THE ROLE OF PROCUREMENT METHOD IN PROJECT PERFORMANCE: A COMPARATIVE STUDY BETWEEN TRADITIONAL AND ALTERNATIVE METHODS

BY

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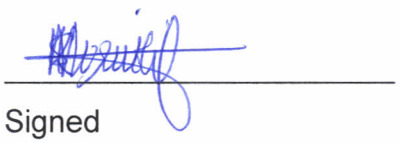
DECLARATION

I, Stephen Karimi Muriithi, hereby declare that this project is my original work and has not been presented for a degree in any other university.



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DECLARATION OF SUPERVISOR

This project has been submitted for examination with my approval as University Supervisor.

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ABSTRACT

Procurement is an important area of construction dealing as it does with the overall planning, management and organization of a project from inception to completion.

The procurement of construction projects in Kenya as with many other commonwealth countries has since independence been dominated by the traditional procurement method and a comparison of the kind undertaken in this research would not have been possible some time in the past. In the last few decades however, new methods of procurement have been developed whose main deviation from the traditional method is the emphasis on management and/or project integration.

A lot of benefits have been claimed to accrue from use of the contemporary procurement methods particularly with regard to the three pillars of project performance namely programme, budget and product also referred to as time, cost and quality performance. It was found necessary therefore to study a sample of projects that have used each of either traditional procurement methods and the contemporary procurement methods to try and determine if the claimed benefits indeed exist in the local context. The study concentrates on time and cost performance of these projects. Another area of study is on whether proper consideration is given to the choice of procurement method that matches the needs of the project and the evaluation is done using a client priority based evaluation chart.

The findings that emerge show that indeed, projects that were carried out using the alternative procurement methods performed better in terms of adherence to programme and budget and this findings are confirmed by a statistical test of hypotheses. It also emerges that in many projects, the procurement method selected may not have been the best as it did not match the needs of the project thus putting

a question mark on the popular rule of thumb method for selection of procurement method. It is also noted that many consultants, even those whose projects used the traditional procurement method knew of and believed the contemporary procurement methods can give better cost and time performance.

In view of this, it is recommended that growth of the contemporary procurement methods be encouraged. It is hoped that this research will be a step forward in the quest for better performance of construction projects with particular regard to this important subject of procurement.

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1.0 CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The construction industry is one of the most important sectors of the economy. Here in Kenya, there are statistics to confirm this position. This is in terms of employment where it is among the seven highest employing sectors accounting for 4.43% of total employment (Statistical abstract 2004) due to its labour intensive methods of operation, and in terms of its input towards macroeconomic stability due to its well recognized forward and backward linkages to other industries. (Grunberg, 1997).

In addition, Grunberg (1997) notes that construction plays an important role in the economy as it produces and maintains the built environment consisting of infrastructure, commercial and industrial buildings and housing. These buildings are needed for production to take place and can be seen as investments in the assets of a country.

An economy's productive capacity is influenced by its stock of fixed capital including buildings and machinery also referred to as Gross Domestic Fixed Capital (GDFC). In some economies almost half of GDFC is in buildings (Grunberg 1997). The construction industry therefore plays a vital role in a country's rate of gross fixed capital formation and economic growth. In Kenya this industry contributed 23.45% of gross fixed capital formation in year 2003 (Statistical abstract 2004).

Despite this importance of the construction industry to the country, it can be deduced from studies by Mbatha (1986) and Talukhaba (1988) that its full potential has not been exploited and that various problems have been allowed to hinder the achievement of this potential. Some of these problems that lead to inefficiency are among others time overruns, cost overruns, poor quality and functionality, adversarial relations and a lack of proper working relationship between the various

participants in the industry (Mbatha 1993). Participants include contractors, project managers, architects, quantity surveyors and engineers.

In addition, Kenya like many other emerging economies has for many years grappled with a serious problem of corruption particularly in the public sector, widely reported in the press, leading to heavy losses of national funds greatly needed for provision of public services and for development projects. Cases have been reported of officials colluding with suppliers to supply goods at exorbitant prices among other malpractices (Daily Nation July 21, 2005). This is despite the fact that rules have always existed detailing procedures to be followed to ensure transparency and fairness in awarding of public tenders.

Due to this situation, government with the urging of international groups in 2000 published the "Exchequer and Audit (public procurement) Regulations of 2000" (Kenya gazette supplement number 24, 2000), with very strict rules of procurement procedure. These rules have caused discontent widely reported in the press due to their cumbersome nature which has slowed down public procurement and led to delays in project implementation and thus arguably becoming a hindrance to economic growth.

It's also arguable that the private sector is not spared from the problems related to procurement that bedevil the public sector. Mbatha (1993) notes that the poor time and cost performance observed for government projects in Kenya characterize to a large extent, the whole Kenyan construction industry. The problem may be less acute in the private sector. This is demonstrated by Talukhaba's (1988) thesis finding that while public projects had a mean percentage cost overrun of 51% and mean percentage time overrun of 112%, private projects had a mean percentage cost overrun of 12% and a mean percentage time overrun of 30%. It can be said therefore that the spotlight on the public sector is necessitated by the public interest in the affairs of government and that there are many areas of possible improvement across the whole industry.

For a long time the traditional procurement systems also referred to a designer led competitive tender with slight modifications have dominated the construction industry in Kenya (Mbaya, 2004).

One of the ways of increasing efficiency is to address the issue of procurement as this is one of the most important initial steps in a construction project process which if it goes wrong affects the entire project. It is also worthwhile for the industry to rethink its overwhelming dependence on one method of procurement namely the traditional method in an age when many other methods have already been developed and are widely in use particularly in developed countries.

According to Michael (1991) and Talukhaba (1988) the Kenyan construction industry essentially adopts the traditional procurement method in its organization and management of projects. This dependence on traditional procurement methods is particularly more grounded in the public sector where nearly all projects are carried out using that method and other procurement methods are only used rarely for example where aid and donor agencies insist on it, having seen it practiced in their countries to produce better project performance. Even in the private sector, the traditional procurement method is still the most common and this is demonstrated by Katani (2001) where out of 15 private sector projects sampled there was only one carried out using contemporary methods while all the others were carried out using the traditional method.

There has been gradual change however in the industry and today more clients are embracing the new procurement methods in their quest for better project performance. It is currently not difficult to count more than twenty firms that list construction management or project management as one of the core areas they are engaged in, many of them having experience and still being involved in the traditional built environment professions mainly quantity surveying, property management, architecture or engineering.

To underline the importance attached to procurement in efficient project implementation the British government in May 2000 overturned 200 years of English construction practice and theory when Treasury advised central departments that any procurement system that separated design from construction would no longer be used thus locking out the traditional procurement system. Instead three other systems were to be used namely Private Finance Initiative (P.F.I.), Design and Build and Prime Contracting. The reasons for this action was the feeling that traditional procurement methods limit the opportunities of eliminating wasteful activities and achieving value for money declaring for example that PFI projects were being delivered on time and within budget unlike previously when government construction projects were alleged to have overrun in time by upto 70% and exceeded budget by upto 73%. (Nisbett 2004).

This was by any standards a momentous decision, which was necessitated by the realization of the benefits to be gained through adoption of well selected procurement systems particularly those that allow higher integration between project phases and also between participants. There is evidence to show that procurement methods in the building and construction industries of other countries that practiced traditional procurement systems like Australia, New Zealand, South Africa and Canada are shifting away from traditional methods due to its poor performance in terms of cost, time and quality, contractual claims and litigation, adversarial attitudes resulting to claims and disputes, poor constructibility and perceived lack of customer/user focus to more efficient and client friendly alternative procurement methods (Mbaya, 2004).

Considering that our construction industry as with many other Commonwealth countries is modeled along the lines of the British system, it is only a matter of time before the effect of the foregoing changes are felt locally.

Some of the main alternatives procurement systems as identified by Turner (1997), Mastermann (1996), peck (2005) Hovet (1994), Seely (1997), Construction Management Association of America (C.M.A.A) (2005), Yakowenko (2004) and Mcdermott (2005) include:-

a) Integrated procurement systems
   - (i) Design and build
   - (ii) Variants of design and build – package deal and turnkey.
   - (iii) B.O.O.T

b) Management oriented procurement systems
   - (i) Management contracting
   - (ii) Construction manager – at-risk
   - (iii) Construction management
   - (iv) Design and manage
   - (v) Agency construction management/professional construction management.

These are looked at depth in the literature review.

Apart from the procurement method, Talukhaba (1988) identifies other variables that affect the time and cost performance of construction projects and in extension therefore the efficiency of project delivery as the tendering method, contract period, variations and delayed payments. Unlike procurement however, these affect particular aspects of project implementation whose effect is limited in scope and do not overhaul the whole organization and management of the project implementation process the way the change in method of procurement does, a fact that Talukhaba (1988) is cognizant of when he reckons that better performance may be achieved by improvement in organization and management than technical improvement in construction methods and technology.

1.2 Problem statement

Procurement is a very important part of the project implementation process and also because of the fact that it has to be done at the beginning of a project, the selection of a procurement path does to a great extent determine the success of all the other stages of a project and of course the final product. According to Mastermann (1996), procurement is a fundamental aspect of the building process that requires early and particular attention if success is to be achieved as it involves the selection of the most appropriate organization for the design and management of the project.

According to Walker (1989), (cited in Mcdermott 2005), an appropriately designed organization structure for a project will provide the framework within which the other factors that influence the effectiveness of the project management process have the best chance of maximum performance in the interest of achieving the client objectives.

Studies by Mbatha (1986) and Talukhaba (1988) demonstrate a poor performance record for the Kenyan construction industry pointing to a lack of appropriate overall organization and management of projects which as seen above are the roles of a procurement method. It is therefore important to study how proper selection of the procurement methods can improve project performance.

Noting that procurement deals with the overall planning, management and organization of a project, Sidwell (1984), states that more recently, researchers have become interested in the organization and management of the building process, the philosophy being that much better performance may be achieved by improvement in the organization and management of projects than technical improvements in construction methods. The manner in which a building team and the building process are organized has a great influence on project cost and time and a number

of researchers have concluded that management is a crucial element in project success. (Mcdermott, 2005; Sidwell, 1984)

The level of management and the structure of organization of construction projects have an important relationship to the choice of procurement method. The procurement method chosen may highlight diversity of the participants and increase fragmentation thus inducing problems in communication, co-ordination and control and result in poor performance. According to Sidwell (1984), research has shown that the problems of differentiation and fragmentation can be overcome by application of particular management procedures and integrative mechanisms. Recognizing that these management procedures and integrative mechanisms need to be carried within the framework of a procurement method, he continues to argue that though traditional contracting methods are good, alternative forms of procurement such as design and build, management contracts and project management can produce better performance.

According to Yakowenko (2004), many factors determine the success of a project. But one factor that is increasingly important is the selection of the best and most appropriate project delivery method or combination of methods.

In view of this therefore, the case as is currently in Kenya where the traditional system has dominated the construction industry (Mbaya 2004) and where almost every project is carried out through the traditional method of procurement almost as a granted does not augur well for a country that values the benefits of an efficient construction industry. This is because each project must be carefully matched with the appropriate procurement method as a first step in ensuring efficiency and growth of the industry.

Even where the traditional procurement method is not the one applied, it is important to know if proper consideration given to the appropriateness of the procurement

method to the project as this may contribute to poor project performance and inefficiency as not every procurement method is suitable for every type of project.

It is important therefore to show the extent to which the choice of a procurement path affects the success of a construction project.

Some of the failures that point to inefficiency in the Kenyan construction industry as identified by among others Mbaya (2004) and Talukhaba (1988) include:

- Poor performance in terms of time, cost and quality.
- Adversarial attitudes between participants leading to poor communication, claims and disputes.
- Poor constructibility of designed facilities, poor workmanship and specification usually blamed on the separation of design from construction as is the case in traditional procurement system.
- Lack of customers focus in that there is little involvement and consideration of the user in project decision-making processes leading to poor functionality of constructed facilities.

Talukhaba (1988) demonstrates the problem in his finding that about 70% of projects initiated have a chance of overrunning in time with a magnitude of up to about 53.3% while 53.7% of projects overrun in cost by up to 20.7%. He writes that in recent years interest has developed in the management and organization of construction and an accusing finger is pointed at the methods of procurement the predominant one being traditional. He further recommends research on the improvement of performance of construction projects.

1.3 Objectives of the study

This study aims to achieve the following: -

(i) Investigate whether in the Kenyan context use of contemporary /alternative procurement methods improves project time performance.

(ii) Investigate whether in the Kenyan context, use of contemporary/alternative procurement method improves project cost performance.

(iii) Establish whether proper consideration is given in the choice of procurement method for construction projects in Kenya and whether the procurement methods selected by the clients and consultants match the client priorities.

1.4 Research hypotheses

The first hypothesis is that use of contemporary/alternative procurement methods i.e those that embrace management and integration can lead to improvement in project time performance.

Secondly, that use of contemporary/alternative procurement methods can lead to improvement in project cost performance.

The third hypothesis states that in majority of construction projects in Kenya, due consideration is not given to the selection of a procurement method that best suits the project and matches the client's priorities.

1.5 Significance of the study

A lot of literature exists on construction procurement and the new methods now available in the global market place. In Kenya, no comprehensive study has been done on whether the introduction of contemporary/alternative procurement methods has improved construction project performance. Although Katani's (2001) study appears to be close to this, it seems to have mainly targeted the variants of the traditional procurement methods and he infact recommends that a study be carried out on the performance of projects carried out through the contemporary (management and project integrating) procurement methods as compared to those carried out through the traditional method.

Mbatha (1993) reviewed various building procurement systems and proposed ideal project management systems for Kenya. The versions recommended were project management with main contractor option, project management with construction manager (onsite) option and collective responsibility. This study will help to show whether the application by the Kenyan constitution industry of these versions and any other management systems serves to improve project performance. It is recommended that one has in mind the fact that these systems are young in Kenya and still developing hence different results may emerge in future when they are fully developed.

This study will show whether the new procurement methods improve project performance and if this is the case, then the findings if implemented are expected to save the construction industry considerable resources considering that the high volume of resources used in construction means a small percentage of saving can result in much better performance of even the national economy.

It is expected that this research will shed light on this issue in a way that is applicable to Kenya and other developing countries. This is important considering the potential of the construction industry as a vehicle of economic growth, employment and wealth creation which all developing countries desire to accelerate.

1.6 The Study Assumptions

It is assumed that all the other factors in a construction project that affect its performance have a minor influence, which is constant irrespective of the procurement method used.

It shall therefore be assumed that the differences in project time and cost performance observed in projects procured through different procurement methods are as a result of the procurement method. Other factors identified by Talukhaba (1988) such as tendering method, contract period, variations and delayed payments mainly operate within the procurement method and are assumed if having an influence on the project performance to have an influence that is constant irrespective of the project procurement method used. This is supported by Walker (1989) (cited in Mcdermott 2005) as seen earlier who says that the organization structure (in this case provided by the procurement system) provides the framework within which the other factors which influence project performance operate.

1.7 Scope and justification

The study concentrates on construction projects completed within the last five years where the period between 2000 and 2005 is chosen and involves two main project participants namely project managers and quantity surveyors as these are the project participants who have most of the information on projects particularly regarding the administration of the projects and their performance from whom information shall be gathered through questionnaires. Although Architects have an influence in selection of procurement method and may therefore have more

information on its choice, it was considered better to approach quantity surveyors because of the other data required for this study which they can get more easily than the architects. In addition, secondary data was used although the extent of this was minimal e.g. data from government ministries and previous related studies.

