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Adama Science and Technology University

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Cause and Effect of delay in Selected Building Construction project at Adama Town

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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.

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 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.

The results obtained indicate that the top major causes of delay were; Design change, contract Modify ,fluctuation of prices of construction materials, project schedule change. In addition the top major effects of delay were; Time overrun, Cost overrun, Total abandonment and Dispute.

The construction industry in Adama Town is an important sector due to its enormous contribution to the Town economic development. This in terms of employment opportunities and attraction of Foreign Direct Investments which grossly contributes to the Town. However due to social and financial situation of the Town, many construction projects are prone to delay. These delay factors can only be avoided by first identifying the factors and their source.

A survey on project management performance of different types of construction projects in Adama Town 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.

The main purpose this paper to find out the main cause of delay in building construction in Adama

CHAPTER 1

1.1 INTRODUCTION

Construction can be defined as an activity of the physical creation of infrastructure, superstructure and related facilities. It therefore comprises all civil engineering works and all types of building projects including; housing as well as maintenance and repair of existing structures (Wells, 1984).

Another definition states construction is a broad process or mechanism for the realization of human settlements and the creation of infrastructure that supports development. This includes the extraction and beneficiation of raw materials, the manufacturing of construction materials and components, and the construction of the project cycle from feasibility to deconstruction and the management and operation of the built environment (Plescis,2002 p.4).

A broad definition of term stipulated that construction is that sector of an economy which through planning, design construction, maintenance, repairs and operation, transforms various resources into constructed facilities. The types of public facilities produced range from residential and non-residential to heavy constructions (Moavenzadeh, 1978).

According to (Ofori, 1990) construction is that sector of an economy which plans, designs, constructs, alters, maintains and eventually demolishes buildings of all kinds of civil engineering works, mechanical work, electrical engineering structures and other similar works. He further describes the construction industry as having different sectors producing heterogeneous products which are immobile, complex, durable and costly.

Construction delay can be referred to as a prolonged construction period beyond that which was estimated previously. These delays have been proven to be a potential source of risks in the construction industry such that many current studies are looking for ways it can be managed.

The various risks associated with projects delay are cost related where delay will generally lead to an overall increase in the cost of the project.

Various studies carried out by (Cohen and Palmer, 2004, Baloi and Price, 2003, Milner and Lessard, 2001) have found sources of and categories of construction risks that needs to be managed as part of the project management process. Delays are an integral part of modern construction processes (Yates and Epstein, 2006). They stated that project delay starts from the inception phase of the project itself. In addition (Scott et al, 2004) mentioned that there is a tendency for construction projects to suffer from delays and such delays poses potential loses for

all stake holders. These include client or owner through loss of use and increase cost and for contractor and consultant through prolong presence on the site and loss of confidence.

Construction projects are a mix of very complex processes that seldom go according to the implementation plan. Project implementation is the stage where all the planned activities are put in to action, the project is produced and the performance capabilities are verified. A project is generally considered to be successfully implemented if it comes in on-schedule, comes in on-budget, and achieves basically all the goals originally set for it and is accepted and used by the clients for whom it is intended (Mbaluku & Bwisa, 2013).

The biggest client of the construction industry in most countries is the government (OkpalaandAiekwu, 1988). A huge amount of their yearly budget is being allocated to carry out construction in the country such as roads, residential and non-residential buildings, hospitals and schools, to stimulate economic growth.

Delay is mostly common in the traditional type of contracts in which the contract is awarded to the lowest bidder. This procurement method is mostly practiced in developing countries. Ensuring that the project is delivered on time is one of the most significant needs of the clients in construction industry (Latham, 1994).

Moreover completion of projects within the estimated time is an indicator of how efficient the construction industry is (Nedo, 1988). Quality, time and Cost are of primary concern to the contractor, but most often construction projects are procured based on only two factors; time and cost (Bennette and Grice, 1990).

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.

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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.

Construction delay can be defined as execute later than intended planned, or particular period, or letter than specific time that all the concerned parties agreed for construction project . Delay in project is counted as a common problem in construction projects. On large level there is no suspicion that the development of country depends upon its achievement of its advance plain with elevated construction contents.

Delay means loss of income according to and for the owner or client. In case of contractor, delay refers to the higher costs due to longer work time, labor cost increase and higher fabrication costs. On time completion of project is an indicator of efficiency. But there are many unpredictable factors and variables resulting from various sources affecting construction projects. Some main sources are the involvement and performance of parties, contractual relations, environmental and site conditions, resources availability etc. It is very rare to see that a construction project is completed on time. In this study, discussed most critical factors delay in large construction project at Adama Town.

Projects are envisaged and visualized with the foresight of achieving the primary objective of timely completion. Some projects are planned and executed successfully whereas others get delayed due to reasons, some of which are analyzed and evaluated in this dissertation.

Delays have a negative effect on the project in terms of performance, time and cost. Thus, it is essential to identify the types of delays that normally occur in a project.

The types of delays can be broadly split in two categories of delay by the client (compensable delays)and the contractor(non excusable delays).The delays can be identified as critical or non critical and whether the delay is concurrent or non concurrent. The identification of the types of delays leads to the reasons of delay.

The reasons for the delays are identified so that the effect on construction projects can be reduced. The reasons for delays are client and contractor related. Unreasonable project scope and inadequate early planning are the prime delays by the client. The client interference and delay in the decision making process also major reasons for delays. The client in some cases delays the design or changes the design leading to various other changes like design related changes to

drawings and their approval by the authorities. The contractor had delays related to overambitious estimates and incorrect task assessment which lead to delays and affect the project. In case of lack of task clarity, an inexperienced contractor or subcontractor may unknowingly delay the works.

The mitigation of delays can be achieved by adopting the process of knowledge management and project learning which gives insight into the various problems and their solutions. In fact the lessons leant feedback from projects is a real eye opener and helpful for others to avoid similar issues.(Shaikh 2009)

Prevention of delays by adopting innovative and teamwork helps in planning and analyzing the requirements in detail which will allow the mapping of resources and identifying the risks. The works can then be estimated, allocated and modularized for execution. The issues that can lead to delays need to be escalated, identified and resolved on a priority to ensure that they do not become a reason for delay.

The methodology for these studies takes into account the key data for each project which included the planning methodology, resources monitoring, cost methodology and the critical decisions which are likely to delay the project. The justification for the data considered is provided and further the method of data acquisition and data analysis is detailed to substantiate the methodology.

The analysis and of the data provided for the project is analyzed further for each case study for their planning, resources, cost and decisions processes. The recommendation for each project is given as to what could have been done to mitigate the delays. The knowledge gained in some of the module is applied for a recommendation which is applying the knowledge gained in a purposeful manner. Conclusions are listed based on the areas analyzed for the methodology for the case studies to allow for better knowledge management in future.

1.1 Characteristics of Construction

The following are common features of construction; immobility, uniqueness, heaviness, bulkiness, complexity, long duration of process, high expenses and durability (Turin,1980).

It was also pointed by (Moavenzadeh, 1978) that construction is often characterized by immobility, custom built nature, high initial expenses, complexity, continuous changing

technology. Thus the features of construction products and the broad range activities in the construction industry make construction worth of different consideration.

The construction industry must satisfy the demand for housing, building constructions such as; social and commercial buildings, heavy engineering constructions and industrial constructions including factories (Palani, 2000).

1.2 Statement of the problem.

Delay in construction projects has been a major issue in the Adama construction industry . The government spends huge amount of money in the construction sector in an attempt to carry out economic development. It's a normal tradition to allocate developmental funds in her yearly budget. Majority of this fund is set aside for the construction of roads, railways, hospitals, schools, residential and nonresidential buildings and airports. If these projects are delayed, it will not only slow down economic growth in the country but it will also increase government expenditures.

This will be due to procurement of materials at a higher price, and also due to change of contractors. The result will be wastage of country's resources that could have been used to for other purposes.

In addition, business organizations every year invest a lot of capital in construction of new facilities in an attempt to expand their businesses and generate more profits by increasing their sizes of operations and also to meet up with competition.

Delay will result to negative perception of the country's construction industry. Investors will not be willing to carry out construction projects in the country.

In addition, predominance of delay will discredit the local construction companies, contractors, consultants and engineers. This will results to the Town construction industry be less competitive.

Therefore with all these problems faced by the government, business organizations, contractor, consultants, community and the construction industry as whole, it is therefore imperative that a study be conducted to ascertain the factors contributing or resulting to the delay of construction projects. With these factors clearly outlined, they can be considered as the critical success factors of the projects.

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).

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 Adama. 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 Adama the causes of delay and its effects on the construction industry.

Chapter Two

2 Aim of the study

The main objective of this study is to determine the causes of delays in civil engineering projects in Adama Town

2.1 Objectives of the study.

The specific objectives of this project were as follows

1. Identifying the causes of projects delay in civil engineering projects
2. Determine the effects of delay in civil engineering projects
3. To determine the risks associated with construction projects delay
4. To identify the relevant ways of eliminating or mitigating the delays of construction.

2.2 Project Questions

1. What are the factors causing delay in construction?
2. What are the effects of construction projects delay?
3. What are the risks of construction delays?
4. How can delay in construction be mitigated?

2.3 Project Significance

The findings from this project will serve as a guide line to construction project holders of Adama that is the government, business organizations, contractors, consultants and the community at large. They will be aware of the uncertain factors that can result to delay of projects right from the inception phase. This study will also generate a list of delay causative factors that can be used as benchmark to control existing and future projects.

In addition stakeholders will also be aware of the delay related factors and how to avoid them. The study will also generate measures to mitigate or eliminate the effects of construction projects delay.

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.

Study findings 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.

Chapter Three

3 LITERATURE REVIEW

The process of construction can be divided into three distinct and significant phases; the project conception phase, project design phase and the project construction phase.

As stated by (Chan and Kumaraswamy, 1997) a vast majority of project delay occur during the construction phase where many unforeseen circumstances and factors occur.

Completing a construction projects within the estimated time and cost is an indicator of efficiency, but the process of construction is subjected to many unpredictable and changing factors which comes from different sources.

These sources include performance of parties, resource availability, environmental conditions, and involvement of other parties and contractual relations, thus the completion of the project within the estimated time is rare (Asaf, 2006).

Delays are usually accompanied by cost overruns. When this occur, it will have a debilitating effect on contractors and consultants in terms of growth and adversarial relationship, mistrust, litigation, arbitration, cash flow problems and a general feeling of trepidation towards shareholders (Ahmed et. al, 2002). In addition, delay of construction projects cause dissatisfaction to all parties involved and the main role of the project manager are to ensure that projects are completed within the estimated time and cost.

Projects stakeholders need to develop the capacity to foresee potential problems likely to affect their current and future projects. Identification of these common problems encountered on past projects in the construction industry is a good option to mitigate the factors that causes delay and their effects (Long et. al, 2004)

Construction project delay is worldwide phenomenon (Sambasivan and Soon, 2007) that affects not only the construction industry but the overall economy of countries as well (Faradi and El-Sayegh, 2006). It often involves multiple complicated issues all of which are invariable critical to recover the cost of delay or the necessity to prolong the project with the consequential entitlement to recover the costs of adjusting to the contract schedules.

When delay arises, there is always a question as to the causes of the delay and the opportunity of blames which most of the times will results to disputes and litigation (Bolton, 1990). Currently stake holders in the construction industry are increasing their concerns about the duration of the construction projects because of increasing interests, inflation, commercial

pressures (Nkado, 1995) and of course it's potential to lead to disputes and claims leading to arbitration and litigation.

3.1 Construction delay

The construction industry is regarded as a complex, fragmented, scheduled and resource driven industry. A successful project is one that is completed on time, within budget and meets the specified quality standard that is satisfactory to the clients and all stakeholders involved (Chan and Kumaraswamy, 1993). A timely completion of the project is a criterion to ascertain project success.

3.2 Factors causing construction projects delays

Several academic researchers have carried out studies over the years to investigate the causes of construction projects delays. Amongst these studies were;

A study carried out by (Sweis et al, 2008) on the causes of delay of residential projects in Jordan found out that financial difficulties faced by contractors and too many changes made by the client were the leading causes of most delays. In another related research performed by (Abd El-Razak, 2008) in Egypt discovered that the most important causes of delay were financing by contractors during construction, delay in contractors' payment by owners, frequent design changes by owners or his agent during construction, partial payments and non-utilization of professional construction and contractual management.

Furthermore a study was conducted by (Assaf and Alhajji, 2006) on time performance of different types of construction projects in Saudi Arabia, in an attempt to investigate the causes of construction delay and their importance according to each project participant (owner ,consultant and contractor). A total of 73 delay related factors were observed and the most common cause of delay identified by all three project participants was change on order.

