

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND
TECHNOLOGY, KUMASI, GHANA**

**Evaluating The Causes of Delays in Construction Projects, Case Study:
Ghana Ports and Harbours Authority**

By

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This Thesis is Submitted to the Department of Construction Technology and
Management, College of Art and Built Environment

In Partial Fulfilment of the Requirements for The Degree of

MASTER OF SCIENCE

NOVEMBER, 2018

CERTIFICATION

I hereby declare that this submission is my own work towards the MSc in Project Management and that, to the best of my knowledge, it contains no material previously published by another person, nor material which has been accepted for the award of any other degree of the university, except where due acknowledgement has been made in the text.

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ABSTRACT

The issue of construction project delays is commonplace in Ghana. Major infrastructure projects undertaken by Ghana ports and Harbours Authority experience the issue of delays. Port expansion and other infrastructure improvement projects undertaken by GPHA, have all exceeded their proposed completion dates. This research sought to evaluate the causes of construction project delays using Ghana Ports and Harbours Authority as a case study. The study aimed to find the important causes of delay in construction projects and to identify the critical negative effects of the delays on construction projects undertaken by GPHA. A questionnaire survey was conducted among purposively sampled respondents who have collaborated with GPHA on different construction projects. Quantitative method of research was adopted for data gathering. Using the Relative Importance Index (RII) technique. The findings revealed that the important causes of project delays were, Political interference; Insufficient data collection and surveys before designs leading to errors; Inadequate cash flow due to non-payment; Unexpected ground conditions. Again time overruns, cost overruns and disputes between contracting stakeholders were established to be the critical negative effects of delays on construction projects undertaken by GPHA.

Keywords: construction, projects, delay, effect

DEDICATION

I am dedicating this thesis to my beloved Dede Annan and to my siblings, Nana Esi Inkoom and Ato Inkoom and my father Mr. Kofi Inkoom Snr.

ACKNOWLEDGEMENT

I would like to express my special gratitude to my supervisors Prof. B.K. Baiden and Dr. Jemima Antwiwaa Ottou, for their guidance and support, without it this dissertation would not have been possible. Furthermore, I would to thank Miss Regina Sarfowaa Osafo for her useful comments and remarks throughout the learning process of this master thesis.

I would also like to thank my loved ones who have supported me throughout the entire process, I am forever grateful.

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CHAPTER ONE

INTRODUCTION

1.1 Background

Delay in construction projects is commonplace, and it is globally considered as a major problem for construction project failure. Construction project delay as defined by Islam *et al.* (2015) is the time delay either beyond the agreed completion date specified in the contract for a delivery of a product. Construction projects are very dynamic with high levels of uncertainties. This has led to the situation where industry players have assumed that delay in construction is unavoidable. This phenomenon affects all the contributing participants or stakeholders (Al-Kharashi and Skitmore, 2009).

According to PMI (2017), a project is defined as an endeavour which is temporary, undertaken to create a unique product, service or result. A project is termed to be successful if it has met its goals and objectives. A successful project has been able to meet its designed technical scope and performance, within the planned time and within the budgetary cost (Frimpong *et al.*, 2003). Projects bring together different participants with different backgrounds, whether professional or artisanal, with different interests and different levels of participation. Construction projects are no exception.

The construction sector contributes immensely to the development of any economy. The Ghanaian construction industry holds great potential for ensuring continuous growth of the economy through the creation of employment. Creating ready markets for sale of construction materials and equipment and infrastructure development. Major construction projects undertaken by the state and the private sector have triggered other activities fueled by the demand for materials and equipment for the sector. This industry is aimed at the creation, repairs, rehabilitation or expansion of assets such as buildings, roads, bridges, land improvement and other asset or infrastructure development. The construction sector

contributes to Ghana's overall GDP immensely. The GDP rose from 5.7% 2006 to 11.5% in 2011. The GDP hiked further to 13.7% in 2017 (Ghana statistical service, 2017). The construction industry's contribution to the overall industrial development also grew from 29.8% in 1993 to 34.3% in the year 2000.

There are researches available which focused on delays road and building projects undertaken by the government, the effect of the delays and possible remedies to the problem. Nonetheless few researches on this issue relate to Ghana, and none to talk of for infrastructure development projects for the ports of Ghana. Some of the researches on the issue are delays in groundwater projects and building construction projects (Frimpong, *et al.*, 2003)

Most construction projects in Ghana experience a lot of delays. Construction projects undertaken by Ghana Ports and Harbours Authority (GPHA) is no exception. This research therefore seeks to add to the existing papers and the body of knowledge on the subject matter in the Ghanaian setting.

1.2 Problem statement

Since 2011, Ghana Ports and Harbors Authority's two main Ports (i.e. Takoradi and Tema Ports) have been operating at full capacity. The port facility has been overstretched to meet the increase in cargo traffic entering the country. This caused the necessitation of expanding the port to create more berths for vessels, increase the storage area for containers, build warehouses and sheds to store bulk cargo etc. Over the years, there has been the consistent increase of vessels calling the port of Tema. Therefore, for these reasons, the port expansion and other infrastructure improvement projects were desperately needed to reduce the turnaround time of these vessels, that is to reduce the time they spend at anchorage before they are loaded or unloaded of their consignment (Sellhorn, 2014).

Most of the projects commissioned to address these needs outlined above have since 2012 all exceeded their planned contract execution to completion date. That is to say all the projects experienced delays. The delays on each project had different causes which cannot be attributed to one source. The causative factors of the delays on each project had negative effects on the projects progress. These delays have caused various issues such as increase in number of vessels at anchorage because the operational berths for unloading and loading of the vessels has been seized for expansion works. Secondly since some of the storage areas will be cordoned for pavement maintenance or improvement works, this reduces the available storage area for containers and other imported goods. This situation leads to loss of revenue by the shipping vessels and GPHA as an institution due to longer waiting time of the vessels (Sellhorn, 2014). A shorter waiting time means the port will be able to serve more vessels in a shorter period of time, therefore increasing revenue and convenience for all parties involved.

Though the outlined issues above were in existence, the problem was compounded by the delays experienced in the expansion and rehabilitation works. Therefore, this research seeks to evaluate the causes of construction project delays in GPHA. This is also relevant because it seeks to give an in-depth and extensive description of this phenomenon.

This research takes an exploratory approach to build a justifiable rationale for the occurrence of pertinent causes of project delays and its effects for further enquiry.

1.3 Research questions

1. What are the important causes of construction project delays in Ghana Ports and Harbours Authority?
2. What are the critical negative effects of construction project delays in GPHA?

1.4 Research aim and objectives

The aim of this study is to evaluate the causes of delays in construction projects undertaken by GPHA.

The objectives are;

1. To identify the important causes of construction projects delay in GPHA.
2. To identify critical negative effects of construction projects delay in GPHA.

1.5 Scope of Study

This research was limited to the delays which occur in construction projects undertaken by GPHA. It was therefore limited to professional staff of GPHA, consultants and contractors who have executed construction projects with the with GPHA as the client. This research is to help discern a real-world situation and presume that such an understanding is likely to involve circumstantial conditions pertinent to the topic (Yin, 2009).

1.6 Research Methodology

A case study strategy was adopted for this research. Relevant literature was reviewed. Primary data was collected from Professional staff of GPHA, consulting and contracting organizations who have collaborated with GPHA to execute construction projects. A set of well-structured questionnaire was distributed to purposively sampled architects, engineers, quantity surveyors and other professional individuals in the construction industry who have executed construction projects with GPHA. The survey was distributed via Netigate.net website platform for surveys and research. This was used for the analysis of the data obtained from the sampled population.

1.7 Significance of study

The issue of delays in construction projects is very prevalent in many countries, where Ghana is no exception. The need to establish the through academic research, the pervasive causes which leads to these delays and its effect will help in drawing up measures to solving them. This research drew significance from the context in which it is based and related it to situation of the case study since no such research is available for GPHA as an organization, therefore conclusions drawn from this research could be used to manage the effects of delays in construction projects. Finally, construction projects undertaken by GPHA are similar to other government ministries, agencies and authorities, so findings in this research can be replicated in those areas.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter reviews relevant published literature on the topic of delay and its impact on construction projects. The review helped the researcher gain pre-knowledge on some theories, methodologies, models that have been employed by other research findings and facts relating to the current study. It gave an overview of delays in construction projects and how it impacts the stakeholders. The two objectives were discussed.