The last five years are chosen as this allows for a period within which alternative procurement methods have been developed and available that could have been used. The period also allows for quicker and easier retrieval of data and stored information as it is not too long as to require the cumbersome retrieval of archived documents. Due to financial and time limitations, projects and participants shall only be sampled in Nairobi. This is considered to adequately represent the country as more than 50% of all building and construction works is carried out in Nairobi and this is justified by the year 2004 statistical abstract from Central Bureau of Statistics quoting figures for year 2003.

1.8 Operational definition of terms

Procurement:

Procurement in general English refers to a system by which an entity may obtain goods or services for a purpose. A lot of writers (mainly American) also refer to the procurement method as the project delivery method. (Turner 1997)

Procurement is also seen as a strategic management decision that enables a building owner to meet his building needs as effectively as possible and that the procurement strategies of all active building owners have an impact on the overall performance of the entire building industry (Mcdermott et al, 2005). Procurement is therefore a concept that is directed towards the aims of the client.

Mbaya (2004) defines procurement as the process that deals with construction project definition and delivery and the technical capabilities of the industry to deliver construction facilities. It refers to the strategic organizational management of

resources in a logical sequence in order to meet the project need for design, construction and delivery, the resources being time, money, equipment, technology, people, materials etc.

He says that fundamental to procurement is the development of a framework that brings together and establishes boundaries of roles, responsibilities and relationships between the parties to a construction project and the determination of the allocation of risks including those relating to time, cost and quality.

According to Yakowenko (2004), the project delivery method is the system that sets the contractual arrangements for project design, construction and in some cases, operation and maintenance. He says that it is vital that an acquisition strategy is established early in project development because of the direct bearing on both the management's organization of roles and responsibilities and risk allocation.

In summary and for the purposes of this research procurement is defined as the overall organization and management system adopted by a client for the purposes of delivering a constructed facility.

Project performance:

Project performance refers to the degree to which the organization mandated by the client to deliver a constructed facility achieves the implementation objectives primarily to do with programme, budget and product also referred to as time, cost and quality targets.

Tendering :

Tendering is a small or limited in scope function within the procurement method that deals with contractor selection and may be considered under open tendering, selective tendering, serial tendering and negotiated tendering (Ramus, 1996).

Type of Contract :

Type of contract is the arrangement that deals with the determination of the contract sum and amounts subsequently due to a contractor from an employer for work done. Types of contract may also be referred to as variants or subsets of the traditional procurement method and these may be considered under lumpsum contracts, schedule of rates contracts, serial contracts and cost plus contracts (Peters, 1981), (Ramus, 1996).

1.9 Summary

Having discussed the background against which the Kenyan construction industry can be viewed, this chapter has also shown why the construction industry is an important sector in the economy and therefore the need to put effort in finding ways of improving it.

It cannot be denied that the Kenyan construction industry has not performed well in terms of the most important performance criteria. This chapter has set out the objective pursued by the researcher in attempting to solve the problem and tentative solutions have been advanced.

In the next chapter the study focuses wholistically on the issue of procurement identifying what it stands for and how it can be applied to improve efficiency in construction. This information is based mainly on the works of authors and past researchers and it serves to lay the foundation for the collection and analysis of data.

2.0 CHAPTER TWO: LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter discusses the existing literature on the subject of construction and construction procurement universally and as practiced locally. The concept of procurement and the various methods of doing so are explored in detail in a way that serves to guide the study and focus it to the structuring of the data collection and analysis.

In addition, the main issues that define the nature of the construction industry are identified and discussed in detail and these are mainly to do with the concept of the construction project, the project participants, the project life cycle and the relationship of construction industry to the national economy.

All the major construction procurement methods are identified and discussed highliting their strengths and weaknesses, how they are used and in which types of circumstances they are most appropriate.

2.2 Construction and the economy

The discussions that follow highlight the importance of the construction industry in terms of its contribution to the national economy and therefore show why it is necessary to have it functioning efficiently.

Contribution to gross fixed capital formation

Grunberg (1997) states that construction industry plays an important role in the economy in producing and maintaining the built environment. The built environment consists of infrastructure, commercial buildings, industrial buildings and housing.

These buildings are needed for production to take place and can be seen as the investments in the assets of a country also referred to as gross domestic fixed capital.

An economy's productive capacity is influenced by its stock of fixed capital including buildings, plant and machinery. The stock of fixed capital also depends on the rate of capital consumption. In terms of built environment, capital consumption means that the building stock is in constant need of repair and maintenance otherwise building become obsolete, dilapidated and unfit for productive use. The stock of buildings may increase if the rate of additional new buildings and repair is greater than the rate of demolition and obsolescence.

In developing countries, construction contributes about half of domestic fixed capital formation. In the year 2002 the building and construction industry contributed a significant 24.55% of gross domestic fixed capital formation (statistical abstract 2004).

Contribution to National Income

The contribution of a particular industry to the economy can be measured by its contribution to the national income. As all income is earned for producing goods and services, the sum of the value of all goods and services in a given year can be used as a measure of the national income. This sum of value of all good and services produced in a country is referred to technically as the Gross Domestic Product (GDP). If net foreign earnings of a country are taken into account the sum of a country's earnings is referred to as Gross National Product (GNP) (Grunberg, 1997).

The contribution of the construction industry in Kenya to Gross Domestic Product in the year 2003 amounted to 4.5% being the 6^{th} highest among all sectors (Statistical abstract, 2004).

Contribution to employment

The contribution of the construction industry to employment in any country cannot be over emphasized. Indeed this is particularly so in developing countries like Kenya where mechanization of construction operations is still very low and the dependence on manual labour is still high. Employment in construction ranges from the highly educated professionals like project managers, architects, engineers and quantity surveyors to technician level employees, artisans to unskilled labour.

The bulky nature of construction operations means that it employs high amounts of labour particularly where mechanization is low thus where construction industry is active, it guarantees numerous employment opportunities to the citizens in all cadres of qualification.

The contribution of building and construction industry in Kenya to employment in the year 2003 amounted to 4.43% being the 7^{th} highest among all sectors (Statistical abstract, 2004).

Construction as a tool of government economic policy

Grunberg (1997) notes that government policies related to the construction industry are concerned primarily with meeting societies needs on one hand and the level of employment on the other. Partly because of the multiplier effect, the construction industry has been considered by governments as a suitable vehicle for economy policy. The government can give stimulus to the whole economy or even to specific regions by varying the magnitude and distribution of its expenditure on the construction industry.

Not only will people be employed in the construction industry but those construction workers will also create work for others as they go out to purchase goods and services using the income they now have. The construction work also creates

demand for goods of other economic sectors which produce raw materials for construction e.g mining and manufacturing.

In addition, whenever factories offices, shops or houses are built, industries which provide goods used in conjunction with buildings e.g furniture, carpeting and machinery will also be stimulated as demand for this goods complements the demand for buildings themselves. When considering the construction industry therefore, the extra jobs and incomes created in other industries should be borne in mind even where the cost of creating a job in construction may appear expensive itself.

2.3 The Construction Industry and the construction project

The construction industry has been defined by Chitkara (1998) as the total industry which involves the utilization of human, economic and natural resources in the conception, design and construction, maintenance and demolition of building and civil engineering works.

He reports that ever since the dawn of civilization, man has indulged in some form of construction activity. Even in ancient times, man created architectural marvels which came to be regarded as wonders of the world for example the pyramids of Egypt, the Great wall of China, the Angkor temples of Cambodia and the tower of Babel. In those days resources were not much of a problem and magnitude and magnificence of the final product was placed much higher than the economy and efficiency in resource utilization. In the present world, technical breakthroughs have revolutionized construction activity and resource constraints have become the norm rather than the exception. The economy and efficiency in resource utilization has become a great determinant of the success of construction projects.

According to Neale (1995), the most basic definition of a project is some form of human activity that has a beginning, a productive middle phase and an end creating

something that has not previously existed. In the construction industry, the project will create a building or a work of civil Engineering construction.

The project set up relied on by most construction work emphasizes the unique characteristics of the construction industry. This is seen in the transitory nature of the construction process where construction teams arrive on site, build and leave for the next project. In addition the work is site specific and yet the site may be in remote areas and far from the various offices of the project participants even sometimes in another country operating in a different social, economic and physical environment. The nature of the construction industry also usually requires that every product is unique in design and execution hence denying the industry benefits of repetition and standardization in addition to the product being bulky, large and expensive.

The fore going is also summarized by Ritz (1994), in what he calls the common traits of all types of construction as follows:

a) Each project is unique and not repetitious
b) A project team works against schedules and budgets to produce specific results
a) The construction team cuts across many organizations and functional lines that involve virtually every department in the company
d) Projects come in various shapes, sizes and complexities

Modern areas of construction include high-rise buildings, dams and irrigation networks, energy conversion and industrial plants and infrastructural facilities like roads, bridges, railways, airports and seaports, satellite stations, on shore and off shore oil terminals etc.

2.31 Project Participants

The client or promoter

The client is the potential owner of the constructed facility 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 client'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 developing countries like Kenya, government and quasi government agencies account for more than half of the demand for construction (statistical abstract 2004). This gives the government a major influence in the determination of the direction of the industry including the procurement process used and the general organization and management of the construction industry.

The consultants

Most clients 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 individual 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 consultants;

a) Project managers

In comparison to the other construction consultancies, 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. Project management is not as widely used in Kenya as the other consultancies but is catching up to emulate its involvement in the developed countries where it first started. As early as 1993 at least five-project management firms were identified two of them being well established in the business (Mbatha, 1993). Today many more firms have started and a directory search will reveal upto thirty firms that list project management as one of their core consultancies.

b) Architects

Under the traditional procurement method, the architect has been the leader of the design team and also 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 as both a 'doer' and manager at the same time has been criticized by the proponents of project management among them Mbatha (1993) who say that the two roles are conflicting as one cannot supervise over their own work. Even then, this supervision role of the Architect is mainly concerned with the proper implementation of design rather than the overall organizational management of the project which is more or less neglected under the traditional system.

c) Engineers

Engineering consultants in construction are of various types – 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.

d) Quantity surveyors

Quantity surveyors are responsible for costing and cost control in construction projects. They also prepare tender documents, advise on tendering methods and forms of contract, value work in progress and prepare final account. They do this as independent consultants mainly in building projects while their involvement in civil engineering is less dominant although still important as they mainly come not as independent consultants but as operatives within the civil engineer's or contractor's organizations.

The contractors

Construction companies form the backbone of the construction industry as they execute the construction works by using their skills and experience to manage and supervise the site assembly work and the attendant supply chain to arrive at the physical facilities. In the competitive construction business that requires special resources for different types of construction works, the contractors tend to specialize in a particular areas of construction. From this functional angle, the contractors are classified by Chitkara (1998) into the following categories:-

a) Building contractors
b) Civil engineering contractors
c) Specialist service contractors e.g electrical and mechanical service contractors

d) General contractors who engage in minor construction works of all types.

Moreover, 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 workload capability divisions e.g A-H for the Kenyan Ministry of Roads and Public Works, for purposes of awarding contracts.

2.3.2 Construction project life cycle

Although various construction projects differ in many ways, the life of a construction project follows a similar pattern with a definite beginning and an identifiable end. Chitkara (1998) identifies four stages that a construction project passes through between its inception and completion.

Inception

This is the stage in which the project process is initiated. It is in this stage that the client first contacts the professional team and outlines his requirements in the form of a brief. The consultant should analyze the needs of the client and develop the best solution. Though not always done, feasibility studies should be carried out at this stage to evaluate the projects potential by examining technical feasibility, economic viability and financial implications of the client's requirement and the proposed solution.

The important decision on the procurement method to be adopted for the organization and management of the project should be made as early as possible at this stage as this will determine the selection of the consultants and how the solution to the client's requirements is arrived at.

The selection of the team to handle the project is done during the inception stage.

Design Stage

It is at the design stage that the preliminary drawings and cost estimates are produced for discussion with the client. The design process then proceeds to produce scheme drawings and gain approval of the project from local authorities before the production drawings are prepared. The productions drawings show the intended final look of the facility and are the ones used to prepare the tender documents in addition to guiding the contractor in his execution of the works.

From the preliminary drawings to the production drawings and tender documents, the client must be involved as his approval of the design and cost estimates generated during this period determines to a great extent the ability to avoid future variation which may lead to time and cost overruns if the client belatedly realizes that a facility under construction does not meet his requirements or it is realized after tender that he does not have enough funds to finance the works.

Tendering stage

Once the drawings and tender documents have been finalized, it is time to invite bids from contractors to carry out the works in the process commonly referred to as tendering. Tendering may involve the following steps:-

(i) Preliminary inquiry to ascertain willingness of tenderness to submit a bonafide tender.
(ii) Prequalification of bidders to shortlist only those with adequate capacity to carry out the works.
(iii) Invitation to tender sent to the prequalified bidders.
(iv) Return and opening of tenders
(v) Evaluation of tenders

(vi) Tender award to the selected bidder.

The tender documents are the documents issued to tenderers containing information on the nature and scope of works and the applicable rules and conditions. Tender documents may include the following:-

(i) Bills of quantities
(ii) Contract drawings
(iii) Specifications
(iv) Instructions to tenderers
(v) Forms of surety undertaking (bid and performance bond forms)
(vi) Form of tender
(vii) List of proposed domestic sub-contractors

After tendering has been completed and the contractor chosen, the project process moves to the execution or construction stage.

Construction Stage

It is during this stage that the project moves to site. Depending on the procurement method, construction at the site is usually supervised and carried out by two separate agencies. These are: the client's team led by the architect or project manager and the contractor workforce managed by his construction manager. Both teams have the common goal of completing the project in time and within specified costs and quality specification.

The involvement of the consultancy team in the site work execution varies depending on the procurement method applied. In the traditional method, the consultancy team only makes regular site visits to inspect the works and ensure that it conforms with the design and that the client interest is safeguarded. Reduced

involvement is enabled by the presence of a single main contractor who co-ordinates his work and that of sub contractors.

In the alternative procurement systems 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)

Some forms of alternative procurement actually involve only one organization being responsible for both design and execution in what may be seen as complete integration e.g design and build forms of procurement and Build-Own-Operate-Transfer (B.O.O.T)

The completion of the construction phase of the project includes certain follow up actions necessary to ensure that the facility constructed functions satisfactorily. These include:-

(i) Handing over of the project to the client by the project team

(ii) Preparation of project completion report showing the scope and schedule of work, important events, equipment maintenance manuals and as built drawings.

(iii) Post completion maintenance period of between 6 months and one year which is the responsibility of the contractor.

(iv) Where necessary, the client staff and workers for operating and maintaining the facility are trained prior to their taking over.

2.4 Procurement

A simplified description of procurement is given by Joy (1991) who describes procurement as all activities necessary for obtaining supplies and services from outside your organization and their delivery.

However, due to the complexity of the process of delivery of such goods and services in the context of construction, a more elaborate definition of the process is called for. In this light, Turner (1997) refers to the procurement path as a "game plan" where the client identifies his priorities and designs an appropriate path of achieving them.

Mbaya (2004) gives a more fitting definition by describing procurement as the process that deals with construction project definition and delivery. It involves the strategic organizational management of resources in a logical sequence in order to meet the project needs of design, construction and delivery. He confirms the development of the project organization as the responsibility of procurement in that procurement develops the framework that brings together and establishes boundaries of roles, responsibilities and relationships between parties to a construction project and the determination of the allocation of risks including those related to time, cost and quality.

Masterman (1996) also describes procurement as the organizational structure adopted by the client for the management of design and construction of the project. It is the amalgam of activities undertaken by a client to obtain a building or other constructed facility.

