

AN INVESTIGATION INTO DELAYS CAUSED BY CONSULTANTS IN THE
IMPLEMENTATION OF ROAD CONSTRUCTION PROJECTS IN THE
ASHANTI REGION OF GHANA

By

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which is a substantial extent has been accepted for the award of any other degree or diploma at Kwame Nkrumah University of Science and Technology, Kumasi or any other educational institution, except where due acknowledgment is made in the thesis.

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ABSTRACT

Available data from the Ministry of Roads and Highways indicates that majority of road construction projects in Ghana awarded from 2015 for completion by 2016 or 2017 had delayed in completion. The general opinion expressed by the public to these delays is delayed payment of work done by the government to the affected contractors. However, consultants who are major stakeholders in the construction industry and work on behalf of the government are often not mentioned to be a contributing factor to these delays. The aim of this study was therefore to establish delays caused by consultants in the implementation of road construction projects in Ghana. The objectives of the study were: to identify key causes of delays caused by consultants in road construction projects in Ghana; to identify the effects of the delays on contractors in the completion of projects; and to outline measures to mitigate the delays caused by consultants in road construction projects in Ghana. Quantitative research method and census sampling technique were employed due to the number of populations which was equal to the sample size for this research work. A total of fifty-five (55) questionnaires were administered and all the fifty-five (55) responses were retrieved indicating a response rate of hundred percent (100%). The respondents for the study were the technical staff of three main road agencies under the Ministry of Roads and Highways in the Ashanti Region namely Ghana Highway Authority (GHA), Department of Feeder Roads (DFR) and Department of Urban Roads (DUR) and two other private consultants engaged by the Department of Urban Roads at the time of this research work in the Ashanti Region. The statistical methods employed in analysing data were descriptive statistics, mean score ranking, relative importance index (RII), correlational analysis and multiple regression method. The top three causes of delays caused by consultants at the implementation

stage of road construction projects were multiple variations orders on same project, delays in issuing variation of works and inadequate fuel and logistics. The major effects of the delays on contractors in the completion of projects were increased interest on loans, claims for extension of time and/or compensation and increased cost of projects. Measures suggested for mitigating road construction delays in Ghana in their order of importance are that procurement process must be transparent to all stakeholders, funds/budget must be allocated before undertaking a project and consultants should produce complete design drawings and cost estimates based on the design drawings.

KEYWORDS: Delays, Consultants, Procurements, Variations, Cashflow, Implementation

TABLE OF CONTENTS

DECLARATION	ii
ABSTRACT	iii
TABLE OF CONTENTS	v
ACKNOWLEDGEMENT	xi
DEDICATION	xii
CHAPTER ONE	1
INTRODUCTION	1
1.0 BACKGROUND OF THE STUDY	1
1.2 PROBLEM STATEMENT	3
1.3 AIM AND OBJECTIVES.....	4
1.3.1 Aim	4
1.3.2 Objectives	4
1.4 SCOPE OF WORKS.....	4
1.5 METHODOLOGY	5
1.6 JUSTIFICATION	5
1.7 LIMITATION	6
1.8 STRUCTURE OF STUDY	6
CHAPTER TWO	7
LITERATURE REVIEW	7
2.1 INTRODUCTION	7
2.2 OVERVIEW OF ROAD CONSTRUCTION PROJECTS IN GHANA	7
2.2.1 Road Financing	7
2.2.2 Road network in Ashanti Region.....	8
2.3 PROCESSES IN CONSTRUCTION PROJECT MANAGEMENT.....	9
2.3.1 Initiation Process Group.....	9
2.3.2 Planning Process Group	10
2.3.3 Executing Process Group	11
2.3.4 Monitoring and Controlling Process Group.....	11
2.3.5 Closing Process Group.....	12
2.4 PROJECT IMPLEMENTATION STAGE	12
2.5 TYPES OF SCHEDULE DELAYS IN CONSTRUCTION PROJECTS	12
2.5.1 Excusable or Non-Excusable Delays	13
2.5.2 Critical or Non-Critical Delays	13

2.5.3 Concurrent Delays	14
2.5.4 Compensable or Non-Compensable Delays	14
2.6 PREVIOUS STUDIES INTO CAUSES OF DELAYS OF CONSTRUCTION PROJECTS	14
2.6.1 Causes of Delay in Public Construction Projects in Iraq	14
2.6.1.1 Client Related Causes of Delay	15
2.6.1.2 Contractor Related Causes of Delay	15
2.6.1.3 Consultant Related Causes of Delay	15
2.6.1.4 Delay Causes due to External Factors	16
2.6.2 Causes of Delays in Road Construction Projects in Kenya	16
2.6.3 Causes of Delays by Project Consultants and Designers in the Gulf Region ...	16
2.6.3.1 Cultural Factors	17
2.6.3.2 Work Environment by Consultants	17
2.6.3.3 Common Factors of Delays Caused by Consultancy Office	18
2.6.3.4 Phases of Project Design	18
2.6.4 Causes of Delays in Construction Projects in Norway	18
2.6.5 Causes of Road Construction Projects in Egypt	19
2.6.6 Causes of Delays to Construction Projects in India	20
2.6.6.1 Client Related Delays	20
2.6.6.2 Contractor Related Delays	20
2.6.6.3 Consultant Related Delays	20
2.6.6.4 Material Related Delays	21
2.6.6.5 Labour Related Delays	21
2.6.6.6 External Related Delays	21
2.6.7 Causes of Delays in Construction Projects of Punjab-Pakistan	21
2.6.7.1 Contractor Related Factors Causing Delay in Project Execution	22
2.6.7.2 Client Related Factors Causing Delay in Project Execution	22
2.6.7.3 Consultant Related Factors Causing Delay in Project Execution	22
2.6.7.4 Material Related Factors Causing Delay in Project Execution	22
2.6.7.5 Equipment Related Factors Causing Delay in Project Execution	22
2.6.7.6 General and Labour Related Factors Causing Delay in Project Execution ...	23
2.6.8 Critical Road Project Delay Factors in Ghana	23
2.6.8.1 Delayed Payment of work done by Government	24
2.6.8.2 Inadequate Experience by Contractors	24
2.6.8.3 Scope Changes initiated by the Client	24
2.6.8.4 Delayed Site Possession	25
2.6.8.5 Rigid funding requirements for projects by donors	25

2.7 EFFECTS OF DELAYS ON CONSTRUCTION PROJECTS ACROSS THE WORLD	26
2.8 MITIGATION MEASURES TO CAUSES OF DELAYS IN CONSTRUCTION PROJECTS ACROSS THE WORLD	26
CHAPTER THREE	30
METHODOLOGY	30
3.1 INTRODUCTION	30
3.2 RESEARCH DESIGN	30
3.3 RESEARCH METHOD.....	30
3.4 POPULATION OF STUDY	31
3.4.1 Sample size	31
3.5 DATA COLLECTION	32
3.5.1 Primary and Secondary information	32
3.5.2 Questionnaire design.....	32
3.6 DATA ANALYSIS.....	33
3.7 ETHICAL CONSIDERATIONS	34
CHAPTER FOUR.....	35
DATA PRESENTATION, ANALYSIS AND DISCUSSION	35
4.1 INTRODUCTION	35
4.2 RESPONDENT PROFILE	35
4.3 CAUSES OF DELAYS CAUSED BY CONSULTANTS IN ROAD CONSTRUCTION PROJECTS	36
4.4 EFFECTS OF DELAYS IN CONSTRUCTION ON COMPLETION OF PROJECTS	40
4.4.1 Descriptive and Relative Importance Index.....	40
4.4.2 Correlational Analysis	44
4.4.3 Multiple Regression Result.....	49
CHAPTER FIVE	60
SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS 60	60
5.1 SUMMARY OF FINDINGS	60
5.1.1 Causes of Delays in Road Construction Projects in Ghana	60
5.1.2 Effects of the Delays on Contractors in the Completion of Projects	60
5.1.3 Measures to Mitigate the Delays in Road Construction Projects in Ghana	61
5.2 CONCLUSION.....	61
5.3 IMPLICATION TO THEORY AND PRACTICAL	62

5.4 RECOMMENDATIONS	63
5.4.1 Stakeholder Involvement Intensification in the Monitoring and Control Stage	63
5.4.2 Transparency in Procurement Process	64
5.4.3 Funds/Budget Allocation before Undertaking a Project	64
5.4.4 Cost Estimate should be based on Completed Design Drawings	64
5.4.5 Support from Professional Bodies during threats from Politicians	65
5.5 SUGGESTED AREAS FOR FURTHER STUDIES	65
REFERENCES.....	66
APPENDIX.....	70

LIST OF TABLES

Table 2.1 Road network in Ashanti Region	9
Table 3.1 Technical Staff Strength	31
Table 4.1: Causes of Delays in Road Construction	37
Table 4.2: Description of the Effect of Construction Delays on Completion Projects	41
Table 4.3: Bivariate Correlational Analysis.....	47
Table 4.4: Model Summary Statistics	49
Table 4.5: Nexus between Construction Delays and Delay in Project Completion ...	51
Table 4.6: Mitigating Measures against Road Construction Delays.....	55

LIST OF ABBREVIATIONS

MRH	Ministry of Roads and Highways
GHA	Ghana Highway Authority
DFR	Department of Feeder Roads
DUR	Department of Urban Roads
RII	Relative Importance Index
DANIDA	Danish International Development Agency
JICA	Japan International Cooperation Agency
GhIE	Ghana Institution of Engineering
GhIS	Ghana Institution of Surveyors

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DEDICATION

This dissertation is dedicated to my wife Mrs. Peace Matti Setornyeme, and my children Selorm Kwabla Setornyeme and Akpene Akosua Setornyeme.

CHAPTER ONE

INTRODUCTION

1.0 BACKGROUND OF THE STUDY

Mulcahy and Mulcahy (2017) describes project as a temporary endeavour undertaken to create a unique product, service or result. Every project is unique in terms of its location, stakeholders, designs, enterprise environmental factors (EEFs), organizational process assets (OPAs), etc. that would be used to execute the project. A project is said to be a temporary endeavour because it has a definite commencement and completion dates. The completion of any project within the stipulated completion date or revised completion date is of utmost importance to stakeholders and this also makes a major milestone in the project. The road construction industry is capital intensive hence any acts of omission by any of the key stakeholders namely the client (government), consultant or contractor that may result to delays of completing road projects must be avoided.

Trauner et al. (2009) describes construction delays as making something happen later than expected, to cause something to be performed later than planned or not to act timely. Assaf and Al-Hejji (2006) defined delay as time overrun beyond the contract completion date or beyond the date agreed by the parties for the delivery of the project. The (Constructor, n.d) also observed that, a project is considered to be delayed when there is time lag in completion from its completion date or revised completion date. Project delay can also be defined as late completion or late start of activities from the commencement date. Project delays may result in extension of time (EoT), cost overrun, time overrun, liquidated and ascertain damages (LAD), termination of contract or combination of above stated factors.

