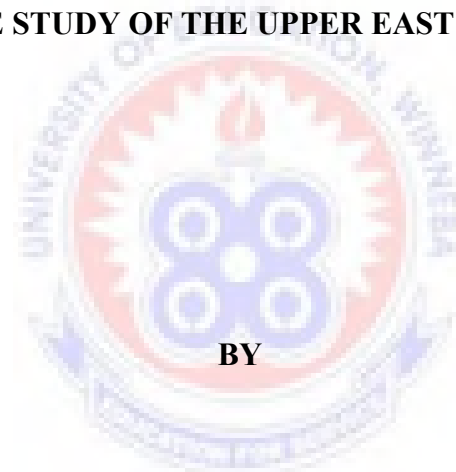


**UNIVERSITY OF EDUCATION, WINNEBA
COLLEGE OF TECHNOLOGY EDUCATION, KUMASI**

**THE CAUSES OF DELAY IN HEALTH CONSTRUCTIONAL PROJECTS AND ITS
EFFECT ON HEALTH DELIVERY OF THE GHANA HEALTH SERVICE
(A CASE STUDY OF THE UPPER EAST REGION)**



BY

GEORGE BOAZ KYEI

AUGUST, 2014

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**A Dissertation in the Department of Design and Technology Education, Faculty of
Technical and Vocational Education, submitted to the School of Graduate Studies,
University of Education, Winneba, in partial fulfilment of the requirements for award of
the Master of Technology Education (Construction) degree.**

AUGUST, 2014

DECLARATION

Candidate's Declaration

I, George Boaz Kyei, declare that this dissertation with the exception of quotations and references contained in published works which have been identified and acknowledged is entirely my own original work and it has not been submitted either in part or whole for another degree elsewhere.

George Boaz Kyei

Signature.....

Date.....



Supervisor's Declaration

I, hereby declare that the preparation of this work was supervised in accordance with the guidance for supervision of dissertation as laid down by the University of Education, Winneba.

Dr. P. P. K. Yalley

Supervisor's Signature.....

Date.....

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DEDICATION

This work is dedicated to God Almighty for giving me the strength, wisdom and understanding throughout my studies.

I also dedicate this work to my beloved parents Mr. R.A. Bosch and Mrs. C.A.A. Bosch for their immense contributions towards my education.



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ABSTRACT

Delay and or time overruns are common in health constructional projects in Ghana especially Upper East Region. The project work presents the results of a study conducted to identify and evaluate the severity and importance of the major factors contributing to delay in Health constructional projects of the Ghana Health Service. The respondents of the survey conducted included personnel from clients/owners, consultants and contractors involved in health constructional projects in the upper east region of Ghana. The results of the study revealed the main causes of delay of health constructional projects in the upper east of Ghana included: Poor Contract Management, Poor Technical Performance, Escalation of Material prices, Inflation, Additional works, Deficiencies in cost Estimates Prepared, material procurement, and Cash flow during construction, monthly payment difficulties and price fluctuations. Design changes, planning and scheduling deficiencies, Low bid, Mistakes during construction and designing. Other factors that emerged clearly though not very important, but of interest, were bad weather Ground problems, unexpected natural conditions, late delivery of materials and equipment and Imported materials. These are the natural factors. It is therefore recommended that, effective project planning, coordinating, controlling and monitoring procedures should be recognized to augment the project performance in order to minimize or avoid delay and its associate problems in health constructional projects in the Ghana Health Service.

CHAPTER ONE

INTRODUCTION

1.0 Background

Project success can be defined as meeting goals and objectives as prescribed in the project plan. A successful project means that the project has accomplished its Technical performance and maintained (Frimpong, Jacob & Crawford, 2003). In pre-colonial Ghana, as it may be in the rest of sub-Saharan Africa, traditional priest were important in providing treatment for the sick. The role of village priest in the medical sphere reflected the belief that unexplained illness; misfortune and premature death were caused by supernatural agents. The traditional village priests were practicing in their homes or villages, some even move a little further from town to build a camp where people can consult him for treatment of various illness and sickness. (<http://www.photius.com>)

Western medicine was first introduced into the Gold Coast by Christian missionaries and missionary societies in the nineteenth century. They were almost the sole providers of modern medicine until after First World War. Attempts by the central Government of the then Gold Coast to expand western medical care in the country were given serious consideration during the tenure of Frederick Gordon Guggisberg (1919-27) as governor. Guggisberg proposed town improvements, improved water supply and the construction of Hospitals. It was during his era that Korle-Bu the first Teaching Hospital in the Gold Coast was completed 1925. The few Health facilities built by the colonial master were used since. (<http://www.photius.com>)

In 1957 when gained independent from the colonial masters, the CPP government strived to continue the development of the country. Under health, the CPP government

built a number of new hospitals, Clinics and health centres while existing ones were expanded. To ease tiff congestion at the regional hospitals, the government put up polyclinics to serve mainly out-patients in the urban areas. Six of such polyclinics were sited mainly in Accra alone. To improve doctor-patient ratio, the government, had by 1960 sent about 400 Ghanaians abroad on scholarship to study medicine and return home to help in health delivery. And in 1964, a Medical School was established first under the control of the Ministry of Health and later (1965) the University of Ghana. Training schools for nurses were also established. (<http://www.photius.com>)

Ghana Health Service is a public organization which provides health care to the citizenry and foreigners living within the country. Since the service uses buildings and roads in the delivery of health care, the need for constructional projects which is known as civil works is inevitable. It is an uncommon these days to see a lot of health constructional projects delayed beyond the expected time of completion. In the year 1999-2000, the Estate Management Unit (now know as Estate Management Division) was established. The main functional responsibility of the Department is to ensure proper integrated planning and budgeting for optimal location, and quality of health facilities. Also it will provide advice, standard technical norms and management guidelines for contract administration to all levels. In addition, it will ensure proper acquisition and legal ownership of all health estates and maintain database on health estates.

The researcher is trying to study the causes of delay in health constructional projects and its effect on health delivery of the Ghana health Service. The researcher will be using the Upper East Regional Health Directorate as the study area.

1.1 Statement of the Problem

The population of Ghana today is growing fast, outwitting the number of health facilities we have in the Country. Hence, the need to expand the existing facilities and build new ones, like clinics, health centres', hospitals, training schools, staff-accommodation and Community-Based Health Planning Service (CHPS) Compounds, but event of the past shows delay beyond the expected completion time. According to project Technical Report the Upper East Regional Health Directorate of the Ghana Health Service, for example in 2008 nine number of CHPS compounds were awarded for construction in flood affected areas in the upper east region. Those projects were expected to be completed in four (4) calendar months. One year after the award of those projects, only five of these projects were completed.

In 2009 another budget of 9 CHPS compound was awarded for construction in five calendar months, but all except two were completed in one and a half year. Some of the 2009 and 2010 projects are still there uncompleted. In the year 2010 the Assembly Hall of Community Nursing Training School in Navrongo was awarded for construction and it was expected to be completed in six months. This project lasted for two years. In that same year award was given for the construction of twelve unit classroom block for Nursing Training School and the construction of a theatre at Bawku. Also the construction of Theatre at Sandema Hospital was awarded that same year for completion in six months but all the projects travelled more than the expected time of completion. (Field Data, Match 2014)

According to Okpala and Aiekwu, (1988), "the biggest customer of the construction industry in most countries is the government. Odeh and Bataineh,

(2002), added that “to the dislike of owners, contractors and consultants, many government projects experience extensive delays and thereby exceed the initial time and cost estimates” This problem is more evident in the traditional type of contracts in which the contract is awarded to the lowest bidder. This procurement strategy is adopted by majority of government projects in developing countries

Also the purpose of sending health care closer to the people would not be realized on time. The anxiety of stakeholders (Health Staff, the citizenry and the Government) of the project increases since the project delays. This research is therefore investigating the causes of delay in Ministry of Health/Ghana Health Service’s constructional project despite Government of Ghana (GoG) effort to bring health care to the people.

1.2 Significance of the Study

The importance of this study cannot be over emphasized, since the researcher seeks to pinpoint or highlight the need to avoid delays in health constructional projects and complete project within stipulated time

In Ghana Health Service, Constructional Projects delay beyond the completion time, hence the study to ascertain the causes and its effect on health delivery of the people of upper east region and the country as a whole. Also, the result of the study will give good information to future researchers who may be interested to carry on in this line.

1.3 Aim of the Study

The objective of this research is to ascertain and assess the factors which cause delay in health constructional projects in the communities in the Upper East Region.

1.3.1 Objectives of the Study

- To identify the various types of delays in the health constructional projects.
- To find out the causes and its effect on these projects.
- To outline remedy to help the Client, the Consultants and the Contractors in dealing with the situation.

1.4 Research Questions

This study seeks to assess the factors which cause delay in health constructional project.

The following questions guided the study:

1. What are the various types of delay in health constructional projects?
2. What are the causes and their effect on health constructional projects?
3. What are the various interventions in dealing with delay in health constructional projects?

1.5 Scope of the study

The Ghana Health Service has been hit with delays in Health constructional projects in all the Regions but the study is intended to focus on the Upper East Region of Ghana. The Upper East was chosen because , the delay of projects in this region seem to

be on the higher scale and also the Researcher works in this Region and the result of the research would be used to address the issues.

1.6 Limitation of the study.

The study was mainly conducted and limited to the Upper East Region.

The instrument used was questionnaire administered to focused groups such as, contractors, consultants, District Directors of Health Services, Regional Director of Health Services, Community Representatives and other opinion Leaders.

1.7 Delimitation of the study

This study was conducted in the upper east region of Ghana only due to time and financial constraints. It therefore confined itself with consultants and contractors working for the Ghana Health Service. Also, the client's representatives like Regional Director of Health Services, District Directors of Health Services and some opinion leaders were contacted for data.

1.8 Organization of the study

This research work is comprised of five chapters. Chapter one deals with background to the study, the problem statement, significance of the study, and objective s of the study. Other aspects of the chapter are specific objectives, the scope of the study, limitation and delimitation of the study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Every client at the beginning of any project aims at having value for the money spent through a quality structure delivered on time and within budget by the contractor. However, researches have shown that in most cases this aim is not met. Morris and Hough, (1989) expressed that, approximately more than 4000 construction activities were examined throughout the world, and result indicates that these projects were not completed within the specified time limit. So the interest to research in this area is to be able to identify the causes of delay, outline them and also to use the result to help in reducing or eliminating the causes of delay.