2.2 Construction Industry

Construction is a major sector in every economy (Hillebrandt, 2000). The reasons for its importance are numerous. Ofori, (2012), outlined some importance of the construction industry in his study on “Developing the Construction Industry in Ghana: the case for a central agency”.

He opined that, the construction industry contributes to a great part of the economy. From statistics it is shown that the sector contributes between 5 and 10% of the gross domestic products in most economies. The sector employs up to 10% of the working population and its responsible for about half the gross fixed capital formation (Lopes, 2012). Owing to this, the construction sector has the potential to contribute to the continuous growth of the national economy. Adversely a period of low construction output affects the growth of the economy negatively.

He also stated that since governments are mostly responsible for the capital investment for the construction of public assets such as schools, hospitals, airports, ports, roads, power infrastructure and bridges; varying the levels of spending in the industry can introduce the desired changes in the economy. The construction industry is that touted to be “an economic

regulator” or “the balance wheel of the economy” (Hillebrandt, 2000a). However, inadequate knowledge about the intricate relationships between construction and other sectors of the economy militates against the effective use of construction for this purpose (Ofori, 1990).

Finally, since construction links the economy to other sectors, it can stimulate activities in other industries. Example is the full reliance on construction materials and equipment made by manufacturing industries. These inputs are manufactured and supplied by the commerce and services sectors for use by the construction industry. Furthermore, the construction industry relies on financial services for loans, insurance, guarantees etc. as well as legal accountancy and other relevant professional services from these sectors.

2.3 Construction Industry in Ghana

The Ghanaian construction sector has made major contributions to the economy, industry and the overall (GDP). In Ghana the construction sector is huge and considered one of the major drivers of the economy. Ofori (2012) remarked the sector is multifaceted, geographically spread and cuts across all sectors of the economy including manufacturing, services, improving accesses to areas of commercial activities by way of roads, bridges etc. construction. The contribution of the construction industry to Ghana’s overall GDP rose from 5.7% 2006 to 11.5% in 2011. The GDP hiked further to 13.7% in 2017 (Ghana statistical service, 2017). The construction industry’s contribution to the overall industrial development also grew from 29.8% in 1993 to 34.3% in the year 2000. In support of this positions, there has also been tremendous increase in trade from the ports due to the development and improvements of its infrastructure. From 20013 there has been an increase container throughput of 848,000TEU’s (Total Equivalent Unit) to 1,163,000TEU’s in 2017 (Müller et al., 2015). This increase can be attributed to the construction of a 450-meter Jetty which increased the quay capacity of the port to extra four berthing areas.

2.4 Causes of Delay in Construction Projects

Generally, in construction projects, delay have been identified to be one of the challenging issues that affects the construction industry which leads to unsuccessful projects (Fugar *et al.* 2010). Projects which are unable to meet its timeline as planned is challenged, thereby leading to negative effects on the project.

Delays have been defined by many researchers and school of thoughts, these are however skewed towards the theme of the research. This researcher (Ahmed, 2015) defines delays as an extension of time in addition to the initial agreed contract period caused by some actions or inactions of stakeholders that is the client, consultant or contractor involved in the project.

Two types of researches have been conducted with regards to this issue. the first relates to the factors that may cause the projects to delay and the second is the analysis of the factors that lead to the delays (Durdyev *et al.*, 2017). Eggleston (2009) identified relevant events which can possibly cause delays in construction projects as; variations and extra works; compliance with instructions; unforeseen ground conditions; late issuance of instructions and drawings; resources unavailability; issues with subcontractors; force majeure; adverse weather conditions; civil disturbances; damage to constructed works. This research will base on these identified relevant events, and they will be used for the primary data collection, evaluation and analysis.

Four major delays outlined by Frimpong and Oluwoye (2003) in responses obtained from the respondents revolved around financing of the project, other economic factors, supply of material and natural conditions. The study of Fugar *et al.* (2010) explained that delay in honoring of payment claims, credit inaccessibility and high costs of borrowing contribute to

project delays. Resource availability follows the issue of financial challenges. Equipment holding, construction material and labour are all considered vital for successful completion of construction projects. Any delay of these resources affects the schedule of the project.

This menace of delay in projects is not country related but a global problem. Durdyev *et al.* (2017) in their study on “the causes of delay in residential projects in Cambodia”, where it used the residential building projects as a starting point, it was observed that that material shortage, unrealistic project timelines; unreliable material delivery; unskilled labour; project complexity; absenteeism; late payment by client; improper site management; site safety issues were the major causes of delay in those projects in Cambodia as ranked by the respondents.

Bangladesh construction industry is no exception. Islam *et al.* (2015) interrogated the major cause of delay in building construction projects in Bangladesh. A survey was done to determine the various causes of delays from the perspective of the owners the contractors and the consultants of large building construction projects. About 70 respondents participated in the survey. Using the importance index analysis, the questionnaire survey outlined the 10 prevalent causes from a list of 30. The causes were; inexperienced project managers; selection of the lowest bidder; lack of funds; improper management; poor planning and scheduling; unskilled labour; site constraints; cash flow problems; price escalation; contractors’ workload.

Aziz and Abdel-Hakam, (2016) investigated the possible causes of road projects in Egypt. The research listed variable causes from literature gathered from different countries and different settings. Data was collected through questionnaires and interviews. These two formed the basis of the research. the questionnaire listed 293 causes and distributed to 500 respondents. The respondents were engineers for consultants and contractors but excluding the client representing the state.

The Relative Importance Index (RII) technique was used for the determination of the level of importance of the factors listed (Enshassi et al. 2007). After the determination, the first twenty factors and the last twenty factors were discussed. A case was analysed and compared to the most important delay as determined in the findings. The results revealed that good correlation of causes between contractors and site design engineers, between consultants and the site design engineers and a somewhat low correlation between contractors and consultants were the main cause of delay that affects projects. However, they opined that they were no root causes that can be taken for granted to represent the least or most prominent delay cause in construction projects.

The research developed a model for predicting the actual road construction duration; a real case of road construction was tested and the accuracy proposed based on the analysis of the case. The causative factors of delays were discussed and some recommendations proposed in order to control or minimise the delays in road construction. These findings could be helpful to project managers, consultants and contractors to mitigate delay in road projects in Egypt. The research further made suggestions for the fundamental and large scale reforms in procurement systems and stakeholder management practices.

Marzouk and El-Rasa, (2014) studied and analyzed “causes of construction delays in Egypt”. Their research retrieved data from literature and listed various causes of construction delays. They used interviews to gain data for the research. The respondents were all construction experts and their feedback was used in evaluating the causes of the problem. A questionnaire survey was also conducted to gather more data. These questionnaires were distributed to thirty-three construction experts who represented clients, consultants and contractor organisations. Importance index, frequency index and severity index were calculated and according to the highest values, the top ten causes of delays were determined. A case study was analysed and compared to the most important delay cause in the research. The results revealed that good

correlation between groups while there are significant differences between them caused some delays. They finally drew up a roadmap for prioritizing delays cause groups.

Thirty-five (35) possible causes have been identified from the literature review, this has been categorised into ten (10) factors as shown in Table 2.1.

