

**AN INVESTIGATION INTO THE CAUSES
OF DELAY IN LARGE CIVIL
ENGINEERING PROJECTS IN KENYA.**

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**An Investigation into the Causes of Delay in Large Civil Engineering Projects in
Kenya.**

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DECLARATION

This thesis is my original work and has not been presented for any academic award in any other University.

Signed _____ Date _____

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This thesis has been submitted for examination with my approval as University supervisor.

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DEDICATION

To my family

Thank you for your love, encouragement and support.

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ABSTRACT

Delays are one of the biggest problems construction firms face. Delays can lead to many negative effects such as lawsuits between owners and contractors, increased costs, loss of productivity and revenue, and contract termination. Even though various studies have been considered into the causes affecting delays, these studies seldom discuss common and general causes of delays in construction projects. Thus, comprehensive study on these delays was deemed to be essential. Since the problems are rather contextual, the study focused on specific causes of delay like insufficient coordination and ineffective communication between involved parties in construction projects located in Kenya.

Currently, construction accounts for a large percentage of the annual gross domestic product (GDP). However, the growth in the construction industry has influenced the country's economic development. As observed in developed construction is considered unique in that it can stimulate the growth of other industrial sectors. Hence, to consider the growth of the construction industry in terms of its contribution to GDP in isolation is somewhat misleading in that, to do so understates the crucial role played by the construction. Therefore, improving construction efficiency by means of cost effectiveness and timeliness would certainly contribute to cost saving for the country as a whole. Effort directed to cost and time effectiveness was associated with management issues.

A construction contract is made between two parties only, i.e. 'the Employer' and 'the Contractor'. Their roles are defined in the contract. However, because there is a need for day-to-day supervision of civil engineering, construction, the two parties may agree that a third person should carry out such duties. This third person can have varying powers under the contract and this is reflected in his designation. He can be designated 'the Engineer' under the contract; or he may be designated 'the Project Manager' or 'Employer's Representative' in both cases occupying a distinctly different position from any other designation.

A survey on project management performance of different types of construction projects in Kenya was conducted to determine the causes of delays which are one of the major source of disputes and "construction claims" and their importance according to each of the project participants, i.e. owner, consultant and the contractor.

Researching on the problem of delay in construction, the report adopted a descriptive research design. The sample size was established through the method of simple random sampling. The instrument used to collect data for the research was a structured questionnaire. A field survey was carried out with participants including 23 contractors, 19 consultants, and 15 owners. During the research, several causes of delay were identified. 76% of the contractors and 56% of the consultants had indicated that average of time overrun was between 10% and 30% of the original contract period. The three parties identified the most common cause of delay as being the variation orders. The surveys revealed that 70% of projects experienced time and cost overrun and that 35 out of the 50 projects considered were not completed on time.

This study is about cause of delay in large civil engineering projects in Kenya. It sought the views of clients, consultants, and contractors on the relative importance of the factors that cause delays in construction projects in Kenya. The study has shown that all the three groups of respondents generally agreed that out of a total of 45 factors the top three influencing factors in causing delay in order of importance as: (a) delay in honoring certificates, (b) lack of experienced contractors for large projects (c) changes in the designs (d) lack of professional project management skills in construction projects (e) lack of skilled tradesmen to coop with the new technology in construction industry.

Project owners ought to pay interim payment to the contractors on time to avoid the impairing of the contractor's ability to finance the work. It is also important that changes can be minimized in order that time is not lost on the extra works and avoidance of delays can be mitigated by reviewing and approving of design documents as anticipated. Further, the bidders ought to be checked for resources and capabilities, before awarding the contract to the lowest bidder.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

In the construction industry, the term "delay" is used to describe the time overrun of a project beyond the officially agreed completion time due to causes by the parties in the contract, who are the, employer, contractor and the consultant. It is a project spilling over its planned schedule and is considered a common problem in construction projects. To the owner, delay means loss of revenue through lack of use of proposed facilities. In some cases, to the contractor, delay means higher overhead costs because of the longer work period, higher material costs through inflation and labor cost increases. Completing projects on time is an indicator of efficiency, but the construction process is subject to the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it rarely happens that a project is completed within the specified time.

Time is of great essence in the construction industry and hence time management is critical in determining the quality of a construction project. Ironically, it is the dual elements of time and money that cause some of the most time and money consuming disputes. One of the most troubled and complicated area is that relating to the concept of concurrent delay, which is a strongly contested topic in the building and construction industry. Both parties to a construction contract regularly use concurrent delay as an excuse to avoid responsibility for extension of time claims and the assessment of liquidated damages.

This study intends to identify the nature of the causes of delays in construction projects. Furthermore the study sought to highlight the various methodologies adopted in resolving disputes arising out of a construction contract. This is important granted that disputes related to delays in projects result in lengthy legal tussles that invariably stall projects and lead to incurring of unanticipated costs in terms of legal fees.

The research will outline the various practical aspects relating to dealing with delays and their related disputes. The construction industry is very critical for the

realization of Vision 2030. Its success depends on how well specific projects are managed with regard to scheduling, costing and quality management system. Delays invariably indicate the extent to which Project managerial action has failed and may result in outcomes that undermine growth and development of the country. It is in this regard that this study of factors affecting delays in large engineering projects is envisaged.

1.2 Statement of the problem.

The success of a construction project is critically affected by the capacity of the implementing firms, the nature of the contract and stability of the economic environment (Dean, 2012). However, there is no agreement among scholars and practitioners as to the nature of the causes of delays in construction projects. There is also a lack of consensus as to the principle causes of delays. For instance, Aibinu et al (2002) argues that the main cause of delay is poor planning. According to Frimpong (2003), poor risk management is to blame while Johansson et al (2012) argues that lack of experience and intellectual ability among contractors is the main reason. Other causes that have been highlighted include; poor organizational culture (Kagiri et 2003), poor government policy guidance (Karimi 1998). In Kenya, more than 40% of all project failures leading to litigation arise from delays in project completion. (Kagiri et al 2008)

The increase in project delays in the construction industry is hurting the economy because it results in wastage of resources, enhanced costs of projects and frustration among customers, yet housing Construction is one of the principal sectors that can revitalize economic growth in Kenya. Investment in housing construction and related infrastructure and services has multiple direct and indirect effects. It triggers forward and backward linkage through additional investment in manufacturing of building material, transport and government (GOK 2007). Unfortunately, delays in large civil engineering projects particularly housing, will continue to plague the construction industry in the foreseeable future unless critical measures are taken by the industry and the government in general to address the problem. Kohli, (2001), points out that an information gap amongst contractors concerning time management to effectively reduce projects schedule is one of the factors resulting in delays among large civil engineering projects.

Contractors have problems in sharing information about risk management which can substantially increase costs or delay completion of the projects. Even though risks such as weather interferences, unanticipated cost increases arising out of shifts in taxation prices or increase in interest rates have a bearing in schedule slippages, they are generally misunderstood or underestimated. Delays in projects are not the result of poor training nor are they a preserve of locally owned enterprises (Kagiri et al 2008). The present study therefore attempts to find out from the practitioners in Kenya the causes of delay and its effects on the construction industry.

1.3 Aim of the study.

The main objective of this study is to determine the causes of delays in large civil engineering projects in Kenya.

1.3.1 Objectives of the study.

The specific objectives of this research were as follows:

- i. Identifying the causes of projects delay in large engineering projects
- ii. Determine the effects of delay in large engineering projects
- iii. Highlight the strategies adopted in reducing delays in engineering projects

1.3.2 Research Questions.

The research questions of this study will be as follows:

- i. What are the causes of projects delay in large engineering projects?
- ii. What are the effects of delays in large engineering projects?
- iii. What are the strategies adopted to reduce delays in large engineering projects

1.4 Significance of the study.

The study sought to highlight the important factors accounting for the delays in large engineering projects. In this way, the study findings will contribute to the universe of knowledge regarding the initiation, planning, execution and termination of construction.

This knowledge is important especially to the construction industry which is constantly looking for better ways to complete on time, within costs and agreed- upon performance parameters. An understanding of the key causes of delays will play an important role in the ways large projects are conceptualized, planned and executed.

This study will also be important to the government in formulation of construction industry policies and the way these policies are implemented. An informed policy provides useful guidelines to the industry which minimizes project failures, reduces risks and severally enables order in the construction industry.

This study also intends to spawn practical and theoretical further research questions that can become useful study basis for future researchers. Study findings should be considered as a contribution in the debate about how to improve the efficiency and effectiveness in the construction industry particularly with regard to scheduling and cost management.

1.5 Scope of the study

The scope of the research includes an assessment of contractors registered/categorized as class NCA 3 and above since these are contractors allowed by law to execute projects ranging from Kenya shilling fifty million to thirty five billion which is within the scope of this study. Consideration was also made to contractors with an average yearly turnover of Kenya shilling one billion.

1.6 Limitations of the study

Due to time limitations, the study will cover large civil engineering projects undertaken only within a period of ten (10) years with an average time frame of three years contract period. The study coverage area was the whole nation (Kenya) and involving selected projects in Nairobi, the greater Eastern and North Eastern provinces of Kenya since these areas had the suitable projects for the study.

Due to logistic problems stakeholders under the civil engineering bodies i.e. IEK and EBK were not available for interviews neither at local nor, national level the same case applied for the government civil engineers in local districts who could not be consulted, mainly due to the fact that there was no central forum to bring them together for an interview. This is recognized as a weakness of the study since it is well known that in

most districts, a majority of civil engineering projects are designed, supervised and managed by Government Civil Engineers and Architects.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature on project implementation. The chapter begins by discussing brief theoretical underpinnings of the study, the empirical data declining with requirements for successful project implementation, the factors causing delay in large civil engineering projects and finally some policy briefs regarding management and implementation of large civil engineering projects.

2.2 Theoretical Literature

2.2.1 Capability Approach

The capability approach or human development approach has been profoundly inspired by Kwak (2002) pioneering works in welfare economics, social choice, poverty and famine and development economics. The key idea of capability approach is that social arrangements should aim to expand peoples capabilities to promote or achieve what they value doing and being. Capability is thus a set of vectors of functioning, reflecting the persons freedom to lead one type of life or another' (Doran, 1994) According to Doran, functioning relate in many different dimensions of life including survival, health, work, education, empowerment, self- expression, entrepreneurship and culture.

According to Kwak (2002) a vitally important phrase in the definition of functioning is 'value and have reason to value' Functioning, are things that people value. In other words an activist or situation counts as a functioning for that person only if that person values it. In this case change is important only in so far it results in outcomes that are valued by people.

Capabilities are the freedom to enjoy valuable functioning. In this way, capabilities are described as the real and actual possibilities open to a given person. The focus of development and policy is to make people free to enjoy some combinations of functioning allowing them to expand their capabilities. For human beings, capability building would involve giving people education, a sense of self- discipline, responsibility,

health, information and material wealth. This is what is referred to as empowerment (Crawford, 2003), the objective of development is to create an enabling environment for people to enjoy long, healthy and creative lives. The capability approach covers all aspects of development whether economic growth or international trade; budget deficit; savings, investments or technology. No aspect of the development model falls outside of its scope Kwak (2002). The aim of development is to widen people's choices and enrichment of their lives. The capability approach has four essential pillars; equity sustainability, efficiency productivity and empowerment.

Equity draws on the concept of justice, impartiality and fairness and incorporates a consideration for distributive justice between groups. Efficiency refers to optimal use of existing resources. Empowerment arises from participatory development which is about the processes that people act as agents of their own development. It is about the freedom to make decisions in matters that concern their lives, the freedom to influence development in their communities. Sustainability refers to the durability of development to the face of environmental limitations. It refers to advancing human development in such a way that the outcomes in terms of social, political, financial and technological endeavors over time.

When applied to organization, the different sets of capabilities I .e, managerial technological, innovation capabilities, investments capabilities, linkage capabilities, production capabilities have an impact on the organizations productive efficiency, innovative capability, significant growth in productivity and improvements on organizational resilience and competitiveness. In developing countries the two most common organizational capabilities are the technological and managerial. Very few firms have investment capabilities which clearly strain their competitive ability.

2.2.2 Managerial Capability

Managers play a key leadership role in maximizing and delivering individual and organizational performance. Management capability is therefore a concern of all those organizations and countries that want to remain competitive Doran (1994). According to (Doran, (1994) an organization can underperform in relation to key competition indicators if the managers are under qualified, have inadequate levels of training and

development or otherwise perceived to be less competent. In many organizations, indicators of management capabilities therefore include management knowledge, skills and aptitudes.

Integrating the managerial knowledge of individuals, an organization achieves its managerial capabilities. Integrating individual managerial knowledge for example, a constellation of people such as a team can provide additional services as the ones rendered by individual managers, because working with each other enables them to provide services that are uniquely valuable for the operations of the particular group with which they are associated (Van Den Busch and Van Wijk, 2000). Consequently they become individually and as a group more valuable to the firm is that the services they can render are enhanced by their knowledge of their fellow workers of the methods of the organization, and the best way of doing things in the measurement capability particular set of circumstances in which they are working. In a collective setting, managers are able to complement and leverage each other's individual knowledge, both at the level of the knowledge components and at the level of the knowledge domains.

When the collective is more or less permanent one, managers are able to specialize and to build and build upon the competences available in the firm Tawil, (1998) Since knowledge and mental models are heterogeneous (Doran (1994) temporal constellations of different managers may also provide enormous benefits in that reconfiguring and reintegrating their managerial knowledge gives rise to new combinations and therefore new managerial capabilities at the firm level. In this case, (Van Den Bosch & Van Lam, 2004) suggest that for managerial capabilities, the duo assets that both composition and durability of a managerial collectivity (e.g. a management team) determine the nature of the managerial capabilities created and success of any managerial action.

2.2.3 Technological Capabilities

Even though there are various capabilities that are important, there is general agreement that technological ones constitute the foundation upon which non technical ones are built. Technological capabilities are the technical, managerial, and institutional skills that allow productive enterprises to utilize equipment and technical information efficiently Lam (2004) It is a collection of firm specific assets including elements with intensive scientific

and technological content and tacit knowledge about production processes, as well as elements that enhance the ability of a firm to benefit from the presence of the technical components. Non-technical elements of a firm's technological capability are components that support acquisition of technological knowledge and learning, both at the individual and firm-wide level. They are a firm-specific form of institutional knowledge made up of the combined skills of its members accumulated over time. Three main constituent elements of technological capabilities - embodied, non-embodied and organizational integration - are all necessary for firms to realize benefits for strategic competitiveness.

