC
15,000,000.00	16,500,000.00	10	TC	TC
111,000,000.00	135,000,000.00	21.62162162	TC	TC
480,000,000.00	480,000,000.00	0	TC	TC
130,000,000.00	130,257,650.00	0.198192308	IC	IC
101,032,370.00	103,861,704.00	2.80042327	IC	IC
367,000,000.00	435,000,000.00	18.52861035	IC	IC
9,190,000.00	18,107,003.00	97.0294124	IC	IC
10,244,623.85	16,589,546.50	61.93416901	IC	TC
51,000,000.00	53,100,000.00	4.117647059	IC	IC
31,752,035.65	33,312,489.00	4.914498608	TC	IC
30,020,098.00	50,208,000.00	67.24795502	IC	IC
12,100,000.00	17,718,654.00	46.43515702	IC	IC
84,700,000.00	93,000,000.00	9.799291617	TC&IC	TC&IC
21,053,500.00	19,559,000.00	-7.098582183	IC	IC
15,000,000.00	16,589,546.00	10.59697333	IC	IC
64,546,348.00	71,342,283.00	10.52876764	IC	IC
18,127,348.00	21,586,342.00	19.0816329	IC	IC
11,830,000.00	11,830,000.00	0	IC	IC
11,500,000.00	13,500,000.00	17.39130435	IC	IC
	MCOR	11.60442571	IC-30	IC-30
			TC-16	TC-16

PROJECTS THAT USED TRADITIONAL CONTRACTS

CODE	PN	Z	OCP(Weeks)	FCP(Weeks)	%TOR
6 b	30		52	64	23.076923
8a	31		68		
8 b	32		72	104	44.444444
5a	33		52	68	30.769231
5 b	34		78	95	21.794872
27a	35		34	36	5.8823529
27b	36		52	49	-5.769231
17 a	37		140	436	211.42857
18 a	38		30	168	460
18 b	39		40	62	55
7a	40		17	27	58.823529
7 b	41		19	21	10.526316
23a	42		60	232	286.66667
23b	43		12	97	708.33333
24a	44		65	71	9.2307692
25a	45		41	37	-9.756098
25b	46		60	85	41.666667
28a	47		52	65	25
28b	48		6	8	33.333333
29a	49		6	8	33.333333
29b	50		12	12	0
				MTOR(%)	70.245806

OCC(KSHS)	FCC(KSHS)	%COR	BPC©	BPC(T)
76,500,000.00	102,000,000.00	33.33333333	IC	IC
27,500,000.00			TC	TC
15,000,000.00	16,500,000.00	10	TC	TC
111,000,000.00	135,000,000.00	21.62162162	TC	TC
480,000,000.00	480,000,000.00	0	TC	TC
130,000,000.00	130,257,650.00	0.198192308	IC	IC
101,032,370.00	103,861,704.00	2.80042327	IC	IC
367,000,000.00	435,000,000.00	18.52861035	IC	IC
9,190,000.00	18,107,003.00	97.0294124	IC	IC
10,244,623.85	16,589,546.50	61.93416901	IC	TC
51,000,000.00	53,100,000.00	4.117647059	IC	IC
31,752,035.65	33,312,489.00	4.914498608	TC	IC
30,020,098.00	50,208,000.00	67.24795502	IC	IC
12,100,000.00	17,718,654.00	46.43515702	IC	IC
84,700,000.00	93,000,000.00	9.799291617	TC&IC	TC&IC
21,053,500.00	19,559,000.00	-7.098582183	IC	IC
15,000,000.00	16,589,546.00	10.59697333	IC	IC
64,546,348.00	71,342,283.00	10.52876764	IC	IC
18,127,348.00	21,586,342.00	19.0816329	IC	IC
11,830,000.00	11,830,000.00	0	IC	IC
11,500,000.00	13,500,000.00	17.39130435	IC	IC
	MCOR	11.60442571	IC-30	IC-30
			TC-16	TC-16