Table 2.1 Summary of attributable causes. (Eggleston, 2009)

Group of causes	No.	Causative factors	Source (Citation)
Force majeure	1	Accidents during construction.	Frimpong <i>et al.</i> (2003);
	2	Global financial crisis	
	3	Natural disasters	
	4	Adverse weather conditions	
Poor stakeholder management	1	Issues with project affected persons	Aziz and Abdel-Hakam, (2016).; Amoatey et al., (2015)
	2	Poor collaboration amongst stakeholders.	
	3	Delays in decision making.	
	4	Inadequate experience of consultants and contractors.	
Civil, Legal economic and political issues	1	Civil unrest and Labour strikes	Mahamid, (2013); Tabish and Jha, (2011) Amoatey et al., (2015).;
	2	Changes in government laws and policies	
	3	Economic price fluctuations	
	4	Political interference.	
	5	Conflicts and legal issues between project stakeholders	
Sub-contractors	1	Inadequate cash flow, due to non-payment	Durdyev et al., (2017), Pourrostam and Ismail, (2012),
	2	Inadequate subcontractor experience	
	3	Use of obsolete technology	
	4	Delays due to rework from errors	
	5	Poor collaboration between plan and subcontractor schedule	
Poor Resource Management	1	Poor site management and supervision	Islam et al., (2015)
	2	Complexity of project	
	3	Poor procurement of resources	
Drawings, specifications and instructions	1	Delays in reviewing and approval of changes in scope.	Islam et al., (2015); Amoatey et al., (2015)
	2	Delays in production of design drawings and technical specifications.	
	3	Improper communication of instructions to contractor or subcontractor.	
	4	Insufficient data collection and survey before design leading to design errors.	
Variations and extra works	1	Delays in reviewing and approval of variations	Amoatey et al., (2015)
	2	Problems allocating resources to extra works.	
	3	Unavailable cash flow for variations.	
Project Financing	1	Lack of funds	Frimpong and Oluwoye (2003);
	3	Delay in progress payments by client	
	4	Unfavourable contract clauses	
Unforeseen physical conditions	1	Unexpected ground conditions	Durdyev et al., (2017),
	2	Cultural or traditional physical barriers in the alignment of construction projects.	
Damage to works	1	Damage of equipment	Eggleston, (2009)
	2	Damage to works	
	3	Injury to personnel involved in the project .	

2.5 Effects of Delays on Construction Projects

When a construction project is delayed, it carries a rippling effect on the contracting parties and all other stakeholders. The factors which cause construction projects to delay may have some geographical restrictions, but the effect is universal in nature. Sambasivan and Soon (2007), conducted a similar survey and ranked the feedback from the respondents in the effects identified. The results were that all the respondents chose time and cost overrun, therefore these effects had the highest ranking.

Faridi and El-Sayegh, (2006) and Ali and Kamaruzzaman, (2010) also analyzed delays of construction and its effects, they indicated that cost overrun is one of the major impacts experienced when projects are delayed. Mahamid *et al.* (2011) also studied the causes the causes that may affect road projects. From his study and analysis, he gave a recommendation that training programs should be held to help improve the managerial skills of the project team. Furthermore, they outlined mitigation measures for project stakeholders so that delay may be minimized.

The cost in excess of the estimated project or contract cost is the cost overrun. It means for government projects the indigenes who pay tax may not get value for money as a result of project increased expenditure. When this happens the consultant on the project may lose his credibility and reputation. The resultant effect is that the client will lose confidence in their performance (Mbachu and Nkado, 2004).

The additional time or excess time beyond which the project completion date had been set is the time overrun. Most government projects are financed with loans and grants from international banks in which they place strict time schedule on the disbursement of the cash and when they expect the project to end so they can recoup their investment. The time is

exceeded or overrun it comes with cost implications, therefore making the project more expensive.

Ameh and Osegbo, (2011) identified a negative relationship between productivity and time overrun, in their research on the relationship between the two variables. Some research findings show that there is a correlation between cost and time overrun. That for each unit of time delay coefficient there is a significant increase in cost at that level.

Construction projects which are delayed often times lead to dispute among parties to the contract. The disputes if not properly managed may further lead to litigation or arbitration as explained by Aryal (2018). Disputes which lead to arbitration, mediation, negotiation or litigation are expensive to deal with. In that the party's may need to hire the services of attorneys, gather expert witnesses, documentation and payment of damages.

Finally, an effect of delay in construction which may occur if not managed properly is the total abandonment of projects (Sambasivan and Soon, 2007). Any of the contracting parties involved in the project can decide to frustrate the projects by abandoning the project entirely. If a that happens employment opportunities are lost, small scale economic activities, government loses revenue in the long run and investors get deterred from funding future construction projects.

Related research on effects of delays

Kikwasi (2013), researched into "the causes, effects and disruptions in construction projects". It was a descriptive study which was designed to obtain responses from owners, consultants and contractors with regards to possible causes of delay and their influence on construction projects. The researcher adopted two techniques for population sampling to select the respondents. These were the purposive and random sampling techniques. Some of the

respondents were also interviewed as part of the data collection process. The results revealed that the factors that caused the delays were; design changes; contractor payments delaying, improper communication of information; financing; obsolete project management practices; compensation issue for project affected persons; and the disagreement on the valuation of works. The research went on further to outline time overruns, cost overruns and negative social impacts; idling of resources and disputes as the effects of delay.

Mahamid (2013) interrogated performances of projects with regards to time for road projects in the west bank, Palestine, to establish all the causes of delay and their levels of severity. Data was sought from consulting and contracting organizations through a questionnaire survey.

A total of 52 causes of delay were identified during the research. The top five delay the survey outlined were; political situations, segmentation of the West Bank; the award of projects to lowest bid price, progress payment delay by owner, and equipment shortage.

Construction projects in India also experience delays. Doloi et al. (2012) opines that the shift in the capacity of the Indian construction industry, there arise a need to systematically analyse reasons for delays in projects to help develop an understanding among the industry leaders.. They identified from the factor analysis adopted in the study, the most critical issues causing the delays. And these were; Commitment issues, poor site management, poor coordination, poor planning, poor definition of scope, poor communication, and poor contract drafting respectively.

Pourrostan and Ismail (2012) also researched into the cause and effect of project delay in the Iranian construction industry, the study identified various causes and its effects in Iran. Various projects were investigated, these included buildings and roads. The cause and effects of delay

in construction was reviewed. A survey was done to gain from respondents the causes and effects of delay, these were obtained from 100 consultants and contractors. Data analysed was ranked using statistical techniques. Recommendations for reducing delay in construction projects were then outlined.

Baloyi and Bekker (2011) in their study on “Causes of construction cost and time overruns: The 2010 FIFA World Cup stadia in South Africa” investigated the factors that causes of expenditure overruns and time overruns during the development of the various stadia. The research adopted a three tier approach which covered comprehensive review of literature on the root factors of time and cost overruns on the construction projects worldwide. The study further conducted investigations into causes that led to time and cost overruns on the six stadia.

A detailed survey was developed to enquire from the respondents their perceptions in lieu of the factors that cause project delays and cost overruns. The questionnaire listed 18 factors that could lead to cost overruns; and 34 factors that can lead to delays; these were to be ranked by the ranked by respondents. In the analyses and ranking the results, they used the Relative Importance Index (RII) as an analyses tool. A total of 60 questionnaires were given out to consultants (24nr), contractors (20nr) and clients (16nr). These respondents were involved in the ten 2010 World Cup stadia construction.

Finally, they compared results obtained from analyzing the effects of delay on the global to the stadia projects. Hikes in cost of materials was the major cause that led to cost overruns for the two levels of study. They opined that for time delays, major causative factor for projects globally was delay in payments but design related issues was the major factor that caused the delay of the stadia projects.