2.1 What is Project?

Gannett (2009) indicated that, “a project is made up of a group of interrelated work activities constrained by a specific scope, budget, and schedule to deliver capital assets needed to achieve the strategic goals of an Agency”

Turner (1993) pointed out that project is “an endeavour in which human or machine, material and financial resources are organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to deliver beneficial change defined by quantitative and qualitative objectives”

Project Management Body of Knowledge (PMBOK) (2004) also stressed that, project is “a temporary endeavour undertaken to create a unique product or service”. Temporary means that every project has a definite end. Unique means that the product or service is

different in some distinguishing way from all similar products or services. According to Rory Burke (2003), project may be defined as a “beneficial change which uses the special project management techniques to plan and control the scope of work in order to deliver a product to satisfy the clients and stakeholder’s needs and expectations”.

The above definitions informs clearly that, project is a temporary endeavour, unique activity or work, beneficial change which is plan and control to deliver a product to satisfy the need and expectations of the client and stakeholders. It also means that project has a start and finish time, thus project has life-cycle-beginning and an end with an associated budgeted cash flow. It implies that project must be completed within the stipulated time frame assigned to it So that the beneficiaries enjoy the fullest benefits there off.

2.2 Project Life Cycle

Every project has a life span, the project start time and the time the project closes or ends. Generally, there is an agreement that most projects pass through four stages or phases. These stages or phases are known as project Life-Cycle.

Rory (2003) said, “The project life cycle and the work breakdown structure (WBS) have come to the forefront in recent years as key framework or structures for subdividing the project’s scope of work into manageable phases or work packages. He further stresses that, where the WBS is a hierarchical subdivision of the scope of work, the project-life-cycle subdivides the scope of work into sequential project phases”.

The Project Management Book of Knowledge, (2008) (PMBOK) states, “because projects are unique and involve a certain degree of risk, companies performing projects

will generally subdivide their project into several project phases to provide better management control. Collectively these project phases are called the project life-cycle”.

According to Clifford, Gray and Larson, (2003), “another way of illustrating the unique nature of project work is in terms of the project life cycle.” They further stated that, “some project managers find it useful to use the project life cycle as the cornerstone for managing projects. The life cycle recognizes that projects have a limited life span and that there are predictable changes in level of effort and focus over the life of the project.”

2.3 Project Management

Any construction project comprises two distinct phases: the pre-construction phase (the period between the initial conceptions of the project to awarding of the contract) and the construction phase (period from awarding the contract to when the actual construction is completed). Delays and cost overruns occur in both phases. However the major instances of project overruns usually take place in the construction phase (Frimpong, Jacob & Crawford, 2003).

Notwithstanding, these phases need to be manage well to achieve to require success of the project. Some projects are effectively and efficiently managed while others are mismanaged, incurring much delay and cost overruns.

Giridhar and Ramesh, (1998), inferred that, “Project management involves managing the resources—workers, machines, money, materials and methods used”.

Frimpong et al. (2003) revealed that project management tools and techniques play an important role in the effective management of a project. Unfortunately, due to various

reasons, project successes are not common in the construction industry, especially in developing countries like Ghana and most prissily in a remote region as upper east.

From several studies and empirical evidence it is clear that project overruns comprising delays and cost overruns occur during the 'construction' phase. Therefore, professionals and scholars have been motivated to take steps to meet this challenge.

(Long et al, 2004), educated that; Practitioners need to develop the capacity to foresee potential problems likely to confront their current and future projects. Identification of the common problems experienced on past projects in their construction business environment is a good option.

2.4 Delays in Construction

Construction delays are delays in progress compared to the baseline construction schedule. Construction delays in Health constructional projects are often the Consequence of miscommunication between contractors, or subcontractors, and the client. These types of misunderstanding and unworkable expectations can be avoided through the use of detailed critical path schedules, which specify the work, and timetable to be used, but most importantly, the logical sequence of events which must occur for a project to be completed. Bramble and Callahan, (1987), defined delay as the time during which some part of the construction project has been extended or not performed due to an unanticipated circumstance. Ahmed et al., (2003), also pointed out that, "Delay is common in construction projects and its extent varies considerably from project to project. Some projects are only a few days behind schedule; some are delayed by over a year. Assaf and Al-Hejji, (2006), agreed that, "In construction, delay could be defined as

time overruns either beyond the completion date stipulated in contract or beyond the agreed date for delivery of a project between the parties.

Aibinu and Jagboro, (2002), said, delay is a situation when the contractor and the project owner jointly or severally contribute to the non-completion of the project within the agreed contract period. Delays in construction projects are frequently expensive, since there is usually a construction loan involved which charges interest, management staff dedicated to the project whose costs are time dependent, and ongoing inflation in wage and material prices. Stumpf (2000) stated that delay is an act or event that extends the time required to perform the tasks under a contract. Delay is actually a postponement of time from the original estimated completion time which might be caused by contractor, owner or consultant as well as by external factors

Chabota et al (2008) stated that, delays on construction projects are a universal phenomenon and road construction projects are no exception. They are usually accompanied by cost overruns. These have a debilitating effect on clients, contractors, and consultants in terms of, litigation, arbitration, cash flow problems, and a general feeling of trepidation towards each other. One can clearly say that, delay is the biggest enemy to the project success hindering the realization of dream of the client. Alaghbari, Razali, Salim, and Ernawati supported the view that, Construction delay is one of the most common, costly, complex and risky problems encountered in construction projects.

According to Sadi (2006) the main factor for the owner is to deliver the project on time and within the cost. One of the biggest hindrances that an organization can or may and does face is the delay of a project. Trauner, (2009) also stressed that; delay is when

an event is not completed on the given time and thus is extended from the required time as defined in the contract.

2.5 Factors Contributing to Delay

There are four factors of delay categorized in broad categories, namely contractor-related factors, consultant-related factors, client-related factors and external factors. At this level, the focus is on the contractor because the failure of a project is perceived as the contractors doing. Some of the factors that affect the contractor are, contractor's financial difficulties, material shortages, labour shortages, poor site management, equipment and tool shortage, coordination problems as well as construction mistakes and defective works.

These significant variables are discussed below

2.5.1 Contractors' Financial Difficulties

According to Zagorsky (2007), financial difficulty is defined as getting into a situation where a respondent's credit is adversely impacted, such as not paying bills. Contractor's financial difficulties are defined as the contractor not having sufficient funds to carry out the construction works. This includes payment for the materials, labourer's salaries and equipment to be used for the construction work. Thornton (2007) carried out a survey and in his survey, found that slow collection, low profit margins and insufficient capital or excessive debt are the 3 major causes of financial difficulties among

contractors. This view was supported by Arshi and Sameh (2006), Majid and McCaffer (1998), Arditi, Akan, and Gurdamar, (1985), Al-Khalil and Al-Ghafly (1999), Assaf and Al-Hejji (2006), and Sambasivan and Yau (2007) who found that delay in payment from the client would eventually cause financial difficulties to the contractor. Thus, most of the construction works cannot be carried out due to these financial difficulties Coulter and Kelley (1992) also agree with this and they further explained that insufficient profit cannot be controlled because it is due to bad economic conditions. Coulter and Kelley (1992) and Thornton (2007) both postulated that insufficient capital is one of the major causes of financial difficulties among contractors. Poor financial control by the contractor can lead to insufficient capital (Liu, 2010). Hence, the contractor will have excessive debt which causes them to face financial difficulties as they cannot pay back the debt.

2.5.2 Material Shortage

According to Majid and McCaffer (1998), material shortages are due to poor materials planning, inefficient communication, unreliable suppliers and late delivery. Mochal (2003) stated that poor planning is mistake number one in project management. This is reflected in the scenario in which poor materials planning from the contractor could lead to material shortage because the materials needed for construction may not be available within a certain time frame. This is due to mistakes in the planning stage relating to when the materials are expected to be used in the construction phase. Hence, it will cause a delay to the project. Inefficient communication is another factor that will lead to material shortage. Dunkelberger (2009), in her articles on How to Stop Losing

Money on Inefficient Communication, stressed that the success or failure of a business is directly related to the ability to communicate. Inefficient communication is, therefore, a significant problem because misunderstandings between contractors and suppliers will lead to either early or late delivery of materials to the site. Earlier delivery might affect the quality of the materials while on the other hand; late delivery will postpone the work to be carried out on the construction site. This will significantly delay the work and thus, delay the project.

According to Ruiz-Torres and Farzad (2006), supplier failure to deliver on time can disrupt operations and delay the completion of a project. In the study conducted by Van der Rhee et al. (2009), they found that delivery by supplier is one of the most significant factors in choosing supplier and it is very important for the supplier to deliver materials on time. They showed that late delivery by the supplier is an important factor because it will directly affect the completion time of a project.

Dada, Petruzzi and Schwarz, (2003, 2007) defined “unreliable supplier” as a factor whereby the quantity of material delivered by the supplier is less than the quantity ordered. This clearly shows that unreliable suppliers will lead to material shortage because the quantities of materials ordered are not delivered to site. Hence, it will lead to material shortage and delay the work of the contractor. This is further supported by Aibinu and Odeyinka (2006) who conducted a study of causes of delay in Nigerian construction projects in which they found that late delivery of materials is the main cause of delay. In addition a study of causes and effects of delays in the Pakistani construction industry which had 150 respondents from clients, consultants and contractors. Sambasivan and Yau, (2007) found that the shortage of material is ranked number six.

From all the studies mentioned above, it shows that material shortage is a very significant factor that will contribute to delay in construction projects.

2.5.3 Labour Shortage

Bruce and Dulipovici (2001) defined labour shortages in simple terms as the difficulty in finding the right people to fill the available job. Labour shortage is a problem faced by many countries all over the world. This is shown by the reports by Wang (2010), Anonymous (2010) and Hanim (2010). These three newspaper reports indicated the labour shortages in three different places in the world namely Beijing, Dong Nai and Pakistan respectively.