In a similar report on the causes delay in large building projects in Saudi Arabia and their relative importance, (Assaf et. al, 1995) reported a total of 56 possible causes were revealed; the contractors, the owners, engineers all ranked the financing group delay factors as the highest cause of delay. According to the contractors, the most important delay factors were preparation and approval of shop drawings, delay in contractors' progress payment by owners, and design changes. To the engineers and architects, the most important causes of delay were cash flow problems during construction, relationship between different subcontractors, schedules in the execution of the project and the slowness of owners' decision making process.

On the other hand, the owners cited the main causes of construction projects delay to be design errors, excessive bureaucracy in project owner organization, labor shortages and lack of skillful personnel.

Moreover a study was conducted by (Ayman, 2000) in Jordan. He investigated the causes of delay of 130 public projects in Jordan. These projects were inclusive of residential buildings, offices, administrative buildings, medical centers and communication facilities. The results indicated that the main causes of delay of the public construction projects were related to designers, user changes, weather, site conditions, and late deliveries of materials, economic conditions and increase in quantity.

In Malaysia, a study of delay factors and their impacts on construction projects completion in the Malaysian construction industry was carried out by (Sambasvian and Soon, 2007). Their results showed a list of 28 different causes. Amongst these causes were; contractors improper planning, contractors poor site management, shortage of material, inadequate labor supply, equipment availability and failure, lack of communication amongst project participants and mistakes during the construction phase.

Previous review also indicated that the factors that leads to delay in construction projects are many and differ from country to country and from circumstances to circumstances.

(Oluguna et. al, 1996) reported that there were distinct problems that caused delays in the construction industry of Nigeria. These factors were classified into 3 groups namely; firstly problems of shortages or inadequacies in industry infrastructure which are mostly supply of resources, secondly problems caused by clients and consultants and thirdly problems caused by contractors' incompetence or knowledge and experience deficiencies.

Also, a research was also conducted in Ghana by (Frank and Adwoa, 2007) to determine the factors causing delay of building construction projects in the Ghana construction industry.

They carry out a survey using a semi structured interview of 15 key players in the construction industry of Ghana. A total of 32 delay related factors were determined.

The most important factors were found out to be; delay in honoring certificates, underestimation of the project cost, underestimation of project complexity, difficulty in accessing bank credit, poor supervision, underestimation of completion time of projects by contractors, shortage of materials, poor professional management, fluctuation of prices, rising cost of materials and poor site management.

In addition (Kaming et al, 1997) cited that design changes, material changes, material shortages, and inadequate planning were the most important cost of delay in construction projects.

A study also was conducted by (Ogulana et. al, 1996) investigating the causes of delay of 12 tall buildings in Nigeria. They focused their studies on clients/consultants related, contractor related and external related causes of time delay. They observed that material shortages, over stretching of technical personnel and design changes were the most important causes of project delays

A detailed literature review for the objectives is done to evaluate the types, reasons of delay and the methods for the mitigation and prevention of delays.

3.3 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. 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.

(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.

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.

3.3.1 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, in so far 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.

3.3.2 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.

3.3.3 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 poormanagement of resources and hence delays. The most frequent causes of delay according to owners, consultants and contractors are shown in Table 3.1

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 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 experience of consultant	Poor qualification of the contractors technical staff

3.3.4 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 labor 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.

3.3.5 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 none 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 sever 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

3.3.6 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.

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.

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.

3.3.7 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.

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.

Technology

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.

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

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.

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.

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

Project management is taking root in Adama 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 Adama. Have impressed the profession of project management and are now producing trained personnel that could fill the gap of the availability

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.

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 Adama.

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.

3.4 Cause factor of construction projects delays.

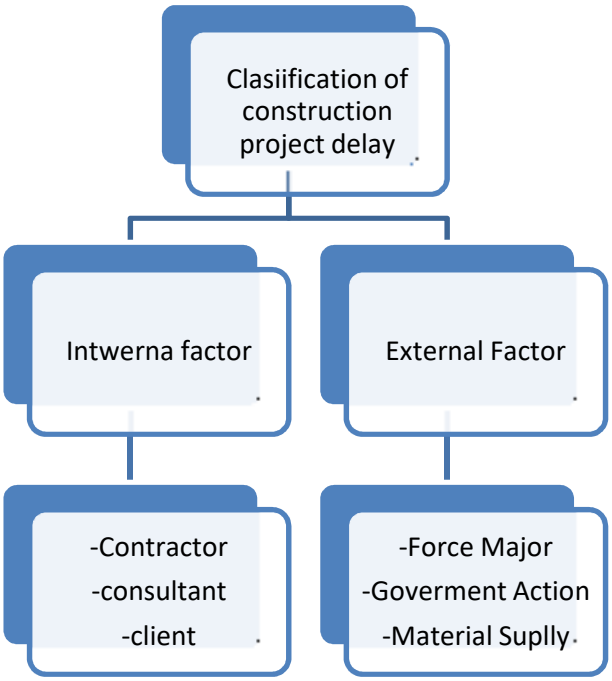

Fig 1

Construction projects can be caused by many factors. (Ahmed, 2003) classified delay into two groups;

1. The internal causes which arises from within the project stakeholders (clients, contractors and consultants).
2. External factors which occur as a result of unforeseen factors. These factors arise not from the project participants. They can be termed act of God and may include the

followings; weather conditions, natural disasters, government actions and material supplies.

3.5 TYPES OF PROJECT DELAYS

3.5.1 Critical delays and Non critical delays

3.5.2 Non Excusable (Contractor Caused) Delays & Excusable Delays.

3.5.3 Compensable (Owner Caused) Delay & Non-Compensable Delays.

3.5.4 Concurrent delay & Non concurrent delay

Before determining the impact of a delay on the project, one must determine whether the delay is critical or non-critical. Additionally, all delays are either excusable or non-excusable. Both excusable and non-excusable delays can be defined as either concurrent or non-concurrent. Delays can be further broken down into compensable or non-compensable delays.

3.5.1 Critical delays and Non critical delays

Delays can be analyzed based on the criticality of activities in the program. The baseline master program prepared in line with the conditions of contract has a critical path.

The critical path is the longest path in the network. The delay to the project occurs when an activity on the critical path is delayed and they have an impact on the successor activities and the overall project. Such activities known as critical activities are important and it should be ensured that the activities on the critical path are not delayed.

When the activities on the critical path are delayed, the delay is reflected on the entire project. Hence, it is required to review the critical activities and analyze whether the re sequencing of works can be done for effective project control "resequencing construction activities is a critical task for project planners for effective project control. Resequencing activities require planners to determine the impact or "role" an activity has on successor activities. They also need to determine the status of activities, i.e., which activities may or may not be delayed" (Koo et. al, 2007).

It is required to distinguish the function and status of activities which would mean that the planners have to understand the logic and sequence of activities. The critical path method (CPM) identifies the sequence of works based on the precedence logic and relationships and identifies the activities based on the criticality in relation to time. Thus for complex and large projects it is difficult to monitor individual activity logic and sequence and this cannot be done manually.

These limitations of the CPM frameworks are addressed "by formalizing a constraint ontology and classification mechanism.

The critical path guides the overall duration of the project. However in certain cases there are delays to activities which are not on the critical path and have a float. During the progress of the project these activities which were initially not critical get delayed and become critical and form part of the new critical path for the project.

3.5.2 Non Excusable (Contractor Caused) and Excusable Delay

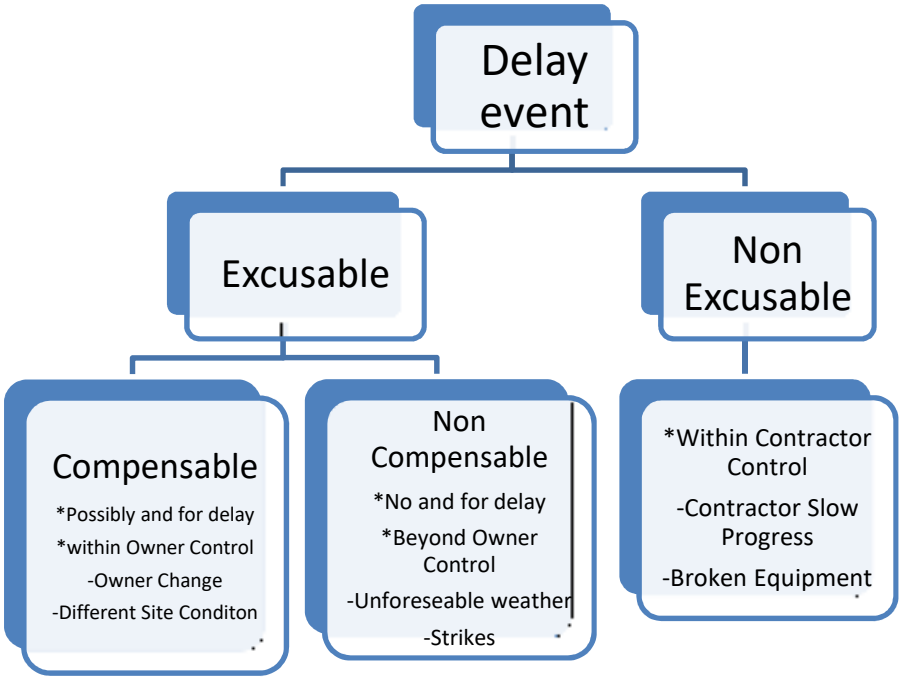

Fig 2

(Trauner et al., 2009)

Any delay to the project which is solely due to the contractor is regarded as a non excusable delay. It becomes the responsibility of the contractor and entirely his risk for the delay and the owner is entitled to claim any delays to the project in line with the terms and conditions as stipulated in the contract. The claim by the owner in such cases of delay by the contractor are normally related to penalty and or liquidated damages. The owners claim for the contractors delay usually range from delayed commencement of work at site, failure in proper coordination affecting progress of works, inability to finalize, order and procure in time and insufficient manpower to carry out the works in line with the program of works.

Also, in such cases where there is a delay by the contractor and the client also delays his decisions concurrent delay comes into the picture.

Delays occur in most kind of projects that range from simple building projects to complex projects such as nuclear power plants. It is important to classify the main causes of non excusable delays and highlight the factors that contribute to those causes. The delays by the client are the compensable delays on which the client can take necessary timely action as he has more control over it. The delays by the contractor are non excusable or non compensable and the contractor has more control and is expected to do whatever is appropriate to prevent them.

There are new trends and bad results in construction contracting which offer a review of the problems that occur in the construction industry. These include uncertain site conditions which are covered as part of the contract as the contractor has visited the site, he is aware of the site conditions. The important factor of any embedded power or water lines not visible at the surface shifts the risk to the contractor and any delay resulting from the same is the sole and absolute responsibility of the contractor in line with terms and conditions of the contract. The consequential damages in terms of liquidate damages or penalty or both would eat into the profit margins of the contractor.

The contractor has control over the non excusable delays and these delays expose the contractor to claims by the owner or the subcontractors. “Non excusable, non compensable delays are within the control of the contractor; examples include delay caused by late mobilization, late equipment deliveries, or an inadequate project work force.

Non excusable delays are not only non compensable but they expose a contractor to delay claims of its subcontractors and liquidated damages (or actual damages if there is no liquidated damages clause) by the owner.” (Schumacher ,1995)

Excusable Delay

Excusable delays are those not attribute to contractor ’s action or inaction ,and typically include unforeseen events .These events are beyond the contractor’s control and are without fault or negligence on his/her part. Excusable delay, when founded, entitle the contractor to a time extension if the completion date affected.(cohen seglias .et al, 2000)

3.5.3.Compensable (Owner Caused) Delay &Non-Compensable Delays.

Non -Compensable Delays, acts of God, fires, floods, etc.There is a general lack of understanding concerning the Non-Compensable Delay for weather. It should be noted that a

Non-Compensable Delay is for unusually severe weather. That is weather which is not anticipated at that time of year in that part of the country. It does not mean that any time there is inclement weather or weather that may prevent the contractor from working that the contractor is entitled to a time extension. The contractor is only entitled to a time extension when the weather is unusually severe. The determination of what constitutes unusually severe weather is based upon a review of the historical weather data for that area. For a contractor to request a time extension for unusually severe weather he should demonstrate what the weather was that he experienced and compare this with historical weather data normally taken from the National Oceanic and Atmospheric Administration (NOAA) records for that area. Normally, the weather data comparison is for the preceding five year period.

Compensable Delays are delays that are unforeseeable and beyond the contractor's control, but for which the contractor is entitled to not only a time extension but also additional compensation. Normally a Compensable Delay is caused by the Government. It may be caused by a direct change, it may be caused by a suspension of work, or it may be caused by any of the constructive changes. For a contractor to request both a time extension and compensation for that time extension, he must demonstrate that the Government was the cause of that delay.