The term Technological Capabilities was first coined in the early 1980s by researchers probing intra-firm technological dynamics in developing countries, where firms operate far from the world's technological frontier. These firms encounter frustrations associated with transfers of technologies and knowledge from abroad due to tacitness associated with new knowledge and the fact that foreign technologies are often less than perfectly suited for local environments.

Accumulating technological capability requires time and resources to assimilate, adapt and improve known technologies, and ultimately create new technologies in-house. Acquired capabilities help firms improve their economic performance, and by assumption regional and national performance as well. Making reference to East Asian firms, Kwak (2002) argue that industrial development is a process of acquiring technological capability in the course of continual technological change. They note that rather than creating radically new technologies, most of the technological changes are minor in a cumulative manner sometimes leading to increases in productivity by 100 percent propelling firms to international competitiveness within a decade.

Marcelle (2005) posits that the capabilities approach is characterized by three main arguments. The first is the notion that technology includes tacit elements: the skills, technical knowledge, and organizational coherence required to make technologies function in a firm. The second is that the tacit elements cannot simply be transferred, but have to be learnt and that learning process requires conscious effort. Lastly, the industry level and national level environments in which firms operate affect their decisions and ability to invest in developing new technological capabilities (Marcelle, 2005).

Production capabilities include productive management (the ability to monitor and improve the operation of installed plants, or production engineering), procurement and use of the information required to optimize operations, maintenance and repair of physical capital, and the discovery of new uses and markets for current products (Al-Hejji. 2006). Further Al-Hejji. (2006) adds that process, product and industrial engineering capabilities are part of the subset of skills needed under production capabilities. They note further that among the large number of operations that require adequate skills are the assimilation of technology, its adaptation and improvement, quality control, inventory control, the monitoring of productivity, the coordination of different production stages and department and finally, the process and product innovations related to basic research activity. Linkage capabilities are required to receive (and pass on) information, experience and technology from components and raw materials suppliers, subcontractors, consultancy firms, service firms and technological institutions. Kwak (2002) argue that linkage capabilities are useful because of high transaction costs in inefficient markets, where the setting up of extra-market linkages is often an efficient strategy necessitating the need for special skills to establish technology linkage among enterprises, between them, with service suppliers and with science and technology institutions. Lastly, innovation capabilities consist of creating new technical capabilities and putting them into economic practice.

In each of the categories described above there are technological capabilities with different degrees of technological complexity, which are used for routine, adaptive and replicative activities or for innovative and risky actions. These correspond to basic, intermediate and advanced levels of technological capabilities as elaborated in the table below. The generic framework is as presented in the table below:

According to Doran (1994) the capabilities have an impact on the firm's productive efficiency and innovative capability as well as on the intensity of technology diffusion at a macroeconomic level and the degree to which industrial structure is reinforced. Most innovative activity in developing countries consists of modification or improvement of existing technologies. Nevertheless, these may lead to significant growth in productivity in certain areas. To be truly competitive, it is argued that firms need to master the

capabilities from across the typology. However, most developing countries are still at the lower rungs of production capabilities. Very few firms have investment capabilities and even fewer have innovation and linkage capabilities clearly straining their competitive ability.

2.3 Empirical Literature.

In the past, a lot of research undertaken has partially addressed the factors that contribute to project failure in general. In Kenya, delays in project implementation have been mainly attributed to time and cost overruns (Kumaraswamy, 1998) He attributed project failure to factors ranging from delayed payments to contractors incompetence, clients delay in disbursement of funds by financiers to the approval of the project by the technical people. However he does not focus on the issue of technical capacity of the contracting firms or the role played by public officials. Kwak (2002) studied project failure in the context of cost. He attributed failure in projects to poor communication among clients and project contractors, inadequate financial resources lack of motivation, long and defective tendering methods and poor project definition and project organization, environmental conditions, quality of project management, lack of proper infrastructure. Doran (1994) in analyzing project failure factors for Kenya Railway Projects, identified poor communication, little experience of the project managers, late procurement of equipment, lack of training of project managers and slow project selection methods as being the major causes of delays and ultimately failure in projects.

2.3.1 Factors Causing Delays in Effective Communication

Effective communication is critical to L.C.E.P projects (Al-Hejji. 2006). Management of communication, education and expectations are critical throughout the organization. User input should be managed in acquiring their requirements, comments, reactions and approval..

The importance of effective communication both inside and outside the project seems so rather obvious however it continues to be a major factor in management of large civil engineering projects. Without effective communication, even minor issues can have significant impact on the project schedule and indeed the completion time. Effective

communication is also key in breaking down change resistance and other barriers that are typically associated with implementation of a major engineering project. It is recommended that 50% of the project leaders' time be spent on communication formal promotion of project teams and the advertisement of project progress to the rest of the organization (Lam, 2004). Workers should be told in advance the scope, objectives, activities and updates and admit change will occur (Kartam2005).

2.3.2 Project Teamwork and Composition

Project teamwork and composition is important throughout the project life cycle. The project team should consist of the best people in the organization (Buckho... et al, 1999, Bingi et al 1999, Rosario 2000; Wee 2000). Building across functional team is also critical. Teams should have a mix of consultants and internal staff, so that internal staff can develop necessary technical skills (Al-Hejji. 2006). Both business and technical knowledge are essential for the project .

The project should be the top and that is only when the workload would be manageable. As far as possible, teams should be collocated together at an assigned location to facilitate working together (Kwak 2002). They should be given compensation and incentives for successfully completing the project on time and within its assigned budget (Kartam,2005). The sharing of information within the company particularly between project partners and between partnering companies is vital and requires partnership trust (Lam, C

2004) Partnership should be managed with regular scheduled meetings. Incentive and risk sharing agreements will assist in working together to achieve similar goals (Al-Hejji. 2006).

2.3.3 Lack of User Involvement

Lack of user involvement has proved fatal for many projects. Without user involvement, nobody in the project feels committed to a system, and can even be hostile to it. If a civil engineering project is to be successful, senior management and project promoters notably

the government needs to be involved from start, and continuously throughout the development. This requires time and effort but can significantly reduce delays.

2.4 Delay-Case Studies

In construction, the term "delay" is used to describe the time overrun of a project beyond the official agreed completion time due to causes by the parties in the contract, who are the, Employer contractor and the consultant.

It is a project slipping over its planned schedule and is considered as a common problem in construction projects. To the owner, delay means loss of revenue through lack of production facilities and rent-able space or a dependence on present facilities.

In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases.

Growing market demands for improved lifecycle performance of facilities are increasing challenges in meeting project objectives. Integrated project delivery offer significant potential assistance in meeting these challenges, but require change by a set of activities that will be termed as construction engineering. The purpose of this research is to identify and describe activities that improve project performance related to cost, schedule, quality, safety, and sustainability and to illustrate their importance. These activities include designing, work process, implementation, contractor and civil engineering professionals challenges, provision of construction resources, and integrating work processes within and between project phases. This study describes the requirements and implications for different types of projects and the construction engineering activities necessary to satisfy the objective of the research . The applications and conclusions highlight the importance of mitigating delays for construction engineering success in meeting project objectives, the career benefits of this experience, and ways to realize these potential benefits

Case studies have been used as a research tool for the deep investigation into the topic of delays in large Civil Engineering projects. Commonly, case studies will employ triangulation in the case study itself, but it is essential to be aware of the validity of

generalizing the findings of a case study research project (Johanson & Samantha, 2001). Case studies are used in this research as an investigative tool to identify the causes of claims in construction projects. The outcomes are not generalized, but provide insights into such causes. The structure of each case study includes a description of the background of the project, followed by an overview of each of the claims involved. The following three case studies are for a hotel in Sinai, a hotel in the North Coast and an administrative building in Cairo.

2.4.1 Case study one

The project of concern is the renovation of a five star hotel in Dahab, Sinai. The owner of the hotel decided to contract a professional project management firm. The project was tendered using a unit price contract and via a short list of selected contractors, which had wide experiences in such type of construction. The planned duration was 6 months and was delayed 130 days in actual construction. Additionally the original contract cost of 10.75 million Egyptian Pounds (EGP) was increased to 12 million EGP. The contractor introduced 8 claims for the project.

The following is a summary of each claim and its cause. (Abd El-Razek, Bassioni & Abd El- Salam, 2008)

Claim No. 1: Type - Time

Special structural requirements led to a structural modification which was delayed by the

Structural consultant. The cause of this claim contributed to “variations initiated by the owner/consultant”.

Claim No. 2: Type - Time and Cost

The excavation depth was increased due a clause in the specification that the contractor must reach the old foundation level and connect it with the new foundations. The cause

of this claim was attributed to “Contract documents having errors, defects and omissions”.

Claim No. 3: Type - Time

The electromechanical consultant made a modification in the electrical design. The cause of this claim can be contributed to “variations initiated by the owner/consultant”.

Claim No. 4: Type - Time

The electromechanical consultant made modifications in the procedures referenced in the specifications for maintenance of air conditioning equipment. The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

Claim No. 5: Type - Time and Cost

Due to the modification to adjust air conditioning in rooms, the electromechanical consultant asked to add an opening in a beam for air return. The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

Claim No. 6: Type - Time and Cost

The architect and structural consultants asked to make a variation in the slabs and wall of suites.

The cause of this claim can be attributed to “variations initiated by the owner/consultant”

Claim No. 7: Type - Time and Cost

The electromechanical consultant also changed the path of the air conditioning ducts.

The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

Claim No. 8: Type - Time

The architect had designed a small pool in the private garden of suites. However, within construction time the owner asked to replace the constructed pools as designed by architect with smaller ones to mitigate the total cost of the project. The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

2.4.2 Case study Two

The second case study concerned the renovation of a hotel in the Mediterranean North Coast. The project was tendered using a unit price contract and contractors were short listed from a list of approved contractors.

The contractor introduced 8 claims within the project. Following is a summary of each claim and its cause. (Abd El-Razek, Bassioni & Mobarak, 2008)

Claim No. 1: Type – Time and Cost

The structural consultant had identified 16 columns to be repaired, which turned out to be 135 columns during construction. The cause of this claim was attributed to “changed conditions” and “inferior quality of design, drawings and / or specifications”.

Claim No. 2: Type - time

The architect changed the design of some room furniture components. The project manager studied the claim and determined concurrent delay, thus refusing the EOT.

The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

Claim No. 3: Type - Time

The architect had decided to use the old sanitary services which were found to be deteriorated during construction and the architect decided to replace all old ducts. The cause of this claim can be attributed to “variations initiated by the owner/consultant “and “inferior quality of design, drawings and / or specifications.

Claim No.4: Type - Cost

Due to the extra structural work nominated in claim no.1, some extra work resulted in reinstalling of walls and electrical works. The cause of this claim was attributed to “variations initiated by the owner/consultant”.

Claim No.5: Type - Cost

The architect decided to choose a different type of bath and shower mixer than those nominated in the BOQ. The cause of this claim was attributed to “variations initiated by the owner/consultant”.

Claim No. 6: Type - Time

The architect and owner decided to make changes to the project’s façade. The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

Claim No. 7: Type – Time

Procurement of ceramic tiles was delayed by a supplier due to their special color. The cause of this claim can be attributed to “stakeholders involved in the project”.

Claim No. 8: Type - Time

The contractor submitted a claim for 10 days and clarified the cause of this claim by the delay in the approval of electrical and fire alarm shop drawing and fixtures. This affected the start and finish of these works. The cause of this claim can be attributed to “delays of approval of shop drawings, instructions and decision making”.

2.4.3 Case study Three

The project discussed in this case concerns the construction of an administrative building complex project in Nasr City, Cairo. The owner tendered the design as a competition between architectural / engineering offices and chose the design that best accomplished his requirements. The project was tendered using a unit price contract through an open tender for companies categorized as grade one companies. The planned duration was 30 month and was constructed in three phases. Construction stopped for 7 months, and the projects consultant was replaced by a new consultant (Abd El- Razek, Bassioni and Abd El-Salam, 2008)

The contractor introduced 15 claims within the project. Following is a summary of each claim and its cause.

Claim No.1: Type - Time

Contact documents nominated a subcontractor responsible for the system of excavation. Through execution of the proposed system, some problems appeared and caused delays. The cause of this claim can be attributed to “stakeholders involved in the project” and “insufficient time for bid preparation and inadequate investigation before bidding”.

Claim No.2: Type - Time

As requested from the structural consultant, the foundation level was increased, after reaching the design depth. The depth of some pumps needed increase and some electromechanical problems required consideration. The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

Claim No. 3: Type - Time

An earthquake had hit Egypt that caused some damage to site works. The cause of this claim is not found in the causes list.

Claim No. 4: Type – Time and Cost

The consultant instructed the contractor to construct a new water barrage in the lower basement. This led to stoppage of work in the original barrage walls and also delayed part of the lower basement roof until the new design for this part had completed. The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

Claim No. 5 Type - Time

The contractor asked the consultant to provide some details for columns and slabs of basement that required a delay of 28 days. The cause of this claim can be contributed to “inferior quality of design, drawings and / or specifications” and “delays of approval of shop drawings, instructions and decision making”.

Claim No.6: Type - Time

The consultant made modifications to the levels around the building that caused a delay in the construction of the upper basement slab. The cause of this claim can be attributed to “variations initiated by the owner/consultant”.

Claim No.7: Type - Time

The contractor suggested changing the structural system. The owner agreed to change the system and was redesigned with the consultant’s approval. The cause of this claim can be attributed to “Inferior quality of design, drawings and / or specifications”.

Claim No. 8: Type – Time and Cost

The changes that happened in the basements slabs lead to an increase in the percentage of reinforcing steel in the concrete cubic meter than specified in the design drawings. The cause of this claim can be contributed to “Inferior quality of design, drawings and / or specifications” and “variations initiated by the owner / consultant”.
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Claim no. 9: Type – Time and cost

The consultant gave some notes on the electromechanical workshop drawings which had already been approved. The contractor considered these notes as a stoppage order as the notes would need time to execute. The cause of this claim was attributed to “Inferior quality of design, drawings and / or specifications”, “delay of approval of shop drawings, instructions and decision making” and “variations initiated by the owner/consultant”.