There are several causes of labour shortages. As stated by Trendle (2008), a shortage of skilled labour can result from an increase in the demand for labour. This is due to the increase in demand for the goods or services provided. In the construction industry context, the buying power of the consumer increases and this will lead to higher quality buildings being produced to meet increasing demands. Thus, more labours are required to produce high quality work.

The second cause of labour shortage is the cost of foreign labour. Hanim (2010) claimed that higher recruitment costs of foreign labour due to payment for the levy, medical checkups, security bond and medical costs by the employers lead to labour shortages in Pakistan. In the Pakistan construction industry, unskilled foreign labourers are widely used because the prices of foreign labourers are much cheaper compared to

local labourers. Hence, the increasing cost to hire foreign labour will result in labour shortages in the construction industry and at the same time; contribute to delays in construction projects in Pakistan. In the Ghanaian context, contractors seem to use local labourers because it is cheaper and sometimes it becomes too cheap to use local labourers because they do not perform to the expectation.

2.5.4 Poor Site Management

Effective and efficient site management by contractors is very important to ensure projects are completed on time. Poor coordination contributes to delay from estimated completion time. Poor site management may occur when contractors do not have enough experience and suffer from a lack of knowledge in managing the project team. A project manager is the leader in a construction project in the sense that he is required to manage all the works on site from monitoring progress of construction works to managing all the administrative work in the project. It is of utmost importance for the project manager to manage the work and project teams effectively. Hence, poor site management from the project manager will affect the whole team and also the progress of works, resulting in the eventual outcome of project delay. This view is supported by studies conducted by Augustine and Mangwvat (2001), Arshi and Sameh (2006), Faridi and El- Sayegh (2006), Toor and Ogunlana (2008), Yang and Ou (2008), Aibinu and Odenyika (2006).who concluded that poor site management is one of the factors that contribute to delay in construction projects. Therefore every effort should be made to manage the site to enhance productivity.

2.5.5 Equipment and Tool Shortage

Chang, Brost, Isaksen, Madronich, Middleton, Stockwell, and Walcek, (1991) highlighted that the input of tools and equipment used in the construction site are either provided through direct investment by the contractor or acquired through leasing. Some contractors may acquire tools and equipment using both methods. The contractor has to plan the usage of equipment according to the construction work to be carried out during a particular period of time because equipment obtained by leasing has to be returned to the supplier by the due date at the end of the lease period. Joyce (2006) added that the construction of high rise buildings is increasing and, as a result, the use of cranes is also increasing. However, this is contributing to equipment shortage as the crane suppliers do not have a sufficient number of cranes to be leased out in order to meet this increasing demand. Hence, it is less likely that the contractor would be able to extend the lease period of cranes if it was necessary to do so. This shows that failures in effectively planning the usage of equipment will cause equipment and tool shortages.

Wendle, (2008), reports that the construction industry in Russia faces equipment shortages because theft is prevalent on construction sites whereby heavy trucks and equipment are frequently stolen. He further report that, during a three month period, 40 heavy trucks, 13 cranes, 1 cement mixer and various other equipment had been stolen from construction sites in Moscow. Therefore, it appears that thefts may be one of the factors in the construction industry facing tool and equipment shortages.

Shree, (2007), stated that the cost of renting construction equipment has risen by around 30% to 40% in only a few years. The increasing cost of equipment affects the contractor greatly as they will face financial difficulty in renting that equipment. Therefore, the

contractor will have to suffer from tools and equipment shortage which consequently, contributes to delay in the project.

Addition to the above, most of the researchers agree that are the issue that continuously happen relate to the contractor:

- i. Inadequate contractor expertise issues with subcontractors.
- ii. Ineffective designing and programming of project progress by contractor.
- iii. Mistakes throughout construction.
- iv. Delay in mobilization.
- v. Incompetent technical employees allotted to the project.
- vi. Poor web site management and oversight by contractor.
- vii. There are alternative factors that additionally vital that causes the delays construction:
- viii. Improper electrical and mechanical coordination and management.
- ix. Conflicts between contractor and alternative parties.
- x. Delays in sub-contractors work.
- xi. Improper technical study by the contractor throughout the bidding stage.

2.5.6 Construction Mistakes and Defective Works

Gerskup (2010) claimed that poor workmanship, carelessness and shortcuts are the three key factors that will contribute to defective works. Zanis, (2010) also agrees that poor workmanship is the main contributor to defective works. She reported that the qualities of schools constructed in Zambia are poor due to poor workmanship by the contractor.

In addition, Kedikilwe (2009), in another case, mentioned that poor workmanship is the main factor that produces dysfunctional solar panels in buildings.

The use of poor quality materials is one example of poor workmanship. In Turkey, several of the building collapses in the Bingol–Karliova earthquakes were due to the use of improper aggregate in the concrete during construction (Binici, 2007). In the same study, Binici, (2007) found that the reinforcement bars used had corroded, leading to the strength of the concrete being greatly reduced.

Poor workmanship that leads to defective works has to be rectified by the contractor but in order to do that; the project will require postponement of time. Careless mistakes such as taking incorrect measurements from plans and specifications will lead to construction mistakes (Thomas, 1991).

Additionally, incorrect units and measures during construction will produce defective work. As a result, the contractors need to reconstruct those construction mistakes which results in taking additional time to complete the project.

A shortcut can be defined as the path that takes lesser time to complete compared to the usual path. Thomas (1991) emphasized that contractors usually use shortcuts to complete the construction work due to time and cost constraints. Shortcuts will, however, eventually produce defective works which need to be rectified later in the completion stage. This will subsequently delay the project.

2.5.7 Coordination Problems

In a construction project, there are many parties involved such as contractor, consultant, sub-contractor and client. Often, it may be difficult for these various separate

parties to coordinate well in order to complete the project. In one study conducted by Assaf et al. (1995) it was found that difficulty in coordination between the parties is one of the factors that contribute to delay. In addition, Majid and McCaffer (1998) also agreed that coordination problems will contribute to delay.

Ali et al. (2008) and Kadir et al. (2005) stated that lack of coordination between contractors and subcontractors will lead to delay, for example in the situation that newly revised construction drawings of a project may be issued later by the contractors to the subcontractors. This leads to construction mistakes and the work requiring to be redone. Reconstruction work takes additional time, therefore impacting upon the completion time of the project.

According to Sambasivan and Yau (2007), most of the unskilled labourers used in the Malaysian construction industry are foreign labourers. These foreign labourers have little formal education (Santoso et al., 2003). Thus, coordination is very important to guide and instruct these labourers to perform their work correctly. Without coordination, the project will be delayed due to rectifying defective works and low productivity of labourers

2.6 Effects of Delay

Many previous studies have been carried out regarding the effects of delay. Studies from Aibinu and Jagboro (2002), Sambasivan and Yau (2007); and Sun and Meng (2009) found many effects of delay in construction projects. Out of all the effects of delay, six most common effects of delay were identified and these are discussed below.

2.6.1 Cost Overrun

Cost overrun is a situation where the amount of money used is greater than the initial project cost or estimated cost (Singh, 2009). Aibinu and Jagboro (2002) found that cost overrun is the most frequent effect of delay in Nigeria. This is further supported by Sambasivan and Yau (2007) who found that cost overrun was ranked second in their study of delay effects in the Malaysian construction industry.

This is due to overtime costs in order to continue the construction work and any compensation required as a result of the delay (Hanna et al., 2004). Besides that, additional money is required for rework if any construction mistakes have occurred. According to Sun and Meng (2009), the cost of rework can be as high as 10-15% of the estimated project cost. This shows that cost overrun is one of the most frequent effects of delay in the construction industry.

2.6.2 Extension of Time (EOT)

Extension of time is an event where extra time is requested in order to complete the project (US Legal, 2010). According to Odeh and Battaineh (2002), client-related delay is the major factor contributing to delays. Thus, contractors can claim suitable EOT if the cause of delay is beyond the control of the contractor and is brought about by client-related factors (Othman et al., 2006).

This is mentioned by Williams, (2003) in his study on assessing Extension of Time delays on major projects. Usually contractors can claim EOT due to client or owner related delays in construction projects.

2.6.3 Late Payment

According to Nichol (2008), late payment is a common problem especially during times of economic crisis. This is supported by Still, (2000), who found that late payment is a major problem in Western countries. In the study by Odeh and Battaineh (2002), late payment was the second highest factor contributing to delay, ranked by consultants.

Harris and McCaffer, (2003), defined late payment as failure of a paymaster to pay within the period of honoring of certificates as provided in the contract. The parties involved in the process of payment claim such as client, contractor, superintending officer, architect, quantity surveyor, banker and other construction players may cause a payment to be delayed. A delayed payment by a party who is involved in the process of payment claim may have an influence on the supply chain of payment in whole. The problems of delayed payment are felt not only in a developing country, as in the case of Ghana, but also in developed countries, such as the United Kingdom and Australia, just to name a few. For instance, a survey of the payment performance in Britain has shown that the construction industry, in particular, is prone to a culture of late payment, with payment of moneys due to subcontractors and suppliers being made, on average, 53 days after receipt of invoices or applications for payment have been rendered (Johnston, 1999).

According to the Construction Industry Working Group on Payment (2007), problems in payment at the higher end of the hierarchy will lead to a serious knock-on cash flow problem down the chain of contracts. The identified causes of late payment include: 1) client's poor financial and business management, 2) withhold of payment by client, 3) contractor's invalid claim, 4) delay in valuation and certification of interim payment by consultant, 5) inaccuracy of valuation for work done, 6) insufficient

documentation and information for valuation, 7) involvement of too many parties in the process of honoring certificates, and 8) heavy workloads of consultant to do evaluation for work done.

Payment is considered as the life blood of the construction industry because construction projects often involve very large capital outlay (Ameer -Ali, 2005). It is very obvious that a healthy and consistent disbursement of money is a critical point in determining contractor's performance. Late payment may Creates a negative chain effect on other parties. As stated by Davis Langdon and Seah Consultancy (2003), 'the construction payment blues have domino effects'. A delayed payment by one party may affect the entire supply chain of payment of a construction project.