3.5.4. Concurrent delay & Non concurrent delay.

Concurrent delays arise when one event causes a delay simultaneously with another event. If the owner caused delay and contractor caused delay affected the same activity or affect different activity on parallel activity path which are equally critical and as such owner caused delay and contractor caused delay would each have delayed the completion date of the project the delay are said to be concurrent. Example Two parallel activity paths are each by five works days during the same window by separate caused one delay was caused by the owner and both affected activities have the same float value .The two five works days delay are concurrent.

3 .6 REASONS FOR DELAYS.

The reasons for delays are project specific and vary from project to project. We identify the delays generally as well project specific.

The delays can be controlled by improving productivity and factors that affect productivity are dealt with the purpose of further increasing productivity and thereby reducing delays. The conclusion of the investigation is ranking of the factors and factor categories that are considered

by various project stakeholders. The areas of disparity between the stakeholders are indicated by their experiences, prejudices and ineffective communication. Thus the project scope factors can be supported by effective communications between all stakeholders.

According to (Abdalla et. al ,2002), projects encounter massive delays and thereby overshoot the initial time and cost estimates which in turn result in extensive delays providing a platform for claims and disputes. A survey done with the objective of finding the most important reasons for delays as per the traditional contracts indicate that "contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and subcontractors are among the top ten most important factors."

3.6.1 Unreasonable project scope.

Generally projects do not have an agreed scope of works document agreed at the start of the project. Even though the scope is identified in the contract documents, it is always possible for parties to interpret in the ways that are suitable and beneficial for them.

Change as defined by(Hanna et. al ,2007) "as any event that results in a modification of the original scope, execution time, or cost of work, is inevitable on most construction projects due to the uniqueness of each project and the limited resources of time and money available for planning." The factors that may result in a change can be changes or errors in design, scope addition or uncertain or unknown substrata conditions. The changes made entitle the contractor for the variation and the impact to the program in line with the change.

The various types of changes that can occur in a project are outlined including the financial aspects regarding each change. Further an overall impact analysis claim program will determine the final cumulative delay due to all the changes, modifications and additions to the project. Notwithstanding the claim for the changes the contractor is also contractually required to do his part and contribute to mitigate the delays which have to be considered in the potential overall impact claim program.

How important is the scope definition can be evaluated from (Song et. al, 2005) "a poor scope definition in an engineering design project disrupts project rhythm, causes rework, increases project time and cost, and lowers the productivity and morale of the workforce." It is clear from the above description that scope of work is not restricted the actual execution specifications but

commences from the engineering and design stage which allows for the smooth progress of the project to the construction phase.

Any changes to the design involves rework which may be abortive, modifications and or additions to the scope of works.

This in turn increases the time required for the rework itself and thus the cost, decreasing the productivity due to the interruption of work flow and affecting the morale of the workmen to a certain extent.

The measurement of the project scope based on quantities indicates the productivity that can be utilized for estimation, control, measurement and monitoring of outputs.

The result of this method led to increased utilization, improved project definition and productivity.

In case where there is a reduction of scope it has to be to have the acceptance of the owner. "Scope reduction involves identifying areas of the project scope of work that can be reduced in quality, quantity, or both in a manner that is acceptable to the owner." (Todd, 2008).

Reduction of scope of work can be for the quality of finishes as well as the quantum of work and can even include substitutions of materials and equipments, such that they help in reducing the cost of the project and they may be an alternative but not an equal substitute.

Another aspect that can be considered for scope reduction is scope deferral which consists of areas that can be delayed and completed in future. Only the necessary elements need to be installed like the structural elements can be completed as a shell and core and the finishes can be done later.

3.6.2 Inadequate early planning.

The primary task before the commencement of any project is as the saying goes"Plan the work, Work the plan". It is of utmost importance for any project to commence with the full planning to ensure the successful execution of works.

According to (Thomas et. al ,2007), "Planning is an essential function of project management." But, it is seen that the medium and small sized contracting companies do not take it as a priority and end up doing a job where there is little planning. If the planning is done from the tender stage or bidding stage then it will help in reducing the costs, allow realistic schedules and labor productivity.

The design and construction strategies need to be reconciled and if required the initial plan should be revised and communicated to all and finally enforce the final program.

The schedule can also be expedited by working concurrently and assessing the options for different work techniques. Since these are simple steps it should give positive results.

The importance of pre project planning and its effect on the success of the project has been recognized even though the process varies with organizations "pre project planning process varies significantly throughout the construction industry from one organization to another, and from one business sector to another." (Gibson et. al ,2006).

The factors that may be applicable for a small contracting company will be very different from the requirements of a large corporate construction group. Even the requirements of the construction industry and other industry requirements would be different. The project performance can be enhanced for any industry by ensuring that a thorough pre project planning has been done.

The owner has to have sufficient strategic information to decide whether to commit the resources and take the risk for the project. Pre project planning is the interface between business and engineering and is also referred to as feasibility study or conceptual or front end planning. "It is an owner's responsibility that it be performed adequately" (Gibson Jr et. al, 1995). However, engineering consultants also carry out these functions for the owner.

3.6.3 Lack of risk management systems.

The issue of risk management is a complex one as risk management has various levels and it is important to understand and attend to all these levels to allow for an effective risk management system.

According to (Weighell, 1999), risk management consists of four levels- business strategy, venture, project and function level. The business strategy generally deals with the competition, investment, relationship, performance and constraints on future strategic steps.

The venture level is responsible for the revenues and operating cost. The project level deals with risk associated with delays to design, engineering and construction. The functional level caters to the supply chain management, plant operations, quality and asset issues.

"Remedying site conditions that are materially different from those specified in contract documents is a common source of delay for contractors."(Siddiqi et .al, 2006).

The study conducted to identify factors that would allow the contractors to handle the delays due to differing site conditions indicated that 70 percent of the delays occurred due to the absence of timely and sufficient communication.

The absence of trust between the owner and the contractor caused 20 percent of the delays and the balance delays were due to various causes. The impact of the delays due to differing site conditions was found to have reduced following the unstinted follow up by the contractor.

The study arrived at a conclusion that a communication at important levels and with urgency was required to deal with such delay causing factors. The risk linked to such factors would require the durations of all delayed activities to be reviewed to reduce the delay.

According to(Bauld et. al ,2008), the allocation of risks in construction projects is towards the supplier and this increases the cost of government projects compared to the private sector.

Despite the fact that governments or municipalities being large customers generally end up paying more as they want to insulate themselves against any possible risks and ensure price certainty. “In a construction project, risk may be defined as the possibility of economic gain or loss relating to a particular aspect of the construction process. Simply stated: Price to the customer = supplier's cost of supply + risk assumed by the supplier + profit.”

In cases where the design is done by the client appointed specialist consultant the risk of the design and other risks are managed by the client..

The proper allocation of risk among the key stakeholders of the project can be done on the basis of who can best manage that risk.

“The term "manages" means to anticipate, price for, and avoid or mitigate the risk.” In traditional contracts the inadequate design and modifications are high risks are allocated to the contractor then it may reduce the quality and the number of bidders.

Also, an over emphasis on the price may cause to overlook the technical and financial capability of the bidder..

Risk management action plan would be to take urgent action when you

notice warning signs that would become visible from a contractor in trouble. In case you see such signs , be prepared to implement a plan to manage the risk that would otherwise be too late and difficult to manage.

3.6.4 Lack of resources & Labor productivity.

The manpower is the most important factor in the successful completion of any project. In case of projects where there is a lack of manpower then it also affects the productivity of the existing workforce as they would be required to undergo long working hours which would reduce the productivity. “poor construction productivity is commonly caused by a lack of resources at the crew level. Providing proper resources is an important planning issue, requires significant effort, and is necessary to properly manage a construction project.” (Pappas et. al ,2003).

The innovative management methods and procedure need to be evaluated and documented for the process of improved productivity through qualitative and quantitative assessments.

The methods indicated that the elements of communication, empowerment, metrics, planning and training were the main factors that helped in achieving the results.

In case of large projects the preliminary design is prepared and only after the approval of the owner the detailed design and engineering is done. It is understandable that the designers would not be willing to deploy manpower unless the project is confirmed. On the other hand once the project is given the go ahead there is not adequate time for the design and engineering process which gives rise to delays on large scale projects.

“An adequate number of persons must be assigned to the engineering and/or construction stages of today's large projects in order to assure timely completion.” (Dwight ,1980).

The number of persons required for the entire project duration based on the productivity assumed for the project scope can give the status of the requirement at any stage of the project. There are various methods of determining the status of the project and the trend toward mini – milestones are now commonly used for many projects.

The reporting system for the progress of works is also shifting from the engineer to the technician level. The concept of earned value has become a proven fact and is implemented in most projects due to its advantages related to schedule and productivity monitoring. However the target schedules are an area of concern as a lot development related to the resource loading and float allocation need to be done.

According to (Lee et. al, 2005), a delay claim occurs when the actual date is delayed compared to the contractual completion date and hence it is important to decipher the cause of the delay

since there are various factors that may cause delays. One important factor which we will analyze is the delay due to loss of productivity or lost productivity.

Despite being a major cause of delay, few analysis of converting the lost productivity into delay duration have been done. The difficulty in quantification of disruption which results in loss of productivity causes the friction between the owner and the contractor.

A method to calculate the delay duration caused by loss of productivity is proposed. The analysis of delays should take into consideration productivity change and constant productivity. The projects have normally a combination of repetitive activities and non repetitive activities. "Learning curve theory, therefore, can be applied where the work activity is repetitious, continuous, and essentially identical" (Jae-Seob , 2006).

This method of delay analysis appears to be a more practical choice for calculation of the delay in terms of activities which are repetitive and can be considered as part of a learning curve with improvements over a period of time compared to the non repetitive activities which will be analyzed with a constant productivity.

The problem lies with the underutilization of the resources and the workers in all categories. The main reasons can be summed as inadequate communication, defensive labor policies and the infirm management responsible for the inefficiency.

It must be noted that pay is not the only reason that is sought by the workers but appreciation, recognition and a sense of contribution to the society is very important to the extent that there must be a sense of purpose in work.

The monitoring of productivity during construction at any point and the forecasting the probable productivity based on previous project profiles is getting popular. The productivity profiles for various trades will differ depending upon the activities and will follow the typical s –curve pattern. Any deviation from the profiles can be viewed as areas for concern and need attention."Scheduling overtime is very costly, so alternatives should be investigated. The preferred, lowest cost method is to improve the productivity of the existing labor force. One of the most effective ways to raise productivity is to focus on work planning" (Forrest , 1985).Thus proper and effective planning followed by efficient monitoring are required solve the problems related to productivity.

3.6.5 Over-ambitious estimates and incorrect task assessment.

In projects which are in the design and tender stage where there is an urgent requirement of the estimated cost, there usually thumb rules are applied for providing the estimates. Such estimates are usually based on quantity takeoffs from the available drawings and details.

An incorrect task description or assessment may result in an incorrect or overambitious estimate which may either derail the project or make the project too costly and uneconomical for the owner.

The accuracy of estimates are vital for any project specially at the preliminary stages. These estimates would enable the owner to take the crucial decision of whether to undertake the project at all or not. "The importance of accurate estimates during the early stages of capital projects has been widely recognized for many years. Early project estimates effect the most basic decisions about a project: whether it will be undertaken at all; how large it will be; how elaborate, sophisticated and durable it will be; and how much it will cost." (Ciraci et .al, 2009).

These initial costs for the projects are important for the owner's and project team.

For the project team, success is generally guided based on the planned v/s (versus) actual cost of the project. In case of inaccurate initial estimates, project have found it difficult to come of those situations and problems would range from the failure to award the contract due to high quotes or very low quotes may make it embarrassing ,design issues, delays and inadequate facilities.

An accurate cost estimate done at the initial stage can avoid many problems.

The decisions made at the design and planning stage of a project is influenced by the pre tender cost estimate. The project details which are responsible for the accuracy of the pre tender estimate and ways and means to make the estimate realistic and more accurate are considered. The author has used a quantitative approach to address this research problem. Analysis of data from various projects through quantity surveying firms indicated that the pre tender estimate is dependent on project size and the main structural element. "The estimates of smaller projects are more biased than the estimates of larger projects.

It was discovered that pre-tender building costs are more often overestimated than are underestimated. Overestimated forecasts are incorrect by a larger amount than underestimated forecasts." (Aibinu et. al, 2008).

The data analysis have indicated that the accuracy of the pre tender cost estimates have not improved over time and the accuracy of these estimates are not satisfactory. To increase the

accuracy of these estimates it is required to incorporate and simulate past estimates, probability estimation and experience gained in the estimation of previous projects, including the quantity surveyor at an early stage, reducing quantity surveying and cost engineering skill turnover and incorporate market sentiments.