The procurement method chosen for a construction project therefore refers to the way that the various projects participants are organized and their relationships and the management of this project organization through out the project life cycle from inception to completion to achieve the project objectives. According to Mastermann

(1996), the choice of building procurement systems available is now so wide that the need to carry out the selection process in a disciplined and objective manner should be self evident, but the fact that such a course of action is not followed for most projects suggests that the philosophy and advantages of a systems approach to both the detailed and general management of construction projects is still not widely accepted.

2.5 Objectives of a good procurement method

The procurement method should first aim to achieve the three basic project objectives of time, cost and quality. Clients are increasingly demanding that all three of these aims are achieved (Neal 1995), (Collins et al, 2004).

The goals and objectives of procurement must indeed be the goals of the project to which it owes its existence. 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 quality, time and cost targets), and that the whole system of construction management exists to ensure these goals are met.

According to Peck (2005), there are five key considerations in developing a construction program that inform the choice of procurement method and these include:-

a) The budget

The owner has an obvious need to determine a realistic budget before a design is created – 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 owner requires that the project be completed at or a near the established figure without excessive overruns.

b) Design

It is of foremost importance to the owner that the designed facility function as envisioned – that the design program successfully fulfils the needs of the owners and user's. Therefore an owner requires that his design team be well qualified in the type of facility designed. In addition, the owner must ensure that the owner's and users' programme needs are clearly conveyed to the design team. Since the design of the property must be buildable and properly communicated in order to be useful, the owner requires that the design documents are constructible, complete and coordinated. The documents should properly incorporate unique features of the site including sub surface conditions, interface with adjoining properties, access and other characteristics.

c) Schedule

The date of completion of the new facility is usually 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 performed early in the planning process. The schedule should then be monitored through out design and construction.

d) Risk assessment

The development of any facility involves many risks. In construction, issues of risk are closely tied to schedule and budget issues. The owner requires an understanding of the risks involved in construction, and should make a decision regarding accountability and allocation of these risks among project participants. In considering risk allocation, the owner should strive to assign risks to those parties that exercise control over those aspects. For example, it would typically be problematic to require that the contractor correct problems due to design errors at no

extra cost since a contractor generally has little control over the cause or magnitude of such errors.

e) Owners level of expertise

The owner's familiarity with the building process and the level of in-house management capability 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 procurement method

According to Mastermann (1996), achieving adequate functional performance and the right level of quality is usually the dominant primary objective in most construction projects. Unless the completed facility is suitable for its purposes and intended use, the clients needs will not have been satisfied and value for money will not have been achieved.

The client must therefore establish a minimum acceptable level of functional performance and quality for his project at an early stage and ensure that the brief accurately reflects his needs.

f) Variants and secondary objectives

The primary objective of time can have a number of variants for example:-

a) Reduction of project duration from inception to completion to the minimum in order to ensure rapid return on investment funds
b) Shorter construction period to minimize disruption for existing operating facility.
c) Commence construction process quickly to satisfy political pressure or to facilitate the needs of the clients expenditure programme.
d) Carry out the design and construction of the project in such a way as to enable a specific construction completion date to be met.

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.

Different categories of clients according to Mastermann (1996) may have different sub goals within the overall cost objective for example;

a) Public clients will require that the project is tendered openly often on a fixed lump sum price basis and the lowest tender be selected. That price is then expected to be subject to minimal change over the life of the project.
b) Other clients 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.
c) All clients want value for money but some may be prepared to authorize additional expenditure during the construction period if it guarantees them enhanced performance of the constructed facility and more efficient operation.

Masterman (1996) also identifies some secondary objectives that clients may require for their construction projects including:-

a) The need to use members of the clients specialist staff, own labour force or services offered by subsidiary sister companies.
b) The provision of training courses for the clients proposed workforce who will eventually operate the new facility.
c) The use of the clients existing plant or structures within the new project.
d) The transfer of maximum risk to parties other than the client.

e) 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.
f) The achievement of minimum maintenance or running costs.
g) The need for single point responsibility.

Having determined the primary and secondary objectives of a project and incorporated this into the brief, it is necessary to compare these requirements with the characteristics of each of the available procurement methods in order to identify the best match that can be achieved between the two. Although it would be unusual to achieve a perfect match, this exercise provided it is carried out systematically will ensure that the most appropriate procurement system is chosen.

2.6 Criteria for selection of a procurement method

Proliferation of different procurement routes necessitates systematic method of selecting the most appropriate procurement route for each particular project (Gichunge 2000). The majority of available methods and aids that can be used to select the most appropriate procurement route for a particular project are based upon the matching of the clients requirements and the characteristics of the various arrangements for designing and constructing buildings.

According to Yakowenko (1994), there is no one size-fits-all procurement method for every project. The appropriate use of a particular method will depend on many factors. In selecting a procurement method that is right for a project, owners should gauge the level of complexity and uniqueness of the project, and maintain an appropriate level of control. Some of the key factors for owners to consider include:

a) Size of the project

The more complex and costly a project, the greater the need for professional management and advice.

b) Owner capabilities

It is important to realistically assess in house capabilities in evaluating project procurement methods and construction management capabilities.

c) Time considerations

If the project needs to be constructed in a severely constrained time frame, methods adapted to fast track construction should be considered but also weighed against the increased cost and risk of fast tracking.

d) Likelihood of changes

If the scope of work cannot be defined adequately or if requirements are likely to change considerately during the project, this factor should be evaluated against the potential cost of such changes.

e) Risk allocation

The contracting agency should perform a study to assess the appropriate allocation of risk associated with all phases of the project development process and the costs associated with this allocation.

Mastermann (1996) advances a rule of thumb method of selecting a procurement system as follows:

a) The traditional procurement system and its variants will enable a project to be completed efficiently and cost effectively provided the complete project documentation is available at tender stage.
b) Where design documentation is not sufficiently complete to allow the project to be effected, in accordance with the clients timing requirements, it will be necessary to implement the works by contemporary procurement methods.
c) Contemporary methods of procurement produce better performances, in terms of speed, in both design and construction phases of the project.

This criteria is however simplistic. Apart from time and completeness of project documentation at tender stage, it does not address itself to many other issues that a client may require a procurement method to offer for example;

a) Price certainty
b) Quality level
c) Accountability
d) Management
e) Risk avoidance

More detailed guidelines that may be used in the selection of a procurement route are advanced by Mastermann (1996) as follows;

a) Traditional procurement system is suitable for projects where:-
    (i) Competitive bids are required to ensure accountability and minimize costs.
    (ii) Time is of essence
    (iii) High standards of quality and functionality are required.
    (iv) Design changes may be needed during the currency of the project.
    (v) Complex and/or prestigious projects where design needs to be under the control of the client.

b) Integrated procurement systems are suitable for projects where:-

(i) Client requires the overall project period to be a short as possible but needs to be aware of his financial commitment at tender stage.

(ii) The client requires one organization to accept responsibility for both design and construction and, if necessary for all other aspects of project procurement such as funding, land purchase, training of management and workforce etc.

(iii) 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.

(iv) Total project costs need to be minimized

c) Management oriented procurement methods are suitable for use in projects where:-

(i) Commencement of construction needs to be accelerated in order to evoke speedy completion.

(ii) Early advice is needed from a management contractor or construction manager on design, buildability, programming, construction methods, procurement of plant and materials.

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

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

(v) Project is of high value and complexity and thus requires the use of sophisticated construction and management techniques in order to ensure success.

(vi) Client wishes to be objectively involved in overall management.

(vii) Where the client 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.

Since most projects by their nature will require various aspects offered by different procurement methods to varying degrees of preference, it can be very difficult to select a procurement method for a project using the above guidelines. It was found necessary therefore to develop selection methods that incorporate rating systems that can be used to score the suitability of a procurement method in comparison to another depending on the priorities of a particular project/client.

In order to develop a rating method Seely (1997), Mastermann (1996) and Turner (1997) reports of nine point procurement assessment criteria developed by Bennet and Grice for Business Round Table 1995 as follows:

a) Timing

Deals with how important early completion is to the success of the project. Timing or programme is recognized as the principle reason why the traditional procurement route has lost a lot of its previous preeminence to procurement by the contemporary methods. 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 under the different procurement routes.

b) Controllable variations

Refers to the ability to control the effect of altering 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.

c) Complexity

Refers to the degree of technical advancement and level of servicing of a building. Complexity is important in deciding procurement because simple construction may be purchased one way and complex design and construction another way. The complexity of the function of the building is not necessarily significant but the complexity of the construction itself and of the environmental services of the facility are usually significant.

d) Quality Level

Refers to the level of quality required in the design and workmanship. Though quality is a subjective value, it is possible to compare between a project and another. Quality can be made objective by specification and the quality of the product offered should then be capable of being checked against the specification. Different procurement methods under similar circumstances may offer different levels of quality and prestige. Quality performance is also one of the three critical objectives that form the iron triangle.

e) Price certainty

Refers to the ability of a procurement route 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.

f) Competition

Deals with whether the client wishes to choose the construction team through price competition. Apart from building contractors who are used to competing on prices in

order to get jobs, designers are also now being required to compete on quality of service, reputation and invariably fees. Most public clients require that the construction teams be selected through price competition.

g) Management

Deals with whether the client would like to manage separate contractors and consultancies or would want just one firm to be responsible for carrying out the project. A client will need fewer management resources if the number of companies working for him are fewer and responsibility concentrated in fewer places is easier to manage and direct.

h) Accountability

Refers to whether the client wants direct professional accountability to him from the designers and cost consultants. For example if a client wants one organization to be responsible and accountable for both design and construction, then design and build procurement is most appropriate.

But if he wants to use his own team of consultants and contractors, and can recognize and manage and accept the division of responsibilities so created, the traditional and management routes will be more appropriate.

(i) Risk Avoidance

Deals with the allocation of time and cost risks and/or their transfer from the client. A client will require a procurement route that allows him to deal with risks in the following ways:

a) Identify his ability to take risk and assess the effects that the occurrence of each risk would have on him.

b) Identify risks that should be avoided if possible or transferred
c) Formulate a policy of managing risks that cannot be avoided or transferred

Using the above nine point criteria, a rating checklist (Evaluation chart) shown in figure 1 below can be used. To use this checklist, you need to study the list of project priorities A-I, considers each in turn and decide which option (1-23) most likely reflects your preference. Then move along the line and note where each procurement route gets a positive score. When every priority has been marked, the scores in each column are added up to give comparative totals. Extra weight may be given to certain priorities by giving a score of more than one. The procurement route with the highest total score should then be chosen.

Figure 1 - Client priority checklist for rating procurement options (Evaluation chart)

					(Traditional) Lumpsum contracting		(Contemporary) Design and build			(Contemporary) Fee Construction		(Contemporary) Design and manage	
					Sequential	Accelerated	Direct	Competitve	Develop & Construct	managem't contracting	Construct'n managem't	Contractor project manager	Consultant project manager
A	Timing	How important is early completion to the success of your project?	Crucial	1		•	•			•	•	•	•
			Important	2		•	•	•	•	•	•	•	•
			Not as important as other factors	3	•								
B	Controllable variation	Do you forsee the need to alter the project once it has began on site?	Yes	4	•	•				•	•	•	•
			Definitely not	5			•	•	•				
C	Complexity	Does your building need to be technically advanced or highly serviced?	Yes	6	•	•				•	•	•	•
			Moderately so	7		•	•	•	•	•	•	•	•
			No just simple	8	•	•	•	•	•	•	•	•	•
D	Quality level	What level of quality do you seek in the design and workmanship?	Basic competence	9			•	•					
			Good but not special	10	•	•	•	•	•	•	•	•	•
			Prestige	11	•	•				•	•		
E	Price certainty	Do you need to have afirm price for the project construction before you can commit it to proceed?	Yes	12	•		•	•	•	•		•	
			A target plus or minus will do	13		•					•		•
F	Competition	Do you need to choose your construction team by price competition?	Certainly for all works contractors	14	•			•	•	•	•	•	•
			Works & construction management teams	15	•				•	•		•	
			No, other factors more important	16		•	•						
G	Management	Can you manage separate consultancies and contractors or do you just want one firm to be responsile after the briefing stage?	Can manage firms	17	•	•			•	•	•		
			Must have only one firm for everything	18			•	•				•	•
H	Acountability	Do you want direct professional accountability to you from the designers and cost consultants?	Not important	19			•	•	•			•	
			Yes	20	•	•				•	•		•
I	Risk avoidance	Do you want to pay someone to take the risk of cost and time slippage from you?	No, prefer to retain control & therefore risk	21							•		•
			Prepared to share agreed risks	22	•	•				•			
			Yes	23			•	•	•			•	
			Totals										

Source: Turner (1997), Seely (1997), Mastermann (1996). Developed by Bennet and Grice (Business round table 1995)

Mastermann (1996) has also reported a simpler rating system developed by Franks shown in the figure 2 below. The procurement systems are rated on their ability to satisfy seven basic requirements on a scale of 1-5. These ratings can be used as a guide to selecting the most appropriate procurement method depending on the project characteristics.

Figure 2 - Chart for rating of procurement systems with regard to client's performance requirements/ expectations

Client's performance requirements/ expectations		Traditional	Management contracting & construction management	Package deal & design and build	Project managemant & client representation
(a)	Technical complexity; the project has a very high level of structural, mechanical services or other complexity	4	5	4	5
(b)	High aesthetic or prestige requirements	5	3	3	4
(c)	Economy; a commercial or industrial project or other project where minimum cost is required	3	4	4	4
(d)	Time is of essence; early completion of the project is required	2	4	5	4
(e)	Exceptional size and/or admnistrative complexity; involving varying client's/user requirements, political sensitivity etc	2	4	4	5
(f)	Price certainty; is reqired at an early stage in the project design development	4	2	4	4
(g)	Facility for change/variation control by client, users or others during the progress of the works	5	5	1	4

Source: Mastermann (1996)

2.7 Procurement Methods

There has lately been a large increase in procurement methods available for use in construction projects involving different levels of management orientation and integration. The main divide however, is between the traditional procurement method also referred to as the conventional method and the contemporary methods. Contemporary methods are fairly recent compared to the traditional method and their emergence has mainly been driven by the perceived shortcomings of the traditional method in its performance (Mbaya 2004, Nisbett, 2004). Contemporary methods also invariably involve higher project integration or are more management oriented.

As explained in chapter three, for the purpose of this study, all the procurement methods shall be grouped in these two broad categories as either being traditional or contemporary procurement methods.

2.7.1 The Traditional or conventional procurement method

This method of procurement is also referred to as design-bid-build particularly in the American context and also as the lumpsum method (Seely 1997). The traditional method is still the most widely used in procurement of construction projects. The unique characteristic of this category of procurement 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. Various variants of the traditional system have been devised or have evolved over the years, as a means of mitigating the shortcomings of the basic system.

The traditional procurement method is as a result of economic specialization. An unfortunate consequence of this specialization is that the art of design has became separated from the science of construction, and the practitioners of one have little

opportunity to positively influence the other. In addition, this procurement method removes incentives for co-operation between the design and 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 (Hovet 1994).

Apart from the separation of design and construction the traditional procurement method exhibits a number of other basic characteristics;

a) Project delivery is a sequential process
b) Design of the project is usually completed before work commences on site.
c) 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.
d) Reimbursement of the clients consultants is normally a fee and expenses basis whilst the contractor is paid for the work completed on an admeasure or lump sum basis.
e) As design is fully developed at tender stage, clients are able to know their financial commitment before entering into the construction contract.
f) Drawings and bills of quantities (nearly always used for contracts of a reasonable size) provide a common basis of tendering and tender evaluation is relatively easy.
g) 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 procurement options.
h) 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.
i) Separation of design teams and construction teams during development of the project until tender stage may lead to the establishment of adversarial attitudes.