Late payment may occur during the construction process and it is likely to be more severe during delay periods. The owner or client may use postponement of the project as a reason to delay the payment to the contractor and this may lead to cash flow problems.

Naseem, (2005), agreed to the fact that, "it is universally accepted that delayed payment affects the contractor's cash flow, which in turn can affect the progress of the works and profitability.

2.6.4 Cash flow issues

The most important aspect of cash flow management is to avoid extended cash shortages which are caused by having too great a gap between cash inflows and outflows. Cash flow management is defined as a process of monitoring, analyzing and adjusting projects' cash flow. Lord Denning famously said that cash flow is the life-blood of the construction industry and ease of cash flow is an essential element in delivering a

successful project (Construction Industry Working Group on Payment, 2007). Thus, a well managed cash flow is important to enable the delivery of a successful project by performing a cash flow analysis on a regular basis to identify cash flow problems. In analyzing the cash flow of a project, cash flow forecasting is an essential method to head off cash flow problems. Following next is to develop and employ strategies that will maintain an adequate cash flow for the project. Therefore, a well managed cash flow will improve the project's cash flow and subsequently improve the timely performance of a project. Conversely, a poorly managed cash flow represents the opposite. The causes to poor cash flow management can be categorized into: 1) contractor handles too many projects at the same time, 2) contractor's instable financial background, 3) unqualified contractor underbidding the project cost, 4) lack of regularly cash flow forecasting, 5) poor credit arrangement with creditors and debtors and 6) capital lock-up. The financial issues have been summarized in a table 1.0 below.

Table 2.1 Financial issues

Category	Sub -categories
Payment issues	Client's poor financial and business management Withhold of payment by client Contractor's invalid claim Delay in valuation and certification of interim payment by consultant Inaccuracy of valuation for work done Insufficient documentation and information for valuation Involvement of too many parties in the process of honoring certificates Heavy work load of consultant to do evaluation for variation order
Cash flow issues	Contractor handles too many projects at the same time Contractor's instable financial background Unqualified contractor underbidding the project cost Lack of regularly cash flow forecasting Poor credit arrangement with creditors and debtors Capital lock-up
Financial resource issues	Difficulties in getting loan from financiers Allocation of government budget not in place
Market issues	Increment of interest rate in repayment of loan Inflation (material prices, labor wages, transportation costs) Increment of foreign exchange rate (imported materials and plants)

Data Source: Abdul-Rahman et al. 2011*

Table one explained various financial issues that can cause delay in construction projects. There are four main categories and four sub-categories illustrating how the main categories could delay a project if these issues are not given prompt attention.

2.6.5 Rescheduling

According to Vieira et al. (2003), rescheduling is the change of original schedule of time in order to respond to disruption and problems that have occurred. In the construction industry, schedules may be updated in order to monitor the time and work in

construction projects (Liu and Shih, 2009). The importance of schedule updates are as mentioned by Liu and Shih (2009): (1) compare the original schedule with the actual progress of the project; (2) identify all delayed activities; (3) identify who or what is responsible for delays; and (4) forecast and modify projected work progress based on actual progress.

Based on the schedule update, delayed activities can be identified and usually, rescheduling is required due to the delayed work. Thus, rescheduling is one of the effects of delay in construction projects.

2.6.6 Affect Company Reputation

According to Djordjevic and Djukic (2008), company reputation is one of the most important intangible assets. Ismail et al. (2006) support this statement and add that reputation is built from the overall performance of the company. The reputation of a company is very important because an adversely affected reputation can become a business threat (Murray, 2003).

Strategic planning, corporate governance and corporate codes of conduct are the top three factors that affect company reputation according to the study conducted by Ismail et al. (2006). Thus, delay in construction projects will affect the company reputation indirectly.

2.6.7 Lost Productivity and Efficiency

According to McDonald and Zack (2004), productivity is the measurement of labour efficiency to complete the required work. Lost of productivity and efficiency of

the labourers always occurs when delays happen (Bramble and Callahan, 2000). This occurs due to acceleration of the schedule and also the pressure to complete the work.

In addition, delays caused by construction mistakes will need rework and this leads to a significant increase in the amount of work the labourers are required to complete. This directly reduces the productivity and efficiency of the working labourers.

2.7 Types of Delay

Delays in construction means time overrun either beyond completion date specified in a contract or agreement and or beyond the date the parties agreed upon for delivery of a project. For the purpose of this project work or research, delay is looked at as the elongation of project duration due to factors to be identified and discuss.

According to Ahuja, Dozzi, and Abourizk, (1994), delay is considered the major cause of construction claims and disputes. Delay could be considered as four types namely, non-excusable delays, excusable non-compensable delays, excusable compensable delays and concurrent delays.

Non-excusable delays are those caused by the contractor as a result of mismanagement or construction mistakes and equipment breakdown or staffing problems. These are all within the control of the contractor or are foreseeable.

Excusable Non-Compensable delays are unforeseeable events which make the execution of the project impossible and are of such importance that it cannot be overcome. They are beyond the contractor's reasonable control and not attributable to the contractor's fault of negligence. These include unexpected natural events, different site or ground conditions,

inclement weather conditions, etc. It is neither the client nor the contractor's fault, but under the terms of the contract, the risk is borne by both parties. Contractually the contractor will not receive compensation for the cost of delay, but he will be entitled for extension of time and is relieved from any contractually imposed liquidated damages for the period of the delay.

Excusable Compensable delays are those caused by a breach of the contractual terms by the owner or client. Examples include considerable additional works, owner interference and inadequate brief including others that lead to the suspensions or interruptions to all or part of the work caused by an act or failure to act by the owner. Under this type of delay, the contractor is not only entitled to extension of time but also to an adjustment for any increase in cost.

Concurrent delays on the other hand, occur when both the owner and the contractor are responsible for the delay. Generally, if the delays are inextricably intertwined, neither the contractor can be held responsible for the delay (forced to accelerate, or be liable for liquidated damages) nor can he recover the delay damages from the owner.

Alwi and Hampson, (2002), informed that, until the development of CPM schedule analysis, there was no reliable method to differentiate the impact of contractor caused delays from owner-caused delays. With the sophisticated computerized techniques now available, however, it has become possible to segregate the impacts of apparently concurrent owner and contractor delays

In analyzing a delay claim, an analysis based on a comparison of the contractor's approved CPM schedule with the as-built CPM schedule should be performed to

apportion proper responsibility for delay. Because the critical path may shift as the job progresses, it is updated based upon contractually required input from the contractor.

Bureau of Engineering project Delivery Manual (version 2, 2006) also stress out that, there are three basic types of delays. They are, “1.Excusable- Non-compensatory, 2.Non –Excusable and 3.Excusable-compensatory. It further explained that, **Excusable-Non-Compensatory** Delays are types of delays caused by an event or party outside the control of the contractor. Examples under these types of delay are excessive inclement weather, labour strikes, riots etc. It should be noted that, if an owner caused delay takes place at the same time as a contractor caused delay, it is a concurrent delay. In cases like this the contractor is entitled to a time extension and not compensation.

Non-Excusable Delays are the types of delay determined to be the responsibility of the contractor. Examples under these types of delay are insufficient manpower, lack of sub-contractors mobilizing and late material deliveries. In this case the contractor is responsible for making up non-excusable delay and providing a recovery schedule to indicate his recovery plan.

Excusable-Compensatory Delays are the types of delay determine to be the responsibility of the city Authority or Statutory bodies. Examples are issuance of change orders that impact the critical path, late return of submittals, or lateness in responding to request for Instruction.

Terry Williams (2003) also revealed that there are three basic ways to classify delays:

- i. Excusable delay with compensation
- ii. Excusable delay without compensation
- iii. Non-excusable delay

2.7.1 Changes

With the help of a written change notice, the owner may without any notice to the sureties (if any), unilaterally make any change, at any time in the work within the general scope of the contract, including but not limited to changes:

1. In the drawings, designs or specifications.
2. In the method, manner or sequence of contractor's work.
3. In customer or owner furnished facilities, equipments, materials, services or site(s).
4. Directing acceleration or de acceleration in the performance of the work.
5. Modifying the contract schedule or the contract milestones.

If at any time contractor believes that acts or omissions of customer or owner constitute a change to the work not covered by a change notice, contractor shall within ten (10) calendar days of discovery of such act or omission, submit a written change notice request, explaining in detail the basis for the request.

Owner may either issue a change notice or deny the request in writing. If any change under this clause causes directly or indirectly an increase or decrease in the cost, or the time required for the performance of any part of the work, whether or not changed by any order, an equitable adjustment shall be made and the contract will be modified accordingly (Ahmed et al, 2003).

The clause recognizes that changes in the work or changes in the method or manner of Performance may require changes in the schedule and schedule milestones and this could further necessitate revisions in activity durations, sequence of work items, or interrelationships of various tasks.

These changes may have a direct impact on the schedule, as where a change in method requires a greater or lesser period of performance or its effects may be subtler, as where the change merely rearranges priorities. In addition to a time extension, the contract's clause provides compensation for any delay resulting from a contract change by allowing an equitable adjustment for the increased cost of the performance of the work caused by the change (Ahmed et al., 2003).

2.7.2 Differing Site Conditions

The portion of the clause addressing cost or time adjustments for 'differing site conditions' provide. If such conditions do differ in material and thus cause an increase/decrease in the Contractor's cost or time required for performance of the work, an equitable adjustment will be made pursuant to the General Condition titled "Changes". No claim of the contractor under this clause will be allowed unless the contractor has given the required notice. The main intention is to leave the contractor neither damaged nor enriched because of the resultant delay (Al-Gahtani and Mohan, 2007).

The differing site conditions clause must not be confused with the site conditions clause in owner issued contracts - the so-called "Exculpatory" clause. Its intent is to disallow any claims for delays relating to conditions at the site, which the contractor should have anticipated. The exceptions are limited to those conditions defined in the differing site conditions clause (Ahmed et al, 2003).

Al-Gahtani and Mohan (2007) added another type of delay that is pacing delay: Pacing delay is deceleration of the project work, by one of the parties to the contract. This is because of a delay to the end date of the project, caused by the other party. The goal is

to maintain steady progress with the revised project schedule.