PROJECTS THAT USED INTEGRATED CONTRACTS

PN	OCP(Weeks)	FCP(Weeks)	%TOR
1	52	87	67.307692
2	60	64	6.6666667
3	60	80	33.333333
4	52	58	11.538462
5	38	40	5.2631579
6	18	15	-16.66667
7	8	10	25
8	52	40	-23.07692
		MT0R(%)	13.670715

OCC(KSHS)	FCC(KSHS)	%COR	BPC©	BPC(T)
12,500,000.00	12,500,000.00	0	IC	IC
12,000,000.00	12,900,000.00	7.5	IC	IC
145,602,971.00	166,802,916.00	14.56010468	IC	IC
15,900,000.00	18,900,000.00	18.86792453	IC	IC
26,000,000.00	25,700,000.00	-1.153846154	IC	IC
75,064,898.66	86,059,534.18	14.64683989	IC	IC
61,769,290.00	61,769,290.00	0	IC	IC
152,000,000.00	152,000,000.00	0	T&I	T&I
	MCOR(%)	6.802627868	IC-7	IC-7
			INT.C.=37	36
			TRA.C.=17	18
			BOTH=2	2
			NO RESP=2	2

TRADITIONAL *CONTRACTS-TIME* PERFORMANCE

CODE	PN	OCP(Weeks)	FCP(Weeks)	%TOR
14 a	1	24	45	87.5
14 b	2	52	68	30.769231
2a	3	.9	16	77.777778
2 b	4	15	17	13.333333
20 a	5	60	112	86.666667
20 b	6	58	112	93.103448
21a	7	48	50	4.1666667
26a	8	26	92	253.84615
26b	9	32	37	15.625
la	10	15	21	40
l b	11	40	60	50
10a	12	52	52	0
10 b	13	34	47	38.235294
11a	14	32	40	25
l i b	15	152	176	15.789474
12a	16	54	75	38.888889
12 b	17	52	100	92.307692
13 a	18	104	130	25
13 b	19	102	102	0
15 a	20	34	38	11.764706
15 b	21	24	39	62.5
16 a	22	88	125	42.045455
16 b	23	68	105	54.411765
19 a	24	104	136	30.769231
3a	25	60	76	26.666667
3 b	26	68	112	64.705882
4a	27	119	147	23.529412
4 b	28	36	48	33.333333
6a	29	52	120	130.76923
6 b	30	52	64	23.076923
8a	31	68		
8 b	32	72	104	44.444444

%DTOR	%SDTOR
17.25419358	297.7071961
-39.47657565	1558.400025
7.531971357	56.73059253
-56.91247309	3239.029593
16.42086025	269.6446512
22.85764186	522.4717912
-282.5	79806.25
183.6003474	33709.08757
-54.62080642	2983.432494
-30.24580642	914.808806
-20.24580642	409.8926776
-70.24580642	4934.47332
-32.0105123	1024.672898
-45.24580642	2047.182999
-54.45633274	2965.492175
-31.35691753	983.2562771
22.06188589	486.7268089
-45.24580642	2047.182999
-70.24580642	3420.03912
-58.48110054	59.9975171
-7.74580642	795.2598459
-28.20035187	250.716877
-15.83404171	1558.400025
-39.47657565	1899.141422
-43.57913975	30.69075867
-5.539924067	2182.42153
-46.71639466	1362.530669
-36.91247309	3663.084895
60.52342435	2224.903556
-47.16888334	4934.47332
-70.24580642	665.7102798
-25.80136198	946.7455621