From the literature review, ten (10) possible effects of delays on construction projects have been identified and listed in table 2 as follows;

Table 2.2 Summary of effects of delay on construction projects (Sambasivan and Soon, 2007)

Nr.	Effects of Delay	Sources (Citation)
1	Cost overrun	Faridi and El-Sayegh, (2006), Ali and Kamaruzzaman, (2010), Al-Hazim et al., (2017), Senouci et al., (2016), Mukuka et al., (2015)
2	Depreciation of value for money	Ali and Kamaruzzaman, (2010)
3	Abnormal losses and cash flow crisis	Faridi and El-Sayegh, (2006),
4	Damaged reputation with regards to the consultants.	Mukuka et al., (2015); (Mbachu and Nkado, 2004)
5	Time overruns	Ameh and Osegbo, (2011); Mahamid et al., (2011); Baloyi, L., Bekker, M., 2011; Islam et al., (2015:82), Kikwasi, (2013);
6	Productivity loss	Ameh and Osegbo, (2011), Doloi et al., (2012), Durdyev, Ismail, (2016)
7	Disputes between contracting stakeholders	Kikwasi, (2013), Pourrostan and Ismail, (2012),
8	Arbitration and litigation	Pourrostan and Ismail, (2012),
9	Abandonment of project.	Pourrostan and Ismail, (2012),
10	Investors, deterred from funding future projects	Sambasivan and Soon (2007)

2.6 Chapter summary

The review of literature shows that delay in construction projects are common in both advanced and developing countries. Hitherto, the impacts of the delay can affect all of the project stakeholders. However, price fluctuations and not paying contractors on time were observed to be factors major in developing countries. This review gave the researcher the needed insight into the issue of project delay which will aid in the collection of data to evaluate how those issues are borne in projects undertaken by Ghana Ports and Harbours Authority.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter of the study discusses the data collection procedure and analysis considered appropriate for this study. These were meant to help the researcher answer the research questions and gain insight into achieving the objectives of the study. The chapter discusses the research design, sampling approach, data collection instruments as well as estimation and ranking model.

3.2 Research design

The researcher adopted an exploratory approach to conducting the research. According to Saunders et al. (2012) research design as a general plan, guides or rules how research questions should be answered. This research adopted a questionnaire survey in the bid to determine the major causes of delays and their impacts on construction projects. The importance of using questionnaire survey method is to question individuals on a topic or topics and then describing their responses (Jackson, 2011). Questionnaire surveys improve replication due to its standardized measurement and sampling.

3.3 Questionnaire content and data required

The data required was sourced secondary and primary data. The secondary data was obtained from reports, newspapers, books, journals and other materials related to the subject under discussion. The primary data was obtained from GPHA professional staff, consultants and contractors who have executed projects handled by GPHA using a well-structured close-ended questionnaire.

The questionnaire structure was based on three sections:

Section A reported the background of the respondent (i.e. Professional background, years in organisation, working experience and project involvement with GPHA). Section B presented ten categories of causes of delays from the literature review that were associated with construction project delays. From these ten categories 35 factors that resulted in delays were reported on using the 5-point Likert scales to answer the set of questions. Section C reported on the effects delays had on construction projects. Respondents were asked to tick where appropriate on the degree of agreement based on individual perceptions and opinion

3.4 Distribution and collection of data

This research is studying Ghana Ports and Harbours Authority as an organisation, however the data collection will be from consulting and contracting organisations, collaborated with GPHA in execution of construction projects. To eliminate the possibility of drawing biased conclusions if data was collected from the GPHA alone. The questionnaire was distributed via email to the respondents, with a link to the website where the survey questions had been uploaded to.

3.5 The Research population and sampling technique

The method adopted for the selection of the respondents to respond to the questionnaire was based on purposive sampling. This non-probability sampling technique was adopted for this study because it permits the researcher to deal with individuals who have knowledge on the topic under study. Jackson (2011) stated that Purposive sampling also known as selective or judgement sampling is a sampling technique in which the researcher depends on his or her own judgment when selecting members of population to partake in the search. The population for this research consisted of construction professionals who have been involved in projects undertaken by GPHA which have run past their initial contract period+ The key being that the

researcher needed groups of respondents who were well vexed with the issues of cause and effect of delay in projects irrespective of their positions.

Forty (40) questionnaires were administered to 40 respondents, these respondents have been engaged or a currently engaged in projects undertaken by GPHA. The respondents were Project Managers, Civil Engineers, Architects, Surveyors, Mechanical Engineers, Quality Assurance and Quality Control officers etc.

Table 3.1 Distribution of respondents.(GPHA)

Professionals	Client	Consultant	Contractor	Sub-contractor	
Architects	0	3	1	0	
Engineers	10	4	4	1	
QA/QC	3	1	2	0	
Surveyor	3	1	3	0	
Others	2	0	0	2	Total
Total	18	9	10	3	40

The respondents were selected purposively because they have had prior in-depth appreciation of some causative factors of delay and their impacts on the project. The sampled population were experts involved in construction projects undertaken by GPHA. The responses from these people were relied on to answer the research questions to realise the objectives.

3.6 Data collection

The questionnaire was the conduit for the data collection. The questionnaire was drawn up by considering the objectives and questions as discussed in Chapter 1. The questionnaires were distributed and answered online only, using the Netigate.net website platform for surveys. This

website is designed for surveys where researchers can upload their surveys and questionnaires, send the links to their respondents to complete the survey. The website collates the results based the answers given by the respondents, without knowing the identities of the respondents. The questionnaire was in three parts as used by (Zou *et al.*, 2014). First part is the background information of respondent, second part covered the “Causes of delay in construction projects”, and the third section covered the effects of delay on construction projects. The criteria for choosing the experts for the survey were that, the target respondents all have knowledge in construction projects either with practical experience or in research. Also, for the clients, the target respondent is in a senior position and have had prior experience with construction provide accurate responses from a comprehensive perspective.

A pilot test for the questionnaires was conducted using four respondents, the comments which came from them was inculcated into the final design of the questionnaire for the sample population.

3.7 Ethical Issues

Respondents require that their identity be kept anonymous as much as possible when giving out information for research work. The netigate.net survey website platform ensures the confidentiality of the information given out. This was brought to the attention of the respondents. In ensuring that accurate responses were given by the respondents, the purpose of the study was explained, as well as meanings of the questions contained in the questionnaire.

3.8 Analysis of data

The main aim of analyzing data is find possible solutions to the research questions. The responses collated from the questionnaires, helped the researcher to identify major factors that caused delay in construction projects organized by GPHA, the stakeholders in relation to the

cause of project delay and the effect of those delays as perceived by the client and all parties involved. The Netigate.net survey website platform collated the data, analysed with its coding features and the results were exported into PDF and excel formats. The raw data was also exported from the platform and from there the outcome from the output data analysis was queued using the Relative Importance Index (RII) as explained earlier. The outcome of the survey as collated and coded by netigate.net website platform is attached in the Appendices.

The opinions of the respondents on the cause and effect of delay were ranked in using the Relative Importance Index technique. This was an approach was adopted by Kometa *et al.* (1995), in their research assessment. The responses were measured on a four-point scale, from 1 (Very low) through to 5 (Very High).

The Relative Importance Index (RII) is calculated using this;

$$RII = \frac{\sum W}{A * N}$$

Where,

W is the weighting given to each factor by the respondents starting from 1 to 5,

A is the highest weight in the scale which is 5,

N is the total number of respondents (which is 50 people).

The RII was the computing method used to rank the causes and effects of delay as listed in the questionnaire. The respective RII for each cause and effect as opined by the respondents was used to judge to get the overall rankings, bringing out a clearer understanding of the study.

It is valuable to understand that the closer the value of Related Importance Index of the known cause is unity (1), the more important it is and the greater is influence on the remaining variables.

For this study factors with an RII of more than 0.5 are considered as important whereas those with RII of less than 0.5 were considered as unimportant.

3.9 Chapter summary

This chapter addressed the methodology adopted for this research. Structured questionnaires were used in collating data from respondents.

The RII is the tool used to queue responses from the questionnaire. The population for this study consisted of professionals who were involved in construction projects which run past their initial contract period.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter analysis and discusses the data collected from the respondents with regards to the research problem of cause and effect of delay on projects handled by GPHA. The results of the findings are presented herein.

The estimated RIIs are first provided under the pooled causes and also in their various categories, followed by analysis and discussions.

4.2 Survey results

With the aid Netigate.net survey website, descriptive statistics analysis was used to generate frequencies and percentages to answer the three sections of the questionnaire. The results in the form of raw data, graphs and the collated responses were exported from netigate.net website.

4.2.1 Response rate and background information

The demographics of the respondents was needed to be identified to establish their relationship to the research and give an indication to their capacity to answer the questionnaire. The survey listed architects, engineers, Quality Assurance and Quality control, Surveyors and others, where others meant any other construction discipline different from what was listed above.