Peck (2005) cites the advantages of the traditional method as follows:-

a) Clients are able to know their financial commitment before entering into a construction contract.
b) Drawings and bills of quantities provide a common basis for tendering and allow for easy and objective evaluation of tenders.
c) The method is widely applicable and well understood with well established and clearly defined roles for parties involved.
d) It offers the owner a significant amount of control over the end product particularly since the facilities features are fully determined and specified prior to selection of the contractor.

It however also has disadvantages as advanced by Hovet (1994) among them:

a) The process is time consuming since all design work must be completed prior to solicitation of the construction contract.
b) 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.
c) 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.
d) The traditional approach tends to promote more adversarial relationships rather than co-operation or coordination among the contractor, designers and client.
e) The contractor pursues a least cost approach to completing the project, requiring increased oversight and quality review by the client and his consultants.
f) The absence of the contractor input into the project design may limit the effectiveness and constructability of the design. Important design decisions

affecting both the types of materials specified and the means of construction may be made without full consideration of a construction perspective.

According to Hovet (1994), while the traditional method emphasizes the choice of the construction team through price competition particularly in public sector projects, the lowest cost is not necessarily the most cost effective alternative. Lowest initial cost ignores the lowest on-going maintenance, operating and life cycle costs. It is assumed that the designers in the process of completing the plans and specifications, have designed the project with all these factors in mind and has arrived at a balance of the factors in keeping with the desires of the client. An experienced general contractor with cumulative experience has been excluded; indeed in the traditional method, the contractor must be excluded from sharing knowledge.

Given the designers' selection process, the amount of time necessary to develop plans, specifications, and bid documents and the required time to bid a project all carried out sequentially, many months may be consumed from the invitation of a project to the beginning of construction. This is cited as a negative against the traditional method as it leads to a high time requirement.

The traditional procurement process also eliminates incentives for the contractor, either before or after bid opening, to value - engineer 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 bidding contractor knows of a substitute for a specified item that is equally good but substantially less expensive. If such a contractor wishes to encourage the change in specifications to the less expensive alternative he would find it very difficult to do so under the traditional method as all as bids are required to be on a uniform basis.

Further, the contractor cannot bid the less expensive, but equal or better, alternative in the hope of winning the contract and later having the change formalized. A bidder

who makes his bid or proposal contingent on the client's acceptance of materially differing terms or specifications is required to be rejected. The contractor also has no incentive to identify the cost effective alternative after winning the bid. Since the selection is based upon competitive bidding with the sole criteria for selection primarily being the lowest bid, the contractor has no incentive to suggest cost saving alternatives on the current project to gain future work in the client agency.

In the traditional method, the contractor is obligated, to do two things: construct the project in accordance with the plans and specifications and complete the project within the specified time frame. The contractor has no incentive to suggest cost saving alternatives and even if the incentive did exist, he has no right or legal standing to suggest the cost saving alternative.

In the absence of financial incentives or legal standing to add value to a project, the bidding contractors' motivation is simply being awarded the bid and making a profit. This situation often leads a constructor to "hard bid" a project to subcontractors and accepts the lowest of the preferred bids, regardless of whether or not a contractor believes the bid realistically reflects the work to be performed. Although it is not the client's concern if a contractor makes money on a project or not, often a subcontractor will harm project quality or schedule once he realizes that he is losing money.

According to Hovet (1994), areas of responsibility, accountability, and liability in traditional procurement are initially quite clear. The designer is responsible for design, the contractor for construction. However, for problems arising after construction is complete, it is extremely difficult and expensive to ascertain liability. These types of problems for example, materials failures or structural flaws may occur several years after completion. 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 was due to workmanship in which case liability would rest with the contractor. It

may also be asked if the failure arose from misuse after construction in which case the client/occupier would be liable. Typically, the question of ascertaining liability, and the cost of pursuing a solution, is so difficult and expensive that the owner may well bear the cost of fixing the problem rather than pursuing damages.

The basic process embodied by the traditional procurement system can be subdivided into four sequential phases of a project life cycle.

a) Inception Stage

This is the stage at which a client establishes the need to build and sets out his requirements. He then appoints a design team normally led by an architect for building projects and an engineer for civil engineering projects.

b) Design stage

The design team prepares the drawings and cost estimates regularly consulting the client for his approval and guidance. They then get approval of the local authorities after which the final drawings and tender documents are prepared.

c) Tendering stage

This is the stage at which the construction team is selected usually through price competition. The tender documents are given to a number of short listed contractors who prepare bids and the lowest is chosen to construct the project.

d) Construction stage

Is the stage in which the construction works are executed by the contractor under supervision of the clients consulting team.

It is important to note that under the traditional method, the above stages follow each other sequentially. However some variants of the traditional method have evolved that allow acceleration of the project life cycle usually through overlapping of the stages. The main variants are:

a) Accelerated

A contractor is appointed earlier in the sequence of design on the basis of partial information either by negotiation or in competition.

b) Partial design of parts or elements of the work

A drawn and specified design is prepared by the clients design consultants and other parts designed by contractor are then incorporated within the construction contract.

In addition Ramus (1996), says the traditional method has evolved during the twentieth century to meet changing circumstances and technological development introducing variants (mainly seen to be dependent on the type of contract) but the essential principles still apply. These variants are:-

a) Based on firm bills of quantities
b) Based on bills of approximate quantities
c) Based on drawings and specifications
d) Based on schedule of rates which may either be
    i. Standard schedule
    ii. Ad-hoc schedule or
    iii. Bills of quantities from a previous contract
e) Based on cost reimbursement also known as prime cost or cost plus which may either be
    i. Cost plus percentage fee

ii. Cost plus fixed fee or
iii. Target cost

The traditional procurement method has been used by the majority of the clients of the industry for the past 150 years in order to implement their building projects (Mastermann 1996). A watershed in the use of the system occurred during the Napoleonic wars (1792-1815), when, as a result of the frequent disputes that arose between the clients and the separate tradesmen, involved in the 'measure and value' system current at the time, the British Governments office of works introduced competitive tendering of entire projects as a superior alternative.

By the 1850s 'contracting in gross' as the system was then known widely prevailed enabling 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 of less co-ordinated tradesmen. At the same time, surveyors were being used by groups of builders and eventually the clients, to take off from the architects drawings the quantities of materials required for estimating purposes and relieving the tenderers of the responsibility for their accuracy and sufficiency.

Mastermann (1996) reports that this system 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 the increase in the use of non-conventional procurement methods from the mid 1960s and the growth of contemporary 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.

This trend has continued upto the present time with clients satisfying their needs by increasingly using contemporary methods to the detriment of the traditional method.

2.7.2 Contemporary/alternative procurement methods

McDermott (2005) reports that since the late 1960s alternative approaches (as opposed to traditional method) to construction procurement have been of increasing interest to the UK industry. The number of different approaches to construction procurement 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 procurement over more traditional on conventional approaches. According to McDermott, the use of management forms of procurement 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 procurement remains the most widely used, with many clients preferring the cost advantages offered by such methods.

According to Ramus (1996), various alternative procurement methods have been devised since the early 1960s. He cites the following reasons why building owners and developers considered the traditional system no longer satisfactory:-

a) The rapidly spiraling costs of construction meant that large sums of money had to be borrowed to finance projects.
b) High interest rates meant that the time occupied by the traditional procedures resulted in substantial additions to the construction cost.

c) Clients were becoming more knowledgeable on construction matters and were demanding better value for money and an earlier return on their investment.
d) High technology installations required a high quality of construction.

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.

Locally in Kenya too, the construction industry has witnessed rapid awareness of alternative procurement methods and the growth of the number of firms offering construction management and project management service either exclusively or in combination with other consultancy or construction service is testimony to the acceptance of the alternative project delivery methods particularly in private sector construction.

It can be argued that the growth of alternative procurement methods locally has been hindered by lack of support and recognition by the government as it has continued to use the traditional procurement method for all its project apart from few cases of donor driven project where use of alternative procurement method has been a precondition to accessing the finances provided by foreign donors in whose countries alternative procurement methods are prevalent and accepted.

These contemporary procurement methods may be considered under 2 main categories.

a) Integrated procurement systems
    (i) Design and build
    (ii) Variants of design and build – package deal and turnkey.
    (iii) Build-own-operate-transfer (B.O.O.T)

b) Management oriented procurement systems

(i) Management contracting

(ii) Construction manager-at-risk

(iii) Construction management

(iv) Design and manage

(v) Agency construction management or professional construction management. (Mastermann 1996)

a) Integrated procurement methods

These allow involvement of the contractor's team right from inception of the project so as to benefit from his knowledge on construction technology, methods and buildability. They include:-

(i) Design and build

This is the procurement arrangement where one organization takes sole responsibility, normally on a lump sum fixed price basis for the design and construction of the whole project. With the contracting organization taking sole responsibility for both design and construction, the contractual and functional relationships between the employer, consultants and contractor are simplified when compared to most other procurement methods with communications being reduced in theory to a single channel (Mastermann, 1996), (Seely, 1997).

According to Yakowenko (1994) the owner selects an organization to complete both design and construction under a single contract. Once the contracting agency identifies the end result parameters and establishes the design criteria, the prospective design/builders develop proposals that optimize their construction abilities. The contracting agency than typically conducts a best value analysis, based on cost and technical factors such as design quality, timelines and management capability. Once the contract is awarded, the design builders become responsible,

for completing the design and all construction at the contracts fixed price, usually on a lumpsum basis.

Design and build enables owners to fix total project costs earlier in the project development process and may simplify and expedite project administration because design and construction are completed by a single entity. By fostering collaboration between designers and contractors, construction knowledge can be incorporated into design. Additionally, by giving the contractor more flexibility in the selection of design materials, and construction methods, this procurement method allows the design builders to provide innovation in the preliminary design.

Hovet (1994) defines design and build as a team based system organized to provide efficient design and construction processes, where the owner contracts with a single entity to provide the whole service. According to him, the client, the designer and the general contractor are teamed shortly after the need for a project is defined. The designer and the contractor are contracted with each other to form one entity, which then contracts with the client. The participants then work together to balance the competing priorities of initial construction cost, on-going maintenance cost, operating costs, life cycle costs, aesthetic design and user functionality and friendliness, and to design and construct a project that meets these priorities.

The process of design and build can then be said to be simple in that, once the decision has been taken to adopt this as the procurement method, the client only needs to prepare his requirements; obtain tenders and evaluate them on the basis of design, specification and price, acceptance of the appropriate tender; and the construction phase is undertaken. From the owner's perspective, the concept of having only one firm responsible for both design and construction is appealing (Yakowenko, 1994).

According to Mastermann (1996) a primary challenge in this method is ensuring that the client provides a clear brief to enable proposals to be formulated without

difficulty. The brief needs to be clearly presented and sufficiently comprehensive so as to leave the contractors with no doubt as to the precise wishes of the employer whilst at the same time giving them the freedom to make use of their technical and managerial expertise as well as their own available particular resources.

Opinion differs about how much information is needed before selecting proposals from prospective design/build teams. The American consulting engineer's council maintains that the client should also have a consultant design approximately 35% of the project. It is necessary for the client to supply detailed space and equipment requirements, site surveys, soil borings, outline specifications, budget parameters and scheduling requirements. For a public agency client, regardless of how much information it can provide, it must also establish a selection board and an objective system for judging proposals. Delineation of the system for judging proposals should be based on well defined performance specifications (Hovet, 1994).

The evaluation of design and build proposals and tenders has also been identified as problematic due to the difficulty of communicating the clients detailed requirements by means of a single brief without the assistance of drawings and bills of quantities as such a brief can be subject to various interpretations by the tenderers.

While the specifications used in the traditional procurement method are referred to as prescriptive, that is, set down as a direction, in the design and build method, the specifications should be what are referred to as performance specifications, that is, they describe the desired performance of an element of the construction. For example, in a library project, among the performance specifications could be something as complicated as "the design of the facility must encourage the use of alternative forms of transportation", and as simple as the facility must comply with all existing local authority and state laws". (Hovet, 1994).

The client, being inexperienced relative to the design services provider and the contractor, should initially only be concerned with the ultimate performance of the completed project i.e the project must perform by meeting the clients established priorities of initial construction costs, life cycle costs etc. Once the design/build team has been assembled, it is possible to couple those priorities with the cumulative knowledge, skills and resources of the team members to translate the performance specifications into prescriptive specifications for a construction project that meets the clients priorities.

In design/build method, accountability and liability for the project, from construction through life cycle is clear. Design and build mandates that the design services provider and the contractor are engaged under one contract with the client. The relationship between the design services provides and the contractor i.e who is the prime contractor and who is sub contractor to the other is unimportant. What is important is being able to assign sole responsibility for design and construction to whoever has the project construction contract.

This sole source of accountability greatly reduces the possibility of litigation arising from problems that develop with the project. In addition it reduces the need for change orders. Because the design services provider and the contractor have developed the design together, that joint entity is undeniably responsible for any omissions found during the course of construction just as it is responsible for failures after construction (Hovet, 1994).

The request for proposals selection process allows the client to base its decision on criteria in addition to the lowest initial construction cost. These criteria may include such things as past experience, reference checks, ability to stay on schedules among others. The request for proposals selection process, by focusing on all factors that make up a successful project, not just initial cost to construct, rewards the designer and contractor for their efforts at ensuring high project performance and enhancement of value for money (value engineering).

According to Yakowenko (1994) design and build procurement method is not necessarily right for every project. Some projects particularly those with major unknowns in scope, unresolved environmental or permitting issues or third party concerns that are not resolved are not suitable for design and build.

The main benefits of design and build method are accepted to be speed, single point responsibility and savings in cost. It however scores poorly with regard to functionality, aesthetic and quality and the prevailing attitude among most clients and architects is that it is most suitable for simple uncomplicated projects.(Masterman 1996)

(ii) Variants of design and build

Package deal

Package deals are very similar to design and build the fundamental difference being that while design and build provides a unique design solution to suit each particular client's specific requirements, package deal uses a proprietary building system in order to produce a scheme which is unlikely to satisfy all of the clients needs or constructs variations of a repetitive theme.

As the name suggests, the intention of the original concept was that clients would be able to purchase a total package "off-the-shelf" to speedily satisfy their building needs at an economic price in the same way as if they were purchasing any other large consumer article. A problem that may arise with package deal is that the use of proprietary systems that have not been tried and tested may result to serious failure and the client is well advised in such cases to arrange for the product to be examined by an independent expert.

Turnkey

In this method, one organization, usually a contractor, is responsible for the total project from design through to the point where the key is inserted in the lock, turned and the facility is immediately operational. The responsibility of the contractor when using the variant is thus extended to include the installation and commissioning of the clients process or other equipment and sometimes the identification and purchase of the site, recruitment and training of management and operatives and the arrangements of funding for the project.

The turnkey method was pioneered in the United States in the early 1900s and is extensively used in the private sector for the construction of process plants, oil refineries, power stations and other complex production facilities.

(iii) Build-own-operate-transfer (B.O.O.T)

B.O.O.T is a method that seeks to bring private sector participation in public infrastructure projects in order to ease the government's burden of financing and technical capacity. The B.O.O.T organization usually a consortium made up of construction and finance companies provides finance from its own sources and constructs the facility. The own and operate part occurs when the B.O.O.T organization retains the facility after completion for a specified period of time in which it levies charges by way of toll or a rent or fee to the users. In this way the B.O.OT organization is able to recover its investment. At the end of the operation of the facility by the B.O.OT organization, the facility is transferred back to the commissioning organization. Various variants of B.O.O.T exist e.g private finance initiative (PFI) and B.O.T (Build-operate-transfer).