Claim no. 10: Type – Time

Due to the decision taken by the government to change the foreign exchange rate, the contractor introduced a claim asking for the difference between the old United States dollar price and the new one. The cause of this claim can be contributed to “Unexpected changes in exchange, interest and inflation rates”.

Claim no. 11: Type – Cost

The contractor introduced a cost claim due to the sudden and unexpected increase in steel prices from 1200 EGP/ton to 3000 EGP/ton. The cause of this claim can be attributed to “Unexpected change in materials prices”.

Claim no. 12: Type – Cost

Stainless steel sheets were used for cladding whose specifications was not specified in the contract documents. The consultant refused the contractor’s sample. This caused a claim that can be attributed to “Inferior quality of design, drawings and / or specifications” and “unbalanced bidding, underestimation and incompetence of contractors”.

Claim no. 13: Type – Cost

Contractor introduced a claim asking for cost of overhead costs in the period of work stoppage. The cause of this claim can be attributed to “acceleration and stop-and-go operations”.

Claim no. 14: Type – Time

The owner contracted with a new consultant after the second phase and the project was delayed due to review of designs, redesign and new works by the new consultant. The cause of this claim can be attributed to “variations initiated by the owner/consultant” and to “inferior quality of design, drawings and / or specifications”.

Claim no. 15: Type – Time

Due to variations that happened by the new consultant to solve project problems, the contractor introduced prices for new items in a claim. The cause of this claim was attributed to variations initiated by the owner/consultant”.

2.5 Review of delays on both Building and Civil Engineering projects.

Ogunlana (1996) studied the delays in both building and civil projects in Thailand, as an example of developing economies. Ogunlana deduced that the difficulties facing the construction industry in developing countries could be categorized into three groups:

- Issue of insufficient supply of resources among other deficits in industry infrastructure;
- Issues brought about by clients and consultants; and
- Issues arising due to the ineptitude of contractors.

Kumaraswamy (1998) examined the causes of construction delays in Hong Kong as seen by clients, contractors and consultants, and studied the factors affecting productivity. The review revealed differences in perceptions of the relative significance of factors causing delays in construction projects between the three groups, suggestive of their experiences, likely bias and lack of effective communication in outlining causes of the delays.

Mansfield (1994) studied the causes of delay and cost overrun in construction projects in Nigeria. The results revealed that the most important factors were financing and payment for completed works, poor contract management, changes in site conditions, shortage of material, and poor planning. Mezher (1998) conducted a survey of the causes of delays in the construction industry in Lebanon from the perception of owners, contractors and architectural/engineering firms. The survey concluded that owners had more concerns with regard to financial issues, contractors regarded contractual relationships the most important, while consultants considered project management issues to be the most important causes of delays. Battaineh (1999) evaluated the progress reports of 164 building and 28 highway projects constructed during the period 1996- 1999 in Jordan. The results indicate that delays were extensive e.g. the average ratio of actual completion time to the planned contract duration was 160.5% for road projects and 120.3% for building projects.

Al-Momani (2000) conducted a quantitative analysis of construction delays by examining the records of 130 public building projects constructed in Jordan during the period of 1990- 1997. The researcher presented regression models of the relationship between actual and planned project duration for different types of building facilities. The analysis also included the reported frequencies of time extensions for the different causes of delays. The researcher concluded that the main causes of delay in

construction projects related to designers, user changes, weather, site conditions, late deliveries, economic conditions, and increase in quantities. Talukhaba (1988) investigated on time and cost performance of construction projects and observed that construction claims in construction are majorly caused by delays in completing projects on time . Mwandali (1996) did an analysis of major factors that affect project management in Kenya Railway projects. Similar observations have been made in developing countries like Indonesia (Kaming, 1997), India (Morris, 1990), Vietnam (Long, 2004), Nepal and Nigeria (Aibinu and Jagboro, 2002) and in Ghana (Frimpong, 2003). Factors ranging from inflation, project complexity, inaccurate material estimation, financing, change orders, design changes, late submission of drawing, poor specification, incorrect site information, poor contract management among many others were found to be main sources of overruns.

Assaf (1995) studied the causes of delay in large building construction projects in Saudi Arabia. The most important causes of delay included approval of shop drawings, delays in payments to contractors and the resulting cash-flow problems during construction, design changes, conflicts in work schedules of subcontractors, slow decision making and executive bureaucracy in the owners' organizations, design errors, scarce and incompetent labour.

Musa (1999) conducted a study on factors influencing delays in water projects in Kenya funded by the Government Lack of capacity for contractor to execute projects diligently was found to be the cause of delay in his study. A similar study by Karimi (1998) focused on factors contributing to cost overruns in projects under the Ministry of Water and the observations in the study were that most projects experience delays due to the fact that the clients delay in honoring progress payments towards contractors.

Jonathan J. Shi (2001) presented a paper on method for calculating activity delays and appraising their contributions to project delay. The method consisted of a set of equations, which could be easily coded into a computer program that would provide fast access to project delay information. The observations were that delays are mostly caused by the non-payment by the client to the contractor and lack of coordination of project activity by the consulting team.

Sabah Alkass, Mark Mazerolle, Frank Harris (1996) presented a paper which discusses delays analysis techniques that issued by practitioners in the construction industry and this technique is called the Isolated Delay Type (IDT). The techniques was tested against a case example and its strengths and weaknesses underscored. It was found to give fair results in the determination of causes of delay.

A detailed study by the New South Wales (NSW)- Australia Royal Commission into Productivity in the Building Industry (1992) of 20 commercial high-rise buildings with a total design and construct value of over \$2.0 billion found 22 specific causes of time overrun. Weather, industrial disputation, client scope changes and variations, and consultant problems were some of the ones occurring with the highest frequency.

Kagiri (1998) identified the important factors that influenced the overruns in the power projects as: contractor inabilities, improper project preparation, resource planning, and interpretation of requirements, works definitions, timeliness, government bureaucracy, and risk assessment. Kaming (1997), on a similar study for overruns on high-rise projects in Indonesia established that, plant usage, resource estimates and human resource shortage influenced delays while environment, cost data, and inflation were significant in determining the cost overrun.

Focused study by scholars as seen in the reviewed literature on large civil engineering projects in Kenya and other developing countries reveals the following: There has been considerable and continued interest on the effects of construction delays. The information available is varied and widespread. Despite the necessity for such research, little work has been carried out to describe the delays in the public construction projects. These factors were among others: - (a) late or none payment to contractors by the clients (b) delay in issuing of technical information for use by contractor form the consultants (c) lack of management capacity by the contractors to execute work. The actual frequency and magnitude of these factors causing delays is not known, which has proven to be a serious and very expensive problem for the construction industry.

Developing countries like Kenya and others, lack resources, managerial skills and have low human capital productivity. Another factor identified in review for delays is incompetent designers/contractors, poor estimation and cost management, social and

technological issues, site related issues, and improper techniques and tools as in the case study of the (Economic Stimulus Projects) ESP-projects in Kenya. Therefore, project design standards, specifications and construction methods must be carefully selected so that they will be appropriate to local financial, human, and material resources required during both the implementation and its subsequent operation. It is important to appreciate that, for a country like Kenya, projects are sometimes implemented on “fast track” basis and some issues are easily overlooked during project preparation and often lead to projects implementation issues that result in delays. In a study on the following water projects(Bura dam,Mitunguu irrigation scheme and the Wikithuki irrigation scheme) funded by the Government of Kenya, the following were distinguished as factors that determined delays in the projects : quality of project management, operating environment, motivation of workers, infrastructure, inadequate resources, and organization of the project team.

2.5.1 Damages for breach of contract due to delay.

If one party has broken the terms of a valid contract, the innocent party is entitled to recover damages for any loss suffered. He must be restored to the position he would have been in if the particular damage suffered had not occurred, insofar as money can be sufficient compensation. Recovery may be confined to those losses that arise naturally in the usual course of events from the breach, and are thus assumed to be within the contemplation of the defaulting party. In a contract for construction works, where there is a client and a contractor, the measure of damages recoverable by the contractor or the client is the difference between the contract price and the new cost at the time when the contractor ought to have delivered the completed project.

2.5.2 Liquidated damages.

A contract may provide that, in the event of a breach, the innocent party may recover from the defaulting party a sum stated in the contract itself. This sum is called liquidated damages. This type of arrangement has the advantage of saving the time, trouble and expense of litigation should a breach of contract occur. Only the agreed sum is recoverable, even if the actual loss suffered greatly exceeds the sum fixed by the

contract. If damages are to be assessed by the contract itself, it is essential to estimate with precision the monetary effect of any possible breach.

2.5.3 Findings affecting management of projects.

The causes of delay frequently experienced as established through research by Ogunlana (2004) reveal that generally, out of the said causes of delay, most are caused by non-adaptation of the professional project management systems that would, when used on major construction projects, minimize the effects that have led to poor management of resources and hence delays. The most frequent causes of delay according to owners, consultants and contractors are shown in Table 2.1

From owners point of view, Morris (1990) the most frequent causes of delay are related to both contractor and labor. Results indicate that owners are realizing that awarding of projects to the lowest bidder is one of the highest frequent factors of delay. Inputs of the contractors indicate, Asaaf (2006) that the most frequent causes of claims are related to the owners. Consultants like owners, assigning and awarding the lowest bidder as the most frequent factor of delay Talukhaba (1988). This is due to the fact that most of owners award the lowest bidder to execute their projects. Generally, the lowest bidders are unqualified contractors with shortage in resources and low capabilities, which lead to low performance and cause delay in completion of the work.

Table 2.1-The most frequent causes of delay according to the stakeholders. Source: Talukhaba, A.A, (1988).

OWNER	CONSULTANT	CONTRACTOR
1. Delay in progress payment by owner	Delay in performing inspection and testing by contractor	Difficult in finishing projects by contractor
2. Delay to furnish and deliver the site to the contractor by the owner	Delay in approving major changes in the scope of work by consultant	Rework due to errors during construction
3. Change order s by the owner during construction	Inflexibility(rigidity) of consultant	Conflicts between contractor and other parties(Consultant and owner)
4. Late in revising and approving design documents by owner.	Poor communication/ coordination between consultant and other parties	Poor site management and supervision by contractor
5. Delay in approving shop drawings and sample materials	Late in reviewing and approving design documents by consultant	Poor communication and coordination By contractor with other parties
6.Poor communication and coordination by owner and other parties	Conflict between consultant and design Engineer	Inefficient planning and scheduling of project by contractor
7.Slownessindecision making Process by owner	Inadequate xperience of consultant	Poor qualification of the contractors technical staff

2.5.4 Changes in design and scope.

As earlier discussed whenever there occurs a delay in a construction project, many changes arise including variations to the scope of the works. A variation is defined as the alteration or modification of the design, quality or quantity of the works as shown upon the contract drawings and described by or referred to in the contract bills, and includes the addition , omission or substitution of any work, the alternation of the kind or standard of any of the materials or goods to be used in the works, and the removal from the site of any work material or goods executed or brought thereon by the contractor

for the purpose of the works other than work material or goods which are not in accordance with the contract. Delay on payment could cause change in scope of delayed project and are recipes for the contractor to spend more for both labour and materials which come due to price fluctuations. Depending on the form of the contract signed between the client and the contractor, the cost of fluctuation of prices must be made somehow by one or both parties in the contract.

2.5.5 Severity of delay causing disappointment to parties.

For the clients to have a construction project whether large or small designed and executed is only a means to an end, not an end to itself. To the clients, having a construction project means their problem of the desire to have a completed project solved. Having made the decision to construct, probably after months if not years of debate, the clients are impatient for results and are led to believe that their financial commitment is precisely established at the outset. To this end it is observed that from an early stage of the design process detailed estimates of time and money are given, changes in cost are monitored as the design is developed, tenders are usually called for on the basis of very detailed measurement and the rates for valuing variations are established as part of the tendering process in advance of letting the contract. Against this background of care, purchased at the clients expense, it appears that little can be done about the fact that the final cost and completion dates are impossible to predict and that the final settlement of cost is arrived at by approximation rather than evaluation. The cost of the project may be based upon countless data from previous schemes, the Contract Bills measured against a precise set of rules, but the claim is too often settled by going to war due to the fact that non of the parties in the contract is willingly ready to accept their defaults in the contract.

The most severe causes of delay, indicated by all parties separately, are highlighted below. Owners point out most of the severe causes of delay to contractor and labor. Inputs of owners underline that delay of progress payment by the owner is one of the most severe causes of delay. According to Aibinu and Jagboro (2002), the most severe causes of delay as seen by the owners are as follows:-

- Shortage of labor
- Unqualified work force.
- Inadequate contractor's experience.
- Difficulties in financing project by contractor.
- Ineffective planning and scheduling of project by contractor.
- Low productivity level of labor.
- Rework due to errors during construction.
- Delay in progress payments by owner.
- Original contract duration is too short.

Similar to owners, consultants indicate that the most severe causes of delay are related to contractors. Following are the most severe causes of delay as seen by the consultants:- Difficulties in financing project by contractor.

- Inadequate contractor's experience.
- Shortage of labor.
- Delay in progress payments by owner.
- Delay in material delivery.

Poor site management and supervision by contractor.

- Ineffective planning and scheduling of project by contractor
- Type of project bidding and award
- Poor qualification of the contractor's technical staff.
- Low productivity level of labor
- Unqualified work force.

Severe causes of delay as seen above by consultants and contractors.

2.5.6 Importance of delay to overcoming challenges of construction projects.

Improvements and changes are required in working conditions, training and skills, design approaches, use of technology and company relationships. Such changes in culture and structure are essential to enable improvements in the project process to meet ambition of construction industry.

In order to bring cultural changes we must start by valuing our people. It is not only the quality of the workforce but also how they are treated. Today the workforce is undervalued, under - resourced, and generally treated as a commodity rather than the most important asset.