There are theories such as the neo classical micro economic theory which makes two suggestions such as an analytical tool for construction cost estimation and full cost pricing which is the normal procedure of pricing by construction firms. However both are exclusive theories in their own right and only one can be correct.

It can be concluded that the theory no one is more correct based on the analysis of evidences in the research literature. In disequilibrium there are differences in behavior, however there is not much difference between them in equilibrium when it is viewed from a practical point of view.

Based on the differences and "the endemic nature of uncertainty in the industry in general makes the task of estimating costs and prices difficult in practice." (Skitmore et. al, 2006).

Thus, this theory provides a sensible analysis for the pricing and is more close to the market than economics.

3.6.6 Lack of task clarity.

The projects are usually having amounts that are reserved as a provisional sum for some section of the works as the client or the designer is unsure as what would be the actual requirement. These works usually involve specialist inputs and cannot be finalized at the initial stage itself. In some cases the client deliberately reserves the amount to decide at a later stage how the money has to be spent.

This gives rise to an uncertain scope of work where there is no clarity regarding the task to be carried out. Even the baseline program of works prepared at the start of the project cannot detail the activities due this lack of task clarity.

The lack of task clarity can give rise to errors as adequate details will not be available and hence changes may be required to rectify the errors or incorporate the additional details as per the new information made available. This has an impact on the cost in terms of cost overruns and time in terms of delay which affects the performance of the project. It is important to realize the impact such errors and changes and work to mitigate their negative effects on the project, this paper presents a system dynamics based construction model, which evaluates the dynamics of

change management including then aspects of quality, scope, request for information an decisions for change approval and their subsequent affect on the project.

"the involvement of designer as consultant, communication gap between constructor and designer, insufficient working drawing details, lack of coordination between parties, lack of human resources in design firm, lack of designer's knowledge of available materials and equipment, and incomplete plans and specifications were considered as the most important causes of the project design and construction interface inconsistencies." (Arain et. al ,2006)

The least important reasons of inconsistencies between the professionals at the design and construction interface were the involvement of the contractor at the conceptual and design development phase, the government regulations, project management professionals, weather conditions and nationalities of stakeholders.

3.6.7 Design delays and Approval of Drawing.

The construction projects are envisaged based on the conceptual design and drawings. If these conceptual designs are not converted to actual designs and drawings including the structural feasibility and practicality then it would necessitate changes to the original concept design which would impact the perspective of the project itself. It would also affect the program for the project in terms of timely completion and thus the cost of the project.

The construction industry is recognizing the need for timely and efficient completion of projects. Due to the fact that unexpected problems arise due to design change and affect the construction process thereby leading to cost escalation and time delays, it is required to evaluate the primary causes for delay to ensure that the cost and time are within the parameters.

These factors have a detrimental impact on the project's success in terms of the timely and contractual completion. Effort to give attention to the factors identified in the study will help in mitigating the risk of contractual disputes.

The variables that have an impact on construction time and cost overruns for high rise projects in Indonesia were identified, ranked as per their apparent significance and rate of occurrence. "Inflationary increases in material cost, inaccurate material estimating and project complexity are the main causes of cost overruns. The predominant causes of delay are design changes, poor labor productivity and inadequate planning." (Kaming et. al,1997).

The variables that are considered for cost overruns and delay are grouped into factors and their relationships are analyzed with factor analysis techniques.

The decisions that are made during the conceptual design stage and briefing of the building project is important for its successful completion. An important decision that is required to be taken at the early stage and which can have a major impact at a later stage is related to the selection of the structural frame. Considering the importance of a finished building, the selection of the structural frame should be unarguably clear and emphatic.

The final decision on the structure to be selected has to be based on the structural frames ability to perform against the criteria for it has been designed for the scheme. However it has been observed that "the heuristics underpinning such decisions tend not to be explicit and thus, are difficult for inexperienced clients to understand (Soetanto et. al ,2006).

This article reports on the research, which determined the criteria used by the stakeholders including client organizations, design professionals and contractors while selecting the most appropriate structural frames.

Problems related to multicultural and multilingual environment resulting in communication gap, excessive participants in the project and presence of foreign designers and contractors were the least problematic issues. These findings can be of help for project managers in developing countries including reforms in the procurement, stakeholders and value chain management systems.

3.6.8 Owner interference & decision-making process.

The successful completion of the project in terms of cost and time has an influence which can be a positive factor as well as a negative factor is the decision making process which is greatly influenced by the owner. Sometimes the owner's influence is also construed as the owner's interference.

According to(Annoymous ,2004)"Owners, particularly those new to construction, are often so intent on cutting costs and speeding up schedules that they expect that hiring their own contractors will work miracles.

There are requirements for the success of every project which are the project parameters and performance indicators. Organizations have been developing systems to provide much needed assistance to those involved in the process by providing data on one approach such as strategic needs analysis in the early critical stages of the project. A total of six research studies based on this analysis were done and this has resulted "in the development of a series of decision-making

attributes that capture the key characteristics relevant to the project inception stages." (Smith et .al ,2008)

In projects when there are the requirements of nominations to be done by the owner the owner has the authority to perform construction with the owner's own workforce and award separate contracts. However, if there is a delay from the nominated contractors, the main contractor can claim for the delays. The coordination of the works will be required to be done between the main contractor and the nominated subcontractors and it should be in line with the agreed construction schedule. However the responsibility for coordination will lie with the owner and it is the architect/engineers responsibility to inform the owner about the same and this should not be a problem if the owner has handled projects of similar nature. The owner can also appoint a construction manager to do the same but the cost saving would then not be possible, According to (Neap et .al, 2004), the principles of value base project management are high lighted and the client's role, responsibility and contribution of the client /owner is investigated. The client has to ensure that the requirements and objectives are conveyed and understood by all parties. The client has to select consultants, designers, contractors and suppliers. It is important that these actions are performed at the appropriate times and in the correct manner.

The objectives set by the client will ensure the optimization of quality, cost and schedule. The owner is not only the investor but a significant stakeholder who contributes to the project in a manner that ensure the successful completion of the Project

3.6.9 Inadequate contractor & Subcontractors experience.

In case of projects where there are contracts that are awarded solely on the basis of the cost then these projects are likely to suffer delays as proper of evaluation of the subcontractors has not been done. The subcontractors who have quote low or simply missed out on any items will fail to perform thereby delaying the project.

In fact the owner may end up losing more money if the project is delayed and the returns expected from the project get delayed. Also, by deploying the contractors or subcontractors without checking their credentials and performance, the owner is risking the quality of the project and his reputation Subcontractors are often faced with the spectre of financial difficulties in case of delayed payments which may result in the failure of the subcontractor.

There were some external factors that were responsible for the profitability of the firm which were related to the economic factors but most of the causes related to the business functioning of the company and the absence of a workable business proposal.

"The primary causes of business failure identified were insufficient capital/excessive debt, lack of managerial maturity, lack of early warning measures, increase in project scope, poor billing procedures, failure to evaluate project profitability, unfamiliarity with new geographical areas, and poor use of accounting systems." (Schaufelberger , 2003) It has been noted that inexperienced or first time owners of small projects will select a designer or contractor who is not qualified to handle that work. "The risks involved in choosing an inexperienced designer include unfamiliarity with contract furnishings and little knowledge of the strict fire codes specifying the types of fabrics required in hotels and motels." (Fox , 1991).

The professional designer will have access to contract vendors who would have the relevant information regarding all the required codes of practice for the specific projects. An inexperienced contractor working on a hotel project may not know the loss of revenue for a hotel for one night and may delay the works to an extent that the project revenue loss is enormous. In case of knowledgeable contractors, adequate acceleration measures will be made in their programs if needed.

The "study revealed that financial difficulties of owners and contractors, contractor's inadequate experience, and shortage of materials are the main causes of delay on construction projects." (Van et .al ,2009).

3.7MITIGATION OF DELAYS

Delays to the projects can be reduced by applying measures which can be reflected as mitigation of delays. This mitigation of delays is possible only by re-sequencing of the works where ever possible and without increasing the resources and manpower. The works that can be achieved without any additional cost to the project is the mitigation.

The mitigation of delays can be possible by also applying the knowledge gained through previous projects experience and these can be implemented where ever their application can be suited for any specific requirement in the process of project learning.

Such knowledge management will help in mitigating delays and the awareness of such knowledge through lessons learnt feedback can in fact be helpful in preventing the delays itself.

3.7.1 Knowledge Management.

The knowledge management is the utilization of knowledge gained in numerous projects and various situations to tackle a specific problem. “Knowledge Management refers to the collection of processes governing creation, storage, reuse, maintenance, dissemination and evaluation of Knowledge in a particular situation or problem solving context.” (Hsiao .et al, 2003).The knowledge gained can be implemented by various people who can improve the construction systems and thus save time and cost of solving problems.

3.7.2 Project learning.

In some projects situations develop and the action can only be taken based on the available information which is project learning and improving with time. This is called as the learning curve usually applied to works which are undertaken for the same time. Initially the outputs and results are low and gradually improvements are noticed as the activities are repeated.

There is a universal concurrence that the delay in construction projects is a common phenomenon worldwide. Project delays are generally related to the inadequate project knowledge management.

The positive impacts to the projects programs are due to the project learning approach. The delay phenomenon in the construction industry can be improved by an excellent leadership and integrated dedication of all the key project stakeholders. All the key factors of mitigation namely knowledge management, project learning and lessons learnt are incorporated in the conceptual model and the results indicate that the best way to meet the requirements of the owner and the market is by applying the project learning in line with the project program and this can be done by maintaining the contractor’s core proficiency.

The Architecture, Engineering, and Construction industries have a vital role in the completion of various infrastructure and facilities projects ranging from residential to industrial, from transportation to energy, from water supply to waste management and communication systems. It has an important responsibility in maintaining their excellence, reliability and endurance.

While playing such a vital role in the progress of the industry it also has many negative effects such as environmental effects and dilapidation, depletion of natural resources, waste generation and its disposal. It has been noticed that the traditional responses to such issues have been slow and ineffective. The efforts to reduce these impacts have proved to be expensive has do not find favor among the key players to implement the same. The industry has been endeavoring to define

the characteristics of sustainable development, the processes and the resources required to achieve the same.

3.7.3 Lessons learned feedback.

The lessons learnt during the projects need to be recorded so that the difficulties faced by the project team and way those difficulties were tackled would be of immense help and guidance to the future projects of similar nature. The negative aspects of the lessons learnt would be more than the positive as the report prepared by the contractor would highlight the delays due the owner, designer and consultant. Likewise the report prepared by a consultant would identify the inefficiency and delays by the contractor. Whatever may be the case the report would be helpful in identifying the pitfalls for the future teams handling such projects.

In projects where delays occur the personnel who are in charge of the construction should implement measures to mitigate the impact of program delays in order to improve the productivity, save cost and time, safeguard against disputes and preserve their professionalism.

Earlier the information available on mitigation the effect of delays was not adequate. In order to ensure that the projects are completed on time and within the budgeted cost, an system has been developed which can be implemented on any project and it is designed to work within the parameters of the project and still achieving the optimum results.

"Four techniques are combined in sequence to produce a process that directs courses of action for mitigating delays. These techniques include: 1. a modification impact evaluation, which resequences project activities with a minimum amount of disruption, 2. resource constraining, which redefines schedules according to projected resource limits, 3. project expediting, which assists in reducing project duration systematically, and 4. value engineering, which attempts to overcome unnecessary costs and design inefficiencies."(Wesley ,1986)

These mitigation techniques allow for the re-sequencing of the delayed activities so that there is little disruption and allowing for resources to be within limits as projected during the baseline program. It allows for expediting the project by reducing the project durations which can be achieved by reducing the activity durations systematically and lastly but implementing value engineering by implementing the alternatives having same specifications but lowered cost. Thus the lessons learnt would require the future projects to evaluate value engineering for all projects and save on unnecessary cost without affecting the performance of the project.

They encounter problems when there are delays to the program, unforeseen cost escalation and overruns, shortfall in budget, defective quality of material and workmanship, confused scope of works and third party meddling. Such conditions can also affect relationships, spoil the reputations and may lead to financial privation of the key stakeholders. Such traumatic circumstances frequently happen all the key stakeholders or some of them are not able predict the future and hence cannot visualize the effects of their action or non action regarding the decisions until there is a serious delay to the project.

At that point of time it is difficult to recover, however it may not be too late. This paper merges several techniques that that evaluate the health of construction projects and key milestones to be monitored.

The quest to reduce the project duration and delivery time has made the construction professionals implement the overlapping of the design and construction activities.