2.8 Critical Delays

Abudul-Rahman, Berawi, Mohamed, Othman and Yahiya, (2006) presented that; critical delays are delay claims that affect the progress, time, and compensation. Non-critical delays do not affect the completion date of the project. They affect the succeeding activities that are not on the critical path of the schedule. This can set back activities if they do not have a float in the schedule.

Theodore, (20093), also writes that delays that affect the project completion time or date are considered as critical delays. Delays that do not affect the project completion time or date are noncritical delays. If certain activities are delayed in the construction project life cycle, the project completion date will be delayed. Determining which activities truly control the project completion date depends on the: the project itself, the contractor's plan and schedule (particularly the critical path), the requirement of the contract for sequence and phasing and the physical constraint of the project

2.9 Delay Responsibility

Ahmed et al (2003) claimed that the issue of responsibility for delay is related to whether the contractor is awarded or is liable for costs and additional time to complete the project. The categories of responsibilities are:

1. Owner (or agent) responsible – contractor will be granted a time extension, where warranted.
2. Contractor (or subcontractor) responsible – contractor will not be granted time or

- costs and may have to pay damages/penalties;
3. Neither party (e.g. “act of God”) responsible – contractor will receive additional time to complete the project but no costs will be granted and no damages/penalties assessed; and
 4. Both parties responsible – contractor will receive additional time to complete the project but no costs will be granted and no damages/penalties assessed.

2.10. Possible Causes of Construction Delays

There are many factors that contributed to causes of delays in construction projects. These range from factors inherent in the technology and its management, to those resulting from the physical, social, and financial environment.

Looking at the above reviews critically, it is possible to pin down the potential delays factors into internal and external causes. Internal causes are those that result from the four main parties namely, client, consultant, contractor and the stakeholders or end users, who are involved in the construction of the project. The external causes are those which come from the Government, material suppliers or the weather.

Standard construction contracts expressly or by implication deal with these causes of delay in a different ways. For example, contractor delays leave an exposure to liquidated damages. Client or employer’s delays give an entitlement to additional time and cost to the contractor while natural delays usually result in a time only award.

Frimpong, et.al. (2003) conducted a survey to identify and evaluate the relative importance of significant factors contributing to delay and cost overruns in Ghana groundwater construction projects. A questionnaire with 26 factors was carefully

designed from preliminary investigations conducted in groundwater drilling projects between 1970 and 1999 in Ghana. The questionnaire was directed towards three groups in both public and private organizations: owners of the groundwater projects, consulting offices, and contractors working in the groundwater works. The questionnaire was distributed to a random sample of 55 owners, 40 contractors and 30 consultants. The result of the study revealed the main causes of delay and cost overruns in construction of groundwater projects: monthly payment difficulties from agencies; poor contractor management, material procurement, poor technical performance, and escalation of material prices. Ayman, (2000) carried out a quantitative analysis on construction delays in Jordan. The result of his study indicated that the main causes of delay in construction of public projects were related to designers, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity.

Similarly, Odeh (2002) also conducted a survey aimed at identifying the most important causes of delays in construction projects with traditional type of contracts from the viewpoint of construction contractors and consultants. Results of the survey indicated that contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labour productivity, slow decision making, improper planning, and subcontractors were among the top ten most important factors.

For the purpose of this project work or research, the delay factors would be classified broadly into eight categories depending on their nature and frequency of occurrence.

In specific terms, Mansfield et al, (1990), Kumaraswamy, Assaf, (1998), Frimpong, (2003) Odeh and Battaineh (2002) have identified the under mentioned as delay factors in

the construction industry. Key delay factors related to the construction industry in developing countries including Ghana are selected and put in a table.

Table 2.2. Client or Employer Based Delays

Delay	Potential Factors
1	Owner's interference
2	Inadequate Brief
3	Delay in approving shop drawing and sample material
4	Finance and payment of completed works
5	Delay to furnish or deliver site to contractor
6	Cash flow problems
7	Land acquisition
8	Suspension of work by Client or owner
9	Change or Variation orders by owner during construction
10	Excessive bureaucracy in owner's administration.
11	Slowness in making decisions by client or owner

Source: David, Odeh and Battaineh (2002)*

In the above table, the possible causes of delay based on Client or Employer were, owner's interference, cash flow problems, inadequate brief, finance and payment of completed works, Change of variation orders by owner during construction and slowness in making decisions by client.

Table 2.3. Consultant Based Delays.

Item	Potential Factors
1	Preparation and approval of drawings.
2	Inconsistent of Bills of quantities
3	Poor communication between consultant and contractor
4	Complexity of design
5	Poor site management and supervision
6	Management of project by Local consultant

Source: David, Odeh and Battaineh (2002)*

This table informs about some potential factors which causes delay based on consultants

activities. These are, preparation and approval of drawings, inconsistent of bills of quantities, poor communication between consultant and contractor and poor site management and supervision. Normally, the consultant engaged in a building project can affect the progress of construction programming through various monitoring measures such as issuing certificates, and endorsing the satisfaction of certain activities or work-done in the construction process. Progress delay can happen if these monitoring measures are not implemented properly.

This appears a typical problem in the mainland of China where a professional called the ‘supervision engineer’ is adopted for supervising construction performance, particularly in committing public sector projects. Supervision engineers are given the authority to endorse the satisfaction of certain procedures such as piling, steel fixing, the quality of key materials, before the construction programming can proceed forward.

It has been found that supervision engineers often cannot endorse these procedures in time, thus construction delays are caused (Wang et al, 2003).

Table 2.4. Contractor Based Delay

Item	Potential Factors
1	Improper planning
2	Poor site management
3	Lack of working capital
4	Improper construction methods.
5	Poor qualification of contractor and Technical staff
6	Inadequate contractor experience
7	Planning and Scheduling Problems
8	Exceptionally low Bids
9	Mistakes during construction
10	Delay in site mobilization
11	Poor communication
12	Delay in subcontractors work
13	Poor workmanship.
14	Improper management of material and lack of skilful management.

Source: David, Odeh and Battaineh (2002)*

Above in the Table are some contractor based potential factors which can cause delay in the execution of project. These are, improper planning, Poor site management, Lack of working capital, Poor qualification of contractor and Technical staff, Improper management of material and lack of skillful management, Poor communication and exceptionally low Bids. Others are inadequate contractor experience, Poor workmanship, Delay in site mobilization and mistake during construction.

Table 2.5. Material –Related Delays

Item	Potential Factors
1	Shortages of materials
2	Quality (Standard)
3	Late procurement of material
4	Change in material type and specification during construction
5	Delay in delivery of material
6	Availability of material

Source: David, Odeh and Battaineh (2002)*

The above table informs about some potential factors which causes delay based on construction material related. These include availability of material, delay in delivery of material, change in material type and specification during construction, late procurement of material, Quality Standard of material and Shortages of materials.

Table 2.6. Equipment-Related Delays

Item	Potential Factors
1	Equipment break down
2	Equipment availability (privately owned)
3	Plant pool (Hiring)
4	Lack of high-technology mechanical equipment
5	Low level of equipment operator skills.

Source: David, Odeh and Battaineh (2002)*

This table relate to the potential factors which affect Equipment delays in constructional projects.

These include Lack of high-technology mechanical equipment, Equipment break down, Low level of equipment operator skills and Plant pool (Hiring time).

Table 2.7. Form of Contract-Related Delays

Item	Potential Factors
1	Change orders and mistakes
2	Types of contract methods
3	Discrepancies in contract document and Contract clauses
4	Unrealistic contract duration

Source: David, Odeh and Battaineh (2002)*

This table relate to the potential factors that affect form of contract which may cause delay in the execution of the project. These are discrepancies in contract document and Contract clauses, Unrealistic contract duration, Types of contract methods and Change orders and mistakes.

A contract administrator is generally engaged and paid by the principal either as an independent party or as an employee. This means that in exercising his/her certification functions, in respect of which he/she is obliged to act fairly and impartially, he/she is in a position of conflict.

Table 2.8. Labour-Related Delays

Item	Potential Factors
1	Nationality of Labour
2	Unqualified Workforce
3	Shortages of Labour Supply
4	Personal Conflicts between Labour

Source: David, Odeh and Battaineh (2002)*

This table shows the potential delay factors which affect labour and cause delay in the progress of work. Majid and McCaffer (1998) identified some of the factors as, slow labour supply that contributes to causes of delays. Odeh and Battaineh (2002) in their research identified “the factors of labour supply as contributors to causes of delays. Besides material, the labour also consider as major source in the construction industry. Generally, labour are categories into two groups such as skilled workers and unskilled workers. In construction industry without labour project could not run. For instance, during construction, materials are ready to but no worker carrying out the work. During the same time because of no worker to progress of work, the project will confront project delay.

Table 2.9. External Factors-Related

Item	Potential Factors
1	Weather conditions
2	Problems with neighbours
3	Political interference
4	Poor site conditions
5	Social- Economical
6	Cultural and Social factors
7	Unavailability of utilities at site
8	Inclement weather
9	Differing site or ground conditions
10	Delays in obtaining permits
11	Highly bureaucratic organization
12	Change in Government regulations and Laws
13	Budgetary allocations
14	Unexpected natural events

Source: David, Odeh and Battaineh (2002)*

2.11 Attributes of a Public Projects

Sambasian, (2006), pointed out that, delay in the construction projects is a fact which cannot be denied. Public projects have a very high probability of delays due to their characteristics and governance. A lot of problems arise and becomes a barrier to the

progress of the public projects and thus causes a delay to its completion. According to Tirmizi (1999) 76% of all the projects of Ministry of Housing and Public Works in Punjab province got delayed by the local contractors. He stated that 76% of the projects that is 110 out of 146 got delayed due to time. In approximately 67% projects contractors requested for time extensions and 89% of these projects were granted the extra time. This is just a statistics which is a limelight on the overall extent of delays in Pakistan's public projects. As government projects are huge they require lots of capital and planning. They have all the resources but as there is lack of ownership equity and none of the government entity steps in to pace up the project or plan it more wisely with regards to international certification system. One system is followed which takes a lot of time and no one is bothered to make sure the project management strategies are followed or not. According to the study of Mezher and Tawil, (1998), most public projects got delayed due to not having the proper project management skills.