Projects are undertaken and financed at specific periods to meet the short to medium term plans of organizations. In Ghana, road construction projects are mainly financed by the central government and the procurement processes are undertaken by the technical staff of the three main agencies under the Ministry of Roads and Highways (MRH) or private consulting firms on behalf of the road agencies. The road agencies include Ghana Highway Authority (GHA), Department of Feeder Roads (DFR) and Department of Urban Roads (DUR). However, there are occasions where the entire procurement processes are undertaken by private consultants who report to the MRH through any of the road agency as required by their terms of reference. A major component of the Government of Ghana's annual budget is earmarked for the road sector. It is anticipated that the timely completion of these roads would open up the local economy of the affected communities in particular and the country as a whole. Mulcahy and Mulcahy (2017) identified time (schedule) as one of the seven constraints namely schedule, risk, resources, cost, scope, quality and customer satisfaction for every project. A delay in time affects all the other constraints which may cause client customer dissatisfaction.

Fan and Kang (2005) assert that studies on road construction is important because roads contribute to the economic growth and poverty reduction of every country. Seboru (2015) further observed that road infrastructure development impacts on overall economic growth, urban growth, agricultural growth, poverty reduction in the rural and urban areas. Without road infrastructure development, sustainable health care, efficient markets and expanded rural economy and economic growth will remain a mirage.

1.1 PROBLEM STATEMENT

Available data from the MRH indicates that road projects awarded from 2015 for completion by 2016 or 2017 had delayed in completion. Amoatey and Ankrah (2017) also observed that about 70% of road projects experience delays in Ghana. The impact of these delays to all the stakeholders in the road sector cannot be underestimated. Delays of completing road projects deprive the beneficiary communities from many socio-economic benefits. Cash crops like cocoa, beans, palm, tomatoes, cashew and bananas are left stuck in the hinterlands to vagaries of the weather therefore deny the local farmers of the benefit of recouping investments made on their farms and prevent the local economy from expanding. Other social interventions like schools, electricity, portable water and healthcare which would have been made available to these communities may be delayed or in some cases given to other communities with better motorable roads.

Delayed completion of roads affects the revenue generation of governments from the exportation of some of these cash crops, the government's desire to provide socio-economic interventions to these communities are frustrated which ultimately affect the electoral fortunes of the government. Boadu's (2015) article observed that Ghanaians live in a country where delays in completing projects are a common occurrence. Gluszak and Lesniak (2015) also stated that the effects of delays in construction projects can be country specific. Evidence on role of consultants in road project delays in Ghana has predominantly been limited. Since consultants play a major role in successful project delivery, it is imperative that an investigation is undertaken to establish their contribution in causes of delays in project delivery.

This study is therefore being undertaken to investigate the contribution of consultants to causes of delays in the implementation of road construction projects and to outline measures to mitigate these delays caused by the consultants.

1.2 AIM AND OBJECTIVES

1.2.1 Aim

The aim of this study is to establish delays caused by consultants in road construction projects in Ghana.

1.2.2 Objectives

The objectives of this study are:

1. To identify key causes of delays caused by consultants in road construction projects in Ghana;
2. To identify the effects of the delays on contractors in the completion of projects; and
3. To outline measures to mitigate the delays caused by consultants in road construction projects in Ghana.

1.3 SCOPE OF WORKS

The geographical scope of this study is Ashanti Region. The contextual scope is limited to Ghana Road Fund, Consolidated Fund, COCOBOD and other donor funded road projects awarded by the Government of Ghana through the GHA, DFR and DUR in the Ashanti Region from 2015 to 2018. Ashanti Region is chosen for the case study because it has the largest road network in the country and many road projects are awarded on contracts in the region.

1.4 METHODOLOGY

A quantitative research method was used in this research work. A review of useful literature on related topics was conducted which helped to decide on data requirements of this particular research work. The study also adopted questionnaire survey to collect data from respondents. A census sampling technique was employed in this research work as the total population was the same as the sample size. Respondents were asked to rate each variable on a Likert rating scale for the questions in the questionnaire. The statistical methods employed to analyse data were descriptive statistics, mean score ranking, relative importance index (RII), correlational analysis and multiple regression method.

The targeted respondents were Project Managers, Engineers, Quantity Surveyors, Laboratory Technicians, Land Surveyors from the GHA, DFR and DUR and private consultants engaged by the three road agencies of the MRH in the Ashanti Region.

1.5 JUSTIFICATION

Most road construction works had delayed in completion across the country. Most of the citizenry are blaming the government and contractors for the causes of these delays. However, consultants as major stakeholder would also have a role to play in the causes of these delay in the road construction projects across the country. This research work is therefore of significant importance to consultants in the road sectors of the country especially to the technical staff of the three road agencies namely GHA, DFR and DUR under the MRH and other private consultants engaged by the three road agencies. Technical staff like Project Managers, Engineers, Quantity Surveyors, Land Surveys and Laboratory Technicians would benefit from the findings of this study greatly as it would bring about increased knowledge about

decisions on the part of these consultants that contribute to delays in road projects leading to good management practices.

Findings of this study would also bring to the fore the effects of the delays on contractors in completing these road projects in the country. This study will greatly benefit academia as it will serve as a major contribution to knowledge and spur others on to engage in research of causes of delay of projects in different fields of endeavour.

1.6 LIMITATION

This research work encountered some limitations just like any other research work. Time constraint and inadequate finances were major limitations to this research work. These limited the research work only to consultants in the Ashanti Region of Ghana. There were only two private consultants engaged by DUR hence the views expressed by the number of professionals from the private consultants were relatively smaller compared with the technical staff from the government agencies.

1.7 STRUCTURE OF STUDY

There are five main chapters for this study. Chapter one covered introduction of the study. Chapter two examined detailed review of previous literature on delays in the construction industry. Chapter three discussed the research methodology and Chapter four analysed the data and evaluate the data collected from the field. Chapter five comprises the summary of findings, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter critically review past literature on causes of delay of construction projects. The chapter focusses on overview of road construction projects in Ghana, process groups or stages in construction project management, types of delays in construction projects, causes of delays for construction projects, effects of the delays and mitigation measures. The chapter ends by identifying a gap in the knowledge area relating to delays caused by consultants in road construction projects.

2.2 OVERVIEW OF ROAD CONSTRUCTION PROJECTS IN GHANA

In Ghana, the MRH is responsible for the overall administration of road construction projects through the three main road agencies. The responsibilities for the road network by the road agencies differ between trunk and non-trunk roads. The GHA is responsible for the routine and periodic maintenance of the trunk roads and related facilities, subject to the country's transport policies and strategies whilst the DFR and DUR are responsible for the feeder and urban roads respectively. However, external consultants are sometimes engaged by the MRH through its agencies to supervise some of the capital-intensive projects.

2.2.1 Road Financing

Nyasulu et al. (2003) observed that the implementations of road construction projects in Ghana are financed from both local and external sources. The local funding source is from the central government's Consolidated Fund, Road Fund and COCOBOD. The external sources are in the form of grants, concessional loans, and credits accruing from bilateral and multilateral donors. Nyasulu et al. (2003) observed that

some of the external sources of funding road infrastructure projects include the World Bank, DANIDA and JICA. The Road Fund and some external sources mainly finance road routine and periodic maintenance projects, while the rehabilitation and new road construction are financed by the Consolidated Funds, COCOBOD and external sources.

Routine maintenance projects are carried out regularly and completed within a year.

Examples of routine maintenance projects include:

- Grass cutting; and
- Reshaping.

Periodic maintenance projects form a significant component in the operation and management of road network in the country and are carried out usually over a number of years. Some examples of periodic maintenance projects include:

- Spot Improvement;
- Re-gravelling;
- Resealing;
- Asphaltic Overlay; and
- Bitumen Surfacing.

2.2.2 Road network in Ashanti Region

According to the World Bank collection of development indicators, the total road network in Ghana was 109,515km as at 2009. The total road network in Ashanti Region is shown in Table 2.1 below:

Table 2.1 Road network in Ashanti Region

ROAD NETWORK IN ASHANTI REGION	
TYPES OF ROADS	LENGTH (KM)
TRUNK ROADS	1,647.80
FEEDER ROADS	5,559.99
URBAN ROADS	2,400.00
TOTAL	9,607.79

Source: Data from Road agencies in the Ashanti Region (2019)

2.3 PROCESSES IN CONSTRUCTION PROJECT MANAGEMENT

Mulcahy and Mulcahy (2017) identifies five (5) main process groups or stages in Project Management. The process groups include:

- i. Initiating;
- ii. Planning;
- iii. Execution;
- iv. Monitoring & Control; and
- v. Closing.

2.3.1 Initiation Process Group

This process group defines a new project or a new phase of an existing project by obtaining authorization to start the project or phase. Antwi (2015) observed that the initiation process of any road construction projects in Ghana involves prioritization and selection of that particular road based on its importance to the socio-economic development of the area and the country and worst conditions state. The road is usually identified by the Area Engineer in conjunction with other technical staffs of the road agency under which the jurisdiction of the road falls and the Metropolitan, Municipal and District Assemblies (MMDA).

2.3.2 Planning Process Group

The planning process group defines the project scope, objectives of the project and the cause of action required to achieve the objectives of the project. Antwi (2015) further observed that the planning process group involves the Area Engineer with other technical staff like the surveyor undertaking a detailed field condition survey to identify the optimum design interventions such as the type of drainage and pavement structure for the prioritised road in the area.

Depending on the type of road i.e. trunk, feeder or urban road, a Quantity Surveyor from the road agency prepares an estimate based on the design information provided by the Area Engineer and the other technical staff of that particular road agency. The estimate is vetted by a senior Quantity Surveyor and an Engineer and it is sent to the MRH through the Regional Director or Engineer and National Director of the road agency for incorporation into the Ministry budget upon the estimate meeting all necessary requirements.

Approval is given for other procurement processes to be undertaken at the regional level of the road agency for the selection of a suitable contractor and award of contract signed by the Head of Tender Entity Committee depending on the threshold of the project.

These processes could also be undertaken by external or private consultants on behalf of any of the agencies under the MRH with prior approval from the sector Minister.

2.3.3 Execution Process Group

The execution process group comprise the processes required to complete the work in order to meet the project requirements. The execution process for a road construction begins with the handing over of the site (site possession) for the construction works to the contractor by the Project Manager through the Regional Director or Engineer of the road agency or private consultant on behalf of the agency. The Project Manager may also assign duties to the Project Manager's (Regional Director or Engineer) representative who shall act for and on behalf of the project manager to assist the Contractor in the acquisition of borrow pits.

2.3.4 Monitoring and Controlling Process Group

This process group track, review, regulates the progress and performance of a project, identify any areas in which changes to the plan are required and initiate the corresponding changes. Majority of the contract administration works between the road agency, contractor and other stakeholders takes place during the monitoring and controlling process group. Some of the activities at the monitoring and controlling process group include:

- Supervision and monitoring of quality of construction works;
- Control cost and ensuring timely completion of the contract;
- Monitor Contractor's works programme; and
- Verify and assess the work done.