Advantages and disadvantages of intergrated procurement methods

Mastermann (1996) cites the following advantages and disadvantages of integrated procurement systems:-

Advantages

- The single point contract between the client and the contractor that is unique to this category of procurement systems means that the client has the advantage of dealing with one single organization that is responsible for all aspects of the project.
- Provided that the clients requirements are accurately specified, certainty of final project cost can be achieved and this cost is usually less than when using other types of procurement systems.
- The use of integrated procurement systems 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.

Disadvantages

- 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 make 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 category of procurement systems, the clients control of this aspect of the project is less than when using other methods of procurement.

b) Management Oriented procurement methods

These are procurement methods that embody the application of management principles with the separation of functions of management from those of doing. One entity is responsible for the general coordination of all aspects of a construction project to ensure the objectives are met within resource constraints.

(i) Management contracting

Management contracting is a procurement method where an organization, normally construction based, is appointed to the professional team during the initial stages of a project to provide construction management expertise under the direction of the contract administrator. The management contractor employs and manages works contractors who carry out the actual construction of the project and he is reimbursed by means of a fee for his management services and payment of the actual prime cost of the construction (Mastermann 1997), (Seely 1997).

A management contractor, provided he is appointed during the early stages of a project, can be able to improve on function and quality by advising on buildability, construction methods and techniques and the economics of the proposed design to allow for speedy and economic implementation while meeting the client's needs. This requires that the management contractor is appointed before any decisions are taken regarding the detailed design of the facility.

The method has also been argued to improve on time performance as some of the trades can start on site while the design of others is being finalized. Time improvement is also realized on site resulting in speedier works completion.

The method however scores poorly on cost and it is argued that the absence of a tender sum when construction commences is a great disadvantage to the client.

The challenge in ensuring a worthwhile contribution to the project by the management contractor lies in preparing the design team to enter into an open dialogue with the management contractor on all aspects of the project and to ensure that he is well briefed as to the design constraints and clients requirements so as to avoid unhelpful and impracticable suggestions being made. The client must therefore ensure that his consultants are fully aware of and committed to the

philosophy of the system, are receptive to suggestions from the management contractor on any aspect of design and desirous of working as a team in finding solutions to problems that arise during both design and construction stages of a project.

(iii) Construction manager-at-risk

A mainly American variation of management contracting is construction manager-at-risk. This method provides the client with the services of a construction management firm that will typically provide recommendations for the project schedule, budget, and constructability during the design phase. In addition and unlike management contracting the client and the construction manager typically agree on a guaranteed maximum price for the construction of the project and then the construction manager becomes responsible for issuing sub-contracts and managing all construction, just as a prime contractor would under the traditional method (Yakowenko, 2004).

The client chooses a construction manager using qualification based selections procedures. Choosing a manager typically takes place at the same time or shortly after the client has selected the designer firm. During the design phase of the project, the construction manager represents the interests of the owner, providing valuable recommendations on constructability and cost reduction opportunities. When the design is partially complete, (60-90%) the construction manager submits a guaranteed maximum price to the owner and warrants that the project will be built at a price not to exceed that figure. The construction manager assumes the risk of meeting that price by functioning as general contractor and sub contracting most, if not all, of the construction work.

This method allows the construction process to start as design proceeds. In addition the incorporation of contractor's perspective and input into planning and design decisions allows reaching early agreement on project features and improves buildability.

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

(iii) Construction management

This is the method where management services 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 procurement method and management contracting, is that with this approach, the client enters into a direct contract with the individual works contractors. The construction manager then acts as the employer's agent when dealing with each of the separate contractors.

The construction manager should be appointed as a consultant during the initial stages of the project and has 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 contractors who are contracted directly to the client but co-ordinated, supervised and administered by the construction manager (Seely 1997).

During the pre-construction stage, the construction manager will be primarily involved in preparation of the project cost budget and the forecasting of the clients cashflow requirements together with the preparation of 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 construction manager controls the cost of the project against the agreed budget, estimates the cost of design and construction proposals, monitoring tender costs and adjusting the content of future work packages to ensure

adherence to the approved estimate. He also manages the programme to ensure time compliance, assesses interim application for payment together with the appropriate member of the design team and establishes the validity of variation claims.

With regard to performance, this method of procurement has not been shown to bring improvement in quality and functionability. It however scores well on time due to the ability to overlap design and construction as some packages can start immediately they are designed and the improved buildability brought about by the construction manager's input in the design process.

Cost savings will also arise 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 project 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.

(iv) Design and manage

In this method, a single organization is appointed to carry out both the design of the project and manage the construction operation. The single organization can either be a consultancy practice or a contracting organization with the later being elevated to a consultant upon appointment although the client may appoint an in-house consultant to supervise the project and will always appoint an independent quantity surveyor to oversee the financial aspects of the project.

All construction is carried out by means of work packages, which are either the subject of direct contract between the client and the package contractors (consultant variant), or contract between the design and manage organization (contractor variant). In the consultant variant, reimbursement is by means of a professional fee, and in the latter, by means of a fee together with the actual cost of common services and work packages.

This system like the other management oriented procurement systems saves time by enabling work to commence on site before the total design is completed. 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 requirements are achieved.

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 beneficial particularly in the improvement that is achieved in the relationships between the client and the design manager (Mastermann 1996) (Seely 1997).

(v) Agency construction management service/professional construction management

Agency construction management also called construction management for a fee, professional construction management or client representation encompasses a range of services provided by a construction manager on behalf of the owner. Peck (2005) argues that the agency construction management is not actually a procurement method in itself but that it in fact consists of a distinct set of services that are applicable to any procurement method. These services can be used by the client as necessary, to extend or supplement his own expertise, his own staff, to

manage the construction process and to help address some of the shortfalls of the project delivery method chosen.

A professional construction manager works as an agent to the client providing the benefit of independent, professional services on the owner's behalf through out the project. In contrast to some other project participants the agency construction manager has no vested interest in the project in either its design or construction and maintains a fiduciary duty to act on the client's behalf and to provide impartial advice concerning the construction project. As such, professional construction management firms should be selected based on qualifications and not on a cost or low bid basis (Peck 2005).

Services offered by the agency construction manager may be grouped according to the project phases as follows:-

a) Predesign and design stage

- Selection of design team – based on historical experience in the market the professional construction manager can assist the owner to select the most qualified design consultants to develop project plans and specifications. He can also assist the owner in evaluating various potential construction sites.
- Budget and cost estimating – preliminary budgets based on historical data for similar projects, will assist the owner in determining financial feasibility of the initial scope. More refined estimates are developed during the design process to pinpoint the necessary construction budget and provide a basis of comparison to contractor bids.
- Constructability review – a review of design plans and specifications will help the owner verify that the design as presented is clear to the contractor, poses no construction conflicts, and is economically feasible to build.
- Contract bidding – a professional construction manager can assist the client in prequalification of contractors and development of the tender documents

to ensure that the contractor selection process is fair and provides the best value to the client.

Most writers contend that professional construction management is most effective during the planning stages of the project, since it can provide the careful planning and organizational skills that can help prevent costly problems during construction. Properly executed services such as constructibility reviews and preliminary scheduling can result in significant risk reduction and cost savings especially in terms of limiting variations, delays and claims. Here the client can maximize the benefits of construction management in a professional advisory role through out the design and construction process because the construction manager has no stake in the construction contracting (CMAA, 2005).

b) Construction phase

- Construction inspection and surveillance – virtually all owners desire supervision of the construction work on a continuous or periodic basis to review progress, ensure compliance with specifications and plans, and to review housekeeping and safety issues.
- Periodic controls – these services are provided to ensure that the project is efficiently and effectively managed. They include maintenance of project correspondence, conducting progress meetings, handling submittals and requests for information, documentation of progress, review of payment requests, schedule reviews and schedule updates.
- Variation review – these services include negotiation of cost of variations with the contractor, coordination with consultants over design changes, determination of responsibility for changed conditions or coordination conflict and review of price and schedule changes.
- Project close out – this involves review of the project to ensure orderly and timely completion, including development of punchlists, monitoring of

implementation, training and warranty periods; resolution of outstanding issues; and review and analysis of claims or disputed issues.

The most frequently cited criticism of professional construction management is that it adds a level of bureaucracy to a project resulting in added costs. While it can be argued that this expense may actually reduce overall project costs, an owner can realize benefits of professional constructional management without necessarily committing to large increases in expenditures by supplementing his own project management and selecting a professional construction manager on a service specific basis.

It is possible to tailor the use of professional construction management services to a client's needs in order to provide the best combination of project control and cost. A public agency may for example have a large contingent of inspection personnel but may lack sufficient management experience to enact effective project cost controls. A client may wish to have more construction knowledge built into the design process by engaging a professional construction manager to perform a value engineering of constructability review. He may also desire enhanced scheduling expertise in coordinating his various designers and contractors.
Other clients may be very comfortable with their design team but may need assistance in finding qualified contractors to perform the work. Many clients use a professional construction manager's/ agency construction manager's construction close out services to resolve intractable problems on project that degenerate due to disputes with a contractor over schedule and delay issues (CMAA, 2005).

Advantages and disadvantages of management oriented procurement systems

Mastermann (1996) cites the fallowing advantages and disadvantages of management oriented procurement systems;

Advantages

a) The use of this category of systems enables commencement of the project to be accelerated, which in turn enables earlier completion to be achieved.
b) Early advice can be obtained from the contractor/manager on design, buildability, programming, materials availability together with general construction expertise
c) 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
d) The use of individual work packages to carry out all the construction work ensures that competition can be achieved on upto 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.

Disadvantages

a) One of the fundamental aims of this category of procurement systems 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 contractors fail to perform and affect subsequent parallel operations.

b) 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.

c) The whole question of maintaining quality control is problematic when using the procurement systems within 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.

d) 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.

2.8 Procurement in Kenya

Studies carried out by various researchers in Kenya confirm that the traditional procurement system is still the dominant method, selected almost by default for most construction projects. This is confirmed by Talukhaba (1988), Katani (2001) and Michael (1991). Katani (2001) after sampling 30 projects from both the private and public sector managed to get only one project that was carried out using any other method apart from the traditional method and its variants.

This state of affairs persists despite the fact that construction projects have continued to perform very poorly in Kenya against the important performance measurement parameters of cost and time as shown by Talukhaba (1988) and Mbatha (1986) thus strengthening the case for re-evaluation of Kenyans procurement methods. To solve this problem of poor performance, writers have time and again advocated for use of alternative procurement methods. While recommending the use of alternative procurement methods Gichunge (2000) says their feasibility should be studied.

Titmus (1990) while agreeing that a significant number of clients are disenchanted with the traditional method of contracting says the way ahead lies in closer

association between the professionals and the contractor to reduce the incidence of misunderstanding; improve communication, improve individual commitment through greater teamwork and identification with the project and to make the best use of contractors knowledge of project construction and organization. The foregoing can best be applied when using the alternative procurement methods.

2.9 Project Performance measurement

Traditionally, the distinction between good and poor performance of construction projects has 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 (Bryde et al 2004) (Collins et al 2004). This three criteria for 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 that this is done within the ever present resource constraints and indeed striving to consume the least amount of resources as possible.

In addition to these three Mbatha (1986) identified other additional criteria of project performance such as:-

a) Productivity
b) Rate of return
c) Value for money
d) Contractors, profit margin
e) Participants satisfaction.

Collins et al (2004) identifies an additional 21 project success criteria apart from the traditional three mentioned above. These include:-

a) Owner satisfaction
b) Cooperation between project teams

c) Meeting organizational goals.
d) Stakeholder satisfaction
e) Project management process – good project management practices
f) Profit gained by participants
g) Construction team members satisfaction
h) High standards of work
i) Achieving scope requirements
j) Cost efficiency of project
k) Risk management and mitigation
l) Change management
m) Repeat work – follow up business as a result of a particular project
n) Meeting international and national standards (ISO etc)
o) Safety
p) Project recognition – peers opinions and positive publicity
q) Satisfaction of user needs
r) Community acceptance
s) Personal development and enjoyable product environment
t) Continuing relationships among project participants after end of the project
u) Environment compliance.

As can be seen from the above most of these criteria are highly subjective and/or present greater difficulties in measurement.

Some researchers have also attempted to broaden the perspectives of project performance to include the impact on different groups of people involved in the project, long terms results yielded by the product for example the long term financial returns from the project and other abstract and psychological criteria. (Bryde et al 2004)

The three components of the iron triangle however still remain the most compelling and understood criteria of project performance. Of the three, quality is the most

difficult to deal with due to its subjective nature leading to difficulties of measurement thus as seen before, this study measures performance using the criteria of cost and time performance.

2.10 Causes of poor cost and time performance

Gichunge (2000), also citing Aniekwu and Okpala (1988) identified 12 factors which if not controlled cause cost and time overruns. By combining the minor ones that are related the factors can be reduced to nine including:-

a) 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.
b) Inclemental weather leading to stoppage of work, loss of expensive man hours and sometimes the destruction of works.
c) Delays in architects instructions, engineers instructions and details and work and material approvals.
d) Introduction of extra or additional work to the project leading to requirements for more financial and time resources.
e) Changes in design sometimes necessitating demolition of finished work and reconstruction to fit new designs
f) Delay in payment leading to suspension or slowing down of work and claims for interest.
g) Shortage of materials and plant required for incorporation in the works.
h) Delays caused by fire, earthquakes, floods accidents etc
j) Industrial and contractual disputes.

However and as supported by Walker (1989), the procurement system has a role in ensuring that these factors do not occur (except the acts of God) and if they do occur ensure that, they have minimal negative effect on the project success. Good planning, communication and co-ordination envisaged in a good procurement

system should for example ensure that enough site investigation is done to eliminate unexpected site conditions, that there are no delays in instructions, approvals and payments. It should also ensure that design changes and variations are minimized through well executed design phase, and that contractual and industrial disputes are minimized through effective communication, while accidents can be minimized through proper site layout, good activity planning and use of protective gear.

2.11 Summary

In this chapter it is seen that there is general agreement on the nature and capabilities of the traditional procurement method and its inherent shortcomings that led the construction industry to explore other methods of delivering constructed facilities. These new methods have been looked at in-depth and it emerges that there is no concrete figures on the extent to they have been able to improve project performance.

It has also been shown that it is possible to categorise all the various procurement methods into two major groups depending on the emphasis of the application of modern management and organization structuring and the integration of project phases. The two categories are traditional and contemporary or alternative methods.

Grouping the procurement methods in this way aids the clarity of the study by ensuring there are not too many variables. This is based on the consideration that many of these procurement variants have very little real difference in the organization and management system they propose for a construction project except probably for the fact that they are developed as different times in different geographical regions and named differently by their proposers.

The foregoing provides a good background for the next chapter on data collection where the two procurement variants are taken to the project participants for a *verdict.*

3.0 CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Study area and population

The study area is Nairobi. Apart from convenience and limitations as earlier stated, Nairobi adequately represents the situation in the country as majority of construction projects are carried out in Nairobi. Apart from the fact that more than 50% of all construction work is concentrated in the capital city (statistical abstract 2004), most other significant projects carried out upcountry are managed by professionals who travel from Nairobi to carry out that work (Gichunge 2000).