Furthermore, as public projects are connected by the nation's budget they get underestimated as they have to be implemented within the allocated budget. Flyvbjerg, (2002) States in his research that most of the public projects are underestimated by the government.

2.12 Delays as a Benchmark of Success

Construction delays are not necessarily a root cause of failure of a project. Many authors investigating the causes of success or failure of projects agree that the classical triangle of cost, time and quality should not be used as the only measure of success of

projects (Morris and Hough, 1987; Gardiner and Stewart, 2000; Atkinson, 1999). The latter argument is based on the fact that most construction projects encounter both time and cost overruns. Rad (1979) estimated that the increase in terms of time and cost of nuclear plant projects in the United States was significant. Perhaps the most extreme view concerning time and cost estimates of projects is expressed by Atkinson (1999) who states: 'Time and cost are at best only best guesses, calculated at a time when least is known about the project'. The overall conclusion drawn from current research is that construction delays and cost overrun is not something rare but instead a common phenomenon.



CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodology of this thesis, the main topics included in this chapter are research strategy, research design, population, sample size, research location, questionnaire design, questionnaire content, and the last thing is the process of data analysis.

3.2 Research Strategy

Naoum (1998) defined the research strategy as the way in which the research objectives can be questioned. Two types of research strategies are used at studies, quantitative and qualitative research. Quantitative approach is used to gather factual data and to study relationships between facts and how such facts and relationships accord with theories and the findings of any research executed previously, but the qualitative approach seek to gain insights and to understand people's perception of "the world" whether as individuals or groups (Fellows and Liu, 1997).

In this thesis, a quantitative approach is used to understand the collective group perspectives of professionals regarding the contribution of key delay causal factors to delay in health constructional projects in the upper east.

3.3. Research Design

The primary data for this research were collected through the use of Questionnaires survey targeted at consultants and contractors working for Ghana Health

Service in the Upper East Region. Also thirteen (13) Various District Directors of Health Services in the Upper East Region were targeted. The Regional Director of Health Services and the Deputy Director-Administration were not left out in the quest of obtaining data.

3.4 Population Size

NO.	DESCRIPTION			THE NUMBER CHOSEN
1	Consultants			8
2	Contractors			20
3	Engineers/Directors of Health Service			15
Total				43
Number of projects site visited				
NO	DESCRIPTION	LOCATION	DISTRICT	No of Sites visited
1	construction of CHPS compound	Atiyorum	Kassena-Nankana West	1
2	construction of CHPS compound	Kultamsi in the	Pusiga	1
3	construction of CHPS compound	Kologu Zuo	Kassena-Nankana Municipal	1
4	construction of CHPS compound	Katanga/Dubila	Bolgatanga Municipal	1
5	construction of CHPS compound	Salpiiga	Bawku West	1
6	construction of CHPS compound	Yiziigu	Garu- Tempane	1
7	construction of CHPS compound	Nugu	Talensi	1
8	construction of CHPS compound	Boe-Tanko	Bongo	1
9	construction of CHPS compound	Kotintabig	Nabdam	1
Total				9

The above table shows the various groups targeted in the population size.

3.5 Sample Size Determination

Wood and Haber (1998) defined the sampling as the process of selecting representative units of a population for the study in research investigation. A sample is a small proportion of a population selected for observation and analysis. The samples were selected randomly from contracting companies working for the Ghana Health Services, consultant offices and owners/owners representatives sectors.

Upper East Region of Ghana is the location of this study, the participated organization of questionnaire was as follows

1. 20 contractors registered with the GHS,
2. 15 owners (Health Directors) ,
3. 8 consultants working for GHS,

The 20 contractors and 8 consultants were chosen because they were registered and working on various projects for the Ghana Health Service in the Upper East Region at the time. The 15 Health Directors were not left out because they represents the Service in the Region.

3.6. Instrument Design

Structured questionnaire was designed to enable the researcher in obtaining data. The questionnaire design took into consideration the objectives of the study with the aim to answer the research questions. Great effort and brainstorming were done for designing the questionnaire. Meetings with some consultants and contractors in the building industry were conducted to identify the right questions required and to present them in a clear and an unambiguous format.

3.6.1 Questionnaire Design

The literature review has showed several factors which affect the delay in construction projects in various countries around the world and at intervals of time, but not all the factors are consistent with the conditions and circumstances surrounding from economic level, the type of projects, geographical region and occupation factors which experienced in Construction projects in Upper East Region of Ghana, so it has been selected factors appropriate with the nature of construction projects and problems in the Health constructional projects in upper east of Ghana.

The draft questionnaire was discussed with the supervisor of the project for review and recommendation. The final questionnaire contains factors contributing to time overruns in construction projects in Ghana. The respondents were asked to fill the questionnaire and they were assured that the information will be confidential and only for research purpose.

3.6.2 Questionnaire Content

The questionnaire included two parts (A&B) that related to the factors of delay at Health constructional projects in the Upper East of Ghana. The first part (section-A) deals with the organization's profile, (Consultants, Contractors and the Owner), major type of work involved in, respondents designation, firms working experience, location of firm, average sum of projects executed by firm per year, number of employees working for the firm and gender of the respondents. The second part (Section-B) also dealt with factors contributing to or influencing delay of health constructional projects.

In order to evaluate and analyze the contribution of key delay causal factors to Health constructional projects in Upper East Region of Ghana, a range of personnel involved in construction projects in the Upper East Region - Ghana were targeted. Personnel were purposely selected from consultants and contractors who were then actively working for the Ghana Health Service. Also Directors of thirteen (13) districts with the Ghana Health Service in the Upper East Region were also purposely selected.

A questionnaire of 42 factors on delay was carefully designed. It was organized in the form of a priority scaling (1=very low, 2=low, 3=medium, 4=high, and 5=very high). In addition, the respondents could add other causes that they experience in their projects. These very few added causes, however, were not significant additions.

The questionnaire was directed towards three groups involved in Health Construction projects, namely, consultants, contractors and owners of the construction projects working in the upper east region of Ghana. The questionnaire was distributed to a random sample of 15 owners, 20 contractors and 8 consultants. The sample selected for each of the three groups is described below as:

1. Owners comprising the thirteen (13) District Directors plus one (1) regional Director and a Deputy Director of Health Services of the Ghana Health Service (key decision-makers) responsible for the projects.
2. Consultants working in the construction industry for the GHS.
3. Contractors who were actively involved in the health constructional projects.

Respondents were from Ghana Health Service (GHS) that sponsor health constructional projects, and the contracting and consulting organizations that work for the GHS.

3.7 Reliability of the Research

The reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring (Poilt and Hungler, 1985). The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability.

They further stressed that ‘Reliability can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same sample of people on two occasions and then compares the scores obtained by computing a reliability coefficient.

3.8. Presentation of Data

A total of 43 questionnaires were distributed to three (3) groups of targeted respondents that are owner(s), consultants and contractors (see Table 3.1 below).

Table 3.1Percent of questionnaire distributed

Description	Questionnaire distributed
Owners	15
Contractors	20
Consultants	8
Total	43

The data was processed based on the severity index (S.I.). **Severity index (S.I.)**: This expresses severity and important of factor that caused delay and price escalations. It is computed as per following formula:

$$\text{Severity} = \frac{\sum \text{Value assigned} \times \text{Number of responses respectively}}{\text{Value of highest severity level} \times \text{Total number of responses}}$$

Illustration:

Computation of severity index (S.I.) as highlighted in table 2 below:

$$\text{Severity index (S.I.) factor No. 1} = \frac{\sum (1 \times 0 + 2 \times 2 + 3 \times 9 + 4 \times 10 + 5 \times 3)}{5 \times 40}$$

$$\text{Severity index (S.I.) factor No. 1} = \frac{0 + 4 + 27 + 40 + 15}{200} = \frac{86}{200} \times 100 = 0.43$$

$$\text{Severity index (S.I.) factor No. 1} = 0.213$$



CHAPTER FOUR

SURVEY RESULTS AND DATA ANALYSIS

4.1. Introduction

This chapter focuses on the presentation and analysis of data collected from 14 owners, 18 contractors and 8 consultants within the Upper East Region of Ghana. The first part of the chapter describes the percentage of questionnaire distributed and percentage of questionnaire returned.

The procedure used in analysing the results was aimed at establishing the severity and importance of the various factors responsible for delay in Health Constructional projects in the Upper East region of Ghana.

A total of 43 questionnaires were distributed to three (3) groups of targeted respondents that are owners, consultants and contractors. Out of this, 40 questionnaires were returned completed. These include: 14 from owners; 8 from consultants; and 18 from contractors.

(See Table 4.1below).

Table 4.1 Percent of questionnaire distributed and number returned.

Description	Questionnaire distributed	Percentage of questionnaire distributed (%)	Number of returned	Percentage of returned questionnaire (%)
Owners	15	100	14	93.33
Contractors	20	100	18	90.00
Consultants	8	100	8	100
Total	43	100	40	

Data source: Field Survey, February 2014*

Though 43 questionnaires were distributed among the targeted respondents, 40 were returned, representing 93.02%. Only three questionnaires representing 6.98% were not return.

4.2. Various types of delay in health constructional projects?

The questionnaire was analysed from contractors, owners and consultants' perspective in order to identify the most severe and important factors that influence delay in Health Constructional projects in Upper East Region of Ghana.

On the basis of ranking of the factors by the various groups, it was possible to identify the most severe and important factors that caused delay in Health Constructional projects in Upper East, Ghana.