2.3.5 Closing Process Group

The processes required to officially complete or close the project. The closing process group for a road construction projects begins at practical completion of works by the contractor. At practical completion, joint site inspection is undertaken by the officials from the road agency, Contractor, and other stakeholders. In accordance with Sub-Clause 54.1 of the Conditions of Contract for medium sized contracts, a certificate of completion is issued to the contractor by the Project Manager and the Defects Liability Period of the project commences as per time frame specified in the Conditions of Contract which is usually one year. The contractor makes good any constructional defects within the Defects Liability Period.

Another joint site inspection is undertaken by stakeholders at the end of the Defects Liability Period to ensure that all constructional defects have been corrected for Defects Liability Certificate to be issued to the Contractor.

2.4 PROJECT IMPLEMENTATION STAGE

The implementation stage of a road project includes the execution, monitoring and controlling and closing process groups. There can be delays at each stage of the project life cycle that can affect the completion of a proposed project. However, this research work focused on the implementation stage of road construction projects.

2.5 TYPES OF SCHEDULE DELAYS IN CONSTRUCTION PROJECTS

Lepage (2017) identified schedule delays in construction projects into four (4) main types. These delays include:

- i. Excusable or non-excusable delays;
- ii. Critical or non-critical delays;

- iii. Concurrent delays; and
- iv. Compensable or non-compensable delays.

2.5.1 Excusable or Non-Excusable Delays

Excusable delays are occasioned by unforeseen circumstances beyond the control of the client or contractor. Examples of excusable delays include but not limited to force majeure, delays caused by government agencies like granting of permits and delays caused by client. The contractor is usually entitled to extension of time or compensation or both.

Non-excusable delays are delays that are foreseen and within the control of the client or contractor. Examples of non-excusable include but not limited to delayed possession of site by the client, delayed mobilization to site, delayed procurement and non-performance by contractor. The contractor may be liable to pay damages like liquidated and ascertain damages (LAD) for non-excusable.

2.5.2 Critical or Non-Critical Delays

A delay is considered as a critical delay if it causes extension of a project duration. Causes of critical delay include but not limited to labour and material cost escalation.

A non-critical delay is a delay that is not a cause of extended project duration. A non-critical delay will still have an effect of getting activities completed late than scheduled completion. Example of non-critical delay cause include but not limited to idle labour and equipment cost.

Non-excusable delays can also result in extension of time and can be compensable or non-compensable depending on the circumstances leading to the delays.

2.5.3 Concurrent Delays

Concurrent delays occur when both the client and contractor are at fault. Concurrent delays can also occur when more than one delay event occurs at the same time.

2.5.4 Compensable or Non-Compensable Delays

A compensable delay occurs when the client or contractor is liable to extension of time. Example of compensable delay include but not limited to delayed possession of site by the client and delays due to discrepancies in design drawings. A non-compensable delay is caused solely by the contractor. Example of non-compensable delay include but not limited to idle labour and equipment cost.

However, non-compensable may fall under critical, non-critical, excusable or non-excusable; depending upon the situation it has created and conditions of contract.

2.6 PREVIOUS STUDIES INTO CAUSES OF DELAYS OF CONSTRUCTION PROJECTS

Delays in completion of construction projects had been experienced in many projects across the world. Zidane et al. (2017) observed that the causes of delays differ from one country to another. This may be due to different situations in each country such as working culture, construction methods, environment, geographical location, stakeholders, government policy, economic situation, availability of resources and political climate of the country.

Some of the literatures reviewed in conducting this research work include but not limited to the following:

2.6.1 Causes of Delay in Public Construction Projects in Iraq

Bekr (2015) conducted a study into the most important causes of delay of public projects in Iraq. The causes of delays identified were attributed to three main parties

in the construction industry. The causes were client related, contractor related and consultant related. Another delay factor identified was external factors.

2.6.1.1 Client Related Causes of Delay

Bekr (2015) identified in the studies that project awarded to lowest evaluated bidder by client is the most crucial delay factor in public projects in Iraq. Other causes of delay related to clients in Iraq include design changes by the client, delayed in payment certificate, inexperience by client in supervising projects and difficulties in obtaining work permits.

2.6.1.2 Contractor Related Causes of Delay

Bekr (2015) identified delays to public project caused by contractors include poor qualification, lack of skills, inexperience of contractor's key personnel, poor supervision of subcontractors, cash flow problems encountered by contractors, slow preparation of change order request by contractor, poor planning and scheduling of the project by the contractors. Other delay factors identified include poor site management, lack of supervision, improper construction methods, poor site management, lack of supervision by the contractor, inappropriate construction methods and problems relating to quality of materials used for the construction.

2.6.1.3 Consultant Related Causes of Delay

Design changes was identified to be the most crucial cause of delay related to consultants for public projects in Iraq. Other causes of delay identified in the studies by Bekr (2015) which relates to consultants include inadequate qualification of the consultant to the project, deficiency in drawings, poor qualification by staff of the consultants and deficiency in drawings. The least important factor under consultant related causes of delay is discrepancies in contract documents.

2.6.1.4 Delay Causes due to External Factors

Bekr (2015) identified that poor security measures in the locality in Iraq were projects are undertaken was the most crucial cause of delay due to external factors. Other external related causes of delays include changes in government policies and bureaucracy, statutory and non-statutory holidays, poor community stakeholders' relations, economic conditions and lack of communication between parties.

2.6.2 Causes of Delays in Road Construction Projects in Kenya

Seboru (2015) carried out an investigation into factors causing delays on road construction projects in Kenya. Five major causes of delay were identified by both consultants and contractors. These five causes include delayed payment for work done by client, slow decision making and bureaucracy in government organization, claims, inadequate planning/scheduling and rain.

The consultants identified five top causes of delay for road construction projects in Kenya and these were delayed payment, slow decision making and bureaucracy in government organization, inadequate planning/scheduling, different site conditions and proximity to borrow pit.

Contractors that were involved in the research work also identified five top causes of delay for road construction projects in Kenya. The causes of delays include slow decision-making and bureaucracy in government organization, delayed payment by client, certificates preparation by engineers', claims and rain.

2.6.3 Causes of Delays by Project Consultants and Designers in the Gulf Region

Atout (2016) conducted a study on the main causes of delay in major infrastructure and building projects in Dubai and other Gulf countries caused by project consultants and designers.

The research work by Atout (2016), classify the main causes of delay in the Gulf region into cultural factors, work environment factors, common factors of delays caused by consultancy office and phases of project design factors.

2.6.3.1 Cultural Factors

Atout (2016), noted that the influx of foreign consultants into the Gulf region had caused a cultural difference between the foreign consultants and the indigenes. This had resulted in communication gap and the inability to understand the objectives of projects by these foreign consultants to meet the expectations of the indigenes. The research by Atout (2016), also identified cultural differences between the foreign consultants and the clients in the Gulf region due to differences in religion, habits and traditions.

2.6.3.2 Work Environment by Consultants

Atout (2016), observed that the inability by project consultants and designers to identify, describe, quantify and specify the work elements of projects precisely is a major cause of delay in the Gulf region.

Lack of experience by the Resident Engineer of the consultants in the overall supervision of site duties of contractors was another major cause of delays by consultants. The inexperience acts by the Resident Engineer causes major contractual conflicts with the contractor which affect the progress of work. Anderson (1997), stated that project would never be completed on time due to lack of experience in contract administration by the consultant engineer and the contractor project manager.

2.6.3.3 Common Factors of Delays Caused by Consultancy Office

Atout (2016), identified major causes of delay by the consultant office. These include incomplete drawings, discrepancies of contract documents, the inability of effectively managing the contracts and poor appreciation of the design management process. Emad (2008), also noted that lack of information about the type of contracts, standard specifications and major design criteria to Resident Engineer are some of the major causes of delays to projects in the construction industry in the Gulf region.

2.6.3.4 Phases of Project Design

According to Atout (2016), project consultants and designers are not finalizing designs that comprehensively document the different phases of projects in the Gulf regions. The phases interact with each other to ensure that the project objectives are achieved. Atout (2016), further noted that the Resident Engineer should be familiar with these phases so as to argue, discuss and communicate with all project stakeholders. Al Khalil, (1999) stated that clients may become frustrated when there is limited interaction between them and consultants at the design phase.

2.6.4 Causes of Delays in Construction Projects in Norway

Zidane et al. (2017) investigated the causes of delays facing the Norwegian construction industry. These causes identified include poor planning and scheduling, poor decision-making process, internal administrative procedures and bureaucracy within project organization, shortage of resources, poor communication and coordination between parties, slow quality inspection process of the completed work, design changes during the stage, lack of commitment by the client, incomplete designs, office and users' issues.

Zidane et al. (2017) further identified ten (10) critical universal causes of delay for construction projects based on an intensive study of one hundred and three (103) existing literature that covers forty-six (46) countries globally. The ten (10) universal causes are changes in design, delays in payment of work done by contractors, poor planning and scheduling, poor site management and supervision, incomplete design drawings, inadequate contractor experience, financial difficulties by contractors, client financial difficulties, inadequate resources and poor labour productivity and shortage of skills.

2.6.5 Causes of Road Construction Projects in Egypt

Aziz and Abdel-Hakam (2016) conducted a study on causes of delay of road construction projects in Egypt and compiled Two Hundred and Ninety-Three (293) combination of causes of delay in road construction projects in Egypt. These delay causes were ranked by consultants, contractors, site/design engineers to determine the major and least causes of delay.

The consultants ranked the government's financial problems as the first cause affecting delays in road construction projects in Egypt. Other causes of delay ranked by the consultants include conflict, war, revolution, riot, public enemy, difficulty in coordination between different parties and changes in client's requirements.

According to Aziz and Abdel-Hakam (2016), the contractors also ranked the government's financial problems as the first cause of delay to road construction projects in Egypt. Other causes of delay ranked by the contractors include cash-flow problems during construction, delayed payment of work done, lack of experience by consultants, inability to obtain permits from regulating bodies on time and excessive bureaucracy.

The site/design engineer's also ranked government financial problems as the first cause of delay to road construction projects in Egypt. Other causes of delays ranked by the site/design engineers include shortages in equipment, materials and skilled operators, site management and supervision and contractor's inexperience in soil investigation.

2.6.6 Causes of Delays to Construction Projects in India

Razdan and Goyal (2019) also conducted studies on causes of delays, effects and mitigation measures of construction projects in India. Razdan and Goyal (2019) posited that the main reasons for delays are client and contractor related.

2.6.6.1 Client Related Delays

The studies by Razdan and Goyal (2019) identified unrealistic project scope, inadequate early planning, lack of risk management systems and delays to design drawings and approvals of same by client as the major causes of delay by clients to construction projects in India.

2.6.6.2 Contractor Related Delays

According to Razdan and Goyal (2019), delay causes that are contractor related include overambitious estimates, incorrect task assessment, lack of task clarity and inadequate contractor and subcontractor experience.

However, Razdan and Goyal (2019) identified other types of delays in the construction industry in India.