Working conditions

Whilst some changes may take time, others can be delivered almost immediately. Facilities for workers at site are generally poor and most clients do not like such poor image of the industry. It is not very important only to provide workers with uniform, proper ablution facilities and rest rooms, the sites areas must be clean and become advertisements for the for the industry.

Health and safety record of construction is perhaps the second worst of any industry. Accidents seem to take place when either workers are not trained or working on processes they do not understand. The industry must reflect not only on the purely welfare consequences of a poor health and safety record but to consider its cost in relation to lost work days, potential prosecutions by injured workers and even enforced closure of sites by the authorities.

Training needs.

There are significant gaps at various levels. Right skills are required to be improved to improve productivity at the:

Top management level: Lack of personnel with the commitment to being in class with the right balance of technical and leadership skills to manage the industry's business. Career structure should be developed to produce construction management leaders of excellence.

Project manager level: There exists a need for training in integrating projects and leading performance improvement from its inception to commission. Training organizations and professional institutions should develop such training programs for construction workers.

Supervisor level: A key grade. In developing countries such a key grade person is virtually absent. Training needs to be identified as a matter of urgency to alleviate such acute shortage.

Designers: High standards of professional competence available must be matched by a more practical understanding of the needs of clients and of the industry more generally. Designers are to develop greater understanding of how their knowledge can contribute value in the project process and supply chain of materials.

Multi-skilling: Building techniques in developing countries require more workers able to undertake a range of functions based around standardized processes rather than trade skills.

Upgrading, retraining and continuous learning: Are not practiced currently in the industry. Frustration exists, as construction workers cannot cope with the new technologies that are being made available.

Quality and training are inseparable: Quality will not improve and costs will not go down until the industry educates its workforce in the skills and in the culture of teamwork. Training can be given deserved emphasis if all major clients, including public sector, insist to contractors who can demonstrate that they used trained workers. Valid training certificate must be produced of the workforce – could be a way forward.

2.5.7 Design, construction and use.

Too much time and effort is spent on construction sites, trying to make design work, in practice fundamental malaise in the industry is the separation of design from the rest of the project process. There is common knowledge of buildings performing poorly in terms of flexibility of use, operating and maintenance costs and sustainability. Designs should be properly integrated with construction and performance in use. Time must not be wasted in reconnaissance.

The following are the practical consequences of projects performance:

- Design team must fully involve subcontractors and suppliers.
- Experience gathered from completed projects must be fed into the next one.
- Right first time must be the target. Quality must become fundamental to the design process.

The era of design fees based on a percentage of the costs of a project must be eliminated. This old concept offers little incentive to build efficiently. Designers should work together with all other participants in the process from the inception of the project.

Whole life cost

Costs of energy consumption and maintenance cost must be encompassed in the design. Clients must also accept their responsibilities for effective design. Clients are too impatient to start the project without appreciating the need for resources to be concentrated up-front on projects if greater efficiency and quality are expected. This attitude of impatience by the clients to get their projects started and completed in the shortest time possible without considering the other project dimensions has hampered the completion time of development projects.

Technology

On its own technology cannot provide the answer to the need for greater efficiency and quality in construction. First, there is need to sort out the culture in the construction industry, followed by defining and improving processes of construction and the aspect of management of construction then apply technology as a tool to support these cultural and construction process changes.

Relationships

In other industries like the manufacturing service delivery, creation of long-term relationships/alliances for doing business together has become an essential element in the delivery of radical performance improvements. A team that does not stay together for long has no learning potential due to lack opportunities gain experience from other team members. Such relationship offers cooperation and continuity to enable the team to

learn and to take risk in improving the product. Good and longer relationships in business are one of the fundamental requirements.

In view of the foregoing the following are recommended:

- a) **New criteria are needed in selection of partners.** It is about best overall value for money and not the lowest price. Selection is on the basis of attitude to teamwork, ability to innovate and to offer efficient solutions.
- b) **Success sharing.** All teammates share success in line with the value they add for the clients. Clients also are to arrange for incentives to enable time savings.
- c) **Reliance on contracts.** Effective partnering does not rest on contracts. Contracts add unnecessary and significant cost and of no value to the client. Client contractor relationship based on mutual interdependence and sound understanding gained from previous completed projects shall make formal construction contracts obsolete. A relationship between British Airport Authority and Taylor Woodrow International is an example Johanson, Samantha and Davis (2012).

Performance measurement and competition against clear improvement targets in terms of quality, timeliness and cost are the main elements of improving, sustaining and bringing discipline to the relationships. These business relationships conducted properly are much more demanding and rewarding than those of competitive tender are. It requires mutual interdependence, continuity in workflow, stability and greater predictability. This kind of concept can be difficult for the industry and for many clients.

Alliances and partnering as described bring immediate savings. It may be unrealistic way of doing business especially for the public sector, but it is vital that a way must be found to modify processes so that tendering is reduced. Comparison between suppliers and rigorous measurement of their performance with quantitative performance targets and open book accounting, together with demanding arrangements for selecting partners“ value for money can be achieved and properly audited.

Table2.2: Most important causes of delay to the participants.

No.	OWNER	CONTRACTOR	CONSULTANT
1.	Shortage of labor	Changes in materials type and specs. during construction	Difficulty in financing project by contractor
2.	Unqualified workforce	Late procurement of materials	Inadequate contractors experience
3.	Ineffective planning and scheduling of project by contractor	Complexity of project design	Shortage of labor
4.	Low productivity of laborers	Delay in performing inspection and test	Delay in material delivery
5.	Rework due to errors during construction	Delay in approving changes	Poor site management
6.	Delay in progress payment by contractor to sub-contractors	Suspension of work by the owner	Supervision by contractor
7.	Difficulties in contractor planning his work	Delay in payments	Ineffective planning and scheduling of project by contractor
8.	Delay by contractor ordering materials on time	Original contract too short	Delay in progress payment by owner
9.	-	-	Original contract duration too short

a) Management Systems

In the construction industry and the traditional arrangement of procurement for work, contractors obtain work from clients, directly or through the consultants. The contract is made directly between the client and the works contractors. Whoever,

unlike the other systems of procurement of construction work a main construction manager is appointed at a fee to act as the client's advisor to provide planning management and co-ordination of construction itself. The project manager, both acting on behalf of and representing the client, has the duty of providing a cost effective and independent service correlating, integrating and managing different disciplines and expertise, to satisfy the objectives and the provisions of the project brief from inception to completion. The service he provides must be to the client's satisfaction, safeguard his interests at all the times and, where possible, give consideration to the needs of the eventual user of the facility.

In dealing with this project team i.e. the architect, quantity surveyor engineers e.t.c the project manager has an obligation to recognize the respective professional codes of other disciplines and in particular, the responsibilities of each disciplines to society, the environment and each other.

b) Construction management services are delivered through two methods:

- The agency construction management
- At-risk construction management

The agency construction management method is where the construction manager only acts as an agent of the client in the construction processes and does not do the execution of the works .The manager is then paid fee for the services. In the agency management system the construction manager does not have any risks in the construction processes.

In the design and construction process, the At-risk management entails a commitment to a guaranteed maximum price. In this process construction manager works through the design but acts as general contractor during the construction phase, now the construction manager who is also carrying the construction process has a risks that come with the construction work but at the same time has an economic interest in the profitability of the construction phase. The areas of risk exposure to delay include project programming, contract system, design development, contract tendering, construction development, financial burden, and environmental factors. Once the variables are firmly identified, effective plans can be developed and applied which

organize the project resources, establish clear lines of authorities and communications, set limits and lead the project forward towards successful completion and commission free from the cloud of delays which leads to claims and litigation.

c) Challenges of construction project management in Kenya.

Acceptability of construction project management by members in the professional fraternity.

Project management is taking root in Kenya although there is the challenge of it being freely accepted in the main stream of the professional circles as a worthwhile aspect in the industry. Some members in the design and consultancy team do not see the need for a project manager for they believe project management is a duplication of efforts and hence an added cost to the client. They also believe project management is competitive but not complementary as it is supposed to be.

d) Lack of trained and qualified personnel to fill the gap in the area of project management.

Some Universities in Kenya i.e. The Nairobi University and JKUAT have impressed the profession of project management and are now producing trained personnel that could fill the gap of the availability of this cadre of personnel but before then, there is a challenge of lack of these people.

e) Local legislation to govern the profession of project management

Construct project management just like other professional bodies must be governed and regulated by an act of parliament which is yet to be worked out. The institute of project managers of Kenya with other stakeholders has prepared draft bill for legislation into an act of parliament (ICPM, 2012).

Local frame work to regulate the mandate of the profession of construction project management

Due to the fact that project management in construction is not officially recognized by law in Kenya, there have been no laws (act of parliament) to regulate the work of projects and construction management and hence the emergence of quacks in the name of construction project managers.

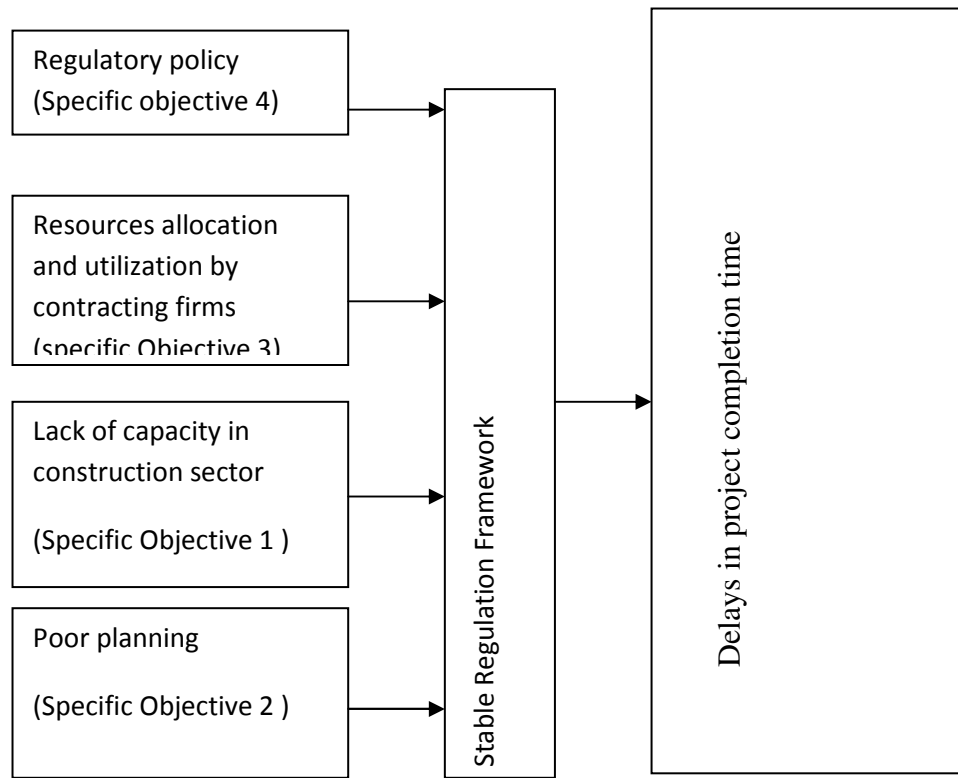
f) Supervisors

While most companies will hire the majority of the workforce just before the start of a building project, they will keep a group of qualified trade workers in employment as supervisors. Supervisors will either manage their particular group of trade workers, such as bricklayers, ground worker, carpenters etc., or they will direct a group of mixed trades within a site-specific project, such as foundation laying and window fitting.

2.6 Conceptual Framework

Conceptual frameworks, according to Kothari (2008), are structured from a set of broad ideas and theories that help a researcher to properly identify the problem they are looking at, frame their questions and find suitable literature. Most academic research uses a conceptual framework at the outset because it helps the researcher to clarify the research questions and aims. Researchers use conceptual framework (figure 2.1)to guide their data collection and analysis. According to sociologists (Haralambos and Holborn 2008), a conceptual framework enables the researcher to find the link between the existing literature and his own research goals.

Moderating Dependent



Independent variables

Figure 2.1: Factors leading to delays in large engineering firms

The study tried to analyze the challenges that are existing in the regulatory framework, poor planning, lack of capacity and resource allocation and utilization pose to the timely completion of construction projects.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction.

This chapter provides the methodology used to carry out the study. The methodology elements considered include the research design, population, sample size and sampling design, data collection methods as well as data analysis.

3.2 Research Design.

A research design is a scheme used to generate answers to the issues and problems reported. The research design employed in this study was descriptive survey method. Descriptive design is a method of collecting data by interviewing or administering a questionnaire to sample of individuals (Orodho, 2003).

This method is preferred because it allows for prudent comparison of the research findings. It was the descriptive survey that helped to determine delay factors in the cause of implementation of large civil engineering projects especially in developing countries. This required primary data collection on quantitative data for comparison. It has been used in similar studies notably.

3.3 Population

The study population for this research was the project lead managers on the projects that were active at the moment. During the time of study there were 120 projects being undertaken by consulting large engineering firms in Nairobi. According to the Ministry of works about 200 firms in Kenya are considered large based on financial turnover and the number of employees. These firms generally have a financial turnover of over ksh.10,000,000/- and employ over 50 workers on any civil engineering projects that they undertake. These respondents were targeted because they had the latest information on large civil engineering projects undertaken in Kenya.

3.3.1 Target population and sampling.

Respondents included twenty three (-23) contractors, nineteen (-19) consultants and fifteen (-15) owners out of 57. These is the group to which questionnaires were distributed, respectively. The contractors surveyed were categorized as grade C and above. They had an average of experience of about twenty 23 years, while, participated consultants have an average of about twenty one 21 years of experience. Purposive sampling was used to select the participants from an already available list. This study covers both private and public projects. Owners who had experience with more than one project are surveyed. The participating owners included government departments viz: 1). Public Works, 2). Roads, 3). Housing, 4). Electricity Company, 5). Local Government, and private developers.

Interviews were conducted on past cases of delay in construction projects .The selected case studies for this research were categorized as those falling under the following heads: Critical, extreme and special.

3.4. Sample Size and Sampling Design.

A sample size of 30 respondents was selected from all active projects which were 120 at the moment. Some of them were still under appraisal and not yet funded. The sample size was considered representative of the population since it comprised 25% of the total population which allows vigorous quantitative analysis. In order to get equitable representation of the project in the sample, stratified random sampling of the actual projects was undertaken as recommended by Mugenda.