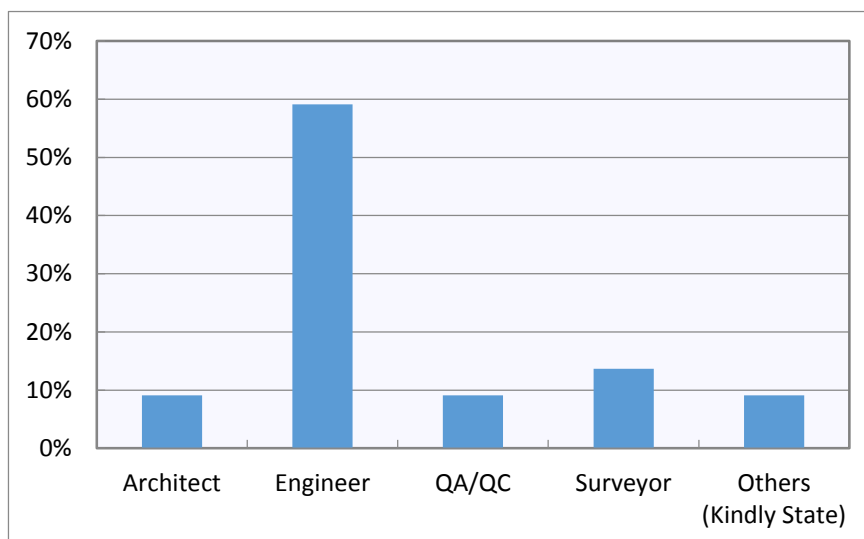
Using the Netigate.net website platform for surveys, the invitations to participate in the survey in the form of emails were extended to the 40 respondents constituting of the client staff, contractors and consultants targeted by the study. At the deadline set for completion and submission of survey, 26 responses had been received, representing approximately 65% usable

response rate. However, this incomplete response rate could be attributed to the limited time allocated to the completion of the survey. Regardless the 65% rate of response is perceived as adequate for the analysis and reporting because it represents more than half the population in the findings of (Miller, 1991).

Respondents background

The survey indicate all the respondents were professionals in the construction industry. In which they have post qualification experience in construction projects. Engineers represented the highest number of respondents who undertook this survey. The respondents' professional backgrounds confirm the reliability of the data.

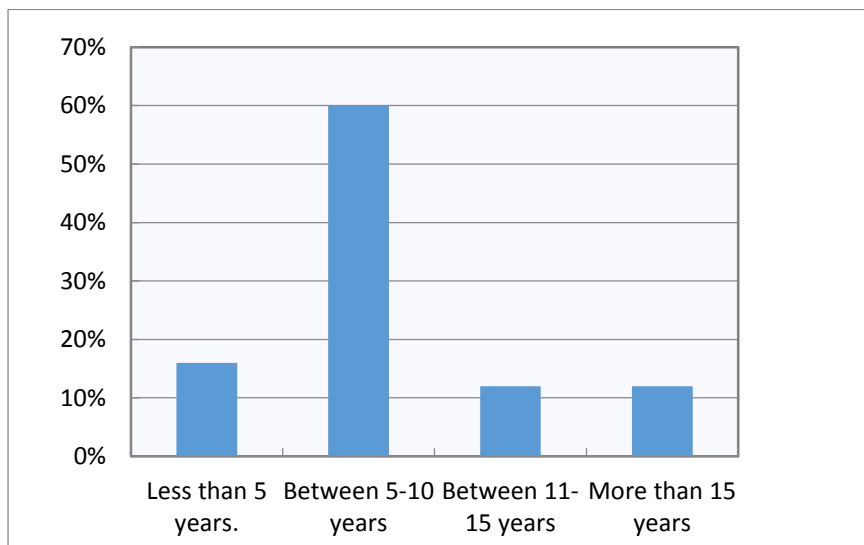
Figure 1. Professional background of respondents (Netigate.net, 2018)



Experience of respondents

The demographic profiles of the respondents show that they were all professionals with only 4 respondents having 5 or less years of experience. The rest had greater than 5yrs working experience in the construction sector. The experienced profile of the respondents added to the quality of the feedback

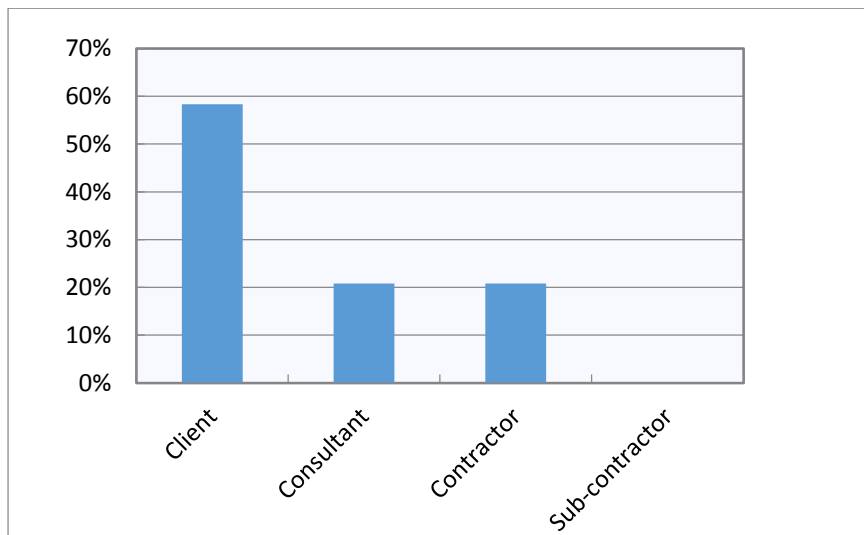
Figure 2. Years of experience of respondents (Netigate.net, 2018)



Respondents field of engagement

Fourteen (14) respondents, representing 58.3% of the population came from the client (GPHA professional staff). The rest of the 12 respondents came from staff of contractors and consultants who have undertaken construction projects with GPHA.

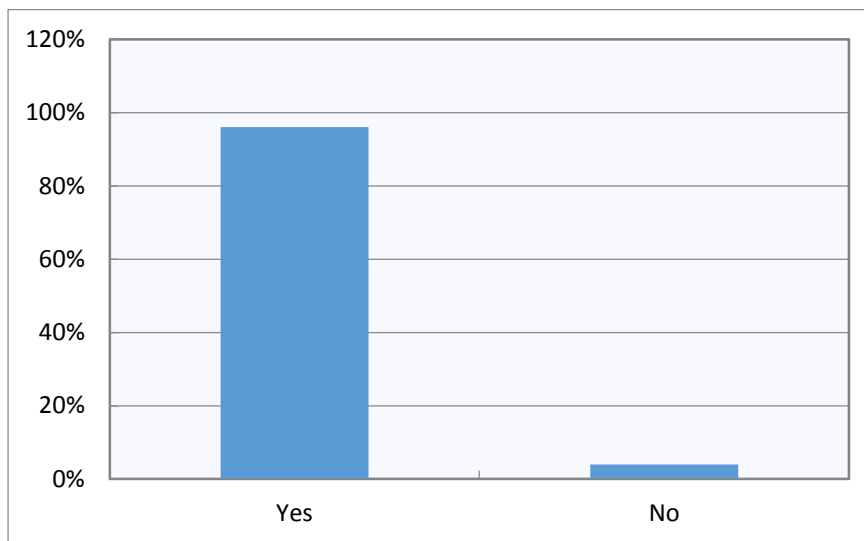
Figure 3. Respondents field of construction. (Netigate.net 2018)



Respondents involvement in project undertaken by GPHA

96% of the respondents indicated that the projects they undertook with GPHA experienced delays, only one respondent indicated otherwise. Appendix 2 presents a summary of the responses obtained on those issues.

Figure 4. Respondents involved in projects undertaken by GPHA (Netigate.net, 2018)



4.3 Causes of delay in construction projects

There were various causes of delays in construction projects established empirically by researchers over the years. This research study by use of primary data evaluated the various causes of delays. From literature, we were able to group the causes under 10 categories; force majeure; poor stakeholder management; Civil, legal, Economic and Political Issues; Sub-contractors; Poor Resource Management; Drawings, Specifications and Instructions; Variations and extra work; project financing; unforeseen physical conditions; and damage of works.