2.6.6.3 Consultant Related Delays

The causes of delays attributed to consultants by Razdan and Goyal (2019) include delays in approving major changes in the scope of works, discrepancies in design drawings, lack of engineering design software, lack of details in design drawings,

delays in producing design drawings, insufficient data collection, lack of communication and coordination and inadequate experience of consultants.

2.6.6.4 Material Related Delays

Razdan and Goyal (2019) identified the delay causes which are material related as delays in material delivery, materials shortage in the market, changes in the type of material during construction, delay in the manufacturing of special building materials and damage of sorted material when in need.

2.6.6.5 Labour Related Delays

The causes of labour related delays identified by Razdan and Goyal (2019) include shortage of labour, low productivity levels of labour, working permit of labour and personal conflict among labours.

2.6.6.6 External Related Delays

Razdan and Goyal (2019) identified the causes of delays related to external factors as ground conditions, effect of the weather on construction activities, delays due to utility service providers, delays due to permits from regulatory agencies, traffic controls and restrictions at construction site, changes in government regulations and laws, delay in final inspection and accident during construction.

2.6.7 Causes of Delays in Construction Projects of Punjab-Pakistan

Rahsid et al. (2013) also conducted studies into causes of delays in construction projects in the Punjab province of Pakistan. The studies identified delayed factors related to contractor, client, consultant, material, equipment, labour and general environmental factors.

2.6.7.1 Contractor Related Factors Causing Delay in Project Execution

Rahsid et al. (2013) posited that contractor related factors causing delays include financial challenges, rework due to errors, lack of communication and coordination, poor planning and scheduling of project, poor construction methods and inadequate contractor's works programme.

2.6.7.2 Client Related Factors Causing Delay in Project Execution

The research work by Rahsid et al. (2013) identified client related factors to delays in Punjab, Pakistan as delayed payment of work done, delayed handing over of site to contractors, variation orders, delayed approval of designs, approving shop and sample material, lack of communication and coordination, slow decision making, conflict between partners and suspension of work.

2.6.7.3 Consultant Related Factors Causing Delay in Project Execution

Two main factors were identified as causes of delay related to consultants by Rahsid et al. (2013). These include changes in project scope causing rework and rescheduling of projects.

2.6.7.4 Material Related Factors Causing Delay in Project Execution

Material related factors causing delay in project execution identified by Rahsid et al. (2013) at Punjab-Pakistan include shortage in construction raw materials, challenges in supply and poor quality of material, delay in material delivery and late procurement of material.

2.6.7.5 Equipment Related Factors Causing Delay in Project Execution

Rahsid et al. (2013) further identified breakdown and shortage of equipment, lack of technical know-how in operating equipment, outmoded equipment and lack of high-

tech equipment as equipment related factors causing delay in project at Punjab-Pakistan.

2.6.7.6 General and Labour Related Factors Causing Delay in Project Execution

According to research work by Rahsid et al. (2013), general and labour related factors had insignificant impact on project delays at Punjab-Pakistan. Rahsid et al. (2013) identified the general factors causing delays as delay in obtaining permits from regulating agencies, inclement weather condition, accidents at construction sites and delays in final inspection and certification of work done. The general factors causing delays were shortage of labourers, low productivity level of labourers and conflicts among labourers.

2.6.8 Critical Road Project Delay Factors in Ghana

Amoatey and Ankrah (2017) also conducted studies into critical road project delay factors in Ghana. Ten (10) top major causes of road construction delays were identified by Amoatey and Ankrah (2017) and these include:

1. Delayed payment of work done by government (client-related);
2. Inadequate experience by contractors (contractor-related);
3. Scope changes initiated by the client (client-related);
4. Delayed site possession (client-related);
5. Rigid funding requirements for projects by donors (donor-related);
6. Contractor's inability to self-finance project (contractor-related);
7. Delay in mobilising to site (contractor-related);
8. Delay in the preparation of shop drawings (contractor-related);
9. Lack of proactive in decision making (client-related);
10. Rework due to errors by contractor (contractor-related);

It is observed from the delay factors above that four (4) were client related, one (1) was donor related factors and five (5) were contractor related. and zero (0) consultant related factors.

Five (5) major causes of delays in road projects identified by the research of Amoatey and Ankrah (2017) are further reviewed below:

2.6.8.1 Delayed Payment of work done by Government

The research work undertaken by Amoatey and Ankrah (2017) identified that four project parties namely Government, Contractors, Consultants and Development Partners ranked delayed payment by government for work done by contractors as the most critical delay factor in the construction industry in Ghana. Delayed payment was common with Government of Ghana sponsored projects. Frimpong et al. (2003) had also cited monthly payment difficulties as the most ranked cause of construction delays in Ghana.

2.6.8.2 Inadequate Experience by Contractors

Inadequate experience by contractors was ranked the second most important cause of delay for construction projects in Ghana by the research work undertaken by Amoatey and Ankrah (2017). This ranking was collaborated by Ubaid (1991) who ranked inadequate experience by contractors as the most cause of delay in Saudi Arabia.

2.6.8.3 Scope Changes initiated by the Client

According to Amoatey and Ankrah (2017), the third causes of delay of road construction projects in Ghana is scope changes initiated by the client during construction. Earlier studies conducted by Kaming et al. (1997) also confirmed that

scope changes initiated by the client is a primary cause of scope creep in Indonesia which results in time and cost overruns.

2.6.8.4 Delayed Site Possession

Amoatey and Ankrah (2017) identified delayed site possession to the contractor as the fourth ranked most critical cause of delay to road projects in Ghana.

2.6.8.5 Rigid funding requirements for projects by donors

The fifth most critical cause of delay identified by Amoatey and Ankrah (2017) was rigid funding requirements for donor sponsored projects. This happens when donors' objects to funds being reallocated to different budget lines. Approval process for the different budget lines takes so long that by the time approval is granted a lot of time has been lost resulting to project delays.

The study of Van et al., (2015) also reported that delays resulting from consultants delay the completion of projects. This study indicated that the three most influential factors of project completion are information delays and lack of information exchange between the parties, incompetent owner, and incompetent supervision consultant. Chan and Kumaraswamy (1997) observed that poor risk management and supervision, unforeseen site conditions, slow decision making, client-initiated variations and work variations are critical causes of delays in construction works. Kaming et al., (1997) also attributed related delays to design changes, poor labour productivity, inadequate planning, and resource shortages. In the study of Frimpong et al., (2003), monthly payment difficulties from agencies, poor contractor management, material procurement, poor technical performance and escalation of material prices were reported as the main causes of delay and cost overruns in construction of groundwater projects. Factors also related to financial and payment problems, poor contract management, inaccurate estimation, improper planning, poor

site management, insufficient experience, and shortage of materials and equipment have also been reported as causes of delays in the construction industry (Fugar and Agyakwah-Baah, 2010; Haseeb et al., 2011).

2.7 EFFECTS OF DELAYS ON CONSTRUCTION PROJECTS ACROSS THE WORLD

Owolabi et al. (2014), Bekr (2015), Sha et al. (2017) and Razdan and Goyal (2019) identified the following as the major effects of construction project delays:

- a) Time overruns;
- b) Cost overruns;
- c) Disputes;
- d) Distrust;
- e) Growth in adversarial relationships;
- f) Claims;
- g) Total abandonment;
- h) Declination of parties' reputation;
- i) Arbitration; and
- j) Litigation.

2.8 MITIGATION MEASURES TO CAUSES OF DELAYS IN CONSTRUCTION PROJECTS ACROSS THE WORLD

Seboru (2015) recommended that clients should improve their financial management systems to enable them pay contractors on time to mitigate delays for construction projects in Kenya. Seboru (2015) further suggested that claims should be settled within the timelines stipulated in the contract. Besides, contractors are also to undertake constructional activities that would not be affected during raining seasons.

Kamanga et al. (2013) also suggested that there should also be payment guarantee clause in contracts just like the performance bond to enable contractors demand payment from the guarantor should the clients failed to honour payment within the stipulated time. Bureaucracy should also be reduced within the client organisation to speed up decision making process.

Razdan and Goyal (2019 (2019) recommended that since conflicts is inevitable in any human institution, all stakeholders are to appreciate that fact for conflicts to be resolved amicably. Conflict management system should also be in place to resolve all differences among stakeholders.

Rahsid et al. (2013) made a number of recommendations to enable construction firms mitigate delays in construction projects. Construction firms are to design an effective system for making timely payment from the client and from the main contractor to sub-contractor and staff. Construction firms are also to have a good working relationship with the client. Rahsid et al. (2013) further suggested that there must be quality control mechanism for materials that would be incorporated into the works. The construction firms must have enough construction materials throughout the construction period.

Amoatey and Ankrah (2017), suggested that to mitigate delay in payment of work done, the client should ensure proper planning, costing and budgeting for road works during the pre-contract period. To mitigate delays caused due to inadequate contractor experience, Amoatey and Ankrah (2017) recommended that contractors should pay attention to the project requirements before tendering for the project. To mitigate delays due to changes of scope by the owner during construction, Amoatey and Ankrah (2017) propose that the client should be involved in discussing the

project requirements right from the project initiation stage. The project scope must also be agreed by the contractor and client before the project commences.

Aziz and Abdel-Hakem (2016) suggested that the first step in reducing delays in road construction is to understand the root causes of the delay. Zidane et al. (2017) noted that the identification of delay factors and causes of construction projects is to enable appropriate mitigation measures to be undertaken in order to deliver projects on schedule or ahead of schedule.

Majority of the research work on the causes of delays on construction projects relates to the building industry. In Ghana, it was observed from the literature reviews that only Amoatey and Ankrah (2017) had explored delays factors in the road construction industry in Ghana from the view point of four (4) project stakeholders namely Government, Contractors, Consultants and Development Partners. However, it was observed from the research work by Amoatey and Ankrah (2017) that no delay was attributed to consultants from the ten (10) most ranked causes of delay in the road projects in the country.

The public would generally blame the government for delays in completion of road projects in the country due to delays in payment for work done by contractors as confirmed by Amoatey and Ankrah (2017) to be the most ranked cause of delay. But how does consultants who manages the implementation of these road projects on behalf of the governments also contributes to these delays in the completion of these road projects? This research work further undertakes an in-depth study on key causes of delays caused by consultants in the implementation of road construction projects in Ghana.

The effects of these delays on contractors in completing projects and mitigation measures to the delays caused by consultants in the implementation of projects are also identified in this research work.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

Chapters one and two contained the introduction and literature review respectively for this research work. This chapter expatiates further on the methodology used for the study. It includes research design, research method, population of study, sampling size and sampling technique data collection, data analysis and ethical considerations.

3.2 RESEARCH DESIGN

Creswell (2014), pointed out that a research design is a strategy or plan to solve a research problem. Naoum (2013), further explained research design as a plan that matches with the outline for collecting and analysing data. It also provides connection between raw data and its conclusion in a logical flow to the research objectives and questions. Oppenheim (2003) pointed out that an advantage of using questionnaires survey to collect data is their ability to be used for generalization. Besides, questionnaire survey enhances consistency of observations. A questionnaire survey was therefore adopted for this study.