3.4.3 Purposeful sampling.

The sample size selected will be sixty. In conducting the study, thirty firms were selected from contractors, twenty firms from consultants and Ten Clients of the three main stakeholders.

3.4.4 Case study sampling.

Interviews were done to investigate cases in construction for which delay has had adverse effects. Case studies are important in this research and have been used as a research tool for the deep investigation into the topic of delays in large Civil Engineering projects in Kenya. Commonly, case studies have been used to employ triangulation in this study, but it is essential to be aware of the validity of generalizing the findings of a case study research project (Fellows & Liu, 2003; Yin, 2001). Case studies are useful in this research as an investigative tool to identify the causes of delays in construction projects. The outcomes are not generalized, but provide insights into such causes. The structure of each case study includes a description of the background of the project, followed by an overview of each of the claims involved due to delays.

Table 3.1 Construction by Sector

Sector		Sample size (%) of population	Sample size (No)
Roads	36	25	9
Building	84	25	21
Total	120	25	30

Source: researcher

3.5 Data collection.

According to Punch (1998), data collection refers to gathering specific information aimed at proving specific issues described in the statement of the problem. The researcher used both primary data (questionnaire and interviews) and secondary data comprising published documents, books, dissertation and government policy publication.

The questionnaires included structured (close ended) and unstructured (open ended) questions. The structured questionnaires were used to facilitate easier analysis as they are in immediate usage form, while the unstructured questions were used so as to encourage

the respondents to give an in-depth responses without feeling held back in revealing of any information. With unstructured questions, a respondent's response may give an insight to his feelings, background, hidden motivation, interests and decisions and give as much information as possible without holding back.

3.6 Data analysis.

After data collection, the questionnaires collected were cleaned of errors made during data collection. The data was then summarized, coded and entered into the computer where analysis of qualitative data was carried out using the Statistical Package for Social Scientists (S.P.S.S). frequency measures of control tendency were used for descriptive statistics while Chi-square, T-test and z- test at 5% level of significance was used for inferential statistics. Qualitative data from professional organization (KAE) and government officials were analyzed using checklist and matrix analysis.

Data collected through quantitative method were analyzed using the thematic approaches under the headings the causes, effects and challenges involves in determining factors causing delays in large civil engineering projects.

3.7 Test for validity and reliability

Validity refers to the degree to which a test or other measuring device is truly measuring what was intended to measure (Kisilu, et al 2003). On the other hand, reliability is synonymous with the consistency of a test, survey, observation or other measuring device. This measure is important to ensure that the data collected is consistent and a representative of what we want to achieve from the research. Content validity helped the researcher to ascertain whether they had included or represented all the content of the research in the study. Test – retest approach enabled the researcher to test consistency among different questionnaires as filled by the respondents. The researcher used the Crobach Alpha method in SPSS computer program to test the reliability of the instrument. The alpha coefficient of correlation was found to be 0.8, thus the instrument was accepted as reliable and internally consistent (Frankel and Wallen, 1993).

CHAPTER FOUR

RESEARCH FINDINGS

4.1 Introduction.

This chapter provides the analysis of the data collected from the respondents. The analysis was based on the objectives of the study where personal data of the respondents were analyzed as well as statistics from their responses with a view to establishing the factors in the investigation into the causes of delay in large civil engineering projects in Kenya. The analysis provided the descriptive statistics, mean and standard deviation and the outcomes presented in form of frequency tables, percentages and charts.

4.2 Data Analysis.

4.2.1 Analysis of Response Rate and Descriptive Statistics.

Survey questionnaires were handed out to twenty three- 23 contractors, nineteen-19 consultants and fifteen-15 owners out of sixsix-66, fiftyone-51 and twenty seven-27 distributed questionnaires, respectively. The contractors surveyed are categorized as grade C and above.

There was a response rate of forty six (46) thus represents 71% of the total respondents who were available during the time the study was conducted. The above response rate was achieved by the researcher discussing with each of the respondent the basis of the study, assuring them on the confidentiality of the data given and allowing them ample time to fill in the questionnaire and hand in. After the lapse of the agreed times, all the respondents were followed up and reminded to hand in the filled questionnaires. Ten (10) or 18% of the respondents did not return their questionnaires even after several reminders and encouragement hence were left out of the study.

4.2.2 Personal Data of the Respondents.

Table 4.1: Distribution of Gender of the Respondents
 Frequency Percentage Valid Percentage Cumulative Percentage
 Valid Male 29 63.0 63.0 63.0
 Female 17 37.0 37.0 100.0
 Total 46 100.0 100.0

From the data that was collected, majority of the respondents were male at 63% while female were 37% as tabulated above.

Table 4.1: Distribution of Gender of the Respondents

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid Male	50	87.7	87.7	87.7
Female	7	13.3	13.3	13.3
Total	57	100.0	100.0	100.0

Source: Research Data (2015)

From the data that was collected, majority of the respondents were male at 87.7% while female were 13.3% as tabulated above.

Table 4.2: Distribution of Highest Academic Level of the Respondents

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid O level	1	1.8	1.8	2.2
Diploma	10	17.5	17.5	19.3
Bachelors	28	41.1	41.1	58.6
Masters	14	24.6	24.6	83.2
Doctorate	3	5.3	5.3	88.6
Others	1	1.8	1.8	100.0
Total	57	100.0	100.0	
Missing System	5	11.8		
Overall Total	57	100.0		

Source: Research Data (2015)

When the respondents were asked about their highest academic qualifications, the majority of them at twenty eight (28) or 41,1% said they had bachelor's degree, fourteen (14) or 24.6% of them had a master's degree, ten (10) or 17.5% said they had a Diploma while one (1) each or 1.8% had 0 level, 3 had doctorate degrees and others qualifications which was not stated (Table 4.3).

Table 4.3: Distribution of Age of the Respondents

	Frequency	Percentage	Valid percentage	Cumulative percentage
Valid 18 – 25	2	3.6	3.6	3.6
26 – 35	14	24.6	24.6	28.2
36 – 45	31	46.1	46.1	74.3
46 – 55	9	15.7	15.7	90.0
Above 55	1	1.8	1.8	100.0
Total	46	100.0	100.0	

Source: Research Data (2015)

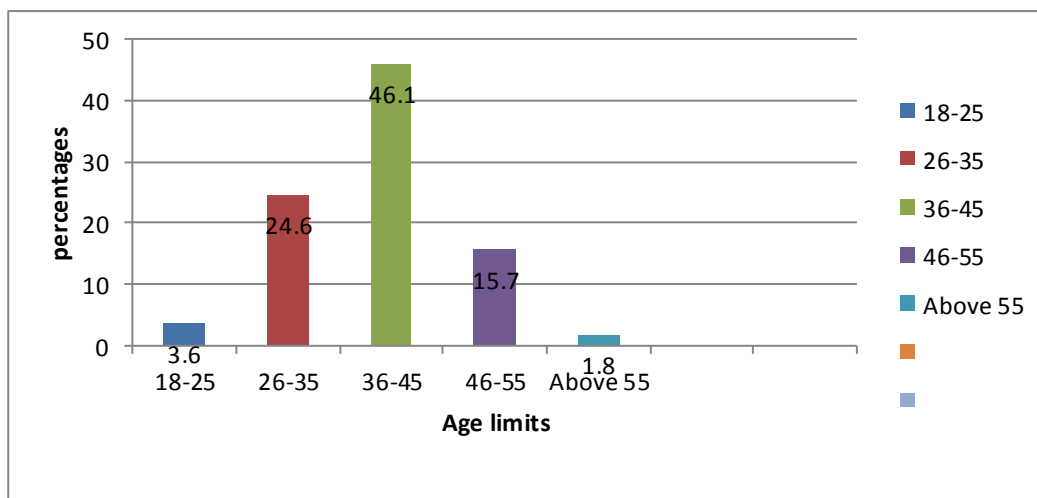


Figure 4.1: Distribution by Age of the respondents :Source: Research Data (2015).

On the ages of the respondents, majority of them, thirty one (31) representing 46.1% were aged between thirty six (36) and forty five (45) years, fourteen (14) or 24.6% of the respondents were aged between twenty six (26) and thirty five (35) years while nine (9) of them or 15.5% were aged between forty six (46) and fifty five (55) years. Only two (2) respondents or 3.6% were aged between eighteen (18) and twenty five (25) and one (1) respondent or 1.8% was aged above 55 years (Table 4.4& Figure 4.1).

Table 4.4: Distribution of Length of Service in the project consulting

	Frequency	Percentage	Valid percentage	Cumulative percentage
Valid Below 3 years	16	28.1	28.1	28.1
3-5 years	28	49.1	49.1	75.2
6-10 years	8	14.0	14.0	89.2
More than 10 years	11	19.3	19.3	100.0
Total	57	100.0	100.0	

Source: Research Data (2015)

The length of the respondents in project consulting was also queried to which sixteen (16) respondents; representing 28.1% had worked for less than 3 years while another fourteen (28) or 49.1% had worked for between 3 and 5 years. Eleven (11) others or 19.3% had experience of more than 10 years. The remaining five (5) representing 14.0% had between 6 and 10 years of experience. The aim of this section is to assess the capacity of respondents in terms of experience. It assists in determining their liability of the information of the participants. The information is given in Fig.4.2 below,

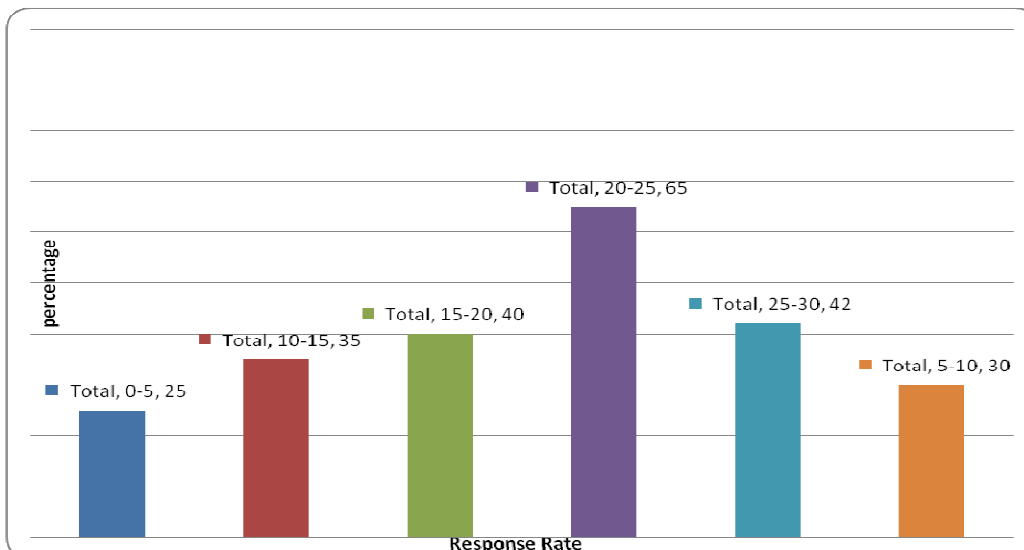


Figure 4.1- Experience of respondents Source: analysis of survey data.

The respondents who ranked high in experience were those between 20 and 25 years and this means lack of experience for the players is not a disadvantage for construction projects in Kenya. This shows that the same people have already been exposed to project management skills.

The respondents were asked to comment on various aspects as regards the delay in timely completion of civil engineering projects. The results of this question show that honoring interim certificates for payment by clients is the major source of delay that ranks at 90% of the respondents with poor contract documentation-25. This means adequate financing of projects is very crucial in mitigating delays in construction projects. The consultants cause delay by not providing comprehensive contract documents for the project administration. Planning with similar responses at 93.5%, and issuance of construction permits with least responses at 82.6% (Table 4.2).

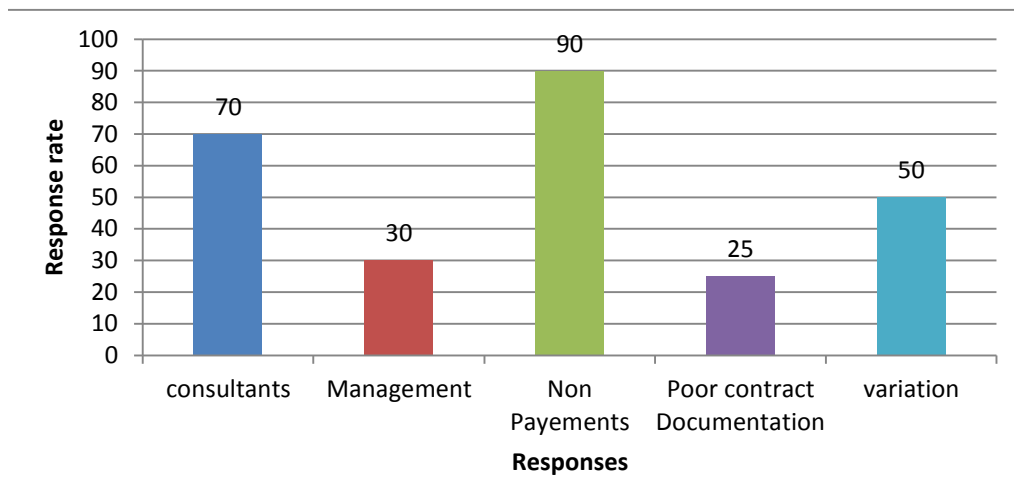


Figure 4.2: Indication of main delay causes in large civil engineering projects

Fig.4.3 shows the largest contributor to delay which is due to, the changes in design informally instructed by the client through the consultants this was indicated by 52% of all the respondents. According to the response received the second largest contributor to delay is contract variations and the least is force majeure at 13%. Because change of design is inevitable in construction it goes without saying that delay cannot be completely be avoided. The other factors range from scope-35%, management- 40% and finances-

50%. If changes occur, the project experiences problems of renegotiations expenses of changing and financing.

Based on their experience in the current projects 85% of respondents pointed out that the largest impact/effect of delay was total disappointment of the project client.