The researcher considered the projects that are likely to give the desired information and these are medium to large value projects carried out with the involvement of consultants in the range of Kshs. 20,000,000.00 upwards completed between year 2000 and 2005 as these are the ones likely to attract procurement methods alternative to the traditional one. Small and informal projects that do not involve consultants are not considered due to the difficulty of collecting data on them as most are not documented and do not use any classifiable procurement methods. The public sector almost exclusively carries out all its projects through the traditional method of procurement and in addition almost all civil engineering construction projects are public financed and therefore the study will only consider building projects in the private sector.

For purposes of this study, and as seen in chapter two procurement systems are classified into two:

a) The traditional procurement method including all its variants.
b) Alternative or contemporary procurement methods i.e those that emphasize either management or integration or both.

3.2 Variables in the study

The independent variable in this study is the procurement method which as seen above is devided into two categories:-

(i) Traditional procurement methods

(ii) Contemporary procurement methods

The dependent variable is the project performance in terms of adherence to programme and budget. Adherence to programme is measured in terms of time overruns while adherence to budget is measured in terms of cost overruns.

3.3 Sampling technique and sample size

In determining the sample size, the following formula was used:

$$n = \frac{Z^2_{\alpha/2}\,\sigma^2}{e^2}$$

where n = Sample size

$Z^2\alpha$ = Critical normal deviate

σ = Estimated population standard deviation

e = Tolerable error level

(Lapin 1990, Kothari 2002)

We therefore first set a tolerable error level (e) for the dependent variable. Low tolerable error levels would give high sample sizes as the tolerable error level is a square denominator in the formula. It is important to balance between a manageable sample size and a reasonable level of reliability.

The figures for e in this case are also informed by the fact that time overruns have been shown to be about twice as high as cost overruns (Talukhaba 1988). The following tolerable error levels are chosen.

Variable	(e)
Percentage cost overrun	7
Percentage time overrun	15

(Lapin, 1990)

This is followed by setting a target reliability probability (1-α) and finding the critical normal deviate ($Z\alpha$ /2)

A reliability of 0.95 is chosen therefore;

α = 1-0.95

α = 0.05

This gives a critical normal deviate $Z\alpha$ /2=1.96 (Lapin 1990 Appendix table E).

Then we establish a value for the estimated population standard deviation (σ). This value can be a guess but sample values from a similar study are better if these are available.

In a study conducted by Talukhaba (1988) in time and cost performance of construction projects it was found that for private clients the standard deviation in percentage cost overrun was 18% while that of percentage time overrun was 45%. Since this sample values emerged with regard to the same issues of time and cost overruns for which we want to establish estimated population standard deviations (σ), then we may use these values instead of using a guess.

Thus for this purpose,

Population standard deviation (σ) for cost performance measured in terms of cost overrun = 18

Population standard deviation (σ) for time performance measured in terms of time overrun = 45

The sample size (n) is then calculated as follows:

$$n = \frac{Z_{\alpha/2}^2 \sigma^2}{e^2}$$

n for cost performance measured in terms of cost overrun is calculated as;

$$n = \frac{1.96^2 \times 18^2}{7^2} = 25.40 \approx 26$$

n for time performance measured in terms of time overrun is calculated as;

$$n = \frac{1.96^2 \times 45^2}{15^2} = 34.57 \approx 35$$

Since the sampling is done once and considering the need to enhance reliability, then we take the higher sample size n = 35 where the population exceeds 35. If the population is less than 35, then the whole population is sampled.

Projects procured through the traditional method are obtained through random sampling where first a sample of 35 quantity surveying firms is selected through simple random sampling by use of a table of random numbers.

These selected Quantity Surveying firms are then asked to provide data on one project that meets the stated criteria. Quantity surveying firms are chosen because with regard to traditional procurement, the project quantity surveyor is the one likely to have most of the information on project performance in terms of cost and time. The list of quantity surveying firms was obtained from the Board of registration of

Architects and Quantity Surveyors of Kenya (B.O.R.A.Q.S) of year 2005 and this showed a total of 99 firms.

Out of these 99 firms, 35 firms were selected by random by using a table of random numbers. The firms were listed alphabetically and given identity numbers and the following 35 identity numbers were selected:-

25, 07, 09, 05, 73, 22, 51, 87, 41, 77, 42, 56, 98, 78, 71, 65, 99, 08, 62, 93, 76, 27, 37, 60, 63, 31, 97, 12, 47, 72, 50, 06, 13, 70, 43.

Projects procured through management methods are obtained by going directly to the project management firms themselves. From their projects that meet the stated criteria one project is selected from which data is collected. From the researcher's field study, it was established that the total population of construction management firms in Nairobi is about 25 which allowed for the whole population to be selected.

As there is no organization that registers project management firms, the list of these firms was developed by the researcher through his own field search. The names of the firms are obtained mainly from telephone directory listings, personal knowledge and enquiries from experienced professionals. Any construction management firms that are missed by such search were assumed to be dormant and unlikely to be useful to this study.

From these two samples data is collected on the type of project, cost overruns, time overruns and the client priorities that determined the selection of procurement method.

3.4 Data collection instruments

After considering the available data collection instruments, the information required from respondents, the time and funds available, the questionnaire was seen to be the most appropriate data collection instrument. The structured system of a questionnaire was appropriate as it allows data to be collected quickly, cheaply and to be easily entered and analyzed. 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.

3.5 Data collection procedures

Attached to the questionnaire was a letter of introduction where the researcher let the respondents know who he is and the purpose of the questionnaire. The introduction letter was in such a way that it encouraged the respondents to answer the questions and to do so objectively. The research assistant who delivered the questionnaire was also on hand to clarify any issues the respondents would raise at the time of delivering the questionnaire. Where necessary, the researcher followed up with telephone calls to ensure the return of the questionnaires was not delayed.

3.6 Data analysis

Quantitative data from the field was collected and analyzed through statistical methods (discussed below) to show whether proper consideration was given to the choice of project procurement methods that are appropriate to the projects and also if there is any relationship between procurement method chosen for building construction projects and the efficiency of project implementation in meeting the goals of cost and time performance. If such a relationship exists, then a statistical determination was made of what kind of relationship it is and appropriate recommendations passed.

For both categories of projects i.e those carried out using the traditional procurement methods and those carried out using the contemporary procurement methods, this study collected data on the cost performance (in terms of percentage cost overrun) and time performance (in terms of percentage time overruns).

The percentage time overrun was calculated using the following formula;

$$\text{Percentage time overrun} = \frac{\text{Time taken to complete the project} - \text{Original contract period}}{\text{Original contract period}} \times 100$$

The percentage cost overrun was calculated using the following formula;

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

3.7 Hypotheses formulation

By testing the hypothesis statistically, it is shown whether projects procured through contemporary methods perform better than those procured through traditional method.

Time performance

The first hypothesis states that use of contemporary procurement methods can lead to improvement in project time performance.

The hypotheses were formulated as follows:

a) Mean percentage time overrun for projects procured through traditional method is designated as μ_{1t}

b) Mean percentage time overrun for projects procured through contemporary methods is designated as μ_{2t}

The research hypothesis (H1) proposes that projects procured through traditional methods have higher mean percentage time overruns than those procured through contemporary methods and this is shown as:-

$$H1: \mu_{1t} > \mu_{2t}$$

The null hypotheses (Ho) proposes that there is no difference in the mean percentage time overrun for projects procured through traditional method and those procured through contemporary method or that projects procured through traditional method actually have a lower mean percentage time overrun than those procured through traditional method and this is shown as:-

$$Ho: \mu_{1t} \leq \mu_{2t}$$

Cost performance

The second hypothesis states that use of contemporary procurement methods can lead to improvement in project cost performance.

The hypotheses were formulated as follows:

a) The mean percentage cost overrun for projects procured through traditional method is designated as μ_{1c}

b) The mean percentage cost overrun for projects procured through contemporary methods is designated as μ_{2c}

The research hypothesis (H_1) proposes that projects procured through traditional methods have a higher mean percentage cost overrun than those procured through contemporary method and this is shown as:-

$$H_1: \mu_{1c} > \mu_{2c}$$

The null hypothesis (Ho) proposes that there is no difference in the mean percentage cost overrun for projects procured through traditional method and those procured through contemporary methods or that projects procured through traditional method actually have a lower mean percentage cost overrun than those procured through contemporary methods and this is shown as:-

Ho: $\mu_{1c} \leq \mu_{2c}$

The research hypothesis is supported if the null hypothesis is rejected.

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.

In the testing of the null hypothesis, the study uses the difference-between-means test and the t distribution. The t distribution is appropriate when one or both of the sample size is less than 30 (Nachmias 1996, Kothari 2002) as is the case with this study.

A right tailed test is used to test the hypothesis because the research hypothesis is directional implying higher cost and time overruns for projects procured through traditional methods.

The test statistics t is calculated as follows;

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\hat{\sigma}\bar{x}_1 - \bar{x}_2}$$

(Nachmias 1996).

Where

$\bar{x}_1 - \bar{x}_2$ = the difference between the sample means

$\hat{\sigma}\ \bar{x}_1 - \bar{x}_2$ = an estimate of the standard error of the sampling distribution of the difference between the means calculated as follows;

$$\hat{\sigma}\ \bar{x}_1 - \bar{x}_2 = \sqrt{\frac{S_1^2}{n_1 - 1} + \frac{S_2^2}{n_2 - 1}}$$

Where n_1 and n_2 are the sample sizes of sample 1 and sample 2 respectively.

.

S_1^2 and S_2^2 are the variances of sample 1 and sample 2 respectively.

The test statistic t was obtained for both cost overruns and time overruns.
The obtained t is compared with the appropriate values in the sampling distribution of t. To do this we require to set the level of significance and calculate the degrees of freedom.

The level of significance was set at 0.05 (or 5%) while the degrees of freedom (df) are calculated using the formula;

$Df = (n_1 - 1) + (n_2 - 1)$

$Df = (35-1) + (27-1)$

$D_f = 34 + 26$

$D_f = 60$

(Nachmias 1996).

The obtained t can then be compared with the sampling distribution of t at 0.05 level of significance with a one tailed test (right tail). The t for which the null hypothesis will be rejected is 1.671 for both cost and time overruns. (Nachmias 1996, Appendix Table F). A t higher than 1.671 is unlikely to occur if the null hypothesis is true thus

if it is higher than 1.671 the null hypothesis will be rejected and the conclusion made that the differences in time and cost overruns are significant. The vice versa is also true.

Choice of procurement method

The third hypothesis stated that in majority of projects, due consideration is not given to the selection of a procurement method that best suits the project and matches the client's priorities.

To determine whether due consideration was given to the choice of a procurement method that matches the needs of the client, the respondents were asked to indicate their perception of the client priorities on the nine point client priority checklist developed by Bennet and Grice (discussed in chapter two). These priorities are then entered in the evaluation chart to show which procurement method gets the highest score and therefore determine whether the procurement method used for the project in question was the most suitable or another procurement method should have been used.

3.8 Summary

In this chapter, the methodology to be used in the research has been developed, the instruments for data collection have been considered and an appropriate choice made in addition to articulating how the data will be analyzed. The chapter therefore lays the ground work for the next phase of the study in which the data collection instrument was administered to the respondents and the information that was obtained is analyzed to reach objective conclusions.

4.0 CHAPTER FOUR – DATA ANALYSIS AND RESULTS

4.1 Responses from the field

The data collection phase of the study encountered a few problems. This was particularly so with regard to questionnaires administered to construction management firms where a number of them could not be traced at their stated addresses. This was attributed to the fact that the construction management profession is still young and many of the players are still trying to establish themselves. While a number of these organizations are large enough and well established, some refused to fill the questionnaires claiming to be too busy to do so something which the researcher thought could be attributed to questionnaire fatigue.

While most of the quantity surveying firms could easily be found, some of them gave unreasonably long timelines within which they would have filled the questionnaire and yet the time was limited thus those questionnaires could not be waited for considering there was no guarantee of their being filled seeing as the researcher did that those respondents were not very keen.

Out of the 35 questionnaires that were delivered to quantity surveying firms, 18 of them were received back representing a response rate of 51.4%. Out of the 25 questionnaires that were meant for construction management firms 12 of them were received back representing a response rate of 48%.

While the effect of non-response is to bias samples - that is to make them different from the population from which they were drawn - the effects of non-response depends on the extent to which those not responding are biased i.e. systematically different from the whole population (Floyd et al 1993). In this sample there was no reason for the researcher to feel that the non-respondents were systematically different from the population after considering geographical proximity, the considerably standardized academic and professional qualification and the type of

projects targeted thus the response rates achieved were considered adequate and no bias was envisaged.

The first objective is to investigate whether in the Kenyan content, use of contemporary procurement method improves project performance. Below follows the analysis of the data received from the respondents regarding project performance measured in terms of adherence to programme and budget and a comparison between traditional and contemporary methods of procurement.

4.2 Time performance

Out of the projects sampled, data was collected on the original completion period the project was expected to take and the construction period actually achieved. From these two periods, the time overrun was calculated and the percentage time overrun for all the projects for the particular procurement method also calculated. From the above data, the following figures emerged:-

TABLE 1 - TRADITIONAL METHOD - TIME PERFORMANCE

PROJECT NUMBER	PERCENTAGE OVERRUN	MEAN OVERRUN	DEVIATION OVERRUN	SQUARED DEVIATION OVERRUN
1	59.74		3.5	12.25
2	57.14		0.9	0.81
3	170		113.76	12941.3376
4	0		-56.24	3162.9376
5	33.35		-22.89	523.9521
6	27.24		-29	841
7	13.64		-42.6	1814.76
8	73.33		17.09	292.0681
9	69.44	56.24	13.2	174.24
10	56		-0.24	0.0576
11	140		83.76	7015.7376
12	50		-6.24	38.9376
13	57.16		0.92	0.8464
14	0		-56.24	3162.9376
15	27.24		-29	841
16	72.22		15.98	255.3604
17	55.83		-0.41	0.1681
18	49.9		-6.34	40.1956
Total				31118.5963

Standard deviation time overrun = $\sqrt{\frac{31118 \quad .60}{18}}$ = 41.58%

Source: Own field research 2005

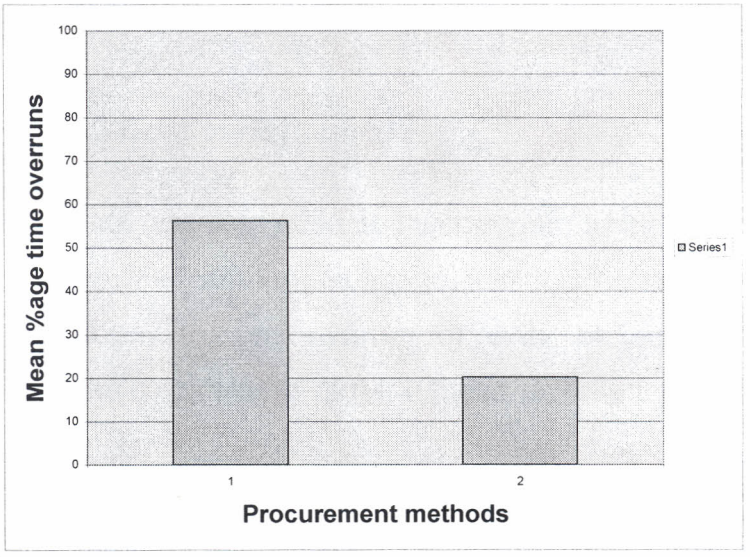
TABLE 2 - CONTEMPORARY METHODS - TIME PERFORMANCE

PROJECT NUMBER	PERCENTAGE OVERRUN	MEAN OVERRUN	DEVIATION OVERRUN	SQUARED DEVIATION OVERRUN
1	16.67		-3.55	12.6025
2	30.07		9.85	97.0225
3	94.54		74.32	5523.4624
4	16.67		-3.55	12.6025
5	29.98		9.76	95.2576
6	0	20.22	-20.22	408.8484
7	14.29		-5.93	35.1649
8	-8.89		-29.11	847.3921
9	31.37		11.15	124.3225
10	16.13		-4.09	16.7281
11	0		-20.22	408.8484
12	1.85		-18.37	337.4569
Total				7919.7088

Standard deviation time overrun = $\sqrt{\frac{7919.70}{12}}$ = 25.69%

Source: Own field research 2005

A comparison of mean percentage time overruns between the two procurement methods can be shown graphically as follows:



Legend:
1 = Traditional method
2 = Contemporary methods

Figure 3: Comparison graph of mean percentage time overruns.