A summary of all the factors of delay in health constructional projects in upper east Region of Ghana with respect to its severity and importance, ranking by the groups, and overall ranking as identified by all groups is shown in the Table 3.2 to table 3.5

Table 4.2 - Rank of factors responsible for project delays

Item	Factor/Cause Description	Owners		Consultants		Contractors		Overall Rank
		(S.I.)	Rank	(S.I.)	Rank	(S.I.)	Rank	
1	Planning and scheduling deficiencies	0.24	13	0.12	28	0.335	23	19
2	Deficiencies in cost estimates prepared	0.22	25	0.125	24	0.35	17	22
3	Inadequate control procedures	0.2	37	0.155	12	0.375	15	20
4	Delays in work approval	0.21	30	0.12	29	0.32	27	35
5	Waiting for information	0.25	11	0.165	7	0.285	33	11

6	Mistakes during construction	0.19 5	39	0.125	25	0.34	21	34
7	Delays in inspection and testing of work	0.25 5	10	0.1	35	0.39	12	17

Table 4.3 - Rank of factors responsible for project delays

Item	Factor/Cause Description	Owners(Clients)		Consultants		Contractors		Overall Rank
		(S.I.)	Rank	(S.I.)	Rank	(S.I.)	Rank	
8	Cash flow during construction	0.16	42	0.12	30	0.455	6	31
9	Frequent breakdowns of construction plant and equipment	0.215	31	0.15	15	0.205	40	36
10	Shortages of technical personnel	0.235	14	0.135	20	0.23	39	27
11	Labour shortages	0.285	6	0.17	6	0.435	9	1
12	Monthly payment difficulties	0.22	26	0.19	1	0.47	3	4
13	Poor contract management	0.32	1	0.155	13	0.41	11	2
14	Shortage of materials, Plant/equipment parts	0.315	2	0.105	33	0.24	37	26
15	Contractor's financial difficulties	0.205	35	0.14	18	0.475	2	15
16	Low bid	0.235	15	0.12	31	0.455	7	13
17	Material procurement	0.225	22	0.115	32	0.34	22	29
18	Imported materials	0.2	38	0.09	38	0.24	38	42

Table 4.4 - Rank of factors responsible for project delays

Item	Factor/Cause Description	Owners		Consultants		Contractors		Overall Rank
		(S.I.)	Rank	(S.I.)	Rank	(S.I.)	Rank	
19	Late delivery of materials and equipment	0.23	17	0.105	34	0.16 5	42	38
20	Escalation of material prices	0.23	18	0.18	3	0.43	10	5
21	Slow decision-making	0.305	3	0.125	26	0.34 5	20	10
22	Inflation	0.23	19	0.18	4	0.46	5	3
23	Difficulties in obtaining construction materials at official current prices	0.22	27	0.145	16	0.33 5	24	23
24	Ground problems	0.185	41	0.125	27	0.26	36	41
25	Bad weather	0.225	23	0.085	39	0.29 5	32	39
26	Unexpected geological conditions	0.22	28	0.1	36	0.27	35	40
27	Poor site management and supervision	0.26	8	0.14	19	0.3	31	17
28	Poor project management assistance	0.29	4	0.16	8	0.31	30	7
29	Financial difficulties of contractor	0.22	29	0.18	5	0.48	1	6
30	Financial difficulties of owner	0.29	5	0.135	21	0.33	25	12

Data Source: Field Survey, February, 2014*

Table 4.5 - Rank of factors responsible for project delays

Item	Factor/Cause Description	Owners		Consultants		Contractors		Overall Rank
		(S.I.)	Rank	(S.I.)	Rank	(S.I.)	Rank	
31	Design changes	0.215	32	0.16	9	0.315	29	25
32	Slow payment of completed works	0.21	33	0.185	2	0.44	8	9
33	Inaccurate estimates	0.205	36	0.13	22	0.33	26	33
34	Mistakes in design	0.225	24	0.155	14	0.18	41	32
35	Obstacles from government.	0.23	20	0.085	40	0.39	13	28
36	Shortages of skilled workers	0.235	16	0.16	10	0.32	28	14
37	Additional works	0.245	12	0.07	41	0.365	16	24
38	Slow information flow between parties	0.23	21	0.1	37	0.285	34	37
39	Poor technical performance	0.28	7	0.145	17	0.35	18	8
40	Incompetent subcontractors	0.26	9	0.07	42	0.465	4	16
41	Obsolete or unsuitable construction methods	0.195	40	0.13	23	0.39	14	30
42	Price fluctuations	0.21	34	0.16	11	0.35	19	21

Data Source: Field Survey, February, 2014*

4.3. The causes of delay and their effect on health constructional projects?

The level of percentages on factors contributing to delay in health constructional projects are ranked and presented in a table. The result of the ranking is shown in Table 4.6.

Table 4.6: Responses on Factors Contributing to Delay

Factors contributing to delay	Number of Respondents	Percentage	Rank
Contractors' Financial Difficulties	36	90	1
Construction Mistakes and Defective works	30	75	2
Material Shortage	28	70	3
Poor Site Management	25	62.50	4
Labour Shortage	15	37.50	5
Coordination Problem	9	22.50	6

Data Source: Field Survey, February 2014*

Based on Table 4.6, the first highest ranked factor is financial difficulties faced by the contractors. All except ten percent (10%) of the respondents commented that late payment by the client causes delay in project delivery whereby the contractor has insufficient cash flow to sustain the expenses of the construction work. Additionally, the economic crisis which affects the profit of the contractors causes delay in construction works because the work cannot be carried out on time. This is probably due to the individual contractors who have gone out of business or simply do not have the financial capability to complete the project. This statement was made by the majority of the respondents in the questionnaire.

Construction mistakes and defective works ranked number two out of the seven factors. Three-quarter of the respondents ranked this as a contributing factor which influences delay in health constructional projects. This reflects the statement made by Gerskup, (2010) where defective works are one of the main contributors to delay. Nearly every one of the respondents ranks this factor decidedly because it takes time to rework the construction mistakes. They further explained that further investigation may have to be carried out in order to identify the causes of the defective work. This will eventually

affect the completion time of the project as certain activities are classified as critical activities that cannot be delayed.

Material Shortage was ranked third out of the seven factors contributing to delay in health constructional projects. 70% of the respondents explained that, due to financial difficulties faced by some contractors, materials will definitely be short at site. A little over sixty two percent (62%) of the respondents agreed that Poor Site Management also contributes to delay in health constructional projects. Labour shortage and coordination problem were in minority of the respondents. These were represented by 37.50% and 22.50% respectively.

Financial difficulties are not a recent issue. A previous study by Arditi *et al.* (1985) found that this is the number one factor contributing to delay in Turkey. According to Kaming *et al.* (1997), one of the most important factors causing delays of high-rise projects in Indonesia is the shortage of resources. A survey by Ubaid (1991) concluded that the contractor's resources are one of the major measures on the contractors' performance that causes delays. The resources include financial resources, human resources, material resources and equipment resources. However, only the financial resources are focused in the research as Abdul-Rahman *et al.* (2006) addressed that lack of funds may affect the project's cash flow and lead to delay of site possession which consequently causes delays to the project as whole. The factors that would cause insufficient financial resources are: (1) difficulties in getting loan from financiers and (2) allocation of government budget not in place.

In my opinion, client of a construction project may cause a late payment to contractor. The delay payment for work done from client may affect the cash flow of the

contractor. More to the point, the instability of financial institutions would imply extra financial commitments that may be beyond the capacity of the contractor which he or she might not be prepared for such extra costs. As a result, the contractor would need to seek for additional financial resources in terms of loans from the financial market such as banks or any other financial institutions. In some instance, the loans might be difficult to obtain from financial institutions as they have a strictly regulated checklist of borrowers' financial situation. Due to failure or setback in getting loans, shortage of financial resources at the time may lead to cash flow shortfalls which may consequently cause delays in project. Some time also corruption practices may cause delay in construction. Although this statement was made, it cannot be substantiated.

Table 4.7 Response of Effects of Delay

Effect of Delay	Percentage %(n=40)	Rank
Late Payment	35.00	1
Extension of Time (E.O.T)	25.00	2
Cost Overrun	15.00	3
Rescheduling	12.50	4
Affect Company Reputation	7.50	5
Lost Productivity and Efficiency	5.00	6
Total	100	

Data Source: Field Survey, February 2014*

Table 4.7 shows that late payment forms greater percentage of opinion of the respondents (35%) as the most frequent effect ranked by them. Fourteen of the respondents claimed that delay in payment will cost more money due to workers salaries and hiring of equipment and tools. Extra expenditure is required to hire labour and for

leasing of equipment for construction because the budget calculated for those fees was based on the original time estimate for project completion.

Extension of time (EOT) is the second highest ranked effect by the respondents. The contractors will normally require extension of time in order to complete project.

As suggested by Sun and Meng (2009), time overrun and cost overrun are inter-related whereby delay will cause cost overrun in most cases. Besides that, required rescheduling/rework due to construction mistakes and defective works which was ranked as the fourth most important factor in Table 3.6 requires a further amount of additional expenditure. This will consequently lead to cost overrun. Only minute percentage (5%) of the respondents' ranked lost productivity and Efficiency as the effect of delay.

4.4. Various Interventions in Dealing with Delay in Health Constructional Projects.

The success of construction projects is critically significant for all project participants especially for clients as well as the country's economy and in a larger picture; it affects the country's development. A research by Abdelnaser et al., (2005) concluded that in order to avoid delays during construction stage, you should make proper planning.

Nguyen, et al. (2004), who studied the factors that can be applied as a method of minimizing construction delays as follows: "competent project manager; frequent progress meeting; accurate initial cost estimates; accurate initial time estimates; awarding bids to the right/experience consultant and contractor." During pre-construction stage, a client should employ a depth knowledge project manager to organize good project team members for work to progress successfully. Besides that, the project team members

should always be discussing the problems seen with the projects during the site meetings. On the other hand, the contractor should employ some workers with experience such as quantity surveyor, so that, during the time or cost estimate they can add on some unforeseen event to avoid the cost and time overrun. Furthermore, the developer should hire some experience consultant and contractor, so that once they are facing problem, they can refer to previous project to solve the problem immediately to enable the project to progress smoothly.

Aibinu and Jagboro (2002), acknowledged two methods to minimize or if possible eliminate delay or time overrun in construction projects as, “acceleration of site activities, and contingency allowance.” They further stressed that “during construction stages, the contractor should carry out his responsibility to make sure that the work progresses and can complete in time”. If found that progress of work is not equal to the estimated schedule, the contractor may accelerate by hiring additional work force.