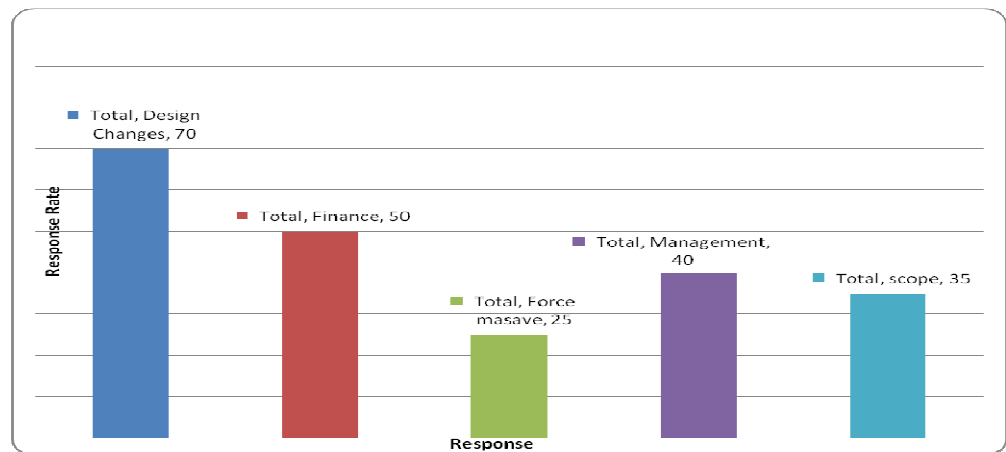


Figure: 4.3-Largest contributor to delay *Source: analysis of survey data.*

From Fig.4.4 –it is revealed that the largest impact/ effect of delay are disappointments by the affected parties and stands at 85% as per the survey conducted. Due to disappointments, progress will be lacking and reduced confidence which leads to lack of motivation. Disappointment leads to little communication among parties which could cause disputes which eventually may lead to arbitration and claims for liquidated and ascertained damages. It also shows that contractors do not care about loss of profits and this causes the company to suffer financial losses.

When asked what the average delay in the project is you have been exposed to this question aimed at establishing the impact and their actions to delay when it occurs in terms of time. The response limits to this question have been given to range from very small (5-25Million), small (15-35Milliom) average (25-45Million), large (45 65 Million) and very large (65M and above). The response shows that the average projects in magnitude (size) experienced the highest delay while the lowest delay is experienced by the very small project standing at 10%. This analysis confirms the fact that most contractors are not willing to rectify delay by spending more money in addition to accelerate work due to the lack of capacity to do it. The bigger the project the higher the risks of delay considering that the causes of delay also become magnified. The project is affected by the fact that participants take causes of delay on an average level showing no initiative to act and therefore delay persists and in long run project problems are left unattended.

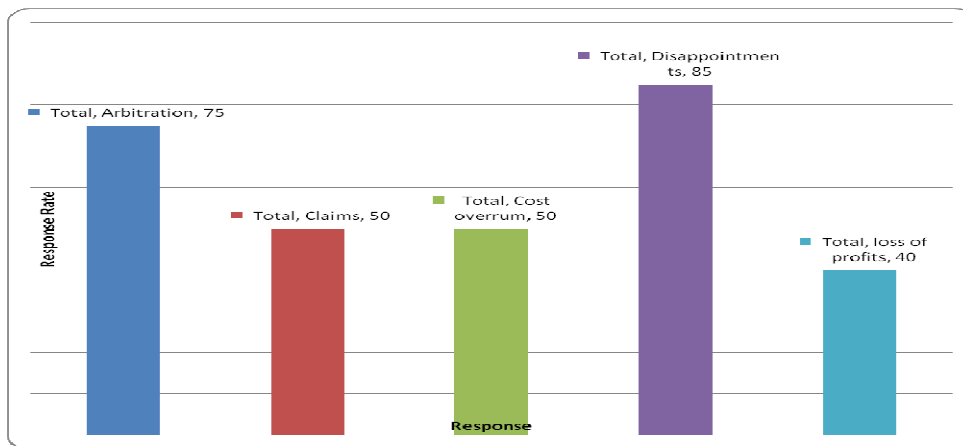


Figure: 4.4 Indication of the impacts of delay in civil engineering projects Source: analysis of survey data.

The respondents were also asked about the effect of licensing processes on the timely completion of engineering projects. The regulator to which the majority at 47.8% said that the effect was to a very high extent while another 23.9% of the respondents said that the effect was to moderate extent, the other 19.6% said that there was no effect. A mean response of 3.9 indicates that the respondents in general said that the effect was to a very

high extent and were more uniform in the response as depicted in the standard deviation of 0.8 (Figure 4.5).

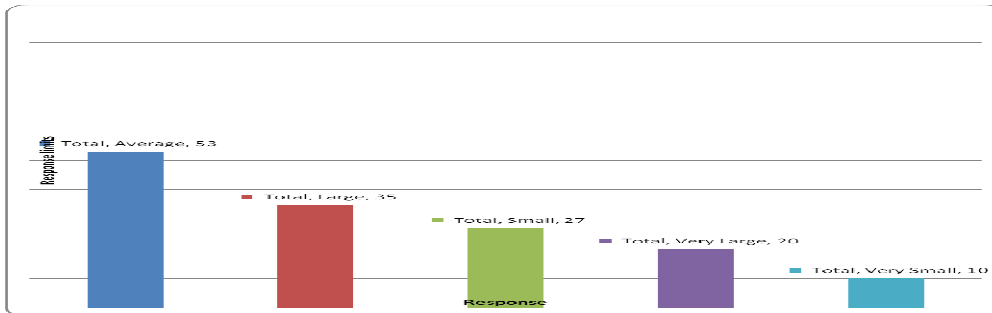


Figure 4.5. Severity of delay. Source: Analysis of Survey Data. Source: Research Data (2015).

On the effect of issue of construction permits on the performance of construction sector, the majority of the respondents, 47.8%, said that the effect was to a very high extent whereas 15.2% of the respondents said that the effect was to an excellent extent. An equal percentage (32.9%) said that the effect was to a good extent. Some eight (8) respondents representing 19.6% did not respond to this question, the highest number of respondents who did not respond to any particular question in the entire questionnaire. The mean response was 3.7 (very good extent) and the standard deviation was 0.9 indicating uniformity of those who responded (Figure 4.6).

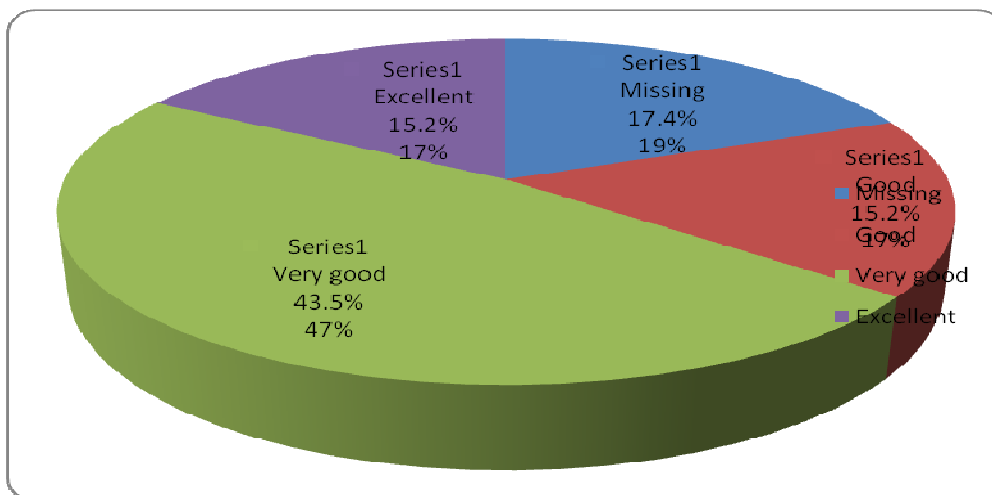


Figure 4.6: Effect of Issuance of Construction Permits Source: Research Data (2015)

When asked to explain their views, some of the respondents said that construction sector reports reviews should shift from being desk exercises to more of field visits and scrutiny so as to make them more thorough and improve sector’s visibility in them.

When projects are delayed some remedial actions are necessary in order that the effects of the delays are minimized. From the questionnaire, most respondents would opt to pump in more resources to mitigate the delay if they realized an eventual delay. This was said by the 80%

of the respondents and the lowest percentage was 20% who said they would improve on their management systems to minimize delays.

What this means is that most respondents would prefer to put more resources than expected than wait to see their projects suffer due to delay even if the said resources are scares. The other remedial action although not considered by the respondents and which needs to be employed is the change of the structural organization in order to improve on the management system.

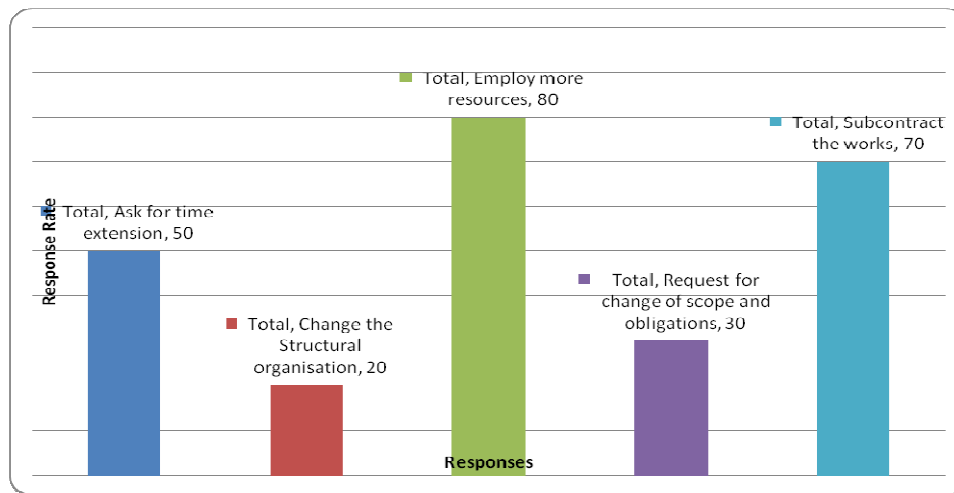


Figure 4.7-Remedial action for delay source: analysis of survey data.

On whether the performance of the regulator was affected by the way the organization handled sector complaints, the majority of the respondents at 45.7% said that the effect was to a good extent, 23.9% said that the effect was to a very good extent, 17.4% said

that the effect was only to a fair extent. Only one (1) respondent representing 2.2% thought that the effect was to an excellent extent. However the mean response rate of 2.9 indicates that in general the respondents said that the effect was to a good extent and a standard deviation of 0.9 shows that the responses were rather uniform (Figure 4.8).

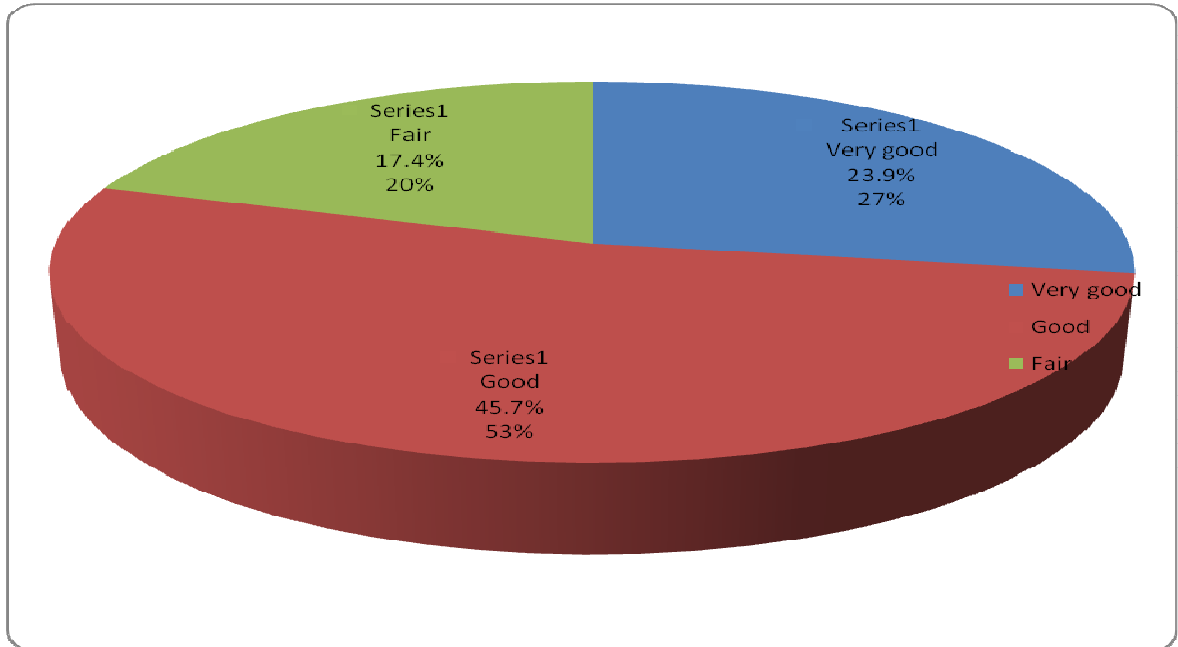


Figure 4.8: Performance of ERC in Handling of Sector Complaints Source: Research Data (2015)

When asked to explain their views on the performance of ERC on handling sector complaints, some of the respondents expressed lack of enforcement powers of ERC's decisions as a weak link to its performance in the indicator as the Commission cannot make awards and sanctions.

Table 4.5 : Effect of Regulatory Framework on the Performance of construction sector

	Frequency	Percentage	Valid percentage	Cumulative percentage

			ge	
Valid	1	2.2	2.2	2.2
Strongly Disagree	1	2.2	2.2	4.4
Disagree	7	15.2	15.6	20.0
Neutral	19	41.3	42.2	62.2
Agree	17	37.0	37.8	100.0
Strongly Agree	45	97.8	100.0	
Total	1	2.2		
Missing	46	100.0		
System				
Total				

Source: Research Data (2015).