Source: Own field research 2005

Table 3: Comparison of project time performance

	Traditional methods	Contemporary methods
Number of cases (n)	18 (n1)	12 (n2)
Mean time overrun (μ)	56.24% (μ_{1t})	20.22% (μ_{2t})
Standard deviation time overrun (s)	41.58% (S_{1t})	25.69% (S_{2t})

Source: own field research, 2005.

Application of the difference between means test shows that projects procured though contemporary methods performed better in terms adherence to programme than those procured through traditional methods.

The projects procured through traditional methods had a higher mean percentage time overrun of 56.24% compared to a lower mean percentage time overrun of 20.22% for the projects procured through contemporary methods.
Therefore, $\mu_{1t} > \mu_{2t}$

4.3 Cost performance

Data was also collected with regard to the original expected cost of each project and the final amount spent to test the adherence to budget. From the two sums of money, the cost overrun for all the projects for each particular procurement method was calculated. From the these records the following figures emerged:-

TABLE 4 - TRADITIONAL METHOD - COST PERFORMANCE

PROJECT NUMBER	PERCENTAGE OVERRUN	MEAN OVERRUN	DEVIATION OVERRUN	SQUARED DEVIATION OVERRUN
1	48.92		13.11	171.8721
2	23.53		-12.28	150.7984
3	38.71		2.9	8.41
4	15.55		-20.26	410.4676
5	14.49		-21.32	454.5424
6	-18.58		-54.39	2958.2721
7	36.36		0.55	0.3025
8	90		54.19	2936.5561
9	3.92	35.81	-31.89	1016.9721
10	13.64		-22.17	491.5089
11	38.46		2.65	7.0225
12	89.6		53.79	2893.3641
13	23.92		-11.89	141.3721
14	15.74		-20.07	402.8049
15	15.96		-19.85	394.0225
16	90.42		54.61	2982.2521
17	14.02		-21.79	474.8041
18	89.88		54.07	2923.5649
Total				18818.9094

Standard deviation cost overrun = $\sqrt{\frac{18118.90}{18}}$ = 32.33%

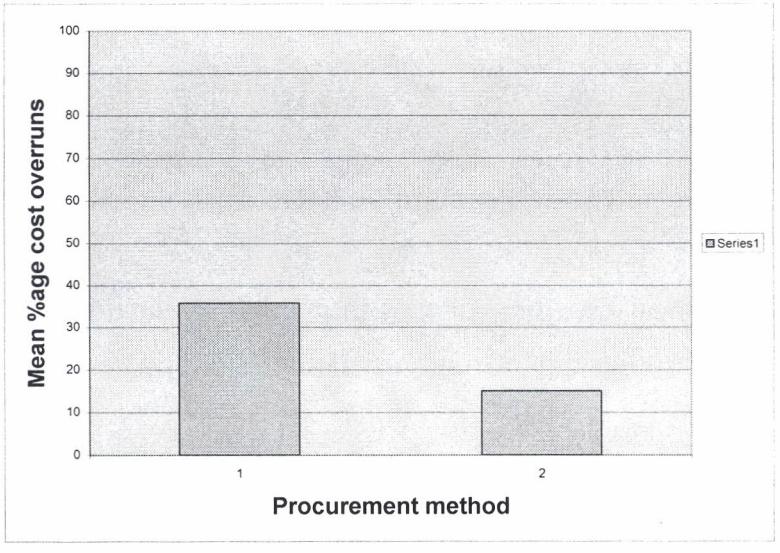
Source: Own field research 2005

TABLE 5 - CONTEMPORARY METHODS - COST PERFORMANCE

PROJECT NUMBER	PERCENTAGE OVERRUN	MEAN OVERRUN	DEVIATION OVERRUN	SQUARED DEVIATION OVERRUN
1	57.14		42.06	1769.0436
2	15		-0.08	0.0064
3	57.02		41.94	1758.9636
4	5.77		-9.31	86.6761
5	12.24		-2.84	8.0656
6	2.36	15.08	-12.72	161.7984
7	10.71		-4.37	19.0969
8	0		-15.08	227.4064
9	15.28		0.2	0.04
10	3.13		-11.95	142.8025
11	2.33		-12.75	162.5625
12	0		-15.08	227.4064
Total				4563.8684

Standard deviation cost overrun = $\sqrt{\frac{4563.87}{12}}$ = 19.5%

A comparison of mean percentage cost overruns between the two procurement methods can be shown graphically as follows:



Legend:
1 = Traditional method
2 = Contemporary methods

Figure 4: Comparison graph of mean percentage cost overruns.

Source: Own field research 2005

Table 6: Comparison of project cost performance

	Traditional methods	Contemporary methods
Number of cases (n)	18 (n_1)	12 (n2)
Mean cost overrun (μ)	35.81% (μ_{1c})	15.08% (μ_{2c})
Standard deviation cost overrun(s)	32.33% (S_{1c})	19.50% (S_{2c})

Source: Own field research, 2005.

Application of the difference between means test shows that projects that used contemporary methods performed better in terms of adherence to budget than those that used the traditional methods.

The projects procured using traditional procurement methods had a higher mean percentage cost overrun of 35.81% compared to a lower mean percentage cost overrun of 15.08% for the projects procured through contemporary methods. Therefore, $\mu_{1c} > \mu_{2c}$.

4.4 Factors cited as causing poor performance

The study went further and enquired from the respondents as to the factors that caused their projects to overrun in programme and budget.

As previously explained it is only an appropriately designed organization and management structure that provides a proper framework within which the other factors that influence project performance have a chance of optimum performance (Walker 1998 cited in Mcdermott 2005). A good management and organization structure makes it possible to identify and control the risk factors that cause projects to overrun in cost and time. For example, while noting that risk management is a product of the project planning and control, Gichunge (2000) states that risk

management should be explicitly stated as one of the services to be provided by a project manager.

The following tables show the reasons advanced for the time and cost overruns and the frequency in which the were cited:-

Table 7: Reasons given for time overruns:-

Risk factor causing time overrun	Frequency (percentage of cases where risk factor was cited as contributing to time overruns)	
	Traditional method	Contemporary methods
Unexpected underground conditions	25%	37.5%
Inclemental weather	31.25%	12.5%
Delayed instructions/approvals	56.25%	37.5%
Introduction of extra works	62.5%	87.5%
Changes in design	18.75%	25%
Payment delays	18.75%	25%
Material shortages	25%	12.5%
Fire, earthquakes, accidents and floods	0%	0%
Industrial and contractual disputes	12.5%	25%
Other – poor planning by contractor	18.75%	12.5%

Source: Own filed research 2005

Table 8: Reasons given for cost overruns:-

Risk factor causing cost overrun	Frequency (percentage of cases where risk factor was cited as contributing to cost overruns)	
	Traditional method	Contemporary methods
Unexpected underground conditions	17.6%	62.5%
Inclemental weather	11.76%	37.5%
Delayed instructions/approvals	17.6%	37.5%
Introduction of extra works	88.2%	87.5%
Changes in design	17.6%	25%
Payment delays	17.6%	37.5%
Material shortages	29.4%	0%
Fire, earthquakes, accidents and floods	0%	0%
Industrial and contractual disputes	17.6%	0%
Others - inflation	0%	25%
Others – contractors inefficiency	0%	12.5%

Source: Own filed research 2005

What is seen from these results is that there is a lot of similarity in the risk factors and their frequency in causing time and cost overruns in projects that used both forms of procurement and yet the traditional procurement methods performs worse in both parameters measured. The implication of these is that faced with the same risk factors, contemporary methods of procurement are better able to control them and hence reduce their effect on project performance.

It is also worthwhile to note that an important set of risk factor that is mainly outside the control of the project organization – fire, earthquake, accidents and floods - is not cited as a contributing factor to time and cost overruns in any of the cases. The main reasons cited as having caused time and cost overruns are within the influence of a good project organization and management structure.

Chitkara (1998) cites various failures in project organization and management that cause the risk factors associated with poor performance and these can be matched as follows;

- Unexpected underground conditions – Inadequate site investigation due to poor planning and coordination.
- Inclemental weather – Inadequate contingency provision in estimation of project time. (some forms of extreme and unusual weather may however be excused as beyond the control of the project organization)
- Delayed instructions/approvals - Poor coordination and poor communication
- Introduction of extra works and changes in design – Poor project planning that does not take into consideration user requirements, lack of customer focus, poor communication
- Payment delays– inadequate cost planning and poor communication
- Material shortages – poor planning
- Industrial and contractual disputes – poor co-ordination and poor communication
- Inflation – Inadequate planning and provisioning for contingency
- Contractors poor planning and inefficiency – poor contractor selection and supervision

While it is not 100% possible for any project organization to deal with all these failures, it is possible to identify the risk factors and put in measures to control and reduce the negative effects of the risk factors on project performance.

4.5 Choice of procurement method

The third objective was to establish whether proper consideration is given to choice of procurement methods and whether the procurement methods selected match the client priorities. The responses obtained are discussed below and also entered into

the evaluation chart discussed in chapter two to determine if the best procurement methods were chosen.

The respondents were also requested to state the reason why the particular procurement method used was selected for the project. For the projects that used the traditional procurement method the following were advanced as reasons why the traditional method was selected:-

1. It gives more competitive prices
2. It's cost effective compared to other methods
3. Lack of information about other methods
4. More advantageous than other methods
5. It is well known
6. Gives opportunity for input of all parties in contractor selection.
7. Higher speed of project execution.
8. The project was small and straight forward
9. It has always worked well in the past
10. It is a shorter and easier process
11. It was believed competition would give a better price.
12. Higher speed of tendering
13. Gives better cost performance
14. Better coordination
15. Ease of contractor selection
16. Project was uncomplicated
17. Has well known processes
18. Enhances competition and accountability

Most of these responses are quite reasonable and tally with the theoretical framework of this study on procurement while some do not tally. For example the reasons given in responses numbers 7, 10 and 12 seem to go against the theory where it is accepted that the many sequential steps to be followed in traditional

method make it unsuitable where time is of essence. Responses numbers 3, 5 and 17 point to the local inexperience and lack of information about how the contemporary procurement methods work and these is something that professional associations and educational institution should be interested to remedy.

For the projects that used the contemporary procurement methods, the following were advanced as reasons why the contemporary methods were selected:-

1. Better time performance and good cost control
2. Best for projects involving large sums of money
3. Easier coordination and running of project
4. Smooth running of the project
5. More efficient due to better project control.
6. Better coordination to ensure strict time, cost and quality targets are achieved.
7. Better results
8. Efficiency due to work packaging to different trade contractors
9. Is better for big projects
10. Better communication and coordination
11. Better time, cost and quality performance
12. Higher efficiency of project implementation

These responses seem to confirm the theory that introduction of management and integration that is inherent in contemporary procurement methods improves the efficiency and effectives of the project organizations hence achieving better performance in the primary project objectives of programme, budget and product.

When the respondents were asked to state which between traditional and contemporary procurement methods was more likely to give better cost and time performance it was surprising to note that as high as 95% of the respondents who

had used the traditional procurement method in their projects chose contemporary methods as more likely to give better time performance while 50% of them said the contemporary method could give better cost performance.

This shows that there is a wide acceptance of good performance of new procurement methods even among the people who are more used to the traditional procurement system. The fact that they are not using these methods can only be attributed to other reasons e.g. lack of adequate knowledge.

As expected, all the respondents whose projects had used the contemporary procurement methods stated that they it gave better cost performance than the traditional procurement method. This was the same response for time performance.

The respondents were also asked to indicate the client priorities. Their answers to the list of questions regarding the client priorities were entered into the evaluation chart for rating procurement options developed by Bennet and Grice (discussed in chapter two) to determine the best procurement method that should have been used for each particular project. The results of this evaluation were that out of the total of 18 projects sampled that were carried out using the traditional procurement method, only 3 of them were best suited for it while the other 15 were more suited for the contemporary procurement methods.

On the other hand, out of the 12 projects sampled that were carried out using the alternative procurement methods, 11 of them were suited for that method while one had a tie of points between traditional and alternative methods and thus could use any of the two (see data in appendix three).

It is clear therefore that more effort needs to be put in the consideration of procurement methods that match the needs of the project. The data above also confirms the research hypothesis that due consideration is not given to the selection

of a procurement method that best suits the project and hence afford the client efficiency and value for money.

4.6 Test of Hypotheses

Using the formulae stated in chapter three, and the data above, the hypotheses can be tested as follows:

Time performance

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

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\hat{\sigma}\bar{x}_1 - \bar{x}_2}$$

where;

$$\hat{\sigma}\bar{x}_1 - \bar{x}_2 = \sqrt{\frac{s_1^2}{n_1 - 1} + \frac{s_2^2}{n_2 - 1}}$$

$$\hat{\sigma}\bar{x}_1 - \bar{x}_2 = \sqrt{\frac{41.58^2}{18-1} + \frac{25.69^2}{12-1}}$$

$$= \sqrt{101.7 + 60}$$

$$= 12.7161$$

$$t = \frac{56.24 - 20.22}{12.7161}$$

$$t = 2.8326$$

The t obtained is 2.8326 and this is compared to the appropriate value in the sampling distribution of t at 0.05 level of significance and 60 degrees of freedom

(calculated in chapter 3) for a one tailed test (right tail). The t for which the null hypothesis should be rejected is 1.671. A t higher than 1.671 is unlikely to occur if the null hypothesis is true. The t in this case is higher than 1.671 thus we reject the null hypothesis and conclude that the difference between the two means is significant and cannot occur by chance thus the research hypothesis is confirmed.

Cost performance

Using the formulae and data presented earlier, t for cost performance is calculated as follows:-

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\hat{\sigma}\bar{x}_1 - \bar{x}_2}$$

$$\hat{\sigma}\bar{x}_1 - \bar{x}_2 = \sqrt{\frac{S_1^2}{n_1 - 1} + \frac{S_2^2}{n_2 - 1}}$$

$$\hat{\sigma}\bar{x}_1 - \bar{x}_2 = \sqrt{\frac{32.33^2}{18-1} + \frac{19.5^2}{12-1}}$$

$$= \sqrt{61.4841 + 34.5682}$$

$$= 9.801$$

$$t = \frac{35.81 - 15.08}{9.801}$$

$$t = 2.115$$

The t obtained is 2.115 which is again compared to the t of 1.671 (the t is the same as for time performance as the level of significance and degrees of freedom are the

same). The t of 2.115 is higher than 1.671 thus we again reject the null hypothesis and confirm the research hypothesis.