CODE	PN	cor* OCP(	TRACTS- TIME Weeks)	PERFORMANCE FCP(Weeks)	%TOR
5a	33		52	68	30.769231
5 b	34		78	95	21.794872
27a	35		34	36	5.8823529
27b	36		52	49	-5.769231
17 a	37		140	436	211.42857
18 a	38		30	168	460
18 b	39		40	62	55
7a	40		17	27	58.823529
7 b	41		19	21	10.526316
23a	42		60	232	286.66667
23b	43		12	97	708.33333
24a	44		65	71	9.2307692
25a	45		41	37	-9.756098
25b	46		60	85	41.666667
28a	47		52	65	25
28b	48		6	8	33.333333
29a	49		6	8	33.333333
29b	50		12	12	0
				MTOR(%)	70.245806

%DTOR	%SDTOR	
30.76923077	2347.493066	
-48.45093463	4142.654144	
-64.36345348	5778.285879	
-76.01503719	19932.57314	
141.182765	151908.3314	
389.7541936	232.4346134	
-15.24580642	130.4684121	
-11.42227701	3566.417561	
-59.71949063	46837.98875	
216.4208602	407155.692	
638.0875269	3722.834763	
-61.01503719	6400.304641	
-80.00190398	816.7672291	
-28.57913975	2047.182999	
-45.24580642	1362.530669	
-36.91247309	1362.530669	
-36.91247309	4934.47332	
-70.24580642		
	824929.5215	
	16498.59043	
	STDTOR%	128.4468389

TRADITIONAL CONTRACTS;-COST PERFORMANCE

CODE	PN	OCC(KShs)	FCC(KShs)	%COR
14 a	1	19,647,293.00	20,755,869.00	5.6423854
14 b	2	71,000,000.00	88,155,093.00	24.162103
2a	3	10,486,274.1)0	10,355,347.00	-1.248556
2 b	4	10,469,242.00	10,469,242.00	0
20 a	5	32,968,880.00	28,882,997.50	-12.39315
20 b	6	357,599,731.62	228,334,274.00	-36.14809
21a	7	13,500,000.00	14,500,000.00	7.4074074
26a	8	43,382,193.00	49,763,229.00	14.708883
26b	9	20,000,000.00	18,551,699.00	-7.241505
la	10	35,236,298.56	33,976,642.10	-3.574883
1 b	11	144,807,919.00	135,000,000.00	-6.773054
10a	12	71,000,000.00	88,155,095.00	24.162106
10 b	13	19,500,000.00	20,887,561.00	5.4927323
11a	14	89,823,674.00	88,978,358.00	-0.941084
11 b	15	42,000,000.00	46,000,000.00	9.5238095
12a	16	111,909,101.00	126,230,530.00	12.797377
12 b	17	70,500,000.00	77,898,458.00	10.494267
13 a	18	32,000,000.00	32,000,000.00	0
13 b	19	1,580,000,000.00	1,580,000,000.00	0
15 a	20	74,124,105.00	71,595,924.00	-3.410741
15 b	21	39,751,288.00	48,850,494.00	22.890343
16 a	22	496,981,600.00	549,208,135.00	10.508746
16 b	23	15,000,000.00	15,600,000.00	4
19 a	24	109,045,231.00	121,915,024.00	11.802252
3a	25	395,000,000.00	471,568,362.00	19.384395
3 b	26	188,033,000.00	212,437,213.00	12.978686
4a	27	215,745,841.00	236,041,714.00	9.4073067
4 b	28	18,381,305.00	20,215,201.00	9.976963
6a	29	92,000,000.00	99,500,000.00	8.1521739
6 b	30	76,500,000.00	102,000,000.00	33.333333
8a	31	27,500,000.00	27,500,000.00	0
8 b	32	15,000,000.00	16,500,000.00	10