It is possible to overlap the design and construction activities to a certain extent, however undertaking the design and construction works in an illogical sequence can give rise to momentous risks. The mitigation of these risks can be done by undertaking more logical overlapping of activities in the design stage and construction stage. The aim of this work is "to determine the factors that contribute to the sensitivity of construction activities." (Blacud et. al ,2009).

Experienced construction specialists state that the level of change, the time required for delivery, modularity and the interface of the components are the factors that indicate the sensitivity in construction activities to upstream design changes. These factors help in analyzing the sensitivity of an activity which can help the implementers reduce the risk when planning the overlapping of design and construction activities.

There are actions that can be undertaken by the owner to tackle the issues of delays in construction projects. The delay to the project from the owner starts from the initial stages and the contractor is required to prepare aggressive recovery schedules in the early stages of the project which has a high probability of failure. The author suggests solution to the problems and ways to mitigate the delays.

The key suggestions are to undertake the project planning from the tender stage and ensuring that the contractor implements effective measures for the project planning and monitoring and control.

The construction industry is not only the nation's backbone but it is also an indicator of its competence and efficacy. Since there is always the factor of risk and complications which are intrinsic to construction projects as well as the diverging interests of the key stakeholders, disputes and claims are expected in the construction industry.

The research carried out has come up with an innovative method for construction claims and disputes by implementing a logical induction decision and thereby creating a multi agent system to suggest legal discourse. A new method using portfolio insurance has been developed to address the issues of risk in the construction sector. The contractor claims are tackled by utilizing a risk retention method to mitigate the negative effects. By undertaking the above measures the positive effects would be reflected on the project and all the parties concerned.

In projects there are lessons to be learnt from the environmental aspects which will provide a greater insight into the mitigation procedures that can be implemented and the management systems that can be successfully deployed to achieve these results. "The effectiveness of environmental impact assessment depends largely on fully implementing cost-effective mitigation and other management measures to prevent significant environmental degradation." (Sanchez et. al ,2005).

The projects where this is a lot of decisions to be taken and the duration of the project is short would require the decisions to be reduced to enhance the project schedule and to undertake a continuous improvement process from engineering to the EPC phase.

3.8 PREVENTION OF DELAYS

Delays can be prevented by applying methods which can be implemented from the project commencement itself like planning and analyzing the requirements in detail which will allow the mapping of resources. The risk can be identified to allow the estimation and allocation of works which is required to be modularized. Escalation of issues at the appropriate times also ensures that the delays can be prevented.

The prevention of delays is possible when all the project stakeholders work as a team to ensure the success of the project. It is also important for the client to employ a proactive consultant, freeze the design and details before the commencement of the project and employ good reputed contractors for the project.

3.8.1 Plan/Analyze the requirements in detail.

The construction industry has to implement new ways of working to be competitive to meet the demands of the clients. Working in collaboration is essential for the design and construction teams during the complete lifecycle of the project. In construction "it is now recognized that good collaboration does not result from the implementation of information technology solutions alone, the organizational and people issues, which are not readily solved by pure technical systems, need also to be resolved." (Shelbourn et .al ,2007).

The collaboration between individuals related to different fields is a more difficult task and it does not happen by implementing techno solutions. The requirements of the construction sector are gathered through literatures, interviews and questionnaires to develop a methodology for the working in collaboration effectively for the construction sector.

The main issue emerging from these analysis is the that the softer issues need more attention than the issues related to technology to ensure that the plan and implementation of collaborative working is more effective in projects.

The planning and analyzing the details can be done by interactive planning which includes an integrated program that defines key milestones, constraints and identifies the major issues that may affect the project. Further, a detailed project execution schedule needs to be developed in coordination with the project team that includes inputs from the team members. This will enable to get a commitment from the project team and everybody will have the knowledge of the requirements. Special attention has to be given to the coordination of inter discipline works and their sequence. The responsibilities have to be identified for the project. The interactive planning is not a onetime occurrence, there has to a constant interaction between all parties at the various stages of the project, (Baar , 2002)

The works in high rise apartment buildings where the individual clients have separate and specific requirements makes it difficult for the finishing works to be done.

But due to these requirements from the clients the cycle is broken and the sequence of works cannot be maintained as the decisions taken by the clients will be arbitrary and not have consideration for the project sequence of works. This results in longer time taken to complete the individual apartments and this has an effect on the progress of works resulting in delays as per the program, budget overruns and general dissatisfaction regarding the process which also includes abortive, additional and modification of works from all the key stakeholders.

With the application of lean construction principles the works can be done by people having multiple skills so that works do not suffer due to lack of manpower and small teams can be deployed in various areas so that the works can progress simultaneously thereby achieving a shorter time cycle than the normal time taken in programs.

The implementation of the above measures help in ensuring early delivery of the customized apartments including reduced time requirement for completion and delivery and thus improving the cash flow. The model was initially proposed as a theory then simulated using a management simulation game and then implemented practically.

3.8.2 Map available resources

The key to successful completion of any project is the optimum utilization of the resources and by achieving the productivities as planned in the schedule. Also, the deployment of the required resources at the appropriate time is absolutely essential in the success of any project. This mapping of resources for a project is the key to any projects success.

In every project, there are key determinants for the performance of the construction program of works and these range from the project manager, project team, planning and monitoring team and cost control team. The study evaluated the objective data on completed projects using neural network method an arrived at five key determinants namely "(1) time devoted by the project manager to a specific project; (2) frequency of meetings between the project manager and other project personnel; (3) monetary incentives provided to the designer; (4) implementation of constructability program; and (5) project manager experience on projects with a similar scope." (Kog et. al ,1999).

These key determinants and their effective utilization will determine the success of the construction program. The most important issue in the key determinants is the time dedicated by the project manager to the project as his presence will help in taking decisive action to ensure that the project is performing within the parameters of time and cost.

The frequent meeting between the project manager and the project team will ensure that the focus is maintained and monetary incentives to the designer will ensure the smooth flow of information.

The program will be monitored for any issues that may affect the performance and cause delays and the project manager's experience on a similar project will come handy in such situations For effective project planning and control, resource management has been a very

important subject. Since the availability of skilled manpower is scarce and whatever is available has to be utilized in the most optimum manner the project management techniques are getting more and more resource oriented. In most of the construction management planning software the focus is not on resource management. The main issue is that the resource planning is done separately from programming activities. In a program prepared for any project, first the activities are scheduled then the resource constraints are applied. In programs, thus since the activities and resources are planned separately in a sequential order, the program plan the activities even when there are no resources available to execute those at that time or the activity itself is delayed unnecessarily whereas the activity duration could have been simply stretched by reducing he requirement of resources. This leads the project team to being misled and misinformed on the baseline master program of works and later becomes the reasons for delays and claims.

Compared to the normal use of program with activities having durations, control policies are developed by allocating planned resources to the activities that capture the uncertainty related to the duration of the activities and the effect of the resource distribution to those durations.

Thus, the optimum resource requirement can be assessed and subsequently deployed to achieve the changing circumstances of a company's expanding potential.

The success of large scale /mega projects require detailed planning by the management, engineers and the project team which is a complex and time consuming effort . While analyzing the status of mega projects in today's environment it is important to note that the time delays and cost overruns are significant problem faced by both the client and the contractor. The primary problem is the lack of complete scope for the project which affects the planning thereby causing delays.

3.8.3 Perform training and knowledge transfer.

The projects completed on time or otherwise are a source of valuable information for the people who would undertake a similar project. The information would be transfer of knowledge for the benefit of those who otherwise would encounter problems similar to those encountered by the earlier counterparts. Also, people who have encountered situations which needs to be known, so that others can take benefit from it can be done by performing training in such specific issues and matters.

In projects the decisions made by the site personnel are important to the success and failure of the project. The decisions made on the field by the team dictates, whether the profit margins are

gained or lost hence the knowledge of planning and scheduling should be integrated at the field level. “Profit margins are gained or lost by the field decisions, so the knowledge of planning, scheduling and managing project cost should be integrated into the field at all levels of supervision.” (Koch , 2008).

It is important note that training alone cannot guarantee the transfer of information to the site personnel but by demonstrating the practices of the company and giving examples where the employees can relate to their own experiences can raise confidence levels. Research has indicated that a person who is confident is to participate and excel in his field.

There are companies where the experience of the estimator plays an important role and is a valuable asset for every construction company. “For reliable cost estimation at the conceptual stage of a building project, the missing data and information, otherwise needed for a detailed cost estimate, have to be substituted by the knowledge of an experienced cost-engineer.” (Bjornsson et .al ,1994).

Thus, the experience of a senior cost estimator comes to the aid of budgeting during the conceptual stages of the project and the decisions are based on his experience. There is a possibility that the estimator may have a bias towards some aspects of budgeting or the selection of cost objectives which can result in an estimate which may not be accurate and optimal.

3.8.4 Identify risks.

For every project whether it is a mega project or a small sized project the identification of all the risks for that project is essential in initial stages. This will help in developing action plans to meet those risks and the make all the stakeholders aware of their effects if not attended to at the initial stages itself.

A realistic procedure is recommended to work out the size of the program for a project or a budget for an unforeseen risk at any stage of the project.“The size of the budget is a function of the number of risks expected at the specified confidence level. The number of risks used for developing the contingency budget depends on the total number of risks to be considered and the estimated probabilities of occurrence of the risks.” (Khamooshi et. al, 2009)

The risks that have to be identified and analyzed for any project from the list of probable risks is a problem where the decision lies with a multi group regarding where to attribute the risk which is a problem. “Conventional approaches to risk identification and risk analysis separately tend to

be less effective in dealing with the imprecise of the risk analysis individually." (Mojtahedi. et ,al ,2008). Since the impact of the risk analysis done individually for each risk may not give the cumulative effect, the risks analysis is not effective from the overall perspective.

The identification of risks is done for a project to evaluate the risks a project faces but the identification of the risks itself is a challenge. "although risk management is considered an integral task in project delivery, particularly in a public private partnership (PPP) project, construction industry practitioners experience challenges in its implementation, especially with respect to risk event identification and selecting responses to individual risks." (Nelms. et al ,2008).

The identification of the risk is a structured process which can be explicit and implicit with the implicit risks being common and hence making way for unpredictability and non optimal choices. Risk drivers arise from the various elements of the project including what has to be built and how will it be built and the effect of the various factors surrounding the project like environment, organization and contractual parameters. Representation of these elements can gain from the concept of profiling which can be the most ideal way to elaborate the components that form part of the project in terms of valid characteristics and their as planned and as built standards.

Risks and uncertainty are intrinsic for all projects. The success of any project is determined by the fact as to how the risks associated with the project are managed throughout the entire lifecycle of the project. "The application of risk management equips team members with the ability to develop a formal process of systematically identifying, analyzing, and formulating an effective risk management strategy.

A risk management strategy will mitigate the potential for loss and monitor risk events from the conceptual development of the project throughout its life cycle." (Gawad et. al, 2008).

The risk management system will help in getting the much required information related to the risks and deriving a strategy to manage the risks and thereby the potential losses to the project. Thus risk management can be considered as a process for the development of strategies to maintain project performance that would be acceptable to all project stakeholders. The key to effective risk management and mitigation of risks is the aptitude to analyze the probable risk events and rank them to evaluate their potential impact.

The management of the projects includes risk management as its vital element as all projects face various types of risks. The identification and analysis of the risks is the key element of risk management. “Risk Identification is discovering, defining, describing documenting and communicating Risks before they become problems and adversely affect a project.” (Barati et. al ,2008).

3.8.5 Estimate and allocate.

The estimation for any project is the key to profitability and the growth of the company. Accurate estimates will help in realizing the outputs with the proper allocation of resources that are required for the project. Thus the estimate for any project has to be accurate to the last detail to ensure competitiveness in the market.

The ability of accurately forecasting the cost of delivering a project is the key to a cost based competition. The literature on cost estimation has focused on specific estimation methods as broad techniques and not much consideration has been given to the distinct requirement of each project. The author attempts to highlight the important factors for an effective estimation at different stages of the project. “Drawing from organization control theory and cost estimating literature, this note develops a theoretical framework that identifies the critical factors for effective cost estimation during each project phase of a conventional construction project.” (Liu et .al, 2007). The main logic is that with the progress of a cost estimate, the programming of the activities and the output measurement can be done in a better manner and the result will be that input oriented control will shift to output control.

3.8.6 Modularize work.

Projects undertaken have to prepare a schedule of works in which the activities have to sequenced in a logical manner to demonstrate as to how the works would be undertaken. The aspect of allowing a logical sequence of works to proceed in the modular way, is the best way to ensure the success of any project.

The project duration is normally fixed when the contract is signed. The details related to the individual activities durations are based on the elements like the quantities and other variables which can impact the estimate for the duration of the activity.