3.3 RESEARCH METHOD

Creswell (2014), identifies three main research methods for a research work. The methods include quantitative, qualitative methods and mixed methods. This study adopted the quantitative method and questionnaires was used in gathering the data. Questionnaires has the ability to obtain conclusive findings for generalization and to recommend a final course of action based on the findings.

3.4 POPULATION OF STUDY

Naoum (2013), defined population as the totality or wholeness of collection of individuals or objects. The population for this research work includes the technical staff of the three road agencies under the MRH namely GHA, DFR and DUR and private consultants engaged by these agencies in the Ashanti Region.

A preliminary visit to the three road agencies under the MRH and private consulting firms in the Ashanti Region reveals the following technical staff strength:

Table 3.1 Technical Staff Strength

ROAD AGENCY	TECHNICAL STAFF
GHA	18
DFR	17
DUR	10
AWERE KYERE & ASSOCIATES	5
ABP CONSULT	5
TOTAL	55

DUR had engaged the services of two (2) private consultants on their projects. The GHA and DFR had not engaged the services of private consultants on any of their projects at the time of the visit.

3.4.1 Sample size

Sample is a group of units selected as part of a study unit. Miaoulis and Michener (1976) identified several approaches in determining a sample size for a research work. Examples of these approaches include using a census for small populations, adopting a sample size of similar studies, using published tables and application of formulas to calculate a sample size. Miaoulis and Michener (1976) further posited that a census is attractive for research work with a small population of two hundred (200) or less to achieve a desirable level of precision. The entire population is

therefore the same as the sample size. The sample size for this research work is fifty-five (55) as shown in Table 3.1.

3.4.2 Sampling Technique

Naoum (2013), defined sampling as a process of choosing the research units from a target population. Naoum (2013) identifies two main sampling techniques which includes probability sampling and non-probability sampling. A census sampling which is a form of non-probability sampling technique was used to engage the entire population for the sample size for this research work.

3.5 DATA COLLECTION

Naoum (2013) identifies two approaches to data collection. The two approaches to data collection are primary data collection which involves surveys, observations, personal interview and questionnaire. Secondary data is the already existing data by the road agencies such as their respective road lengths in the Ashanti Region. The two approaches to data collection were adopted to give credibility to this study.

3.5.1 Primary and Secondary information

Questionnaire was used to solicit primary information from respondents at first-hand through answers provided on the questionnaire. Secondary information was also obtained by the data provided by the road agencies on current road length and technical staff strength of the three road agencies and private consultants in the Ashanti Region.

3.5.2 Questionnaire design

Questionnaires were designed to help achieved the aim and objectives of this research. The questions in the questionnaires were close ended and scaled. The Likert scale of response was used to measure the intensity and strength of the

respondents. Naoum, (2013) identified that respondents can be reached in a short spate of time when questionnaire are self-administered. The first section of the questionnaire covered the respondents' profile while the second part tackled the specific objectives of this research work. All the questionnaires were self-administered and retrieved in person.

3.6 DATA ANALYSIS

There are two choices for statistical considerations. These include non-parametric and parametric tests. Non-parametric statistical testing was used in this study. The Statistical Package for the Social Sciences (SPSS) software was used for the inputting and editing of collected data. The statistical methods employed in analysing data were descriptive statistics, mean score ranking, relative importance index (RII), correlational analysis and multiple regression method.

The relative importance index technique was employed by Kometa et al. (1994) to determine the relative importance of the various causes and effects of delays. The same method is employed in this study to rank the severity of the various causes of delays caused by consultants in the implementation of road construction projects. The five-point scale ranging from 1 (Not important at all) to 5 (Very important), 1 (Not severe at all) to 5 (Very severe) is employed in the derivation of the weights and the associated relative importance indices (RII) for each factor using the formula below:

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

Where, W is the weighting given to each factor by the respondents (ranging from 1 to 5), A is the highest weight (i.e. 5 in this case), and N is the total number of

respondents (N=55). The RII value had a range from 0 to 5 (0 not inclusive), higher the value of RII, more important was the cause of delays. The RII was used to rank (R) the different causes. These rankings made it possible to cross-compare the relative importance of the factors as perceived by the consultants surveyed.

3.7 ETHICAL CONSIDERATIONS

Respect for dignity of research participants were given the utmost priority. Consent of participants was sorted first, information and data provided by research participants and the various road agencies were used solely for the purpose of the research work and no other purposes and the privacy of research participants accorded the needed attention. Not only were these, but confidentiality of data and information provided by the road agencies and the research participants were also not divulged to any third party.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

This chapter presents the data of the study, analyses and discusses the result. The areas discussed in the chapter were the profile of the respondent, causes of delays in road construction, effects of delays in construction on completion of projects and the measures to mitigate the delays caused by consultants in road construction projects.

4.2 RESPONDENT PROFILE

This section of the study examines or discusses the profile of the respondent and their involvement in delayed road construction projects. The demographic profile of the respondent discussed were the category of profession of the respondent, the years the respondent have been in practice, the respondent involvement in delayed road construction projects and the source of funding for the road construction projects.

Majority (87.3%) of the respondent agreed to have been involved in road projects that delayed in completion whereas 12.7% indicated otherwise. The construction projects of the companies of the majority (76.4%) of the respondent relied on Ghana Road Funding. Besides, 9.1%, 1.8% and 12.7% of the construction projects of the companies of the respondent was funded by COCOBOD Fund, Consolidated Fund and Donor Sponsored respectively. It is evident from the study that the implementation of road construction projects in Ghana is financed from both local and external sources (Nyasulu et al., 2003).

4.3 CAUSES OF DELAYS CAUSED BY CONSULTANTS IN ROAD CONSTRUCTION PROJECTS

This part of the study identifies the possible causes of the delays in road construction projects. In the questionnaire, 26 items were presented to respondent to indicate the level of severity of each factor as a major cause of delays in road construction projects through a five pointer Likert-scale measurement method. The result is presented in Table 4.1 through descriptive and RII statistical analytical methods.

Table 4.1: Causes of Delays in Road Construction

Delays	RII	Mean	Rank
Executing Stage			
Delayed site possession	0.469	2.35	25th
Difficulty in acquiring borrow pit	0.538	2.69	22nd
Poor co-ordination among staff	0.502	2.51	23rd
Poor communication among staff	0.585	2.93	14th
Discrepancies in BoQ as against ground condition	0.655	3.27	6th
Delayed issues of contract document	0.575	2.87	18th
Poor contract documentation	0.593	2.96	11th
Unrealistic imposition of project duration	0.567	2.84	20th
Award of project to bidders with unrealistic price	0.644	3.22	7th
Monitoring and Controlling Stage			
Inadequate supervision	0.585	2.93	14th
Bureaucracy and slow decision-making process	0.662	3.50	4th
Inexperience among consultant staff	0.560	2.80	21st
Conflicting site instructions from consultants' staff	0.593	2.96	11th
Political influence on consultant staff	0.662	3.50	4th
Delays in vetting of contractor's invoice	0.640	3.20	8th
Delays due to software usage in certificate preparation	0.571	2.85	19th
Delays in issuing variation of works	0.709	3.55	2nd
Multiple variations orders on same project	0.742	3.71	1st
Lack of adequate technical staff	0.618	3.09	9th
Inadequate fuel and logistics	0.676	3.53	3rd
Project documents missing from project files	0.462	2.31	26th
Documents not properly filed	0.480	2.40	24th
Closing Process Stage			
Unresolved claims	0.589	2.95	13th
Delays in undertaking final site inspection	0.575	2.87	18th
Delays in final certificate preparation	0.582	2.91	16th
Delays in final account preparation	0.596	2.98	10th

[1=Not severe at all; 2=Not severe; 3=Neutral; 4= Severe; 5=Very severe]

Source: Field Survey (2019)

Table 4.1 shows that the respondent does not perceive delayed sit possession as a severe cause of road construction delays (\bar{x} =2.35). Based on the result of the relative importance index, delayed sit possession as a cause of road construction delay was ranked 25th among a total of 26 items or factors. Thus, delayed sit possession was

the factor least considered as a cause of delay in road construction. However, the respondents were uncertain or neutral about factors such as the difficulty in acquiring borrow pit, poor co-ordination among staff, poor communication among staff, discrepancies in BoQ as against ground condition, delayed issues of contract document, poor contract documentation, unrealistic imposition of project duration and award of project to bidders with unrealistic price as causes of road construction delays in Ghana as indicated by the approximate mean response of 3.0. Thus, not many of the factors at the execution stage of road construction were deemed as severe cause of delays in road construction in Ghana. The two highest ranked factors as causes of delays in road construction at the execution stage based on the RII were discrepancies in BoQ as against ground condition and award of project to bidders with unrealistic price with RII values of 0.655 and 0.644 and ranked 6th and 7th respectively. These findings are supported by the study of Razdan and Goyal (2019) that also reported award of project to bidders with unrealistic price and discrepancies in BoQ as against ground condition as critical causes of delays to construction projects in India.

Table 4.1 shows that the respondent perceived multiple variations orders on same project as a severe cause of delays in road construction as indicated by approximate mean response of 3.71. Multiple variations orders on same project as a cause of delays in road construction produced the highest RII value of 0.742 suggesting that the respondent perceived this factor as the most important or critical or highest ranked cause of delays in road construction in Ghana. This result is consistent with the study of Rahsid et al. (2013) that also reported multiple variation orders as a severe cause of construction delays in Punjab in Pakistan. The respondent also perceived delays in issuing variation of work as a severe cause of delays in road

construction in Ghana ($\bar{x}=3.55$). Thus, delays in issuing variation of works with RII value of 0.709 was ranked as the second highest cause of delays in road construction in Ghana. It is therefore evident that delays related to variation orders at the monitoring and controlling stage are perceived as the critical causes of delays in road construction in Ghana. This result is consistent with the study of Rahsid et al. (2013) that also reported issuing variation of works as a severe cause of construction delays in Punjab in Pakistan. Inadequate fuel and logistics were also perceived as severe cause of delays in road construction in Ghana ($\bar{x}=3.53$). The RII value of 0.676 of inadequate fuel and logistics implies that this factor is perceived as the third highest cause of delays in road construction in Ghana. This finding is consistent with several previous studies that also reported material and logistic shortages as major cause of delays in construction projects (e.g. Rahsid et al., (2013); Bekr (2015); Aziz and Abdel-Hakam (2016); Razdan and Goyal (2019).