5.0 CHAPTER FIVE – CONCLUSIONS AND RECOMMENDATIONS

5.1 conclusions

The objectives set out at the beginning of this study were achieved after the collection and analysis of data which then yielded the following conclusions-:

i) The first objective was to investigate whether use of contemporary/alternative procurement methods improves project time performance. The research hypothesis stated that use of contemporary/alternative procurement methods leads to better project time performance. After collection and analysis of data, it was seen that from the project sampled, the projects that were carried out using the traditional procurement method performed worse in terms of adherence to programme having a higher mean percentage time overrun of 56%. This is compared to projects that were carried out using the alternative/contemporary procurement methods which performed better in terms of adherence to programme having a lower mean percentage time overrun of 20%. The test of hypothesis revealed the difference was significant and unlikely to occur by chance and therefore the research hypothesis was confirmed.

ii) The second objective was to investigate whether use of contemporary/alternative procurement method improves project cost performance. The research hypothesis stated that use of contemporary/alternative procurement methods leads to better project cost performance. Collection and analysis of data showed that from the projects sampled, the projects that were carried out using the traditional procurement method performed worse in terms of adherence to programme having a higher mean percentage cost overrun of 36%. This is compared to projects that were carried out using the alternative/contemporary procurement method which performed better in terms of adherence to budget having a lower mean percentage cost overrun of 15%. The test of hypothesis revealed the difference was significant

and unlikely to occur by chance and therefore the research hypothesis was confirmed.

iii) In addition, the study also aimed as establishing whether proper consideration is given in the choice of procurement method for construction projects and whether the procurement methods selected matched the client's priorities. The data obtained from the respondents on the client priorities was entered into an evaluation chart to determine the most suited procurement method for each particular project. This analysis revealed that only 3 out of 18 projects carried out using the traditional procurement method were most suited for that method while the rest should have used alternative procurement methods. Of the 12 projects that were carried out using alternative procurement methods, 11 were found to be suited to that method while one could have used the traditional procurement method or the alternative procurement methods as there was a tie of points. It can be deduced therefore that due consideration is not always given to choice of procurement method that best suit the priorities of the client particularly in the use of the traditional procurement method.

Apart from the few (three) respondents who admitted lack of sufficient knowledge of the contemporary procurement methods and how they work, it is notable that both sets of procurement methods are well known and are gaining acceptance among professionals in the industry. A situation where even the majority of respondents who used the traditional method to carry out their projects admit that contemporary methods are more likely to give better performance is encouraging and points at more liberalized thinking such that in future, projects are more likely to be keenly considered to establish the procurement method that best matches the needs of the project unlike the case is today where many projects carried out using one procurement method are shown to have been more suited to the other and vice versa.

5.2 Recommendations

The realization that more consultants for example those like quantity surveyors who are more used to the traditional procurement method are opening up to the new methods is encouraging and confirms that the Kenyan construction industry is moving in tandem with the rest of the globe towards a more liberated view of the management of construction, integration of project phases and project participants and towards improved efficiently in construction. It is recommended that this change be encouraged by all influential stakeholders of the construction industry including government, professional associations and educational institutions. Educational institutions have already taken the lead by training construction and project managers as an area of specialization and this must be commended.

Professional associations are encouraged to use the various fora available to them including the continuous professional development programmes to expose their members to the new procurement methods and avail to the client of the industry the benefits to be had through their use. The evident growth of these new procurement methods in liberalized developed economies can only be as a result of their good performance and developing economies cannot afford to be left behind in implementing new methods that save on scarce economic resources.

The government should also open up its projects to the new procurement methods particularly in projects of civil engineering as this would go a long way in enhancing the growth of management and integrating methods considering the government is the single biggest client of the construction industry. This would also open up opportunities for new graduates of construction and project management to grow in the industry.

5.3 Areas for further Research

It is noted that the alternative procurement methods are still new in this country and the people using them are still on the learning curve. Most of the established firms in this discipline are also owned by non-indigenous people. It may be therefore be necessary to have continuous studies on the development of these procurement methods and whether they continue to improve the performance of our construction industry. Bigger populations of projects are expected by then to be available. It would also be worthwhile to investigate the need for review of the various acts of parliament and regulations governing construction professions so that they can be in tune with the new construction systems particularly to do with new procurement methods. There is need to study how to introduce new ways of regulating the new disciplines of construction and project management.

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APPENDIX 1 - QUESTIONNAIRE TO QUANTITY SURVEYORS

Questionnaire No. .....

Date.....

Please choose one project that your firm handled that used the traditional procurement method completed in the last 5 years and kindly answer the following questions. Please answer for a project whose original contract sum was at least Kshs. 20,000.000.00

1. Type of project. Please tick on the dotted line
    a) Commercial .....
    b) Residential .....
    c) Educational .....
    d) Industrial .....

2. Period of construction.....to.....

3. Project location .....

4. Please fill in the following details with regard to time performance.
    a) Original completion period.....
    b) Final completion period.....
    C) If the final completion period (4b) is higher than the original completion period (4a) , please give the reason for the increment by ticking below (Where you tick more than one please indicate percentage contribution)
        (i) Unexpected underground conditions.....
        (ii) Inclemental weather.....
        (iii) Delayed instructions/ approvals.....
        (iv) Introduction of extra works.....

(v) Change in design.....

(vi) Payment delays.....

(vii) Material shortages.....

(viii) Delays caused by fire earthquakes, accidents and floods....

(ix) Industrial and contractual disputes .....

(x) Other. Please specify.....

5. Please fill in the following details with regard to cost performance

a) Original construction cost .....

b) Final construction cost .....

c) If the final construction cost (5b) is higher than the original construction cost (5a) , please give the reason for the increment by ticking below (Where you tick more than one please indicate percentage contribution)

(i) Unexpected underground conditions.....

(ii) Inclemental weather.....

(iii) Delayed instructions/ approvals.....

(iv) Introduction of extra works.....

(v) Change in design.....

(vi) Payment delays.....

(vii) Material shortages.....

(viii) Delays caused by fire earthquakes, accidents and floods....

(ix) Industrial and contractual disputes .....

(x) Other. Please specify.....

6. Why in your opinion was the traditional procurement method chosen for this project.....

.....

.....

7. Please tick for item A-I, your perception of the client priorities for that project on the dotted line.

A. Timing (how important was early completion to the success of the project?) Please tick one

(i) Crucial .....

(ii) Important .....

(iii) Not as important as other factors .....

B. Controllable variation (was the need foreseen to alter the project once it had begun on site?)

(i) Yes .....

(ii) Definitely not .....

C. Complexity (Did the building need to be technically advanced or highly serviced?)

(i) Yes .....

(ii) Moderately so.....

(iii) No. Just simple.....

D. Quality level (What level of quality was required in the design and workmanship?)

(i) Basic competence .....

(ii) Good but not special .....

(iii) Prestige.....

E. Price certainty (did the client need a firm price for the project before committing it to proceed?)

(i) Yes.....

(ii) A target plus or minus was enough .....

F. Competition (was there need to choose construction team through price competition?)

(i) Certainly for all works contracts .....

(ii) Works and consultancy teams .....

(iii) No. Other factors were important .....

G. Management (could the client manage separate consultancies and contracts. Would he/she/it be more suited to one firm responsible after the briefing stage?

(i) Could manage many firms .....

(ii) Better one firm for everything.....

H. Accountability (was there need for the client to have direct professional accountability from the designers and cost consultants?

(i) Not important.....

(ii) Yes .....

I. Risk avoidance (was there need for the client to pay someone to take the risk of cost and time slippage?)

(i) No. Preferred to retain control and therefore risk.....

(ii) Prepared to share agreed risks .....

(iii) Yes .....

8. In your opinion which of the following categories of procurement methods can give better cost performance (Lower cost overruns). Please tick one

(i) Traditional methods .....

(ii) Contemporary (management and integrating methods).....

9. In your opinion which of the following categories of procurement methods can give better time performance (Lower time overruns). Please tick one

a) Traditional methods.....

b) Contemporary (management and integrating methods).....

APPENDIX 2 - QUESTIONNAIRE TO CONSTRUCTION/PROJECT MANAGERS

Questionnaire No. .....

Date.....

Please choose one project that your firm handled where your firm was the construction/project manager completed in the last 5 years and kindly answer the following questions. Please answer for a project whose original contract sum was at least Kshs. 20,000.000.00

1 Type of project. Please tick on the dotted line

a) Commercial .....

b) Residential .....

c) Educational .....

d) Industrial .....

2. Period of construction.....to.....

3. Project location .....

4. Please fill in the following details with regard to time performance.

a) Original completion period.....

b) Final completion period.....

c) If the final completion period (4b) is higher than the original completion period (4a) , please give the reason for the increment by ticking below (Where you tick more than one please indicate percentage contribution)

(i) Unexpected underground conditions.....

(ii) Inclemental weather.....

(iii) Delayed instructions/ approvals.....

(iv) Introduction of extra works.....

(v) Change in design.....

(vi) Payment delays.....

(vii) Material shortages.....

(viii) Delays caused by fire earthquakes, accidents and floods....

(ix) Industrial and contractual disputes .....

(x) Other. Please specify.....

5. Please fill in the following details with regard to cost performance

a) Original construction cost .....

b) Final construction cost .....

c) If the final construction cost (5b) is higher than the original construction cost (5a) , please give the reason for the increment by ticking below (Where you tick more than one please indicate percentage contribution)

(i) Unexpected underground conditions.....

(ii) Inclemental weather.....

(iii) Delayed instructions/ approvals.....

(iv) Introduction of extra works.....

(v) Change in design.....

(vi) Payment delays.....

(vii) Material shortages.....

(viii) Delays caused by fire earthquakes, accidents and floods....

(ix) Industrial and contractual disputes .....

(x) Other. Please specify.....

6. Why in your opinion was a management/integrating procurement method chosen for this project

.....

.....

.....

7. Please tick for item A-I, your perception of the client priorities for that project on the dotted line.

A. Timing (how important was early completion to the success of the project?) Please tick one

(i) Crucial .....

(ii) Important .....

(iii) Not as important as other factors .....

B. Controllable variation (was the need foreseen to alter the project once it had begun on site?)

(i) Yes .....

(ii) Definitely not .....

C. Complexity (Did the building need to be technically advanced or highly serviced?)

(i) Yes .....

(ii) Moderately so.....

(iii) No. Just simple.....

D. Quality level (What level of quality was required in the design and workmanship?)

(i) Basic competence .....

(ii) Good but not special .....

(iii) Prestige.....

E. Price certainty (did the client need a firm price for the project before committing it to proceed?)

(i) Yes.....

(ii) A target plus or minus was enough .....

F. Competition (was there need to choose construction team through price competition?)

(i) Certainly for all works contracts .....

(ii) Works and consultancy teams .....

(iii) No. Other factors were important .....

G. Management (could the client manage separate consultancies and contracts. Would he/she/it be more suited to one firm responsible after the briefing stage?

(i) Could manage many firms .....

(ii) Better one firm for everything.....

H. Accountability (was there need for the client to have direct professional accountability from the designers and cost consultants?

(i) Not important.....

(ii) Yes .....

I. Risk avoidance (was there need for the client to pay someone to take the risk of cost and time slippage?)

(i) No. Preferred to retain control and therefore risk.....

(ii) Prepared to share agreed risks .....

(iii) Yes .....

8. In your opinion which of the following categories of procurement methods can give better cost performance (Lower cost overruns). Please tick one

a) Traditional methods .....

b) Contemporary (management and integrating methods).....

9. In your opinion which of the following categories of procurement methods can give better time performance (Lower time overruns). Please tick one

a) Traditional methods.....

b) Contemporary (management and integrating methods).....

APPENDIX 3 - DATA ENTRY SHEETS

DATA ENTRY SHEET 1

PROJECTS PROCURED THROUGH THE TRADITIONAL METHOD

1	2	3	4	5	6.00	7.00	8	9
Project serial NO.	Type of project	Original completion time (Wks)	Final completion time (Wks)	Percentage time overrun	Original cost (Kshs.)	Final completion cost (Kshs.)	Percentage cost overrun	Best procurement method as determined using Bennet and Grice guide
1	Commercial	65.98	104.28	59.74	115,500,000.00	172,000,000.00	48.92	Contemporary
2	Commercial	29.96	47.08	57.14	21,250,000.00	26,250,000.00	23.53	Contemporary
3	Commercial	50	135	170	31,000,000.00	43,000,000.00	38.71	Contemporary
4	Residential	78	78	0	45,000,000.00	52,000,000.00	15.55	Contemporary
5	Residential	51.42	68.57	33.35	69,000,000.00	79,000,000.00	14.49	Contemporary
6	Commercial	25.7	32.7	27.24	48,107,599.00	39,169,577.00	(18.58)	Contemporary
7	Commercial	44	50	13.64	33,000,000.00	45,000,000.00	36.36	Contemporary
8	Educational	30	52	73.33	20,000,000.00	38,000,000.00	90.00	Traditional
9	Church	36	61	69.44	51,000,000.00	53,000,000.00	3.92	Traditional
10	Residential	100	156	56	22,000,000.00	25,000,000.00	13.64	Contemporary
11	Industrial	20	48	140	26,000,000.00	36,000,000.00	38.46	Contemporary
12	Residential	51.43	77.14	50	30,350,000.00	57,545,346.00	89.60	Contemporary
13	Commercial	35.95	56.5	57.16	25,500,000.00	31,600,000.00	23.92	Contemporary
14	Residential	94	94	0	54,000,000.00	62,500,000.00	15.74	Contemporary
15	Commercial	30.84	39.24	27.24	58,729,119.00	68,103,492.00	15.96	Contemporary
16	Educational	36	62	72.22	24,000,000.00	45,700,000.00	90.42	Traditional
17	Residential	120	187	55.83	26,400,000.00	30,100,000.00	14.02	Contemporary
18	Residential	61.72	92.57	49.9	36,420,000.00	69,154,415.00	89.88	Contemporary

Average time overrun (U1t)	56.24%
Standard deviation time overrun (S1t)	41.58%
Average cost overrun (U1c)	35.81%
Standard deviation cost overrun(S1c)	32.33%

DATA ENTRY SHEET 2
PROJECTS PROCURED THROUGH THE CONTEMPORARY METHODS

1	2	3	4	5	6.00	7.00	8	9
Project serial NO.	Type of project	Original completion time (Wks)	Final completion time (Wks)	Percentage time overrun	Original cost (Kshs.)	Final completion cost (Kshs.)	Percentage cost overrun	Best procurement method as determined using Bennet and Grice guide
1	Residential	48	56	16.67	21,000,000.00	33,000,000.00	57.14	Contemporary
2	Residential	42.83	55.71	30.07	60,000,000.00	69,000,000.00	15	Contemporary
3	Commercial	55	107	94.54	114,000,000.00	179,000,000.00	57.02	Traditional/Contemporary
4	Commercial	77.14	90	16.67	26,000,000.00	27,500,000.00	5.77	Contemporary
5	Educational	42.86	55.71	29.98	49,000,000.00	55,000,000.00	12.24	Contemporary
6	Residential	104	104	0	677,000,000.00	693,000,000.00	2.36	Contemporary
7	Commercial	42	48	14.29	56,000,000.00	62,000,000.00	10.71	Contemporary
8	Residential	45	41	-8.89	20,000,000.00	20,000,000.00	0	Contemporary
9	Residential	51	67	31.37	72,000,000.00	83,000,000.00	15.28	Contemporary
10	Commercial	93	108	16.13	32,000,000.00	33,000,000.00	3.13	Contemporary
11	Residential	125	125	0	813,000,000.00	83,200,000.00	2.33	Contemporary
12	Residential	54	55	1.85	22,000,000.00	22,000,000.00	0	Contemporary

Average time overrun (U2t)	20.22%
Standard deviation time overrun (S2t)	25.69%
Average cost overrun (U2c)	15.08%
Standard deviation cost overrun (S2c)	19.50%