The project should implement a system that would integrate all the elements of the work and ensure that these are monitored for the performance. The author “presents a system that supports project time and cost control in an integrated manner.” (Moselhi et .al,2004)

According to this system, the process of project delivery is represented by object oriented modeling and these are designed to map the same. The resource utilized in each control object is represented by eighteen key parameters and sensors to identify the difficult sectors having non satisfactory results.

Every project is unique in its own right in terms of the time, place and cost are never the same for any two projects. Hence, the response to every project needs to be unique in its own right. The literature for the implementation of construction projects indicates that flexibility can be an important factor in a projects success.

The search for alternative solutions to manage the projects has proposals recommending for a "room to maneuver" to ensure the successful completion of the project. But, the debate regarding the flexibility and rigidity in managing projects is very much alive and kicking. It is noticed that "Rigidity in schedule specifications and constant monitoring and adherence to original plan offers its own charm of predictability. At the same time, unrealistic assumptions can create severe problems in execution and can even erode the credibility of management." (Pundir et. al ,2008).

Thus, the project manager has to address the issues regarding the form of approach for the project.

A project can either be managed by a rigid or flexible approach and the right balance for flexibility and rigidity, and the conditions under which the manager can opt for flexibility.

The works that are of repetitive nature in a project can be project in a format which is known as line of balance(LOB) and these are usually better than the conventional bar charts and network diagrams for the purpose of repetitive construction, but its use is not widespread.

3.8.7 Escalate issues.

The project has numerous decisions to be taken and some are interlinked in such a way that without the decision being taken on one issue the other issue cannot progress. In such a case if the decision is pending from the client then it will be required to highlight the issue at an appropriate time to ensure that there is no delay to the project. Unless and until the issue is escalated the client would not action the issue with urgency and this may lead to delays to other works as well delay the project.

The issues related to quality and cost are essential for any project."Cost and quality are inseparable issues on any project. The generally perceived notion that 'quality' has a direct

bearing on 'cost' to the owner is generally valid assuming all procedures are well managed and executed by all parties." (Duttenhoeffer , 1992).

There are numerous stages in a project where a bad quality of works can result in rework or abortive works and increase the cost unless all the stakeholders understand the importance of quality. The typical areas which can lead to cost escalation are related to the owners acquisition of the property, financing the project, planning and engineering through the consultant and construction and maintenance. The design by the consultant can significantly affect the project and it is advisable to have a quality management program that includes all features of the professional's involvement to ensure the desired results.

In projects , to ensure the success from all aspects the author proposes the following

Steps to be undertaken

" (1) `Win-win' environment. The expectations of the owner must be met by the capability of the contractor. The owner will minimize their risk only when the contractor minimizes their risk. The owner must know that the contractor can perform, and the contractor must meet the owner's expectation while making a profit.

(2) Maximum value. Performance must be considered along with price.

(3) Self-motivation of contractors to increase performance. Contractors

must be motivated to do better construction on every job regardless of the owner's expectations.

(4) Free market system. Contractors must compete based on price and capability or performance.

(5) Minimize the difference of perception and expectations. The expectation level of both the owner and contractor must be identified, with the selection of the contractor with the closest expectation that the owner can afford as the `best value'.

(6) Minimum control. Management theory has proved that external control by the owner and attempting to increase the contractor's capability (false expectation caused by bias) are ineffective, costly and increase risk."

(Kashiwagi et .al ,2002).

From the above points it is clear that a win win environment has to be created where everybody feels comfortable and is motivated to perform to gain the maximum value.

The control has to be minimum with broad guidelines and as a free market system which will help in minimizing the differences of expectations and perception of all parties.

The construction projects are generally susceptible to delays and cost overruns as compared to the baseline master programs and tender estimates thereby causing huge losses to all key stakeholders. However, in seldom cases the variations cause the viability of a project to be jeopardized as compared to the baseline plans. Thus, it is important to develop systems that would identify the expected variance to the time and cost of the project as compared to the baseline plan.

SUMMARY

Delay occurs when the critical activities are affected. This delay is either non excusable(contractor caused) or compensable (client caused) and mostly the delay is concurrent. The delays to projects is primarily emanating from the client due to various reasons like project scope not being finalized at the initial stage, delay in nominating subcontractors at the appropriate time.

Delay due to inadequate early planning can be avoided if the client implements risk management systems. Delays are also a result of over ambitious estimates, lack of task clarity, resources , inadequate contractor selection and labor productivity as analyzed by(Williams,1980) “productivity does not mean making people work harder; it involves ensuring that workers are properly organized, equipped, and trained to work more effectively”.

Mitigation of delays can be implemented through knowledge management; project learning and the lessons learnt feedback.

The delays can be prevented by implementing measures of planning/analyzing the details, mapping available resources ,identifying risks, estimating ,allocating and modularizing work by escalating issues as per (Baar , 2002) "inter active planning." It is the facilitated process…of an integrated project schedule, which highlights logic through work processes, defines key constraints, defines key milestones, and last but not least, identifies major issues that may affect the projec

Chapter Four

4 Project Research Methodology

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

4.1 Project Research Design.

A project 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 project 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.

4.2 Population

Respondents included nine (9) contractors, three(3) consultants and three (3) owners out of 15.These is the group to which questionnaires were distributed, respectively. The contractors surveyed were categorized as grade 5 and above. list. This study covers both private and public projects.

4.2.1Case 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 Adama Town. 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.

4.3 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.

In order to determine the perception of different stake holders in Adama Town construction industry regarding factors causing delays, a questionnaire was developed. This was the main tool used to collect the data from our target respondents.

4.4Data analysis

Analysis and Findings

Used the Relative Importance Index method to determine the relative importance of the various causes and effects of delays The RII was used to rank (R) the different causes.

These rankings made it possible to cross-compare the relative importance of the factors as perceived by the three groups of respondents (i.e. clients, consultants and contractors). Each individual cause's RII perceived by all respondents should be used to assess the general and overall rankings in order to give an overall picture of the causes of construction delays in Adama construction industry.

Data was analysed by calculating frequencies and Relative Importance Index (RII).

The Relative Importance Index (RII) is calculated as follows:

RII = SW/AxN

Where; W = weight given to each factor by respondents from 1to 4(where No=1 ,Low=2, Medium=3, High=4)

A = highest weight(i.e.4 in this case)

N = total number of respondents.

For the purpose of this study A=4 and N=15

Relative Importance Indices (RII) comparison table was used to rank the results by taking into account the average scores and the RII

4.5Demography

4.5.1 Participants job positions.

Table shows the job distribution of the participants that took part in the survey.

Table 2 the job distribution of the participants

Job profile	Frequency	Percent
Contractor	9	60%
Consultant	3	20%
Client	3	20%
Total	15	100

Figure (3) shows a chart of the participants' job profile

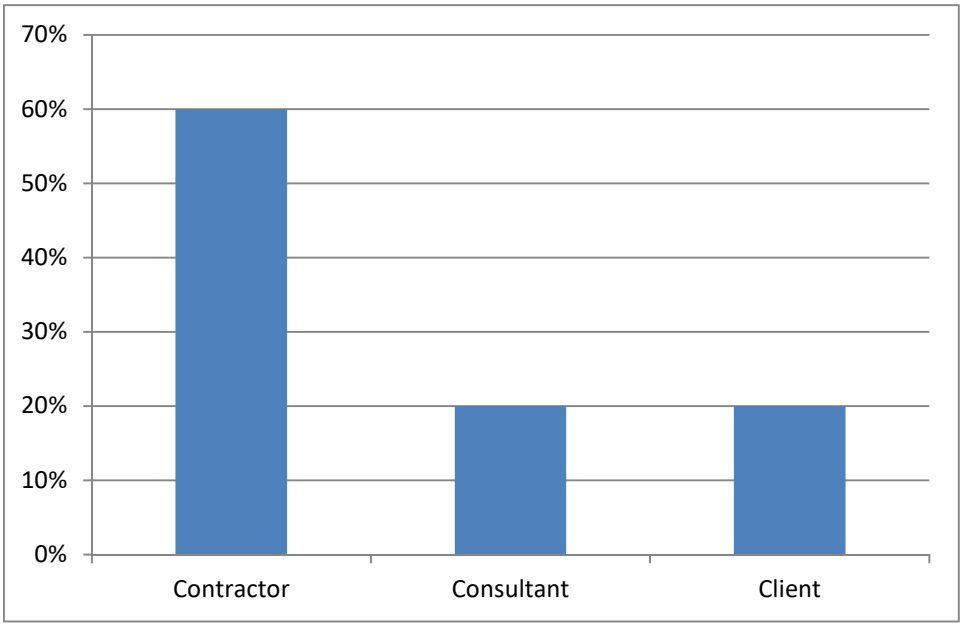

Figure 4.1 participants job positions

The results indicate that out of 15 questionnaires that were distributed, 15 were successfully completed and returned. Out of the 15 questionnaires returned, 9 (60%) were answered by Contactors, 3 (20%) were responded to by Consultants and 3 (20%) were answered by Client.

4.5.2 Distribution of Highest Academic Level of the Respondent

Table 3: show Highest Academics Level

Academic Level	Frequency	Percentage
Diploma	1	6.5%
Bachelors	13	87%
Masters	1	6.5%
Total	15	100

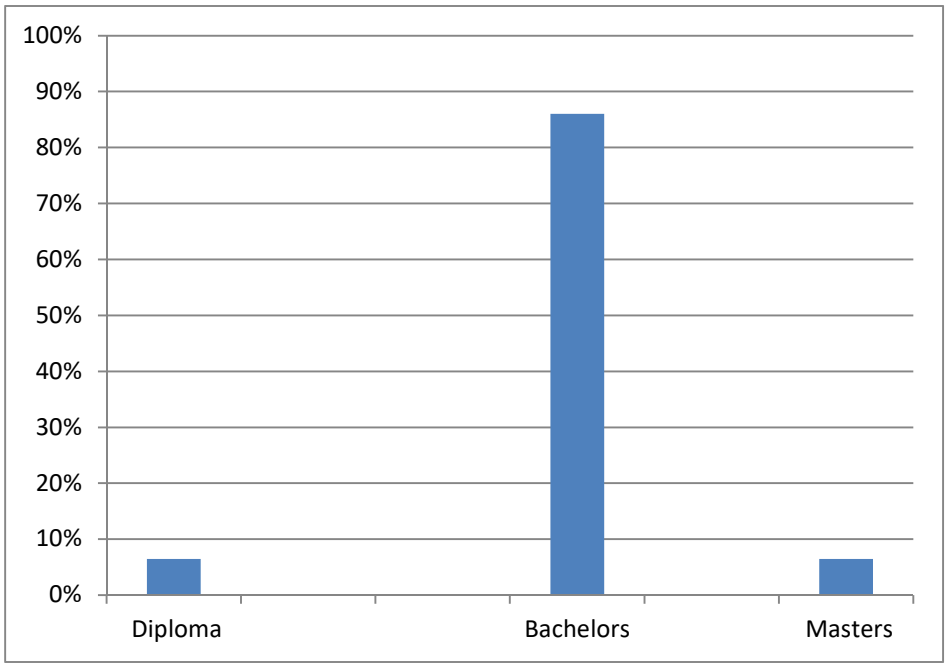

Fig 4

When the respondents were asked about their highest academic qualifications, the majority of them at one (1)or 6.5%of them had a diploma thirteen(13) or87% said they had bachelor's degree, one (1) or6.5% of them had a master's degree, Qualifications

Chapter Five

5.1 Selected building Construction Project Delays in AdamaTown

This part of the project research deals with the analysis and discussion of the gathered from the case study and questioner survey. It study on public building and private building relationship between rate of time over run contract project , completion time , main cause of delay and finally effect of delay.

Delays are common to the construction projects in Adama. By examining 10 projects in Adama Town, the delay encountered in most projects range from 16% to 300% of original contract time. Project delays are the major causes of claims for time extension and associated cost using questionnaires and summarized them in tables.

Percent is calculated as the ratio of delay to contract time.

$$\text{That is } \%\text{delay} = \frac{\text{Delay} * 100}{\text{Contract time}}$$

5.2For the case building construction project are selected show below the table 4

No	Project Name	Contract Time (Month)	Delay (Month)	Contractor	Consultant	%Delay	Remark
1	Multipurpose Hall at ASTU	12	10	Afrotsion	Habtamu International Consultant	83.33%	On progress
2	Administration Building at ASTU	24	17	FE contractor	Habtamu International Consultat	70%	On progress
3	Front Fence at ASTU	6	4	Eshtu Lemma	Yhannes Abay Consultant	66.6%	Complete
4	Adama sport academy at ASTU	7	21	Afrotsion	Habtamu International Consultant	300%	On progress
5	Showa Floure Factory	12	14	Select Construction	Chita Architect	117%	Complete
6	Adama referral hospital	24	18	Tilahun	Afri Consultant	75%	On progress
7	German amente hotel Building	24	4	Mulugeta	MH Consultant	16%	On progress
8	Market Center	24	25	Belete Arega	Mohamed Consultant	104%	On progress
9	Sorte Interational Trading PLC	18	5	Temesgane Asemamaw	Lidya International Consultant	27%	On progress
10	Minch Market Center	48	20	GK Contractor	MY Consultant	41%	On progress

To determine if there are significant differences between the delay factors caused by clients, contractors and consultants Participants were also asked to add to the list any other reasons they consider relevant. The factors were ranked according to their rank from highest to smallest. The factor with the highest rank is the most common delay factor caused.