Based on the ranking of the causes it was made possible to evaluate and discuss the first ten causes that has most influenced project schedule. RII of the 35 factors causing delay in construction projects were outlined as shown in Table 4.1 on the next page.

In order to validate the results, they were compared to the findings of the relevant researches in the literature review.

4.3.1 Empirical results

For this study, the causes with an RII of more than 0.5 are considered as important whereas those with RII of less than 0.5 were considered as unimportant. Subsequently the effects of delays with an RII greater than 0.60 are considered paramount, whereas RII of less than 0.60 are considered non paramount.

Using the Relative Importance Index approach, the causes of delays were ranked in the following table.

Table 4.1 Respondents ranking of causes of delays

Causes of Delay	RII	Rank	Category
Political interference	0.56	1 st	Civil, Legal economic and political
Insufficient data collection and surveys before designs leading to errors	0.54	2 nd	Drawings, specs & instructions
Inadequate cash flow, due to non-payment	0.52	3 rd	Sub-contractors
Unexpected ground conditions	0.51	4 th	Unforeseen physical conditions
Delays in decision making	0.49	5 th	Poor stakeholder management
Poor collaboration and communication	0.48	6 th	Poor stakeholder management
Poor procurement of resources	0.48	7 th	Poor Resource Management
Delays in production and approval drawings & specs	0.47	8 th	Drawings, specs & instructions
Problems allocating resources to extra works	0.47	9 th	Variations and extra works
Economic price fluctuations	0.45	10 th	Civil, Legal economic and political
Delays in progress payment by client.	0.45	11 th	Project Financing
Issues with project affected persons	0.45	12 th	Poor stakeholder management
Delays in reviewing, justification and approval of scope	0.44	13 th	Drawings, specs & instructions
Adverse weather conditions	0.43	14 th	Force majeure
Poor collaboration btn plan & subcontractor schedule	0.42	15 th	Sub-contractors
Poor use of resources (equipment and personnel)	0.42	16 th	Poor Resource Management
Unavailable cash flow for variations.	0.42	17 th	Variations and extra works
Poor communication of instructions to contractor.	0.40	18 th	Drawings, specs & instructions
Cultural or traditional physical barriers	0.40	19 th	Unforeseen physical conditions
Changes in government laws and policies	0.39	20 th	Civil, Legal economic and political
Use of obsolete technology	0.39	21 st	Sub-contractors
Delays due to rework from construction errors	0.39	22 nd	Sub-contractors
Conflicts and legal issues between project stakeholders	0.38	23 rd	Civil, Legal economic and political
Poor site management and supervision	0.38	24 th	Poor Resource Management
Inadequate sub-contractor experience	0.35	25 th	Sub-contractors
Lack of funds for project	0.35	26 th	Project Financing
Damage to constructed works	0.34	27 th	Damage to works
Unfavorable contract clauses	0.33	28 th	Project Financing
Damage of major equipment.	0.33	29 th	Damage to works
Global financial crisis	0.28	30 th	Force majeure
Inadequate experience of consultants and contractors.	0.27	31 st	Poor stakeholder management
Accidents during construction	0.27	32 nd	Force majeure
Injury or death of a personnel involved in the project.	0.20	33 rd	Damage to works
Natural disasters	0.19	34 th	Force majeure
Civil unrest and labour strikes	0.17	35 th	Civil, Legal economic and political

From the table, it was observed that political interference which is under the civil, legal economic and political issues ranked highest as the most important cause with a RII rate of 0.56 followed by insufficient data collection and surveys before designs leading to errors, also belonging to drawings, specifications and instructions with RII rate of 0.54. The third and fourth most important factors which are inadequate cash flow, due to non-payment belonging to the sub-contractors' category and unexpected ground conditions such as soil, high water table belonging to unforeseen physical conditions followed closely with an RII rate of 0.52 and 0.51 respectively. It is also observed that the factors that ranked least with RII rate of 0.17 and 0.19 were civil unrest and natural disasters belonging to civil, legal economic and political issues and force majeure. These factors were considered unimportant because the RII was less than 0.5.

4.3.2 Discussion of findings

The results from the table 4 ranks from the top, the major causes that lead to delays projects undertaken by Ghana Ports and Harbours Authority. The top ten which has the most influence as agreed by the respondents who comprised of professional staff of GPHA, consultants and contractors who have collaborated on various construction projects as the major causes of project delays are; Political interference; insufficient data collection and surveys before designs leading to errors; inadequate cash flow due to non-payment; unexpected ground conditions such as soil, high water table; delays in decision making, poor collaboration and communication among stakeholders and discontentment from the public; poor procurement of resources (materials, labour and equipment); delays in production and approval of design drawings and specifications; problems allocating resources to extra works; economic price fluctuations.

But based on the RII rankings the first four causes are considered important because they had the RII greater than 0.50. the last six are considered less important based on the criteria adopted for this research, but will be discussed.

Political Interference

The respondents ranked political interference the most significant cause for construction project delay among the thirty-five causes. Placing first with an RII of 0.56. This outcome corroborates the findings of Toor and Ogunlana (2008) and Tabish and Jha (2011), who ranked political interference as one of the most influencing “problems causing delays in major construction projects in Thailand” and an important factor for success of public construction projects respectively.

Civil, Legal, Economic and Political issues

This is not unusual because GPHA is a government institution heavily dependent on governmental laws and policies. Furthermore, in Ghana different political parties have different ideologies and they enter government or power with different policies, so one project deemed fit by the previous government can be halted, delayed or cancelled by the new government. In addition, to control corruption in construction projects a newly installed government, sets up enquiries into previous projects to ascertain if the procurement processes were not negatively influenced which led to the selection of a biased consultant or contractor. This leads to delay in the construction project, therefore political influence plays a significant role in causing project delay. This was also the first major cause in Mahamid (2013).

Insufficient data collection

The second most significant cause as ranked by the respondents as responsible for project delay is insufficient data collection and conducting of surveys before designs leading to errors in design. This cause ranked second 0.54 RII These surveys include appraising of project,

conduction of feasibility studies, bankability or viability, health and safety and environmental impact assessment. Except for major construction project undertaken by GPHA, appraisal and other data collection protocols are not undertaken for projects deemed minor i.e. has a lower capital cost. This leads to uncertainty as to the expectations when the project starts and when it is ongoing. In these situations, there is always a high probability of occurrence of a requirement which was not identified from the project conception. This mostly leads to delay, because the requirement has to be addressed and managed. This has time and cost implications. The proper collection of project data and surveys assist in the production comprehensive drawings and works specification. This result corroborates the findings of Amoatey et al. (2015).

Inadequate cash flow due to non-payment

This cause was ranked the third most important cause of project delay in GPHA construction projects with an RII of 0.52. Finance issues are of much importance in construction projects. Lack of finances, non-payment of claims and delay in process of payments by the clients lead to delay in projects. This is usually caused by underfunding and tight budgetary allocations to projects. Also the review of claims goes through a long process because it has to go through different departments in the authority. The contractor or consultant on the project needs the consistent cash flows as agreed in the contract for the construction works to proceed steadily, any delay affect progress. This issue is also illustrated comprehensively in Al-Kharashi and Skitmore (2009), who stressed the “causes of delays in Saudi Arabian public sector construction projects”. Notwithstanding, delay in payment of claims to contractors, sub-contractors or consultants may lead to the project being delayed.

Ground conditions

The respondents ranked unexpected ground conditions such as unsuitable soil and high water table as the 4th significant cause of the delay in construction projects undertaken by GPHA with an RII of 0.51. This is not surprising because the port area poses as a unique area because of its proximity to the sea the soil conditions exhibit different characteristics. Unforeseen soil conditions are a major external factor which has caused delay in most construction projects. In the execution of construction especially for pavement works, a subsurface soil condition can occur which was not initially envisaged for. This issue will need to be rectified before the actual works can continue. This will ultimately lead to delay because to encompass new works which will require extra resources. Because these resources were not initially included in the planning it will affect the project cost and time adversely. Toor and Ogunlana (2008) also concluded that effects of subsurface conditions of soil and unforeseen ground conditions are some of the “major problems causing delays in major construction projects in Thailand”. This therefore goes to substantiate their findings.