The influence of politicians on consultants' staff is also perceived as a severe cause of delays in road construction in Ghana ($\bar{x}=3.50$). Based on the RII value of 0.662, political influence on consultants' staff was ranked as the 4th highest cause of delays in road construction in Ghana. This finding is consistent with several previous studies that also reported external factors like political influence as major cause of delays in construction projects (e.g., Bekr (2015); Aziz and Abdel-Hakam (2016); Zidane et al., (2017); Razdan and Goyal (2019). The bureaucracy and slow decision-making process is also perceived as a severe cause of delays in road construction in Ghana ($\bar{x}=3.50$). Based on the RII value of 0.662, bureaucracy and slow decision-making process was ranked as the 4th highest cause of delays in road construction in Ghana. This finding is consistent with several previous studies that also reported bureaucracy and slow decision-making process as major cause of delays in

construction projects (e.g., Kamanga et al., (2013); Bekr (2015); Seboru (2015); Aziz and Abdel-Hakam (2016); Zidane et al., (2017). However, the respondent deemed factors such as project documents missing from project files and documents not properly filed with mean response of 2.31 and 2.40 respectively as less severe causes of delays in road construction in Ghana. It is evident from Table 4.2 that the critical and severe causes of delays in road construction are in the monitoring and controlling stage of road construction.

Table 4.1 also show that the respondents were generally uncertain or neutral about factors such as unresolved claims, delays in undertaking final site inspection, delays in final certificate preparation and delays in final account preparation as causes of delays in road construction in Ghana as indicated by the approximate mean response value of 3.0. Thus, none of the factors in the closing process stage were perceived as severe causes of delays in road construction.

4.4 EFFECTS OF DELAYS IN CONSTRUCTION ON COMPLETION OF PROJECTS

This part of the study examines the causal effect of delays in construction on the completion of road construction projects. The effect was examined and presented using varying statistical methods. The statistical methods employed were descriptive statistics, RII, correlational analysis and multiple regression method.

4.4.1 Descriptive and Relative Importance Index

This part of the study identifies the possible effect of the delays in construction on the completion of project. In the questionnaire, 19 items were presented to respondent to indicate the level of severity of each factor as an effect of delays in construction on the completion of projects through a Likert-scale measurement

method. The result is presented in Table 4.3 through descriptive and Relative Importance Index statistical analytical methods.

Table 4.2: Description of the Effect of Construction Delays on Completion Projects

Factors	RII	Mean	Rank
Increased loan interests	0.858	4.29	1 st
Claims of extension of time and/or compensation	0.829	4.15	2 nd
Increased cost of project	0.822	4.11	3 rd
Cash flow challenges	0.818	4.09	4 th
Completing project beyond set date	0.800	4.00	5 th
Increased in overhead cost of contractors	0.800	4.00	5 th
Refusal to complete the work by contractors	0.745	3.73	7 th
Bad contractor reputation	0.738	3.69	8 th
Poor project performance	0.724	3.62	9 th
Laying off workers	0.720	3.60	10 th
Loss of other business opportunities	0.713	3.56	11 th
Sale of assets of contractors	0.713	3.56	11 th
Bankruptcy on the part of contractors	0.709	3.55	13 th
Psychological and health challenges of contractors	0.698	3.49	14 th
Rework of already completed work	0.684	3.42	15 th
Dispute with consultants and creditors	0.680	3.40	16 th
Disagreement leading to arbitration	0.676	3.38	17 th
Refusal to co-operate with consultants	0.644	3.22	18 th
Conflicts leading to the law courts	0.633	3.16	19 th

Rank: [1=Not severe at all; 2=Not severe; 3=Neutral; 4= Severe; 5=Very severe]

Source: Field Survey (2019)

Table 4.2 shows that the respondent perceived increased interest on loans as a severe effect of road construction delays on delays in the completion of projects (\bar{x} =4.29). Increased interest on loans with RII value of 0.858 was ranked as the highest effect of delays in road construction on the completion of projects. The claims of extension of time and/or compensation is also deemed as a severe effect of road construction delays on delays in the completion of projects (\bar{x} =4.15). The claims of extension of

time and/or compensation with RII value of 0.829 was ranked as the second highest effect of delays in road construction on the completion of projects. The increased cost of project is also deemed as a severe effect of road construction delays on delays in the completion of projects (\bar{x} =4.11). The Increased cost of project with RII value of 0.822 was ranked as the third highest effect of delays in road construction on the completion of projects. The cash flow challenges are deemed as a severe effect of road construction delays on delays in the completion of projects (\bar{x} =4.09). The cash flow challenges with RII value of 0.818 was ranked as the fourth highest effect of delays in road construction on the completion of projects. These findings are supported by several previous studies that also reported increased loan interests, claims of extension of time and/or compensation, increased cost of project and cash flow challenges as key effects of construction delays on completion projects (e.g., Owolabi et al., (2014); Bekr (2015); Sha et al., (2017); Razdan and Goyal(2019).

Table 4.2 shows that the respondent perceived completing project beyond specified completion date as a severe effect of road construction delays on delays in the completion of projects (\bar{x} =4.00). Completing project beyond specified completion date with RII value of 0.800 was ranked as the fifth highest effect of delays in road construction on the completion of projects. The increased in overhead cost of contractors is also deemed as a severe effect of road construction delays on delays in the completion of projects (\bar{x} =4.00). The Increased in overhead cost of contractors with RII value of 0.800 was ranked as the fifth highest effect of delays in road construction on the completion of projects. The refusal to complete the work by contractors is also deemed as a severe effect of road construction delays on delays in the completion of projects (\bar{x} =3.73). The refusal to complete the work by contractors with RII value of 0.745 was ranked as the seventh highest effect of delays in road

construction on the completion of projects. The bad contractor reputation is deemed as a severe effect of road construction delays on delays in the completion of projects ($\bar{x}=3.69$). The bad contractor reputation with RII value of 0.738 was ranked as the eighth highest effect of delays in road construction on the completion of projects. These findings are supported by several previous studies that also reported completing project beyond set date, increased in overhead cost of contractors, refusal to complete the work by contractors and bad contractor reputation as key effects of construction delays on completion projects e.g., Owolabi et al., (2014); Bekr (2015); Sha et al., (2017); Razdan and Goyal (2019).

Table 4.2 shows that the respondent perceived poor project performance as a severe effect of road construction delays on delays in the completion of projects ($\bar{x}=3.62$). Poor project performance with RII value of 0.724 was ranked as the ninth highest effect of delays in road construction on the completion of projects. The laying off workers is also deemed as a severe effect of road construction delays on delays in the completion of projects ($\bar{x}=3.60$). The laying off workers of contractors with RII value of 0.720 was ranked as the tenth highest effect of delays in road construction on the completion of projects. The loss of other business opportunities is also deemed as a severe effect of road construction delays on delays in the completion of projects ($\bar{x}=3.56$). The loss of other business opportunities with RII value of 0.713 was ranked as the eleventh highest effect of delays in road construction on the completion of projects. The sale of assets of contractors is deemed as a severe effect of road construction delays on delays in the completion of projects ($\bar{x}=3.56$). The sale of assets of contractors with RII value of 0.713 was ranked as the eleventh highest effect of delays in road construction on the completion of projects. The bankruptcy on the part of contractors is deemed as a severe effect of road

construction delays on delays in the completion of projects ($\bar{x}=3.55$). The bankruptcy on the part of contractors with RII value of 0.709 was ranked as the thirteenth highest effect of delays in road construction on the completion of projects. These findings are supported by several previous studies that also reported poor project performance, laying off workers, loss of other business opportunities, sale of assets of contractors and bankruptcy on the part of contractors as key effects of construction delays on completion projects e.g. Owolabi et al., (2014); Bekr (2015); Sha et al., (2017); Razdan and Goyal (2019).

4.4.2 Correlational Analysis

This section of the study employs bivariate Spearman's correlational analysis in examining the relationship between the causes of delays in road project construction and delays in the completion of project. The two important areas examined by the Spearman's correlation are the magnitude of the relationship indicated by the Spearman's rho and the direction of the relationship.

Table 4.3 shows that there is positive correlation between site possession as a cause of delay in road construction and delays in project completion ($r=.328$, $P<.01$). This result suggests that increasing road construction delays due to site possession related factors is associated with increasing delays in the completion of projects. This finding is consistent with the study of Amoatey and Ankrah (2017) that also reported that increasing delays construction resulting from site possession is also associated with increasing delays in project completion. The co-ordination and communication lapses as a cause of delay in road construction is positively correlated with delays in project completion ($r=.474$, $P<.01$). This result suggests that increasing road construction delays due to poor co-ordination and communication related factors is associated with increasing delays in the completion of projects. This result is

consistent with previous studies that also reported that increasing delays due to poor co-ordination and communication is associated with increasing delays in the completion of projects e.g., Rahsid et al., (2013); Bekr (2015); Zidane et al., (2017); Razdan and Goyal (2019).

The contract documentation lapses as a cause of delay in road construction is positively correlated with delays in project completion ($r=.566$, $P<.01$). This result suggests that increasing road construction delays due to poor contract documentation is associated with increasing delays in the completion of projects. This result is consistent the studies of Bekr (2015) and Atout (2016) that also reported that increasing contract documentation lapses is associated with increasing delays in the completion of projects. The scheduling and controlling lapses as a cause of delays in road construction is positively correlated with delays in project completion ($r=.611$, $P<.01$). This result suggests that increasing road construction delays due to poor scheduling and controlling is associated with increasing delays in the completion of projects. This result is consistent with previous studies that also reported that increasing delays due to scheduling and controlling is associated with increasing delays in the completion of projects e.g. Rahsid et al., (2013); Bekr (2015); Zidane et al., (2017); Razdan and Goyal (2019).

The supervision lapses as a cause of delays in road construction is positively correlated with delays in project completion ($r=.510$, $P<.01$). This result suggests that increasing road construction delays due to poor supervision is associated with increasing delays in the completion of projects. This result is consistent with previous studies that also reported that increasing delays due to supervision lapses is associated with increasing delays in the completion of projects e.g. Bekr (2015); Van et al., (2015); Atout (2016); Aziz and Abdel-Hakam (2016); Zidane et al., (2017).

High level of political influence on consultants' staff as a cause of delays in road construction is positively correlated with delays in project completion ($r=.597$, $P<.01$). This result suggests that increasing road construction delays due to high level of political influence on consultants' staff is associated with increasing delays in the completion of projects. This finding is consistent with the study of Zidane et al. (2017) that also reported that increasing delays due to political influence is associated with increasing delays in the completion of projects.

Table 4.3: Bivariate Correlational Analysis

	Constructs	1	2	3	4	5	6	7	8	9	10	11	12
1	Site Possession	1.000											
2	Coordination Communication	.558**	1.000										
3	Contract Documentation	.563**	.580**	1.000									
4	Scheduling Controlling	.316*	.430**	.632**	1.000								
5	Supervision	.461**	.609**	.567**	.572**	1.000							
6	Political Influence	.405**	.535**	.450**	.498**	.502**	1.000						
7	Certification	.282*	.592**	.479**	.680**	.638**	.601**	1.000					
8	Variation Orders	.312*	.503**	.646**	.777**	.553**	.427**	.740**	1.000				
9	Resources	.442**	.568**	.510**	.477**	.544**	.585**	.608**	.607**	1.000			
10	Project Document Filing	.442**	.615**	.517**	.406**	.633**	.482**	.667**	.449**	.563**	1.000		
11	Closing Process	.389**	.390**	.450**	.563**	.614**	.375**	.557**	.627**	.642**	.563**	1.000	
12	Project Completion	.328**	.474**	.566**	.611**	.510**	.597**	.579**	.566**	.496**	.360**	.477**	1.000

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: Field Survey (2019)

Table 4.3 shows that there is positive correlation between certification as a cause of delay in road construction and delays in project completion ($r=.579$, $P<.01$). This result suggests that increasing road construction delays due to certification related factors is associated with increasing delays in the completion of projects. This finding is consistent with the study of Rahsid et al. (2013) that also reported that increasing delays due to certification lapses is associated with increasing delays in the completion of projects.