Tables below show summary of the results

Table 5: Cause of delay in the Adama Town

Cause	N	RII	Rank
Design changes	15	0.83	1
contract Modify	15	0.81	2
Fluctuation of price	15	0.78	3
Project schedule change	15	0.75	4
Inaccurate cost estimation	15	0.71	5
Absence of consultant's site staff	15	0.71	5
Incorrect time estimation	15	0.63	6
Finance problem	15	0.63	6
Lack of coordination with contractors	15	0.62	7
Old technology	15	0.62	7
Slowness making decision	15	0.57	8
Lack of materials equipment and tools on market	15	0.57	8
Shortage of qualified Worker for consultant	15	0.57	8

Force major	15	0.57	8
Accident during construction	15	0.57	8
Poor site management	15	0.57	8
Late delivery of materials	15	0.57	8
Shortage of materials on site	15	0.57	8
Shortage of equipment on site	15	0.53	9
Rework due to errors	15	0.51	10
Inappropriate construction method	15	0.48	11
Delays caused by Subcontractors	15	0.46	12
Poor understanding of the project	15	0.45	13
Poor site condition (location, ground)	15	0.33	14
Poor weather condition	15	0.33	14

Participants added corruption and unclear/conflicting contractual agreement to the above list.

As can be observed from the table, the three most likely causes of delay in Adama Town are Design change, contract Modify and Fluctuation of price. These issues therefore require more attention in researches aimed at reducing construction delays.

5.3 Causes of Construction delay due to Contractor

The table 6 below shows the different factors causing construction delay. The factors were ranked according to their rank from highest to smallest. The factor with the highest rank is the most common delay factor caused by contractor

Causes of Construction delay due to Contractor Table 6

cause	N	RII	Rank
Finance problem	15	0.63	1
Old technology	15	0.62	2
Shortage of materials on site	15	0.58	3
Poor site management	15	0.57	4
Late delivery of materials	15	0.57	4
Accidents during construction	15	0.57	4
Shortage of equipment on site	15	0.53	5
Rework due to errors	15	0.51	6
Inappropriate construction method	15	0.48	7
Delays caused by Subcontractors	15	0.46	8

The result suggests that the three most likely causes of delay by the contractor are delay in Finance problem, old Technology, and Shortage of materials.Therefore, in future Adama building constructions or expansions the above points should be addressed properly.

Table 7: Cause of delay in the Adama Town construction project, consultant's responsibility

5.4Causes of Construction delay due to consultant's responsibility

Delay Factor	No	RII	Rank
Design changes	15	0.83	1
Project schedule change	15	0.75	2
Inaccurate cost estimation	15	0.71	3
Absence of consultant's site staff	15	0.71	4
Incorrect time estimation	15	0.63	5
Shortage of qualified worker for consultant	15	0.57	6
Force Major	15	0.57	6
Poor understanding of the project	15	0.33	7

From the results, table 7 shows the causes of delays on the project where the consultant takes the responsibility. Design Change Project Schedule Change and Inaccurate cost estimation absence of consultant's site staff Inaccurate time estimation, Shortage of qualified worker for consultant Poor understanding of the project, Force Major , Poor understanding of the project were the main causes selected by the participant.

Table 8: Causes of Construction delay due to owner responsibility.

Delay factor	N	RII	Rank
Contract Modify	15	0.81	1
Fluctuation of price	15	0.71	2
Slowness making decision	15	0.57	3
Finance problem	15	0.63	4
Lack of coordination with contractors	15	0.62	5

Table 8 summarizes causes of delays derived by owner/employer. Contract Modify, Fluctuation of price slowness in making decisions, Finance problem, lack of coordination with contractors and the main causes selected by the participants.

5.6Causes of Construction delay due to External factors

Delay factor	N	RII	Rank
lack of material, equipment and tools on the market	15	0.57	1
Poor site condition (location, ground)	15	0.33	2
poor weather condition	15	0.33	2

Table 9 summarizes participants' response to causes of delays by external factors and external work due to lack of material, equipment and tools on the market, Poor site condition (location, ground) poor weather condition were the main causes pointed out.

In general, from the four tables; Delays caused by Design changes ,Finance problem, contract modify and lack of material, equipment and tools on the market are the leading causes, therefore require attention in future Adama Building constructions and expansion.

5.7 Effects of Construction Delay

It is obvious that the effect of delay on the project owner (client) or end user is more severe than any other parties in construction industry.

Although the degree of effect of delay varies on the stakeholder in the industry, all the parties involved are affect by delay .The first victim of delay would be the project owner since he has envisaged his construction project to be realize within an allocated budget and time frame .Anything outside these stated frames are cost overrun and time over run to the client.

Because of delay project delivery the owner loses both tangible and intangible benefit the project could hospital to accept and treat patient school building which are excepted to enroll students. For commercial building, the owner loses money that he can earn by running the facility.

Contractor is the second severely affected party with losses due to material and labors escalation, prolonged overhead, and the cost idle equipments.

Consultant are also affected by delay by delay, as they would be tied down on one job longer than excepted, with a fixed payment

The other important negative impact on both consultant and contractor is loss of goodwill of companies that affect their performance records.

Excessive time require additional budget ,this is in turn up the scarce financial resource of the country , which lead to further budget short fall for construction projects. This prevent the planned increase in property and service production from taking place , and this phenomenon in turn affect , in a negative way , the rate of national growth .Time over run will also be a source of dispute among stake holders and it will lead to adversarial relationship among project participants. Project owner will lose confidence on consultant and professional in general. To the industry as a whole, time overrun could bring about a drop in building activities, bad reputation,

and inability to secure project finance easily from public authorities in the future. All these effect undermine the viability and sustainability of the construction industry.

5.8 Identification of effect of delay based on rate of occurrence

Based on literature review and some interview with construction practice as the preliminary investigation at the outset of this project research, it was possible to identify certain major effect of delay on project delivery. The four effect of delay identifies were; time over run; cost overrun; disputes; and total abandonment; as shown in Table 5.7.

Effect of construction delays in Adama Town (respondents' perception Table 10

Effect of Delay	N	RII	Rank
Time overrun	15	0.98	1
Cost over run	15	0.85	2
Total abandonment	15	0.68	3
Disputes	15	0.45	4

The most important delay effects in construction industry of Adama Town are time overrun, cost overrun, abandonment disputes and dispute.

In Adama construction projects, the analysis of data from the questionnaire survey, four important effects of delay based on ranking are as follows.

Time overrun refers to the late completion or late delivery, from the time specified or agreed by all parties, of construction project. The main causes for the time overrun are Design change financial problems, late payments for the completed work and ongoing work, change orders, confilict among the involved parties contract Modify organizational changes etc. Cost overrun refers to the increased costs of labor, working force, materials and equipment etc. The main causes for the cost overrun are change orders, mistakes in the contract, changes in drawings etc.

Abandonment refers to the total abandonment of the construction project stopping every work or suspending the project for long time. The main causes for abandonment are organizational changes, regulatory changes, finances and payments, natural disasters etc.

In Adama Town construction projects are temporarily or permanently abandoned due to financial crisis, natural disasters, organizational changes etc.

Disputes refer to the small problems in between different parties in the construction project. The main causes for disputes are slow or late payments for completed or ongoing work, client interference, neighbor issues, change in requirements, distribution of work, less communication within parties, subcontractor issues etc. There are also some more effects, but we discussed the main effects of delay in building construction projects.

Conclusion

We conducted this research for the construction delays in Adama building construction industry. We developed questionnaire to get the data about the causes and effects of delay. We analyzed the data by Relevant important Index(RII). Based on descending order we ranked the causes and effects of delay. More important is the cause or effect. We discussed the 25 important causes of delay, which are: Design changes, Modify contract, Fluctuation of price, Project schedule change ,Inaccurate cost estimation, Absence of consultant's site staff, Slowness making decision, Lack of material, equipment and tools on market ,Incorrect time estimation, Finance problem, Lack of coordination with contractors, Old technology, Shortage of qualified worker for consultant ,Force major, Accidents during construction, Poor site management, Late delivery of materials, Shortage of materials on site Shortage of equipment on site, Rework due to errors, Inappropriate construction method ,Delays caused by subcontractors, Poor understanding of the project ,Poor site condition (location, ground),Poor weather condition.

Then we discussed the 4 main effects of delay, which are: Time overrun, Cost overrun, Abandonment, and Disputes. We also related these effects with the causes relating to these effects.

CHAPTER Six

6 FINDINGS, CONCLUSIONS AND RECOMMENDATIONS:

6.1 Project 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.

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.

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.

6.2 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.

6.3 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

6.4 Recommendations

These delays are badly affecting the shorten construction industry and it is needed to find solution for countering the delays. The solution to avoid and counter delays is to avoid and lessen the causes related with delays, and in result there will be lesser effects of delays on large construction industry.

It is suggested to deal with the causes and find a solution so that these causes not happen or happen very less. The financial problems should be avoided, by making the payments on time.

The client should make timely payments to the contractor and contractor should make the timely payments to the subcontractors, suppliers and labor. It is suggested that the time and cost estimation of the project should be accurate. The material should not face the shortage situation and the materials quality should be checked properly so that less errors and problems happen.

The subcontractors should complete their work on time and the suppliers should supply the materials on time. The site should be managed properly and there should be proper equipment for the construction. The new technology and techniques should be preferred and there should be skilled workers and labor working on the construction project. All changes should be done before the start of construction, because change orders and design changes during the construction should be avoided .

The site conditions should be studied in detail before the start of construction and there should be consideration about the disaster, geographical and soil conditions. It is suggested that during the construction stage, the organizational changes and regulatory changes should be avoided or so they should not affect the progress of construction.

The effects should be lessened by dealing with causes leading to the effects. Time overrun and Cost overrun are most common effects, which can be solved or lessened by dealing with the causes leading to time overruns and cost overruns.

If the construction project is started, then it should be completed and the case of abandonment should not be considered. The disputes, negotiations and court cases should be solved on time and it is preferred that they should not happen and if they happen then the timely solution should be done. By studying the relationship between effects and causes, we can counter the delays by dealing with causes leading to effects.

In Adama, many large construction projects faced delays and the Town economy progress is affected because of the delays. These large construction projects contribute to Town development and progress. If there is delay in the completion of these crucial large Construction projects, then the Town economy is affected because of loss of investment on the project and the development and progress is affected because these crucial large construction project leads to the development of the Adama Town. It is suggested that proper actions should be taken in Adama to solve and lessen the delays in completion of large construction projects in Adama.

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.

A) 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, financial and cash flow problems: could be mitigated through management of financial resources and plan cash flow by utilizing progress payment.

Secondly, 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.

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.

B) 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.

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 project which would generally revolve around the need for application of professional project management skills in construction projects.

B) Client should look to the following points;-

All change order demands must be evaluated to assess their impact on quality of work envisaged, scope and cost, possible claims and disruption to work so as to avoid unnecessary disputes and litigation.

Clients should ensure that proper planning and costing of the works are made during the pre-contract period so as to avoid intermittent stoppage of works as a result of funding constraints since this not only increases the construction period but also impacts on the contractors overhead costs and costs associated with mobilization and demobilization during the period within which the works were suspended.

Clients should ensure that interim payment certificates are paid in time within the stipulated

time-frame so as not only to avoid having interest penalty clauses invoked, but also to facilitate the progress of works to ensure timely completion.

Client must make quick decision to solve any problem that arise during the execution.

Key Term

Contract modification; - cancel specifications or terms of an existing contract, while leaving intact its overall purpose and effect.

Cost estimations;-forecast the resources and associated costs needed to execute a project, which helps ensure to achieve project objectives within the approved timeline budget. Summation of all the costs involved in successfully finishing a project, from inception to completion (project duration).

Late payment ;-is defined as failure of a paymaster to pay within the period of honouring of certificates as provided in the contract

Cash flow management ;-a process of monitoring, analyzing and adjusting projects' cash flow

Financial Problem;-This happens when agreed milestones for payment are not followed or when there is no cash flow projection in the project implementation plan.