%DCOR	%SDCOR
-5.962040264	35.54592411
12.55767711	157.6952544
-12.85298168	165.199138
-11.60442571	134.662696
-23.99757494	575.8836031
-47.75251145	2280.30235
-4.197018299	17.6149626
3.104457268	9.637654927
-18.84593071	355.1691042
-15.17930874	230.4114139
-18.37748002	337.7317718
12.55767993	157.6953252
-6.111693383	37.35279601
-12.54550946	157.3898075
-2.080616183	4.328963699
1.1929508	1.423131611
-1.11015904	1.232453094
-11.60442571	134.662696
-11.60442571	134.662696
-15.01516638	225.4552215
11.28591687	127.3719195
-1.095679507	1.200513583
-7.604425706	57.82729032
0.197826333	0.039135258
7.779969737	60.5279291
I.374260482	I.888591871
-2.197118986	4.827331837
-1.6274627	2.648634839
3.452251793	II.91804244
21.72890763	472.1454267
II.60442571	134.662696
1.604425706	2.574181847

	TRADITIONAL	CONTRACTS-COST	PERFORMANCE	
CODE	PN	OCC(KShs)	FCC(KShs)	%COR
5 a	33	111,000,000.00	135,000,000.00	21.621622
5 b	34	480,000,000.00	480,000,000.00	0
27a	35	130,000,000.00	130,257,650.00	0.1981923
27b	36	101,032,370.00	103,861,704.00	2.8004233
17 a	37	367,000,000.00	435,000,000.00	18.52861
18 a	38	9,190,000.00	18,107,003.00	97.029412
18 b	39	10,244,623.85	16,589,546.50	61.934169
7a	40	51,000,000.00	53,100,000.00	4.1176471
7 b	41	31,752,035.65	33,312,489.00	4.9144986
23a	42	30,020,098.00	50,208,000.00	67.247955
23b	43	12,100,000.00	17,718,654.00	46.435157
24a	44	84,700,000.00	93,000,000.00	9.7992916
25a	45	21,053,500.00	19,559,000.00	-7.098582
25b	46	15,000,000.00	16,589,546.00	10.596973
28a	47	64,546,348.00	71,342,283.00	10.528768
28b	48	13,127,348.00	21,586,342.00	19.081633
29a	49	11,830,000.00	11,830,000.00	0
29b	50	11,500,000.00	13,500,000.00	17.391304
			MCOR(%)	11.604426

%DCOR	%SDCOR		
10.01719592	100.344214		
-11.60442571	134.662696		
-11.4062334	130.1021603		
-8.804002436	77.5104589		
6.924184648	47.94433304		
85.4249867	7297.428352		
50.32974331	2533.083061		
-7.486778648	56.05185452		
-6.689927099	44.75512458		
55.64352931	3096.202354		
34.83073132	1213.179844		
-1.805134089	3.258509079		
-18.70300789	349.8025041		
-1.007452373	1.014960284		
-1.075658068	1.157040279		
7.477207194	55.90862743		
-11.60442571	134.662696		
5.786878641	33.48796441		
	21342.24541		
	426.8449082		
	STDCOR(%)		20.66022527

INTEGRATED **CONTRACTS- TIME PERFORMANCE**

CODE	PN	OCP(WEEKS)	FCP(WEEKS)	%TOR	%DTOR	%SDTOR	
9a		52	87	67.307692	53.63697706	2876.925308	
9 b		60	64	6.6666667	-7.004048583	49.05669655	
19 b		60	80	33.333333	19.66261808	386.6185499	
21b		52	58	11.538462	-2.132253711	4.546505889	
17 b		38	40	5.2631579	-8.407557355	70.68702068	
22a		18	15	-16.66667	-30.33738192	920.3567415	
22b		8	10	25	11.32928475	128.352693	
24b		52	40	-23.07692	-36.74763833	1350.388923	
			MTOR(%)	13.670715		5786.932438	
						723.3665548	
						STDTOR(%)	26.89547461