Delays in decision making

This cause was ranked by the respondents fifth most significant cause of delay in undertaken by GPHA. Toor and Ogunlana (2008), Tabish and Jha (2011), and Amoatey *et al.* (2015) identified slow management decision as a major factor affecting various aspects of construction project progress. It is well agreed that management should take important decisions which might affect the progress of the project based on facts and well documented evidence which will help in the successful completion of the project. Generally, a project requiring a decision from the authority’s management level means the project or the project team have somewhat strayed from what the contract entails or an activity which was inadequately planned is undermining the project or simply if the project is not conforming to the project plan. Based

on this possible occurrences, the need for management decision goes through a process which will cause delay on the project. These decisions even if it comes on time needs to be reworked into the project budget and time leading to time and cost overruns.

Poor collaboration and communication among stakeholders

Poor collaboration and communication among stakeholders and discontentment from the public as the sixth ranked significant cause of construction project delay undertaken by GPHA. Mok et al., (2015) agrees to this cause that stakeholder engagement should aim at involving all stakeholders in the planning, decision making and implementation of the project to reduce conflicts and establish clear project priorities. This should be a management tool to promote collaboration. Yang et al. (2009) identified effective communication as an essential tool for maintaining the support and commitment of all stakeholders. Planned, effective and regular communication with members of the project is necessary for the timely success.

Poor procurement of resources

Respondents ranked poor procurement of resources (materials, labour and equipment) seventh significant cause of delay in projects undertaken by GPHA. Research in the field of procurement has proven that procurement of works, services or goods in developing countries involves a significant amount of bureaucracy with several administrative levels, approval checks etc. this cause lots of delay on the realization of the project. All these factors also lead to inefficiencies and may increase the cost of construction project. This finding is in line with the research of Toor and Ogunlana (2008), that major problems which construction projects face are usually due to inadequate procurement system.

Delays in production of drawings, approval of drawings and specifications

Delays in production of drawings, approval of drawings and specifications ranked as the eighth cause of delay in construction projects undertaken by GPHA. Preparation and approval of

drawings was identified by Senouci *et al.* (2016) as one of the delay factors in construction projects. Amoatey *et al.* (2015) stated that changes in drawings and incomplete documents were critical causes of delay in Florida. Lack of clarity of drawings and specifications may also be an issue even if the drawings are produced in time. This is in line with our research findings and as an issue which should be checked and managed.

Allocating resources to extra works

The ninth ranked significant cause of delay by the respondents is problems in allocating resources to extra works. A change in scope by project manager or management of the authority which may arise due to incomplete designs or other issues leads to variations. Due to the time constraints on projects any increase in scope will need extra resources i.e. material, equipment and labour which as at the time they are needed might not be available if they might be engaged in other projects. The waiting time required for the resources to be freed for them to be used on the extra works causes delay. This agrees with Amoatey *et al.* (2015) research findings in delay in Ghanaian state housing construction projects.

Economic Price fluctuations

Finally, the 10th ranked major cause of delay by the respondents is economic price fluctuations. This typically affects materials and equipment due to the escalation of material prices. The research by Durdyev *et al.* (2017) ranked price fluctuations as the 15th cause of project delays in Cambodia. This does not seem to be major but it still has some level of influence on the contract execution to completion on the proposed date. Ghana's economy is reliant on the dollar value, slight depreciation of the Ghana cedi as against the dollar has adverse effect on the market price of construction materials. The volatile nature of the Ghana cedi leads to high inflation rates and price fluctuations as confirmed and identified in the research conducted by Amoatey *et al.* (2015) to be the second major of project delay, among 13 identified causes.

4.4 Effects of delays in construction projects

The researcher went ahead to identify the effects of delay in construction projects. The effects found in literature were presented to respondents to rank in their opinion as an effect as a result of project delays. They were also further asked to share other effects that were not part of the ranking list. RII was again used by the researcher to rank the negative effects caused by construction delays.

4.4.1 Empirical results

For this study, the effects of delays with an RII greater than 0.60 are considered as critical, whereas RII of less than 0.60 are considered non paramount and not critical.

Table 4.2 Respondents ranking on effects of delays

Effects of Delay	RII	Rank
Time overruns	0.69	1 st
Cost overruns	0.67	2 nd
Dispute between contracting stakeholders	0.61	3 rd
Abnormal losses and cash flow crisis	0.59	4 th
Loss of productivity of resources	0.58	5 th
Litigation	0.58	6 th
Arbitration	0.56	7 th
Investors are deterred from investing in future projects	0.54	8 th
Total abandonment of project	0.54	9 th
Damaged reputation with regards to consultant	0.48	10 th

It was observed that time overruns were ranked highest among the negative effects of delays with an RII rate of 0.69 closely marked by cost overruns with RII rate of 0.67. This is not surprising because ones' time set is exceeded, you sure have to make provision for extra cost. Dispute between contracting firms was ranked third with RII of 0.61. Damaged reputation and total abandonment of project ranked least with RII of 0.48 and 0.54 respectively.

4.4.2 Discussion of findings

From the table above the respondents ranked time overruns, cost overruns and disputes between contracting stakeholders as the most pervasive effects of delay on construction projects undertaken by GPHA. These three effects all had RII rankings greater than 0.60, therefore considered the most rampant effects if construction projects delay.

Time overruns

This effects of delay were ranked first with an RII of 0.69 by the respondents. The additional time or excess time beyond which the project completion date had been set is the time overrun. Most government projects are financed with loans and grants from international banks in which they place strict time schedule on the disbursement of the cash and when they expect the project to end so they can recoup their investment. Ameh and Osegbo (2011) identified a negative relationship between productivity and time overrun, in their research on the relationship between the two variables. Some research findings show that there is a correlation between cost and time overrun. That for each unit of time delay coefficient there is a significant increase in cost at that level. From experience it has been realised that time overrun and cost overrun to go hand in hand. This is because same was realised in the research conducted by Amoatey et al. (2015).

Cost overruns

When the planned budget for a project is exceeded the project is said to have overrun its cost. The common reasons may be attributed to poor planning relating to assigned duration, scope and design changes. Same factors will cause time overruns in addition to inadequate project handling by contractors and delay in the payments of the completed works. This confirms the findings of Faridi and El-Sayegh (2006), and Ali and Kamaruzzaman (2010).

Dispute between contracting stakeholders

This was evaluated and ranked to be the third most important effect on construction delays. Disputes arise in contracts by factors such as unclear contract document, lack understanding of contract by stakeholders and contract clauses. These disputes if not properly managed leads to litigation or arbitration. Alinaitwe et al. (2013) ranked disputes among the parties involved in the project as one of the five factors that were ranked the highest in terms of their impact on delays. This confirms the findings of the research.

Other effects ranked less important

Abnormal losses and cash flow crisis; and loss of productivity of resources were evaluated and ranked by the respondents to be the fourth and fifth effect most likely to impact construction projects undertaken by GPHA which are delayed respectively. Both are less than 0.60 according to the ranking so are less likely to have effects on construction projects if delays occur. the last 5 effects; litigation; arbitration; investors deterred from investing in future projects; total abandonment of project; damaged reputation with regards to consultant are also possible impacts which can be experienced somehow, they are rare as compared to the first two effects ranked by the respondents. This verity is confirmed from the RII rankings of less than 0.60, thus these are considered non relevant effects according to this survey.

4.5 Chapter summary

Chapter 4 explained the analysis obtained from the primary data collected. A brief discussion was drawn from the questionnaires retrieved. The relative importance index was used to rank the causes and effects of delays on construction projects undertaken by GPHA. The most important causes were discussed based the literature review conducted to confirm its veracity.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the purpose, methodology and findings of the study presented in the previous chapters. From these, the achievement of the objectives and the contributions of the research are presented. conclusions are drawn based on findings from the study. Section five also gives suggestions for further studies.