The variation orders lapse as a cause of delays in road construction is positively correlated with delays in project completion ($r=.566$, $P<.01$). This result suggests that increasing road construction delays due to poor variation orders is associated with increasing delays in the completion of projects. This finding is consistent with the study of Rahsid et al. (2013) that also reported that increasing delays due to variation orders is associated with increasing delays in the completion of projects. The resource inadequacy as a cause of delays in road construction is positively correlated with delays in project completion ($r=.496$, $P<.01$). This result suggests that increasing road construction delays due to resource inadequacy is associated with increasing delays in the completion of projects. This finding is consistent with previous studies that also reported that increasing delays due to resource inadequacy is associated with increasing delays in the completion of projects e.g. Kaming et al., (1997); Bekr (2015); Aziz and Abdel-Hakam (2016); Zidane et al., (2017); Razdan and Goyal (2019).

The project documentation filing lapses as a cause of delays in road construction is positively correlated with delays in project completion ($r=.360$, $P<.01$). This result suggests that increasing road construction delays due to poor project documentation filing is associated with increasing delays in the completion of projects. This finding

is consistent with previous studies that also reported that increasing delays due to project documentation lapses is associated with increasing delays in the completion of projects e.g., Bekr (2015); Atout (2016). The project closing lapses as a cause of delays in road construction is positively correlated with delays in project completion ($r=.477$, $P<.01$). This result suggests that increasing road construction delays due to poor closing process is associated with increasing delays in the completion of projects.

4.4.3 Multiple Regression Result

This section of the study employs multiple regression statistical analysis to explain the relationship between road construction delaying factors and delay in the completion of projects. The estimated OLS model constituted eleven independent variables. The considered dependent variable of the model was delay in the completion of projects. The diagnostic result of the estimated model is presented in Table 4.4 and the standardized and unstandardized coefficients are also presented in Table 4.5.

Table 4.4: Model Summary Statistics

Model	R	R ²	Adj. R ²	SE of the Est.	Durbin-Watson	F	Df	Sig.
1	.714 ^a	.510	.484	.62600	2.009	19.779	11	.000
a. Predictors: (Constant), Closing_Process, Political_Influence, Site_Possession, Project_Document_Filing, Contract_Documentation, Coordination_Communication, Scheduling_Controllering, Supervision, Resources, Certification, Variation_Orders								
b. Dependent Variable: Delay in Project Completion								

Source: Field Survey (2019)

Table 4.4 provides diagnostic information on the specified OLS model. The summary statistics of the model produced an R² value of 0.510 indicating that about 51% of the change or variation in the delays in project completion (Dependent Variable) is explained by the independent variables of the model. The combined

explanatory power of the independent variables as indicated by the F-statistics was statistically significant ($F=19.779$, $P<.01$). More so, Durbin-Watson value of 2.009 which is approximately 2.00 suggests the absence of autocorrelation in the estimated model. The tolerance values of all the predictors were below the required threshold of 1.00 and the variance inflation factors of the predictors were also all below the threshold of 10 suggesting the absence of multicollinearity in the estimated model.

Table 4.5: Nexus between Construction Delays and Delay in Project Completion

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	SE	Beta			Tolerance	VIF
Independent Variables							
(Constant)	1.691	.175		9.691	.000		
Site Possession	.106	.057	.130	1.855	.065	.477	2.095
Coordination & Communication	.139	.063	.181	2.202	.029	.345	2.899
Contract Documentation	.257	.078	.290	3.277	.001	.299	3.343
Scheduling & Controlling	.064	.067	.085	.951	.343	.296	3.377
Supervision	.148	.072	.180	2.045	.042	.346	2.889
Political Influence	.093	.046	.147	2.011	.046	.438	2.282
Certification	.051	.083	.063	.615	.539	.224	4.465
Variation Orders	.282	.095	.280	2.974	.003	.198	2.041
Resources	.169	.079	.199	2.148	.033	.303	2.297
Project Document Filing	.185	.068	.218	2.723	.007	.365	2.736
Closing Process	.227	.075	.262	3.043	.003	.317	3.152
Dependent Variable: Delay in Project Completion							

Source: Field Survey (2019)

Table 4.5 shows that road construction delays due to site possession positively and significantly influences delays in project completion ($\beta=0.130$, $P<0.10$). This result indicates that a statistically significant unit increase in road construction delay due to poor site possession is associated with 0.130 unit increase in delays in project completion. This finding is consistent with the study of Amoatey and Ankrah (2017) that also reported that increasing delays construction resulting from site possession is also associated with increasing delays in project completion. The road construction delays due to poor co-ordination and communication positively and significantly influences delays in project completion ($\beta=0.181$, $P<0.05$). This result indicates that a statistically significant unit increase in road construction delay due to poor co-ordination and communication is associated with 0.181 unit increase in delays in project completion. This result is consistent with previous studies that also reported that increasing delays due to poor co-ordination and communication is associated with increasing delays in the completion of projects e.g. Rahsid et al., (2013); Bekr (2015); Zidane et al., (2017); Razdan and Goyal (2019). The road construction delays due to poor contract documentation positively and significantly influences delays in project completion ($\beta=0.290$, $P<0.01$). This result indicates that a statistically significant unit increase in road construction delay due to poor contract documentation is associated with 0.290 unit increase in delays in project completion. This result is consistent the studies of Bekr (2015) and Atout (2016) that also reported that increasing contract documentation lapses is associated with increasing delays in the completion of projects. The road construction delays due to poor supervision positively and significantly influences delays in project completion ($\beta=0.180$, $P<0.05$). This result indicates that a statistically significant unit increase in road construction delay due to poor supervision is associated with 0.180 unit increase

in delays in project completion. This result is consistent with previous studies that also reported that increasing delays due to supervision lapses is associated with increasing delays in the completion of projects e.g. Bekr (2015); Van et. al., (2015); Atout (2016); Aziz and Abdel-Hakam (2016); Zidane et al., (2017).

Table 4.5 shows that road construction delays due to political influence on contractors positively and significantly influences delays in project completion ($\beta=0.147$, $P<0.05$). This result indicates that a statistically significant unit increase in road construction delay due to the political influence on contractors is associated with 0.147 unit increase in delays in project completion. This finding is consistent with the study of Zidane et al. (2017) that also reported that increasing delays due to political influence is associated with increasing delays in the completion of projects. The road construction delays due to poor variation orders positively and significantly influences delays in project completion ($\beta=0.280$, $P<0.05$). This result indicates that a statistically significant unit increase in road construction delay due to poor variation order is associated with 0.280 unit increase in delays in project completion. This finding is consistent with the study of Rahsid et al. (2013) that also reported that increasing delays due to variation orders is associated with increasing delays in the completion of projects.

The road construction delays due to resource inadequacy positively and significantly influences delays in project completion ($\beta=0.199$, $P<0.05$). This result indicates that a statistically significant unit increase in road construction delay due to resource inadequacy is associated with 0.199 unit increase in delays in project completion. This finding is consistent with previous studies that also reported that increasing delays due to resource inadequacy is associated with increasing delays in the

completion of projects e.g. Kaming et al., (1997); Bekr (2015); Aziz and Goyal (2016); Zidane et al., (2017); Razdan and Goyal (2019).

The road construction delays due to poor project documentation filing positively and significantly influences delays in project completion ($\beta=.218$, $P<.01$). This result indicates that a statistically significant unit increase in road construction delay due to poor project documentation filing is associated with 0.218 unit increase in delays in project completion. This finding is consistent with previous studies that also reported that increasing delays due to project documentation lapses is associated with increasing delays in the completion of projects e.g., Bekr (2015); Atout (2016). The road construction delays due to poor closing process positively and significantly influences delays in project completion ($\beta=.262$, $P<.01$). This result indicates that a statistically significant unit increase in road construction delay due to poor closing process is associated with 0.262 unit increase in delays in project completion.

4.4 Measures to Mitigate the Delays Caused by Consultants in Road Construction Projects

This part of the study identifies the possible measures that can be employed to mitigate delays caused by consultants in the implementation of road projects. In the questionnaire, 10 items were presented to respondent to indicate the level of importance of each measure in mitigating delays caused by consultants in road construction projects through a Likert-scale measurement method. The result is presented in Table 4.6 through descriptive and Relative Importance Index statistical analytical methods.

Table 4.6: Mitigating Measures against Road Construction Delays

Mitigating Measures	RII	Mean	Rank
Procurement process must be transparent to all stakeholders	0.905	4.53	1st
Funds/budget must be allocated before undertaking a project	0.902	4.51	2nd
Consultants should produce complete design drawings and cost estimates base on it	0.872	4.36	3rd
Vetting of payment certificates should be done in stipulated contract provisions	0.851	4.25	4th
Grant approval for variations of works before additional work commences	0.847	4.24	5th
Professional bodies should support members during threats from politicians	0.829	4.15	6th
Internet connectivity and adequate in-service training for consultant staff	0.818	4.09	7th
Schedule analysis model for estimating project duration	0.811	4.05	8th
Adequate provisional sum for materials and logistics in bill of quantities ect.	0.807	4.04	9th
Communities must own the project	0.782	3.91	10th

Rating: [1=Not important at all; 2=Not important; 3=Neutral; 4=Important; 5=Very important].

Source: Field Survey (2019)

Table 4.6 shows that the respondent perceived procurement process transparency to all stakeholders as very important mitigating measure against road construction delays in Ghana ($\bar{x}=4.53$). Procurement process transparency as a mitigating measure against road construction delay with RII value of 0.905 was ranked as the first and the most important strategy or mitigating measure against road construction delays in Ghana. The respondent also perceived fund or budget allocation before undertaking a project as very important mitigating measure against road construction delays in Ghana ($\bar{x}=4.51$). Thus, fund or budget allocation before undertaking a project as a mitigating measure against road construction delay with RII value of 0.902 was ranked as the second most important strategy or mitigating measure against road construction delays in Ghana. The respondent also perceived the production of complete design drawings and cost estimates by consultants as important mitigating measure against road construction delays in Ghana ($\bar{x}=4.36$). Thus, the production of complete design drawings and cost estimates by consultants as a mitigating measure against road construction delay with RII value of 0.872 was ranked as the third most important strategy or mitigating measure against road construction delays in Ghana. The respondent also perceived the vetting of payment certificates within stipulated contract provisions as important mitigating measure against road construction delays in Ghana ($\bar{x}=4.25$). Thus, the vetting of payment certificates within stipulated contract provisions as a mitigating measure against road construction delay with RII value of 0.851 was ranked as the fourth most important strategy or mitigating measure against road construction delays in Ghana. These findings are consistent with previous studies that also reported transparency in procurement process, allocation of funds before undertaking projects, producing complete design drawings and cost estimates base on it and vetting of payment certificates done in stipulated

contract provisions as mitigating measures for delays in the completion of projects e.g. Rahsid et al., (2013); Amoatey and Ankrah (2017); Zidane et al., (2017).