INTEGRATED CONTRACTS-COST PERFORMANCE

CODE	PN	OCC(KSHS)	FCC(KSHS)	%COR	%DCOR	%SDCOR	
9a	1	12,500,000.00	12,500,000.00	0	-6.802627868	46.27574592	
9b	2	12,000,000.00	12,900,000.00	7.5	0.697372132	0.48632789	
19 b	3	145,602,971.00	166,802,916.00	14.560105	7.757476815	60.17844654	
21b	4	15,900,000.00	18,900,000.00	18.867925	12.06529666	145.5713835	
17 b	5	26,000,000.00	25,700,000.00	-1.153846	-7.956474022	63.30547887	
22a	6	75,064,898.66	86,059,534.18	14.64684	7.844212021	61.53166223	
22b	7	61,769,290.00	61,769,290.00	0	-6.802627868	46.27574592	
24b	8	152,000,000.00	152,000,000.00	0	-6.802627868	46.27574592	
						469.9005368	
			MCOR(%)	6.8026279		58.7375671	
						STDCOR(%)	7.664043782

Fom the above, it can be seen that Traditional Contracts had higher mean time and cost overruns than Integrated Contract
Similarly Traditional Contracts had higher standard deviation time and cost overruns than Integrated Contracts

TYPE OF DEVELOPER - PUBLIC

PROJECTS THAT **USED TRADITIONAL CONTRACTS**

CODE	PN	OCP(WEEKS)	FCP(WKS)
20 b	6	58	112
21a	7	48	50
26a	8	26	92
11a	14	32	40
11 b	15	152	176
12a	16	54	75
13 a	18	104	130
16 a	22	88	125
3a	25	60	76
3 b	26	68	112
6a	29	52	120
17 a	37	140	436
18 a	38	30	168
7a	40	17	27
28a	47	52	65
28b	48	6	8
29a	49	6	8

TYPE OF DEVELOPER - PUBLIC

PROJECTS THAT USED INTEGRATED CONTRACTS

CODE	PN	OCP(WEEKS)	FCP(WKS)
19 b	3	60	80
22a	6	18	15
22b	7	8	10
24b	8	52	40

MTOR(%)

%TOR	OCC(KSHS)	FCC(KSHS)	%COR	TOD
93.10344828	357,599,731.62	228,334,274.00	-36.15	PU
4.166666667	13,500,000.00	14,500,000.00	7.407	PU
253.8461538	43,382,193.00	49,763,229.00	14.71	PU
25	89,823,674.00	88,978,358.00	-0.941	PU
15.78947368	42,000,000.00	46,000,000.00	9.524	PU
38.88888889	111,909,101.00	126,230,530.00	12.8	PU
25	32,000,000.00	32,000,000.00	0	PU
42.04545455	496,981,600.00	549,208,135.00	10.51	PU
26.66666667	395,000,000.00	471,568,362.00	19.38	PU
64.70588235	188,033,000.00	212,437,213.00	12.98	PU
130.7692308	92,000,000.00	99,500,000.00	8.152	PU
211.4285714	367,000,000.00	435,000,000.00	18.53	PU
460	9,190,000.00	18,107,003.00	97.03	PU
58.82352941	51,000,000.00	53,100,000.00	4.118	PU
25	64,546,348.00	71,342,283.00	10.53	PU
33.33333333	18,127,348.00	21,586,342.00	19.08	PU
33.33333333	11,830,000.00	11,830,000.00	0	PU

%TOR	OCC(KSHS)	FCC(KSHS)	%COR	TOE
33.33333333	145,602,971.00			
16.66666667	75,064,898.66	86,059,534.18	14.65	PU
25	61,769,290.00	61,769,290.00	0	PU
23.07692308	152,000,000.00	152,000,000.00	0	PU
74.30906556		MCOR(%)	11.28	

TYPE OF DEVELOPER - PUBLIC

PROJECTS THAT USED TRADITIONAL CONTRACTS

CODE	PN	OCP(WEEKS)	FCP(WKS)
20 b	6	58	112
21a	7	48	50
26a	8	26	92
11a	14	32	40
11 b	15	152	176
12a	16	54	75
13 a	18	104	130
16 a	22	88	125
3a	25	60	76
3 b	26	68	112
6a	29	52	120
17 a	37	140	436
18 a	38	30	168
7a	40	17	27
28a	47	52	65
28b	48	6	8
29a	49	6	8