5.3 Summary

This research has been carried out to identify the important causes why construction projects undertaken by GPHA have been experiencing delays. Various causes of delays were identified from literature review and through secondary data collection. These causes were then categorized under factors, as proposed by Cross et al. (2009). A questionnaire was designed to collect primary data from purposively sampled respondents, these responses were ranked thereof. The research objectives were revisited to consider how they were attained through the various stages of the study. By adopting a case study approach, a justifiable rationale for the occurrence of the important causes of construction project delays and its effects on the construction projects were built for possible further enquiry.

5.3.1 The important causes of delay

The research identified four important causes of project delays in GPHA. They are: Political Interference; Insufficient data collection and surveys before designs leading to errors; Inadequate cash flow; Unexpected ground conditions.

5.3.2 The critical negative effects of delay

The research identified three critical negative effects on construction projects, when delays occur. They were: Time overrun; Cost overrun; Disputes between contracting stakeholders.

5.4 Conclusion

On the basis of this research, several causes and effects of construction projects have been established and the researcher would like to make the following conclusions:

- Political interference; insufficient data collection and surveys before designs leading to errors; inadequate cash flow due to non-payment and unexpected ground conditions such as soil were found to be the paramount causes of project delays in construction projects undertaken by GPHA.
- It was then concluded that time overruns, cost overruns and dispute between contracting stakeholders, were the paramount effects of delays on construction projects undertaken by GPHA.

5.5 Limitations

The study looked at the critical causes of delays and its effects on construction projects, however the responses of the study were obtained from professional staff from GPHA, consulting and contracting organizations against the assumption that they only will know the pertinent causes of delays whilst ignoring the viewpoints of non-professionals or artisans who have also been involved in the projects. Comparatively the numbers of non-professionals as against the professional are always higher on any construction project. There is therefore the possibility that some of the responses gathered could not reflect the reality on the ground though they are relevant.

5.6 Recommendations

In lieu of the factors that have been identified as causes of delays of construction project undertaken by Ghana ports and Harbours Authority, the following are recommended to mitigate the issue during the project execution or even if possible to eliminate it. Based on the findings of the study, the following recommendations were made;

- Political interference was identified as the most important cause of delay in projects. This problem may be mainly due to influence from persons of political authority. The management of GPHA therefore should enforce the stipulations of the GPHA Act, 1986 which gives the authority the full mandate “to plan, build, develop, manage, maintain, operate and control ports in Ghana”. This will help any control politicians from regulating the use of the port and the port facilities if it goes contrary to the objective of the port and from delaying projects.
- Another important factor identified in the survey is the insufficient data collection and surveys before designs leading to errors in designs and specifications. The engineering project team of GPHA should make it a policy to always conduct thorough site investigations, geotechnical and geophysical investigations; also to conduct health social and environmental impact analysis of each proposed project. The results and recommendations from this investigation should then be included in the design, to as much as possible reduce errors when it is being implemented by the contractors.
- Inadequate cash flow due to non-payment was another factor identified as a very important cause of delay. This problem is due to inadequate budgeting before contract is awarded. GPHA should therefore budget and award projects that its funds can support within a particular time. This is to say management should plan and budget for projects

which can be completed depending on the available cash as at the time of proposals.

Therefore, eliminating the situation where different projects are started concurrently with limited budget that may lead to cash shortages as the project is ongoing.

5.7 Further research

Future research should focus on the measures to mitigate the various effects of delay in construction projects as well as to look at construction projects undertaken by the government of Ghana in general (Ofori, 2012) and (Amoatey et al., 2015).

A similar study should be conducted to validate findings of this study by collecting data from artisans and non-professional staff of GPHA, contracting and consulting organisations who have executed construction projects undertaken by GPHA.

Researchers can also consider using RII, ANOVA, and the Factor Analysis approaches to rank response to see whether they may follow the same trend or give varying results (Durdyev et al., 2017) and (Doloi et al., 2012).

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APPENDICES

QUESTIONNAIRE

EVALUATING THE CAUSES OF DELAYS IN CONSTRUCTION PROJECT, CASE OF GHANA PORTS AND HARBOURS AUTHORITY.

This research is part of a Master's dissertation being submitted to the Department of Building Technology, Kwame Nkrumah University of Science and technology, Kumasi.

By completing this questionnaire, you participate in a study to highlight causative factors of delays and its subsequent effects on construction projects undertaken by Ghana Ports and Harbours Authority. Please note that answers to this survey are anonymous and confidential. Participation is voluntary and the results will be presented in such a way that no individuals may be recognised.

SECTION A

Background Information About the Respondent

1. What is your Professional background?
(a) Architect [] (b) Engineer [] (c) QA/QC [] (d) Surveyor [] (e) Others []
If other, kindly state.....
2. How many years have you been engaged in construction projects?
(a) <5yrs [] (b) 5 – 10yrs [] (c) 11 – 15 yrs [] (d) >15yrs []
3. Does your company have construction projects outside Ghana?
Yes [] No [] If yes, state where (place).....
4. What role does your company play in the construction industry?
(a) Client [] (b) Consultant [] (c) Contractor [] (d) Sub-contractor []
5. Have you been involved in any construction project undertaken by GPHA?
(a) Yes [] (b) No []
6. Did the project delay?
(a) Yes [] (b) No []
7. If yes, for how long?
(a) <6months [] (b) 6months – 1yr [] (c) 1 – 2yrs [] (d) >2yrs []

SECTION B

GPHA has been undertaking various construction projects over the years. But most of these projects have experienced delays, which can be attributed to different factors. This section is designed to help evaluate the various causes of delays which affect construction projects undertaken by GPHA.

Kindly rank by ticking (✓) the following factors as causes of delays in construction projects undertaken by Ghana Ports Harbours Authority

Category of causes	No.	Causative factors	Very High	High	Medium	Low	Very Low
Force majeure	1	Accidents during construction.					
	2	Global financial crisis					
	3	Natural disasters					
	4	Adverse weather conditions					
Poor stakeholder management	1	Issues with project affected persons					
	2	Poor collaboration and communication amongst stakeholders.					
	3	Delays in decision making.					
	4	Inadequate experience of consultants and contractors.					
Civil, Legal economic and political issues	1	Civil unrest and Labour strikes					
	2	Changes in government laws and policies					
	3	Economic price fluctuations					
	4	Political interference.					
	5	Conflicts and legal issues between project stakeholders					
Sub-contractors	1	Inadequate cash flow, due to non-payment					
	2	Inadequate subcontractor experience					
	3	Use of obsolete technology					
	4	Delays due to rework from errors					
	5	Poor collaboration between project plan and subcontractor schedule					

Category of causes	No.	Causative factors	Very High	High	Medium	Low	Very Low
Poor Resource Management	1	Poor site management and supervision					
	2	Complexity of project					
	3	Poor procurement of resources					
Drawings, specifications and instructions	1	Delays in reviewing and approval of changes in scope.					
	2	Delays in production of design drawings and technical specifications.					
	3	Improper communication of instructions to contractor or subcontractor.					
	4	Insufficient data collection and survey before design leading to design errors.					
Variations and extra works	1	Delays in reviewing and approval of variations					
	2	Problems allocating resources to extra works.					
	3	Unavailable cash flow for variations.					
Project Financing	1	Lack of funds					
	3	Delay in progress payments by client					
	4	Unfavourable contract clauses					
Unforeseen physical conditions	1	Unexpected ground conditions					
	2	Cultural or traditional physical barriers in the alignment of construction projects.					
Damage to works	1	Damage of equipment					
	2	Damage to works					
	3	Injury to personnel involved in the project .					

SECTION C

There have been apparent negative effects on the construction projects which occur due to the project delays.

In this section Kindly rank by ticking (✓) your level of agreement as to the occurrence of these Effects as a result of delays in construction projects.

	Effects of delays	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Time overruns					
2	Cost overruns					
3	Dispute between contracting stakeholders					
4	Abnormal losses and cash flow crisis					
5	Damaged reputation with regards to consultant					
6	Investors are deterred from investing in future projects.					
7	Loss of productivity of resources					
8	Arbitration					
9	Litigation					
10	Total abandonment of project .					

THANK YOU.