The study also sought to find out the other various factors that affected the performance of the organization. The respondents were asked if the regulatory framework within which the construction sector worked affected the performance positively to which the majority of them at 41.3% agreed, 37% of them strongly agreed, seven (7) representing 15.2% were neutral, meaning they did not know the effect. One respondent each disagreed and strongly disagreed (Table 4.5).

When asked to explain their answers to the effect of regulatory framework, some of those who responded said that the building construction act was a good starting point for the to review to give the Commission powers to enforce the penalties provided for non-compliance and include financial wards for aggrieved parties.

Table 4.6: Alignment of Regulatory Knowledge to timely completion of construction projects.

	Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	19	31.3	31.3	41.3
Very Effective	25	44,3	44,3	95.7
Moderately Effective	10	19.1	19.1	97.8
Slightly Ineffective	2	2.2	2.2	100.0
Very Ineffective	57	100.0	100.0	
Total				

Source: Research Data (2015)

The same data can also be illustrated in a pie chart as figure 4.9 below;

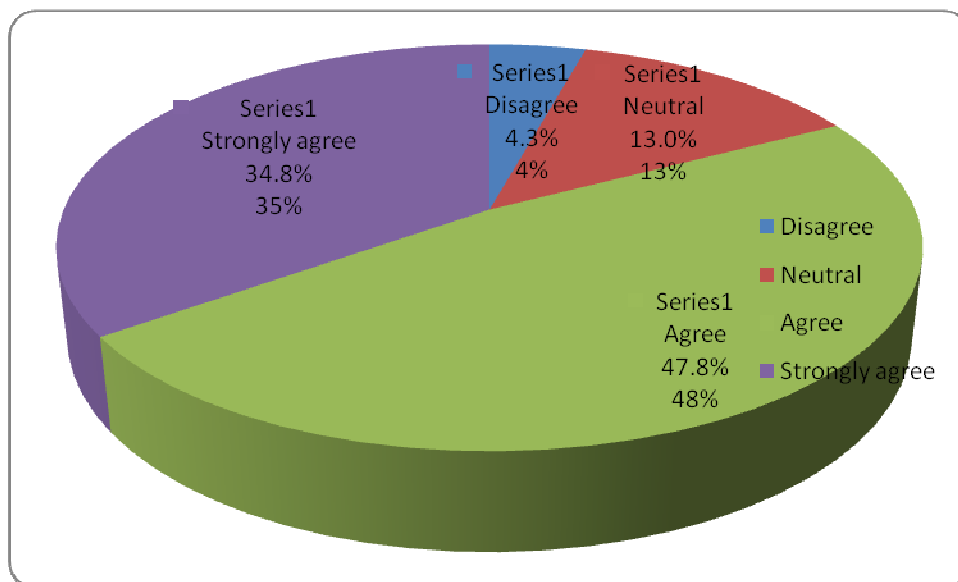


Figure 4.9: Alignment of Regulatory Knowledge to timely completion of construction projects Source: Research Data (2015)

The respondents were also asked if construction sector's regulatory knowledge were aligned to organization avoidance of delay, majority of the respondents (22) agreed that they were aligned while another 16 of them strongly agreed that the knowledge was aligned to the goals of the Commission. Only six (6) respondents were neutral on this while another small group of respondents (2) disagreed that the knowledge was aligned to the sectors goals. No respondent strongly disagreed that the goals and the knowledge were aligned (Table 4.6 & Figure 4.9).

Table 4.7: Regulatory Knowledge and timely completion of construction projects.

	Frequency	Percentage	Valid percentage	Cumulative percentage
Valid Disagree	5	10.9	10.9	10.9
Neutral	14	30.4	30.4	41.3
Agree	16	34.8	34.8	76.1
Strongly Agree	11	23.9	23.9	100.0
Total	46	100.0	100.0	

Source: Research Data (2013).

However, when asked whether the regulatory knowledge was structured around organization performance, the majority of them (16) agreed that regulatory knowledge was structured around the organizational performance while fourteen (14) of them were neutral on this. Eleven (11) others strongly agreed that the regulatory knowledge was structure around the performance yet the remaining five (5) said that they disagreed that the knowledge was structured around the regulatory knowledge (Table 4.7 & Figure 4.10)

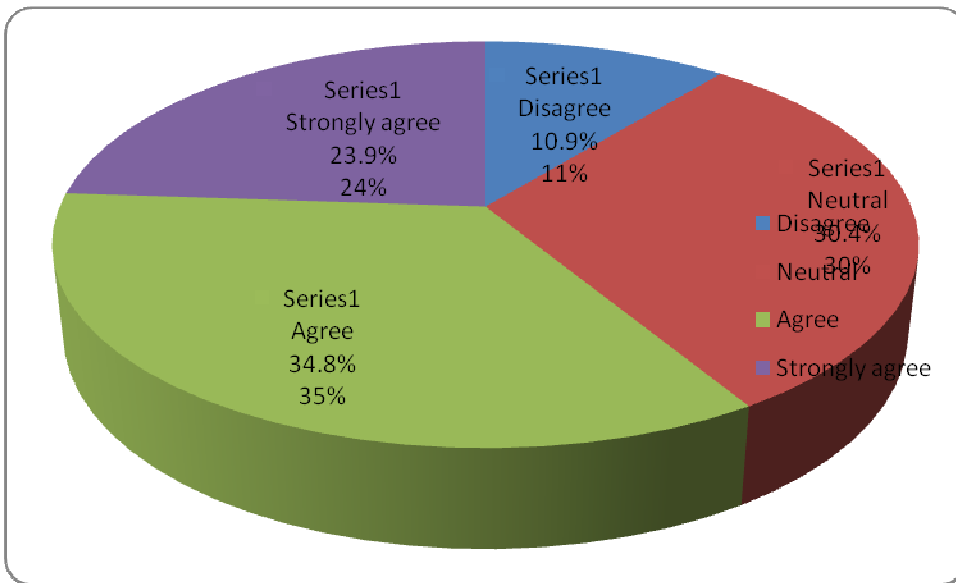


Figure 4.10: Regulatory Knowledge and timely completion of construction project

Source: Research Data (2015).

4.4 Conclusion

Civil engineering works: building construction are the main civil engineering projects. Experience and exposure to delay has been shown to influence building industry. The fact that the number of respondents in building was high also helped to analyze the causes of delay diligently. Causes of delay: according to the analysis on the chart, the most significant causes of delay include; non-payment, poor management and design changes by client.

Effect of delay: from the analysis done earlier in the chapter, it indicates that the main impacts on civil engineering projects by delay are disappointment and arbitration.

Reaction of delay: according to the respondents, the average projects in magnitude are the most affected by delay.

Recommended action on project: most respondents agreed that employing more resources would help mitigate delay; contractors could also mitigate delay by way of subcontracting the works.

Management: for best practice, the choice and change of internal structural organization could be cheap to implement and these structural organizations are recommended by the project manager

4.5 Results and Discussion

Civil engineering works: building construction are the main civil engineering projects. Experience and exposure to delay has been shown to influence building industry. The fact that the number of respondents in building was high also helped to analyze the causes of delay diligently.

Causes of delay: according to the analysis on the chart, the most significant causes of delay include; non-payment, poor management and design changes by client.

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Recommended action on project: most respondents agreed that employing more resources would help mitigate delay contractors could also mitigate delay by way of subcontracting the works.

Management: for best practice, the choice and change of internal structural organization could be cheap to implement and these structural organizations are recommended by the project manager.

4.5.1 Summary of discussion.

This study focused on delay of construction projects in Kenya. The study sought the views of clients, consultants, and contractors on the relative importance of the factors that cause delays in construction projects in Kenya. The study showed that all the three groups of respondents generally agreed that out of a total of 45 factors the top three influencing factors in causing delay arranged in descending order of importance are:

- Delay in honoring certificates

- Lack of experienced contractors for large projects.
- Changes in the designs.

The 45 factors were categorized into major groups and were ranked. The results show that clients, consultants, and contractors all agreed that the financing group of delay factors was the most influential factor. Material factors were considered the second most important factor causing delay in construction projects followed by scheduling and controlling factors.

It was important to undertake this research so as to identify the significant causes of delays in construction in order to establish viable solutions that will address the resultant causes. The significant factors that as revealed by the research are 1- Non-payment by the client to the contractor which can be seen as a factor that affects an average contractor who may not have access to financial support facilities .These contractors are those registered as class C- and Bellow. Most of these contractors will encounter problems from banks and other financial institutions due to unpaid overdrafts. From the research that has been carried out, many factors have been established as being the most significant in the causes of delay in large civil engineering projects. These factors range from; delays in honoring payments, the effects of disappointments caused by the delays in the projects, the financial implication to an average contractor registered under class C and the eventual change of mind by the client in changing the design and scope of the works. All the above factors will affect small contractor who do not have stable financial resources to run the construction business. This type of contractor would run to the financial institution for loans that eventually accrues interests on overdrafts.

Considering that there could be some changes in the environment in the course of the said delay, the contractor is subjected to unforeseen circumstances of losing out on profits as a result of losses that come with the effects of inclement weather conditions that come with delays and hamper the smooth running and completion construction projects.

The identification of the significant factors established by selecting and factor scoring 50 above through the research and will fulfill the first objective of the study and will be a pointer to solutions to the study problem. Variables associated with most of the causes of delay include: delay in honoring payments and disappointments of parties in the contract.

An average contractor registered as class C- and below could not be having the financial capability to handle projects diligently without financial constraints due to their inadequacy of stability of cash-flow. These contractors will borrow money and eventually experience the cost of financing bank overdrafts when the money is not paid because the non-payment by the client due to the factor that work is not in progress. As the delay persists, the contractor could be faced with another challenge of increased scope of work, and complex interfaces of various work packages.

Construction projects will be completed faster through proper management schemes that will facilitate and translate into good use of resources. This implies that for instance, construction projects will be executed faster and the community will be able to access their use faster enabling a vibrant economy. After this study, it is expected that there will be a potential to produce knowledge for some useful application by way of adopting the recommendations made in the research which would generally revolve around the need for application of professional project management skills in construction projects.

Construction delay is a critical function in construction projects. Projects investigated in this study exhibit a delay in some construction sites in Kenya. In practice, this phenomenon is expected to continue unless management actions are taken to control these causes within the planned element of the design and construction works. Thus, good practice in planning, coordination, and the change of the control procedures of the public institutions needs to be recognized and the implications understood. We believe that the arguments and findings presented in this study provide a good guidance for managerial intervention, and provide some guidelines and actionable information that managers can utilize to manage their projects. In summary, this paper summarized some reason behind the delays caused in these sites and proposes some recommendation, which might enable the contractor organization to develop in house competitiveness for the achievement of one of the major goal in construction of a project, on 'time' completion. Further research is needed to investigate the limitations and potential improvements to causes of delays within each construction site.

Both owners and consultants specify labor and contractor related causes as the severe and important sources of delay, while, contractors indicate that the important sources of delay

in construction projects are owners and consultants. Only one cause of delay is common between all parties, namely “change orders by owner during construction”.

There are many causes which are common between two parties, such as delay in progress payments by owner, ineffective planning and scheduling of project by contractor, poor site management and supervision by contractor, shortage of labor and difficulties in financing project by contractor.

All three parties agree that the following delay causes are the least important:

- Changes in government regulations and laws.
- Traffic control and restrictions at job site.
- Effect of social and cultural factors.
- Accidents during construction.

The large Civil Engineering/ construction projects in Kenya have the characteristics described as necessary in project definition. They differ, however, in much aspect from other general types of projects. The role of the client, although similar to that of top management of an institution commissioning a project, is rather unique. The client does not control the designing and the contracting firms administratively.

It is the conditions of contract between them that regulate their relationships. Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include; the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it rarely happens that a project is completed within the stipulated time. As an investment good, the projects product contributes significantly to the gross capital formation of an economy. Governments, directly as clients and indirectly through the fiscal and the monetary policies, use construction industry to regulate their economies.

This is necessary in order to influence solvency, employment, economic growth, and to control inflation. The project as implied in general project management theory, faces different circumstances from those faced by a construction project. The nature of the

construction product and the process of making decisions during its planning and construction differ very significantly from those of other sectors. Due to the differentiation of the service offered by the design and construction teams, the construction project is mainly coordinative.

Design and construction organizational separation does neither, in the operations, favor economies of scale, nor, in the leadership, support the unity of command. The same has, within the professional, threatened the co-operative effort of the project organization.

It is surprising that management methods have not established themselves in this area where, in my opinion, they are most required. The industry is faced with the challenge to develop a professional with the technical know-how of the industry and a specialist in its managerial, economic and legal aspects. The engineer's approach, which emphasizes on the tools, though a recommendable attempt, is not adequate. Tools and techniques are technology based and become obsolete with technology. Management principles, on the other hand, provide a reliable and an all time knowledge base.

4.5.1.1 Recommended Remedies for Delay .

The importance of adequate and timely provision of financial resources in construction project management cannot be over emphasized.

Adequate finance is the hub around which everything else revolves. Everybody and everything connected with construction is adversely affected by lack of sufficient cash flow.

The project is not only delayed but the morale of workers goes down because of non-payment.

4.6 Mitigation measures.

4.6.1 Contractors should consider the following factors:

Project owners ought to pay progress payment to the contractor on time because it impairs the contractor's ability to finance the work. It is also important to minimize change orders during construction to avoid delays. And avoidance of delays in reviewing

and approving of design documents as anticipated. Further, they ought to check for resources and capabilities, before awarding the contract to the lowest bidder.

Firstly, the Shortage and low productivity of labor can be addressed by providing enough number of laborers who should be assigned and be motivated to improve productivity. Secondly, financial and cash flow problems: could be mitigated through management of financial resources and plan cash flow by utilizing progress payment.

Planning and scheduling should be done in the continuing processes during construction and match with the resources and time to develop the work to avoid cost overrun and disputes. Regarding site management and supervision, the administrative and technical staff should be assigned as soon as project is awarded to make arrangements to achieve completion within specified time with the required quality, and estimated cost.