TYPE OF DEVELOPER - PUBLIC

PROJECTS THAT USED INTEGRATED CONTRACTS

CODE	PN	OCP(WEEKS)	FCP(WKS)
19 b	3	60	80
22a	6	18	15
22b	7	8	10
24b	8	52	40

MTOR(%)

%TOR	OCC(KSHS)	FCC(KSHS)	%COR	TOD
93.10344828	357,599,731.62	228,334,274.00	-36.15	PU
4.166666667	13,500,000.00	14,500,000.00	7.407	PU
253.8461538	43,382,193.00	49,763,229.00	14.71	PU
25	89,823,674.00	88,978,358.00	-0.941	PU
15.78947368	42,000,000.00	46,000,000.00	9.524	PU
38.88888889	111,909,101.00	126,230,530.00	12.8	PU
25	32,000,000.00	32,000,000.00	0	PU
42.04545455	496,981,600.00	549,208,135.00	10.51	PU
26.66666667	395,000,000.00	471,568,362.00	19.38	PU
64.70588235	188,033,000.00	212,437,213.00	12.98	PU
130.7692308	92,000,000.00	99,500,000.00	8.152	PU
211.4285714	367,000,000.00	435,000,000.00	18.53	PU
460	9,190,000.00	18,107,003.00	97.03	PU
58.82352941	51,000,000.00	53,100,000.00	4.118	PU
25	64,546,348.00	71,342,283.00	10.53	PU
33.33333333	18,127,348.00	21,586,342.00	19.08	PU
33.33333333	11,830,000.00	11,830,000.00	0	PU

%TOR	OCC(KSHS)	FCC(KSHS)	%COR	TOE
33.33333333	145,602,971.00			
-16.66666667	75,064,898.66	86,059,534.18	14.65	PU
25	61,769,290.00	61,769,290.00	0	PU
-23.07692308	152,000,000.00	152,000,000.00	0	PU
74.30906556		MCOR(%)	11.28	

TYPE *OF DEVELOPER* - PRIVATE

PROJECTS **THAT USED TRADITIONAL CONTRACTS**

CODE	PN	OCP(WEEKS)	FCP(WKS)
14 a	1	24	45
14 b	2	52	68
2a	3	9	16
2 b	4	15	17
20 a	5	60	112
26b	9	32	37
la	10	15	21
l b	11	40	60
10a	12	52	52
10 b	13	34	47
12 b	17	52	100
13 b	19	102	102
15 a	20	34	38
15 b	21	24	39
16 b	23	68	105
19 a	24	104	136
4a	27	119	147
4 b	28	36	48
6 b	30	52	64
8a	31	68	
8 b	32	72	104
5a	33	52	68
5 b	34	78	95
27a	35	34	36
27b	36	52	49
18 b	39	40	62
7 b	41	19	21
23a	42	60	232
23b	43	12	97
24a	44	65	71
25a	45	41	37
25b	46	60	85
29b	50	12	12