Slow decision making;- Clients are the project Owners. When they do not make decisions on time regarding project matters, they slow down activities at the project sites. Slow decision making could be caused by an organization's internal bureaucracy or wrong channels of communication.

Design change;- any change in the design or construction of a project after the contract is awarded and signed.Change in specifications and scope which were not considered originally or changes of design to address some omissions that were vital to project functionality

Interference by Owner; - Top management staff of the Client's establishment could interfere in project execution because of vested interest. For instance, some scope could be introduced without due authorization.

Poor coordination of subcontractors;- Some aspects of construction works are subcontracted to nominated specialized subcontractors. These subcontractors must be properly coordinated by the Prime contractor to ensure timely delivery of assigned aspects of works. Contractors must therefore ensure that each subcontractor delivers at the stipulated time expected and to specifications.

Inappropriate construction methods;- Construction activities are required to be carried out using best practices and tools. When the procedures are not followed, errors occur, leading to rework and delays.

Rework due to errors;- Inexperienced contractors usually make errors during construction. Sometimes contractors employ low skilled staff in order to make more profit by paying them lower salaries. Tendencies of errors are, thus, higher. Rework of an already executed aspect of a scope slows down project progress. This has serious impact if it involves execution of critical tasks.

Shortage of qualified worker;- of unskilled personnel at the project sites impedes execution of work to specification and leads to error or mistakes during construction. Time is then spent on alterations and corrections.

Improper equipment selection;- The use of the incorrect equipment extends tasks while faulty equipment leads to delay due to the time spent to repair.

Poor quality materials;- lead to poor quality workmanship, thus an unacceptable product. Most often, the project owners insist that correction be made or that parts of work be completely redone

Material shortages;- This results in slowed activities and sometimes temporary abandonment of site

Poor contract management;- Most projects have consultants as the contract managers. They liaise between the client and the contractor. Projects get delayed when the required management principles are not utilized during projects' execution.

Lack of adequate communication between the parties;- Poor or inadequate communication between parties leads to misunderstanding and misrepresentation of facts. This could breed conflicts and consequently hinders smooth progress of activities.

Weather conditions;- In areas where there is frequent rainfall, inexperienced contractor/consultants do not account for weather projections in their project implementation plan.

Natural disasters (e.g. floods, lightning strikes);- There are areas that usually experience natural disasters such as floods. These disasters are generally unpredictable. However, well established project management organizations possess requisite skills to manage natural disasters.

Site condition;- Differing site conditions in construction projects can cause schedule delays, cost increases, and dangerous working conditions.

Force Major;- it relates to exceptional, unforeseen events or circumstances that are beyond the reasonable control of a party to a contract and which prevent or impede performance of their obligations under the contract. Generally it cannot be an event that the party could reasonably have avoided or overcome.

Accident during construction;- construction site manager's is an occupational health and safety specialist who designs and implements safety regulations to minimize injuries and accidents on construction sites.

Fluctuation of price;- significant costs fluctuation may lead to under or over estimation of tender costs.

Time overrun;-is any delay beyond the baseline construction schedule.

A cost overrun;-, also known as a cost increase, underrated or budget overrun, involves unexpected costs incurred in excess of budgeted amounts due to an underestimation of the actual cost during budgeting.

Abandonment;- when a contractor is no longer able to perform the work on a project.

Disputes ;-conflict will arise among projrcct participant asto will bear the responsibility as a result of the delay,

Classification of delays

Delays are categorized as follows: excusable non-compensable delays, Non- excusable delays, Excusable compensable delays and concurrent delays

Excusable non-compensabe;- ldelays are those which are beyond the control of both the owner and the contractor.

Non-excusable delays ;-are those which are the responsibility of the contractor.

Excusable compensable delays;- are delays caused by the project owner (client).

Concurrent delays;- those caused by both the owner and the contractor.

Reference

- Abd El-Razek, M.; Bassioni, H.; and Mobarak, A. (2008) *Causes of delay in building construction projects in Egypt.*
- Aibinu, A. A. and Jagboro, G. O. (2002). *The effects of Construction Delays on Project Deli very in Nigerian Construction Industry.*
- Arain, F.M., Pheng, L.S., Assaf, S.A. (2006)*Contractors' views of the potential causes of inconsistencies between design and construction* in Saudi Arabia.
- Assaf, S.A., S.Al-Hejji. (2006). *Causes of Delay in Large Construction Projects*.
- Assaf, S.A., Alkhail, M., and Al-Hazmi M. (1995) '*Causes of delay in large building construction projects'*,
- . Ayman H. (2000*). Construction delay: a quantitative analysis* **..**
- B. Trigunarsyah, *Constructability practices among construction contractors in Indonesia,*

- B. Trigunarsyah, *Constructability practices among construction contractors in Indonesia,* Journal of Construction Engineering and Management 130 (5) (2004)
- Bolton, J. (1990) '*Type of claims', Construction and disruption claims, Course Manual.*

- Baloi, D., Price, A.D.F. (2003). *Modelling global risk factors affecting construction cost performance,*
- Bennett, J. and Grice, T. (1990) '*Procurement systems for building'*
- Bjornsson, Hans, Hjaroar, Bjarni P. (1994)*Construction expertise transfer with knowledge based systems. Computing in Civil Engineering (1994*)

- Cohen, M.W., and Palmer, G.R. 2004. *Project risk identification and management, AACE International Transactions*
- Chan, D.W.M and Kumaraswamy, M.M. (1997) *'A comparative study of causes of time overruns*
- Duttenhoeffer, Richard(1992).*Cost and quality management. Journal of Management in*
- Dean Kashiwagi*,* Richard E Byfield. (2002*) Selecting the best contractor to get performance: On time, on budget, meeting quality expectations***.**

- Frimpong, Y., Oluwoye, J. and Crawford L. (2003) '*Delay and Cost Overruns in Ghana as a Case Study',*
- Gawad, M.A., Fayek, A.R. . (2008)*Comparison of risk analysis techniques for capital*
- Gibson Jr., G.E., Kaczmarowski, J.H., Lore Jr., H.E. (1995) *Preproject-planning process for capital facilities*
- Hanna AS (Hanna, Awad S.), Swanson J (Swanson, Justin) (2007), *Risk allocation by law - Cumulative impact of change orders*

- Jae-Seob Lee.(2006)*Delay Analysis Considering Productivity*

,

,
- Gawad, M.A., Fayek, A.R. . (2008)*Comparison of risk analysis techniques for capital*
- Gibson Jr., G.E., Kaczmarowski, J.H., Lore Jr., H.E. (1995) *Preproject-planning process for capital facilities*
- Hanna AS (Hanna, Awad S.), Swanson J (Swanson, Justin) (2007), *Risk allocation by law - Cumulative impact of change orders.*
- Kaming, P.F., Olomolaiye, P.O., Holt, G.D. and Harris, F.C. (1997) '*Factors Influencing Construction Time and Cost Overruns on High-Rise Projects in Indonesia'*
- Karimi, R.B., "*Factors which are Critical in Project Cost Overruns*:
- Kumaraswamy, M.M. and Chan, D.W.M (1998) '*Contributors to Construction Delays',Construction Management and Economist*
- Kagiri David and Wainaina Gituro (October 2008). *Time And Cost Overruns In Power Projects*
- Kog, Y.C., Chua, D.K.H., Loh, P.K., Jaselskis, E.J.(1999) *Key determinants for constructionschedule performance*
- Kohli U. (2001) "*How to Minimize Time and Cost Over-Runs of Projects*",
- Koch, D.C..(2008) *Increasing field use of planning, scheduling and project cost through assessed training programs*
- *Lee, Hyun-Soo - Ryu, Han-Guk - Yu, Jung-Ho - Kim, Jae-Jun.* (2005)*Method for Calculating Schedule Delay Considering Lost Productivity.*
- Liu, L., Zhu, K..(2007) *Improving cost estimates of construction project using phased cost factors.*
- Mansfield, N.R., Ugwu O.O., and Doran T. (1994) '*Causes of Delay and Cost Overruns in Nigeria Construction Projects'*
- Mezher, T.F. and Tawil, W. (1998) *'Causes of Delays in the Construction Industry in Lebanon', Engineering, Construction and Architectural*
- Moselhi, O., Li, J., Alkass, S..(2004).Web-based integrated project control system. *Construction Management and Economics*.
- Moavenzadeh, F. (1978*). Construction Industry in Developing Countries*
- Nkado, R.N. (1995*) Construction Time- Influencing Factors*.
- NEDO (1988) *Faster Building for Commerce*
- Ogunlana, S.O., Promkuntong, K., and Jearkjirm, V. (1996) *'Construction delays in a fast-growing economy.*
- Ofori, G. (1990). *The Construction Industry: Aspects of its Economic and Management*
- Pappas, M.P., Tucker, R.L., Borcherding, J.D. (2003)*Evaluating Innovative Construction Management Methods*
- Scott, S., Harris, R.A., and Greenwood, D. (2004) '*Assessing the New United Kingdom Protocol for Dealing with Delay and Disruption'*
- Sambasivan, M. and Soon, Y.W. (2007) '*Causes and effects of delays in Malaysian construction industry',* International Journal of Project Management
- Song LG, AbouRizk SM(2005*), Quantifying engineering project scope for productivity.*
- Talukhaba, A.A., "*Time and Cost Performance of Construction Projects*",

- Thomas HR (Thomas, H. Randolph), Ellis RD (Ellis, Ralph D., Jr.)(2007) *Contractor prebidplanning principles. Journal of construction Engineering and management*
- Todd W Waddl*e.* (2008**)** *The Contractor's Role in Building Cost Reduction After Design (Bringing a Project Into Budget).Cost Engineering.* Morgantown
- Trauner, T. J., W. A. Manginelli, J. S. Lowe, M. F. Nagata and B. J. Furniss (2009) *"Construction Delays*
- Weighell, S. (1999) *Risk Managementin Engineering Projects*
- Ωελλσ, Θ. (1984β). *Τηε Ρολε οφ Χονστρυχτιον ιν Εχονομιχ Γροωτη ανδ Δεϖελοπμεντ.*

- Yates, J.K. and Epstein, A. (2006) *'Avoiding and Minimizing Construction Delay Claim Disputes in Relational Contracting*

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Appendix

I INTRODUCTION

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.

Delays have a negative effect on the project in terms of performance, time and cost. Thus, it is essential to identify the types of delays that normally occur in a project.

II Objective

The objective of this study would be identify the major cause and effect of delay in public building construction project in Adama construction industry through a survey and find the perception of different parties toward the problem ,what their responsibility are and how they carry out them out. It is expected that this study will provide some empirical data on the extent and type of delay in public building construction project in Adama . For effective system for deliver projection time, within budget and to quality standard, which fully satisfy the client as well as the intended end –users.

III Instruction

This questioner consists of three section

Section A Respondent profile

Section B Cause delay It includes a list of delays. You are request to choose the type of delay,chance of occurrence and fill in the blanks.

Sesction C Effect of delay . It include list of delay.You are request to choose the frequency of occurrence of effect of delay and fill in the blanks.

Frequency of occurence

No =1 Low=2 Medium=3 High= 4

Causes of Construction delay due to Contractor

Delay of factor	Frequency of occurrence			
Finance problem	1	2	3	4
Old technology	1	2	3	4
Shortage of materials on site	1	2	3	4
Poor site management	1	2	3	4
Late delivery of materials	1	2	3	4
Accidents during construction	1	2	3	4
Shortage of equipment on site	1	2	3	4
Rework due to errors	1	2	3	4
Inappropriate construction method	1	2	3	4
Delays caused by Subcontractors	1	2	3	4

5.4Causes of Construction delay due to consultant's responsibility

Delay Factor	Frequency of occurrence			
Design changes	1	2	3	4
Project schedule change	1	2	3	4
Inaccurate cost estimation	1	2	3	4
Absence of consultant's site staff	1	2	3	4
Incorrect time estimation	1	2	3	4
Shortage of qualified worker for consultant	1	2	3	4
Force Major	1	2	3	4
Poor understanding of the project	1	2	3	4

Table **5.5: Causes of Construction delay due to owner responsibility**.

Delay factor	Frequency of occurrence			
Contract Modify	1	2	3	4
Fluctuation of price	1	2	3	4
Slowness making decision	1	2	3	4
Finance problem	1	2	3	4
Lack of coordination with contractors	1	2	3	4

5.6Causes of Construction delay due to External factors

Delay factor	Frequency of occurrence			
lack of material, equipment and tools on the market	1	2	3	4
Poor site condition (location, ground)	1	2	3	4
poor weather condition	1	2	3	4

Effect of construction delays in Adama Town (respondents' perception Table 4.7

Effect of Delay	Frequency of occurrence			
Time overrun	1	2	3	4
Cost over run	1	2	3	4
Total abandonment	1	2	3	4
Disputes	1	2	3	4