4.6.2 Consultants should look to the following points:

Firstly, the consultants should review and approve design documents: any delay caused by the consultant engineer in checking, reviewing and approving the design submittals prior to construction phase, could delay the progress of the work. To address Inflexibility, consultants should be flexible in evaluating contractor's works and Compromise between the cost and high quality should be considered. Finally; Architect/design engineer should focus on the following issues: Producing design documents on time: Architect/Engineer should set a schedule to complete design documents on time, otherwise result in a delay of work completion. Mistakes and discrepancies in design documents: They are common reasons for redoing designs and drawings and may take a long time to make necessary corrections and project Management Concept formulated to mitigate delay.

Many contractors in developing countries are entrepreneurs who are in the business to make more profit (Ogunlana and Olomolaiye, 1989; Wahab, 1997) and therefore, may not be willing to pay highly skilled staff. All this results in poor management which results in delay. It is therefore very important that contractors come up with a well structured form of organization that will help in alleviating problems that come as a result of poor management accompanied with the desire to save money by the contractors.

Whenever there occurs a delay in the construction projects, resources are restrained which eventually causes disappointments to the players in the project.

Delay whether caused by lack of payment to the contractor or any other reason results into de-motivation and lack of project progress that will normally result into making the project more expensive than envisaged by way of payment to the contractor for claims and liquidated damages to the client.

From the questionnaire, most respondents would opt to pump in more resources to mitigate the delay if they realized an eventual delay.

CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS:

5.1 Introduction

This chapter summarizes the major findings of the study in relation to the objectives and research Questions provided in chapter one, conclusions and suggestions for further research. Completing projects on time is an indicator of efficiency, but the construction process is subject to many variables and unpredictable factors, which result from many sources. These sources include the performance of parties, resources availability, environmental conditions, involvement of other parties, and contractual relations. However, it rarely happens that a project is completed within the specified time.

Time is of great essence in the construction industry, time management is critical in determining the quality of a construction project. Ironically it is the dual elements of time and money that cause some of the most time and money consuming disputes.

One of the most troubled and complicated area is that relating to the concept of concurrent delay, which is a strongly contested topic in the building and construction industry. Both parties to a construction contract regularly use concurrent delay as an excuse to avoid responsibility for extension of time claims and the assessment of liquidated damages.

This report aims to identify the variety of principles or methodologies that may be followed in resolving delays disputes arising out of a construction contract. To this end, the first part of this report will investigate causes of delay in projects and other legal and technical methodology or principles adopted or applied by contracts in dealing with delays and disputes.

The second is to outline the various practical aspects relating to dealing with delays and their related disputes. The second part of the report examines methods of assessing delays, categories of information that must be sourced in resolving delays disputes and practical contractual management techniques in securing relevant information to deal with the consequences of delays within a construction contract.

The success of a construction project is critically affected by the firms involved on the project, the way they are organized, and the conditions that define their relationships (Sanvido 92). An understanding of the relationships between project delivery and total project costs should lead to more objective and informed project organization decisions. As far as the contractor is concerned, delay results into higher overhead and cost overruns for both materials and labor which is always to be transferred to the owner by way of contractual claims by the contractor and as a result overshooting the project budget.

The rationale of this evaluation is: To appraise the major causes of delay that result in disputes in terms of the impact on the parties involved in order to minimize the delays and ultimately improve the functionality of management of projects within the construction industry.

The aim of this research was to find among other things the following: To identify the causes of delays in large civil engineering project in Kenya, To establish the significant causes of delay in these projects and to formulate a structure to mitigate the projects delay.

Following the study conducted, several results were achieved as pertains to the above aims of the study. The respondents in this study included the major players in the construction industry who are the clients, consultants and the contractors. There are a few limitations to this study; first of all, the study will cover large civil engineering projects undertaken within a period of Ten (10) years only and due to time limitations I will not do an assessment of the status quo before the project starts. This implies that I will not have a solid base for the analysis of the contributions of the project, and what might be the results of other organizations or initiatives. My coverage area will be the whole Nation (Kenya) with specific projects in Nairobi and the greater Rift Valley.

The stakeholders in the civil engineering industry like tradesmen and the site supervisors may not be available for interviews neither at local nor national level, and government Civil Engineers in the local districts will not be consulted, mainly due to the fact that no central body of Civil Engineers and Technicians exists that works systematically with them. This is recognized as a weakness of the study since it is well known that in most

districts, a majority of civil engineering projects are designed, supervised and managed by Government Civil Engineers and Architects.

5.1.1 Research findings.

From the results of the study, it came out clearly that contractors responded more than the consultants and the clients and those they were (contractors) well experienced. The exposure response of the participants indicated that building/housing had the highest rank as having been undertaken comprehensively compared to other construction works scubas water, roads electrical etc.

From sections 4&6 fig 4-6(data analysis), the following are the major causes of delay according to the results of the field data honoring interim certificates of payment by the client, poor management by the consultant which comes about when they do not supervise work diligently, and design changes by the client and the architect.

According to the analysis of data in the said sections, thus questions 8& 9 the projects that mostly react to delay are those of average in magnitude. Therefore it is recommended that in these projects and any other civil engineering projects the contract documented instructions, terms and rules are followed strictly with diligence by the supervision team and the contractors to mitigate delays.

The structural organization should be molded to the best practice requirements of the project.

5.1.2 Formulating a management structure.

Many contractors in developing countries are entrepreneurs who are in the business to make more profit (Ogunlana & Olomolaiye, 1989; Wahab, 1997) and therefore, may not be willing to pay highly skilled staff. This all results in poor management which results in delay. It is therefore very important that contractors come up with a well structured form of organization that will help in alleviating problems that come as a result of poor management accompanied with the desire to save money by the contractors.

5.1.3 Summary of findings.

Whenever there occurs a delay in the construction projects, resources are restrained which

Eventually causes disappointments to the players in the project.

Delay whether caused by lack of payment to the contractor or any other reason results into de-motivation and lack of project progress that will normally result into making the project more expensive than envisaged by way of payment to the contractor for claims and liquated damages to the client.

From the questionnaire, most respondents would opt to pump in more resources to mitigate the delay if they realized an eventual delay

5.2 Conclusion.

The main aim of this study and evaluation of data was to appraise the major causes of delay that result in disputes in terms of the impact on the parties involved in order to minimize the delays and ultimately improve the functionality of management of projects within the construction industry. According to the analysis of collected data and findings, we have been able to gather main causes of delay, their impact and recommended good mitigation measures.5.2.1 Causes of delay

Based on the different groups of delay, the respondents generally agreed that the top three groups of delay are: financial, Design changes and mismanagement. From the many factors gathered in the literature review that agreed with the findings gathered, they were grouped into broad group Financial, Material, Scheduling and control and Design changes factors

The following brief discussion is focused on the groups of delays in descending order of their importance that includes; Nonpayment (90%), It is inability of clients (building owners) to honour payments on time.

In agreement with Frimpong and Oluwoye (2003) who found that financial problems are the main factors that cause delay in the construction projects in Kenya. Financial difficulties have also been identified as the first major factor causing delay in

construction projects in Malaysia (Alaghbari et al. 2007, Assaf et al. 1995). According to chapter 4, non-payment by client is the main cause of delay.

It is encouraging to note that clients interviewed also admitted that their inability to provide the needed funds on time is the most important delay factor. Change in design (70%) (Morris's, 1990)' cost and time overruns in public sector projects variation (70%)

Contractors and clients agreed that within this group, client initiated variations is the most important delay factor in causing construction delays Poor management (40%)

Conditions of contract should be incorporated in construction contract since they provide an administrative mechanism for ensuring the correct procedures are observed. Unfortunately, there is the perception that some parties are not very familiar with the conditions of contract resulting in breaches causing delay.

5.2.2 Impact of delay on the project

Considering that there could be some changes in the environment in the course of the said delay, the contractor is subjected to unforeseen circumstances of losing out on profits as a result of losses that come. As the delay persists, the contractor could be faced with another challenge of increased scope of work, and complex interfaces of the various work packages. Therefore it has been concluded that the main effect of delay on the project is disappointment to the workers (85%) and arbitration (75%) by the community which leads to poor communication between the parties.

5.2.3 Recommended to the mitigating factors.

We believe that the arguments and findings presented in this study provide a good guidance for managerial intervention, and provide some guidelines and actionable information that managers can utilize to manage their projects.

In practice, this phenomenon is expected to continue unless management actions are taken to control these causes within the planned element of the design and construction works. Thus, good practice in planning, coordination, and the change of the control

procedures of the public institutions needs to be recognized and the implications understood.

Constructions projects will be completed faster through proper management schemes that will facilitate and translate into good use of resources. This implies that for instance, construction projects will be executed faster and the community will be able to access their use faster enabling vibrant economy.

After this study, it is expected that there will be a potential to produce knowledge for some useful application by way of adopting the recommendations made in the research which would generally revolve around the need for application of professional project management skills in construction projects. The table 5.2 below shows findings and recommendations for future projects

Table 5.1 recommendations for future projects.

Findings	Recommended solution
Poor management.	It is important to adopt the recommendations made in this research, that there is need for change of structural organization and empres an effective management system in construction projects.
Nonpayment. Disappointments. Design changes. Loss of profits.	Nonpayment to the workers leads to lack of motivation to work. Therefore, the client should pay the contractor according to the terms of contract to avoid disappointments. Motivating participants towards work. Projects to be fully designed at the initial stage. Bonus schemes to be introduced to help contractors.

The figure 5.1 below shows a system of resolving a “best practice” in project management. The diagram outlines the Project Life-Cycle. An enhanced system of construction project management.

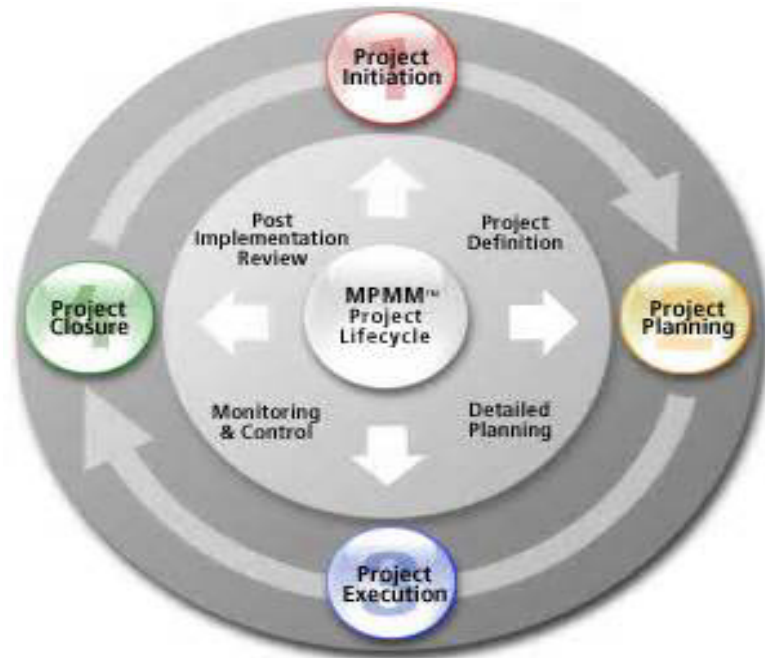


Figure 5.1: Project life cycle. Source:(<http://www.shilpabichitra/v083.htm>)

5.2.4 The Project Life Cycle consists of four phases:

The Initiation Phase is the first phase in the project. In this phase a business problem (or opportunity) is identified and a business case which provides various solution options is defined. A feasibility study is then conducted to investigate the likelihood of each solution option addressing the business problem and a final recommended solution is put forward. Once the recommended solution is approved, a project is initiated to deliver the approved solution. A 'Project Charter' is completed, which outlines the objectives, scope and structure of the new project, and a Project Manager is appointed. The Project Manager begins recruiting a project team and establishes a Project Office environment. Approval is then sought to move into the detailed planning phase. The other phases of project management include, project planning, project execution and project closure.

5.3 Recommendations for future studies.

Similar study can be performed in other countries of Africa. Another study can be done for a specific type of construction projects, such as utility projects, highways construction project, dam construction projects, etc. Detail studies can be done to evaluate the involvement and effect of a specific party or resource of construction project to the time overrun in construction projects.

A research can be carried out to investigate the effect of financing and cash flow problems on delays in construction projects.

5.4 Acknowledgments.

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APPENDIX-1

ANNEX 1: QUESTIONNAIRE FORM
INVESTIGATING DELAYS IN LARGE CIVIL ENGINEERING PROJECTS IN
KENYA

QUESTIONNAIRE

Date...../.....2013

Tick the appropriate box:

PART A – BIODATA

Q1. Which is your position in the project?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Arch	Client	Eng.	Qs	Contractor	Sub- Contractor
------	--------	------	----	------------	--------------------

Q 2. What is your experience in years in the Construction Industry?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Above 25yrs	16-25 yrs.	11-15yrs	5-10yrs	2-5yrs	0-1yrs
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PART B PROJECT DATA

Q 1. Which type of project have you been exposed to?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

Roads	Water	Building	Sub Contracts	Labour based	Others (specify)
-------	-------	----------	---------------	--------------	------------------

Q2. Have you experienced any delays in any construction projects? If yes, what could have been the cause(s)?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

Tendering process procurement of materials Commencement of works

Meeting of contract Obligations Communication Relationship between parties

Q3. What size of project have you been involved in?

2-35 Billion 1-2 Billion 500M- 1Billion 101- 500 Million 51-100 Million
1-50 Million

PART C – INDICATORS OF DELAY

QI Based on the following what in your opinion would be the largest contributor to delays?

Changes in design Delay in instructions honoring payments

Mismanagement Incapacity Weather conditions

PART D – EXPOSURE IN THE INDUSTRY

Q 1 Based on your experience in your current projects, what would you point to be the largest impact /effect of delay?

Arbitration/ Litigation

Claims Cost and time overdue

Poor quality Client dissatisfaction loss of reputation

PART E- SUGGESTIONS ON BEST PRACTICE

Q1. In your opinion what is the average delay in the project you have been exposed to?

5-10%

11-15%

16-20%

21-25%

26-30%

31% and above

Q2. What action do you take when you realize that your project is getting delayed?

Ask for extension of time Recapitalize the project Employ more resources

Change the structural organization Sub –contract the works request for change of scope and

obligation.

PART F- RESPONDENTS OPINIONS

Q.1 .What would you like to be done to improve on mitigation of delay in construction projects?