%TOR	OCC(KSHS)	FCC(KSHS)	%COR	TOD
87.5	19,647,293.00	20,755,869.00	5.642	PR
30.76923077	71,000,000.00	88,155,093.00	24.16	PR
77.77777778	10,486,274.00	10,355,347.00	-1.249	PR
13.33333333	10,469,242.00	10,469,242.00	0	PR
86.66666667	32,968,880.00	28,882,997.50	-12.39	PR
15.625	20,000,000.00	18,551,699.00	-7.242	PR
40	35,236,298.56	33,976,642.10	-3.575	PR
50	144,807,919.00	135,000,000.00	-6.773	PR
0	71,000,000.00	88,155,095.00	24.16	PR
38.23529412	19,800,000.00	20,887,561.00	5.493	PR
92.30769231	70,500,000.00	77,898,458.00	10.49	PR
0	1,580,000,000.00	1,580,000,000.00	0	PR
11.76470588	74,124,105.00	71,595,924.00	-3.411	PR
62.5	39,751,288.00	48,850,494.00	22.89	PR
54.41176471	15,000,000.00	15,600,000.00	4	PR
30.76923077	109,045,231.00	121,915,024.00	11.8	PR
23.52941176	215,745,841.00	236,041,714.00	9.407	PR
33.33333333	18,381,305.00	20,215,201.00	9.977	PR
23.07692308	76,500,000.00	102,000,000.00	33.33	PR
	27,500,000.00			PR
44.44444444	15,000,000.00	16,500,000.00	10	PR
30.76923077	111,000,000.00	135,000,000.00	21.62	PR
21.79487179	480,000,000.00	480,000,000.00	0	PR
5.882352941	130,000,000.00	130,257,650.00	0.198	PR
-5.769230769	101,032,370.00	103,861,704.00	2.8	PR
55	10,244,623.85	16,589,546.50	61.93	PR
10.52631579	31,752,035.65	33,312,489.00	4.914	PR
286.6666667	30,020,098.00	50,208,000.00	67.25	PR
708.3333333	12,100,000.00	17,718,654.00	46.44	PR
9.230769231	84,700,000.00	93,000,000.00	9.799	PR
-9.756097561	21,053,500.00	19,559,000.00	-7.099	PR
41.66666667	15,000,000.00	16,589,546.00	10.6	PR
0	11,500,000.00	13,500,000.00	17.39	PR

TYPE OF DEVELOPER - PRIVATE

PROJECTS THAT USED INTEGRATED CONTRACTS

CODE	PN	OCP(WEEKS)	FCP(WKS)	%TOR	OCC(KSHS)	FCC(KSHS)	%COR	TOD
9a	1	52	87	67.30769231	12,500,000.00	12,500,000.00	0	PR
9 b	2	60	64	6.666666667	12,000,000.00	12,900,000.00	7.5	PR
21b	4	52	58	11.53846154	15,900,000.00	18,900,000.00	18.87	PR
17 b	5	38	40	5.263157895	26,000,000.00	25,700,000.00	-1.154	PR
			MTOR(%)	55.70718017		MCOR(%)	10.75	

From the above, it can be seen that Public Projects had higher mean cost and time overruns than Private Projects

REFERENCE KEY

ABREVIATION	MEANING
PN	Project No.
OCP	Original Contract Period
FCP	Final Contact Period
% TOR	Percentage Time Overrun
OCC	Original Contract Cost
FCC	Final Contract Cost
% COR	Percentage Cost Overrun
BPC(C)	Best Perceived Contract for Cost Performance
BPC (T)	Best Perceived Contract for Time Performance
T	Traditional Contract
I	Integrated Contract
MTOR (%) *	Mean Percentage Time Overrun
MCOR (%)	Mean Percentage Cost Overrun
DTOR(%)	Deviation Time Overrun
DCOR(%)	Deviation Cost Overrun
SQDTOR(%)	Squared Deviation Time Overrun
SQDCOR(%)	Squared Deviation Cost Overrun
STDTOR(%)	Standard Deviation Time Overrun
STDCOR(%)	Standard Deviation Cost Overrun
PU	Public Project
PR	Private Project

**CALCULATION/
EXPLANATION**

((FCP-OCP)/OCP))X100

((FCC-OCC)/OCC))XIOO

(SUM OF % TOR)/NO OF PROJECTS)
(SUM OF % COR)/NO OF PROJECTS)
%TOR-MTOR%
%TOR-MTOR%
Squared(%TOR)
Squared(%COR)
Square root of((SUM OF % SQDTOR%)/NO OF PROJECTS))
Square root of((SUM OF % SQDCOR%)/NO OF PROJECTS))