Odeh and Battaineh, (2002), also recommended that, to improve the situation of construction project delays, the following are required: “enforce liquidated damage clauses and offering incentives for early completion; developing human resources in the construction industry through proper training and classifying of craftsman.” During construction stage, client does not want to incur any loss or additional expenditure as a result he imposes the liquidated damages clauses. Once client find out that contractor due to his own fault the project delays, he can claim for liquidated and ascertain damages. On the other hand, if contractor completes the project earlier than the deadline then he can claim for incentive.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter presents the conclusions on the findings of the research based on the literature review and the questionnaire survey. The main survey of contractors and consultants as discussed in previous chapter relate to the construction projects.

5.2. Conclusions

There are three objectives of this study which have been achieved. These objectives were to identify the major causes of delays, the effects of delays, and the methods of minimizing delays in health constructional projects.

5.3. The Major Causes of Delays

The first objective of the study has been successfully identified. A total of forty two factors that causes delays were identified. Out of these factors, fifteen of them were identified as the most important factors that contributed to the causes of delays include: Financial difficulties of contractor, Contractor's financial difficulties, Monthly payment difficulties, Incompetent subcontractors, Inflation, and Cash flow during construction. The rest were Low bid, slow payment of completed works, Labour shortages, Escalation of material prices, Poor contract management, Delays in inspection and testing of work, Obstacles from government. Obsolete or unsuitable construction methods and Inadequate control proceduresdelays, finance-related delays, consultant-related delays, external-related delays, and labour related delays.

5.4. The Effects of Delays

The second objective of this research was to identify the effects of delays in health constructional project. This objective has been successfully achieved. There are six factors that affect delays in health constructional projects which include: time overruns, cost overrun, dispute, arbitration, total abandonment; and litigation. The results of the study shown that, time overruns and cost overrun was the two most common effects of delays in construction project.

5.5. The Methods of Minimizing Construction Delays

The third objective of this study was to identify the effective methods of minimizing delays in health constructional project has been fruitfully achieved. A total of thirty five methods of minimizing delays were identified. The most effective methods of minimizing delays includes: to ensure adequate and available source of finance until project completion; competent project manager; availability of resources; frequent progress meeting; awarding bids to the right/experience consultant and contractor; use of experienced subcontractors and suppliers; Multidisciplinary/competent project team; accurate initial cost estimates; competent and capable of clients representative; use of appropriate construction methods; performs a preconstruction planning of project task and resources needs; and project management assistance.

5.6. Findings

Based on findings, some methods of minimizing Health constructional delays are summarized in the Table 5.1 below.

Table 5.1. Various interventions in dealing with delay in health constructional projects

No.	Methods of Avoiding or Minimizing Delays
1	Accurate initial cost estimates
2	Adopting a new approach to contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors
3	Perform a preconstruction planning of project tasks and resource needs
4	Selection of a competent consultant and a reliable contractor to carry out the work
5	Allocation of sufficient time and money at the design phase
6	Availability of resources
7	Commitment to projects
8	Competent project manager
9	Comprehensive contract documentation
10	Ensure adequate and available source of finance until project completion
11	Frequent progress meeting
12	Enforcing liquidated damage clauses
13	Offering incentives for early completion
14	Hire an independent supervising engineer to monitor the progress of the work
15	Multidisciplinary/competent project team
16	Use up to date technology utilization
17	Absence of bureaucracy

Table 5.1 continues various interventions in dealing with delay in health constructional projects

No.	Methods of Avoiding or Minimizing Delays
18	Accurate initial time estimates
19	Adopting new approaches to contracting such as Design-Build (D/B) and
20	Construction management (CM) type of contracts
21	Awarding bids to the right/experience consultant and contractor
22	Clear information and communication channels
23	Developing professional and skillful of human resources in the construction industry through proper training and classifying of craftsman
24	Effective strategic planning
25	Ensure timely delivery of materials
26	Proper emphasis on past experience
27	Community involvement
28	Systematic control mechanism
29	Acceleration of site activities
30	Contingency allowance.

Data Source: Field Survey, February, 2014*.

5.7 Recommendations

From this study, some recommendations are given as follows:

(1) Health Constructional projects delays caused by contractors are due mainly to the low technical and managerial skills of contractors in the upper east region of Ghana. In order to

improve contractors' managerial skills there is a need for continuous work-training programs for construction firms who works with or for the Ghana Health Service to update their knowledge and be familiar with the modern project management techniques and processes that may be adopted by the service.

(2) Delays in health constructional projects can be reduced through the joint efforts of stakeholders in the constructional project area. Clients, consultants/designers, contractors, suppliers, finance sources, and the government should cooperate to provide the necessary logistic to speed up the infrastructure needed for efficient management of health care delivery. A means of achieving this is to formulate and execute a participatory program for the development of the construction firms who carry out Government projects, for that matter Ghana Health Service through a devoted national agency.

(3) All parties involved in project agreed that delay occurs mostly during the construction phase. Therefore, in resolving those problems, suggestion to increase construction productivity, followed by enhancing the expertise and skill of human resources, and conducted site meetings more frequently. A strategic view of solving delay problems should be considered as an importance of management aspects, the effects of knowledge and information flow between the organization levels, and importance of top management contribution in solving the problems.

5.8 Further Studies.

Although the current research was able to fully achieve its objectives, a number of further research directions have been identified during the study which students or Researches may endeavor. These include: (1) Determination and ranking the factors causing the cost variation in all types of Ghanaian Government construction projects

(2) Determination and ranking the factors causing time delay in Ghanaian Road construction projects

(3) Contractors' Perception of Factors Contributing To Project Delays in Ghana.

(4). What Causes Cost Overrun in Road Infrastructure Projects in Ghana?



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DEPARTMENT OF DESIGN AND TECHNOLOGY EDUCATION

**PROGRAMME: MASTER OF TECHNOLOGY EDUCATION IN CONSTRUCTION
TECHNOLOGY**

QUESTIONNAIRE FOR OWNERS, CONSULTANTS AND CONTRACTORS

This questionnaire is developed for owners, consultants and contractors involved in health Constructional Projects in Upper East of Ghana.

This is to help the researcher collect data for this project work on “ESTIMATING THE CONTRIBUTION OF KEY DELAY CAUSAL FACTORS TO CONSTRUCTION PROJECTS TIME OVERRUNS IN GHANA”. The collection of this data is purely for academic purpose only and will strictly be treated as such.

SECTION A: GENERAL ORGANIZATION INFORMATION

1. Name of organization:

.....
.
.....

...

2. Major type of work involved:

Buildings Roads Water and Sewage

3. Respondents designation:

Consultant Owner (Representative) Contractor

4. Relevant working experience (Years) :

1-5 Yrs 5-10 Yrs 10-15 Yrs 15Yrs and above

5. Location of Organization:

Upper East Region Northern Region other

specify.....

6. Average of projects executed per year in (Gh¢):

- [] Less than 1 Hundred Thousand [] 1-2 Hundred Thousand [] 2-3 Hundred Thousand
 [] More than 3 Hundred Thousand

7. No. of constant employees:

- [] 5- 10 [] 10-15 [] 15-20 [] 20 and above

SECTION B: FACTORS INFLUENCING DELAY OF HEALTH CONSTRUCTIONAL PROJECTS IN UPPER EAST REGION OF GHANA

8. What is your gender? (Tick) Male Female

INSTRUCTION

- a. In some cases you are to indicate your response for a specific completed project by Ticking from options and in some other cases, you are to state your response.
- b. Also indicate numerically the Level of severity for each Factors Influencing Delay in the *table 1 below*. The priority scaling are (1 = very low severity, 2 = low severity, 3 = medium severity, 4 = high severity, and 5 = very high severity).

(Tick √ where is applicable)

The priority scaling are (1 = very low severity, 2 = low severity, 3 = medium severity, 4 = high severity, and 5 = very high severity).

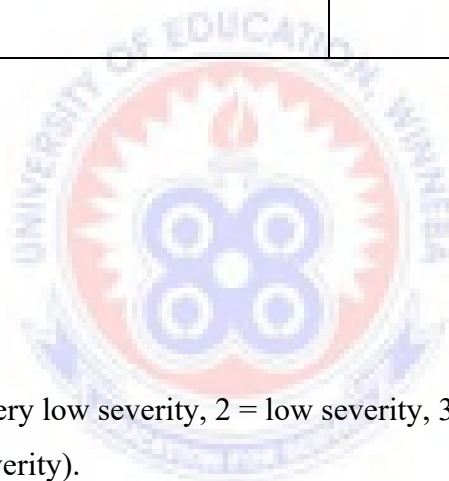
Factors Influencing Delay	Level of Severity on Construction Projects
Planning and scheduling deficiencies	
Deficiencies in cost estimates prepared	
Inadequate control procedures	

Delays in work approval	
Waiting for information	
Mistakes during construction	
Delays in inspection and testing of work	
Cash flow during construction	
Frequent breakdowns of construction plant and equipment	
Shortages of technical personnel	
Labour shortages	
Monthly payment difficulties	
Poor contract management	
Shortage of materials, Plant/equipment parts	
Contractor's financial difficulties	
Low bid	
Material procurement	

The priority scaling are (1 = very low severity, 2 = low severity, 3 = medium severity, 4 = high severity, and 5 = very high severity).

Factors Influencing Delay	Level of Severity on Construction Projects
Imported materials	
Late delivery of materials and equipment	
Escalation of material prices	
Slow decision-making	
Inflation	

Difficulties in obtaining construction materials at official current prices	
Ground problems	
Bad weather	
Unexpected geological conditions	
Poor site management and supervision	
Poor project management assistance	
Financial difficulties of contractor	
Financial difficulties of owner	



The priority scaling are (1 = very low severity, 2 = low severity, 3 = medium severity, 4 = high severity, and 5 = very high severity).

Factors Influencing Delay	Level of Severity on Construction Projects		
	Owner Scaling	Consultant Scaling	Contractor Scaling
Design changes			
Slow payment of completed			
Inaccurate estimates			
Mistakes in design			
Obstacles from government.			
Shortages of skilled workers			
Additional works			
Slow information flow between parties			
Poor technical performance			
Incompetent subcontractors			
Obsolete or unsuitable construction methods			
Price fluctuations			

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Thank you for taking part in this research survey