Table 4.6 shows that the respondent also perceived the granting of approval for variations of works before additional work commences as important mitigating measure against road construction delays in Ghana (\bar{x} =4.24). Thus, the granting of approval for variations of works before additional work commences as a mitigating measure against road construction delay with RII value of 0.847 was ranked as the fifth most important strategy or mitigating measure against road construction delays in Ghana. The respondent also perceived the support of professional bodies like GhIE and GhIS for members during threat on their jobs from politicians as important mitigating measure against road construction delays in Ghana (\bar{x} =4.15). Thus, the support of professional bodies like GhIE and GhIS for members during threat on their jobs from politicians as a mitigating measure against road construction delay with RII value of 0.829 was ranked as the sixth most important strategy or mitigating measure against road construction delays in Ghana. The respondent also perceived internet connectivity and adequate in-service training for consultant staff as important mitigating measure against road construction delays in Ghana (\bar{x} =4.09). Thus, internet connectivity and adequate in-service training for consultant staff as a mitigating measure against road construction delay with RII value of 0.818 was ranked as the seventh most important strategy or mitigating measure against road construction delays in Ghana. These findings are consistent with previous studies that also reported the granting of approval for variations of works before additional work commences, support of professional bodies for members during threats from politicians and Internet connectivity and adequate in-service training for consultant

staff as mitigating measures for delays in the completion of projects e.g. Rahsid et al., (2013); Amoatey and Ankrah (2017); Zidane et al., (2017).

Table 4.6 shows that the respondent also perceived the making of schedule analysis model for estimating project duration available to consultant technical staff by the agency's head offices as important mitigating measure against road construction delays in Ghana ($\bar{x}=4.05$). Thus, the making of schedule analysis model for estimating project duration available to consultant technical staff by the agency's head offices as a mitigating measure against road construction delay with RII value of 0.811 was ranked as the eighth most important strategy or mitigating measure against road construction delays in Ghana. The respondent also perceived making available adequate provisional sums for provision of fuel and logistics in the Bill of Quantities and allowing Regional Managers to utilize up to certain threshold without prior approval from the agency's head offices as important mitigating measure against road construction delays in Ghana ($\bar{x}=4.04$). Thus, making available adequate provisional sums for provision of fuel and logistics in the Bill of Quantities and allowing Regional Managers to utilize up to certain threshold without prior approval from the agency's head offices as a mitigating measure against road construction delay with RII value of 0.807 was ranked as the ninth most important strategy or mitigating measure against road construction delays in Ghana.

The respondent also perceived communities owning the project as important mitigating measure against road construction delays in Ghana ($\bar{x}=3.91$). However, a community owning the project as important mitigating measure against road construction delays with RII value of 0.782 was ranked tenth and least among all the measures. These findings are consistent with previous studies that also reported

schedule analysis model for estimating project duration, provision of adequate sum for materials and logistics in bill of quantities etc and communities owning the project as mitigating measures for delays in the completion of projects e.g. Rahsid et al., (2013); Amoatey and Ankrah (2017); Zidane et al., (2017).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter summarizes the main findings, concludes and suggests measures to mitigate delays in the completion of road construction projects. The chapter also provided information on the contribution of the study to theory, practice and methodology; and further suggested areas for further studies.

5.1 SUMMARY OF FINDINGS

This section summarizes the key findings of the study based on the investigated problem, research questions and research objectives. The summaries are provided in sub-sections below.

5.1.1 Causes of Delays in Road Construction Projects in Ghana

The highest ranked ten causes of delays in road construction projects in Ghana caused by consultants as revealed by the study were multiple variation orders on same project, delays in issuing variation of works, inadequate fuel and logistics, bureaucracy and slow decision-making process, political influence on consultant staff, discrepancies in BoQ as against ground condition, award of project to bidders with unrealistic price, delays in vetting of contractor's invoice, lack of adequate technical staff and delays in final account preparation. The factors identified to cause delays in road construction in Ghana were largely in the monitoring and controlling phase of construction.

5.1.2 Effects of the Delays on Contractors in the Completion of Projects

The major identified effects of the delays in road construction in the completion of projects on the activities of contractors were increased loan interests, claims of extension of time and/or compensation, increased cost of project, cash flow challenges, completing project beyond set date, increased in overhead cost of

contractors, refusal to complete the work by contractors, bad contractor reputation, poor project performance, laying off workers, loss of other business opportunities, sale of assets of contractors and bankruptcy on the part of contractors.

Furthermore, the study revealed positive and statistically significant effect of road construction delays like poor coordination and communication, poor contract documentation, poor supervision, political influence, variation orders, inadequacy of resources, project document filing and closing process on delays in project completion in Ghana.

5.1.3 Measures to Mitigate the Delays in Road Construction Projects in Ghana

The measures suggested for mitigating road construction delays in Ghana in their order of importance are that procurement process must be transparent to all stakeholders, funds/budget must be allocated before undertaking a project, consultants should produce complete design drawings and cost estimates base on it, vetting of payment certificates should be done in stipulated contract provisions, grant approval for variations of works before additional work commences, professional bodies should support members during threats from politicians, internet connectivity and adequate in-service training for consultant staff, schedule analysis model for estimating project duration, adequate provisional sum for materials and logistics in bill of quantities etc and communities must own the project.

5.2 CONCLUSION

Delays in road construction projects completion in Ghana are persistently becoming part of the Ghanaian construction culture. The monitoring and controlling stage of road construction is the most persistently disrupted by delays. The major causes of delays in road construction in this stage are multiple variations orders on same

project, inadequate fuel and logistics, bureaucracy and slow decision-making process, political influence on consultant staff, delays in vetting of contractor's invoice and lack of adequate technical staff. The road construction execution stage is also disrupted by delays caused by the award of project to bidders with unrealistic price and discrepancies in BoQ as against ground conditions. The main causes of delays in the closing process stage are delays in final account preparation and unresolved claims.

The road construction delays often cause severe adverse effect and delays the completion of road projects. The severity of the effects of the road construction delay factors is more evident in financial difficulties. The delays of the construction projects often result in increased loan interest, claims of extension of time and/or compensation, increased cost of project, increase in overhead cost of contractors, cash flow challenges and even bankruptcy on the part of contractors. Nonetheless, there are also critical effects of construction delays on contractor's workers and project performance. The contractors are adversely affected in terms of bad reputation, sale of assets, psychological and health challenges, dispute with consultants and creditors, and litigations. Workers can also be laid off or/and face delays in payment of their wages or salaries and other entitlements. This therefore indicates that road construction delays are a critical challenge of the construction industry that requires immediate attention in Ghana.

5.3 IMPLICATION TO THEORY AND PRACTICAL

The contribution of this study is largely methodological. Studies on delays in the completion of construction projects have largely relied on relative importance index and descriptive statistical methods without possible consideration of the causal relationship between delay related factors and delay project completion through

multiple regression and correlational analysis. This study therefore adds to the existing knowledge by examining the causal relationship between delay causal factors and delay in project completion through inferential statistical methods like multiple regression and Spearman's correlation.

Practically and theoretically, delays in road construction caused by multiple variations orders on same project, delays in issuing variation of works, inadequate fuel and logistics, bureaucracy and slow decision-making process, discrepancies in BoQ as against ground condition, award of project to bidders with unrealistic price etc often positively influences delays in the completion of road projects e.g. Bekr (2015); Seboru (2015); Atout (2016); Zidane et al., (2017). These theory and practice are supported by the findings in this study as the study reported positive relationship between poor communication, poor contract documentation, poor supervision, poor project document filing, resource inadequacy and delays in project completion.

5.4 RECOMMENDATIONS

This section provides several suggestions or measures necessary to mitigate the causes of delays in road construction and road project completion based on the main findings.

5.4.1 Stakeholder Involvement Intensification in the Monitoring and Control Stage

As the causes of road construction delays are more mark in the monitoring and controlling stage, there is the need for more stakeholder involvement at this stage. After the award of road construction projects, there is the need for persistent and periodic meetings between contractors, consultants, workers, suppliers of materials and financiers of the project in order to reduce delays related to variation orders,

resource inadequacies, filing of project documents, supervision and delays in vetting of invoices.

5.4.2 Transparency in Procurement Process

The road construction stakeholders involved in the study perceived transparency as a critical part of the measures required in mitigating delays in the completion of road projects in Ghana. Road contracts are often awarded with little regard to due procurement processes. Contractors abandoned sites just after commencement of works or after payment of the first interim payment certificates. Other stakeholders like the chiefs or opinion leaders should be involve in the procurement process to also serve as a check on the other parties like the governments and consultants on the projects. There is therefore the need for high level of transparency among all stakeholders in the procurement process.

5.4.3 Funds/Budget Allocation before Undertaking a Project

To avoid delays related to resource inadequacy in the form of persistent shortages of fuel and logistics, there is the need for adequate contingency for provisional sums in the Bill of Quantities to cater for activities of consultants throughout the construction phases before the project commences.

5.4.4 Cost Estimate should be based on Completed Design Drawings

To avoid delays associated with cost estimate based on completed design drawings, consultants should strictly ensure that cost estimates are based on complete design drawings and funds allocated for such projects before contractors undertakes the works on site. This reduces possible variations on the works when construction commences and enhances payment of payment certificates on time.

5.4.5 Support from Professional Bodies during threats from Politicians

Evidence from the study indicates that persistent political influences during road implementation causes consultants to issue instructions to contractors to carry additional works without seeking the necessary approvals. It is therefore recommended that professional Bodies like GhIE and GhIS openly stand firm for their members during threat on their jobs from politicians.

5.5 SUGGESTED AREAS FOR FURTHER STUDIES

This study focused on delays caused by consultants in the implementation of road construction projects. The study also geographically focused on the Ashanti region which eventually reduces the generalizability of the conclusions. Thus, further studies can widen the scope to include other major regions in Ghana with relatively large road network. Further studies can also be undertaken on the impact of the delays of construction on the affected communities who are direct beneficiary of the road projects.

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APPENDIX
KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY,
KUMASI
MSC PROJECT MANAGEMENT
DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND
MANAGEMENT
TOPIC: “AN INVESTIGATION INTO DELAYS CAUSED BY
CONSULTANTS IN THE IMPLEMENTATION OF ROAD
CONSTRUCTION PROJECTS IN THE ASHANTI REGION OF GHANA”
Dear Sir/Madam

RESEARCH QUESTIONNAIRE SURVEY

I am Richard Kofi Setornyeme, an MSc Project Management student at the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi conducting a research on **delay caused by consultants in the implementation of road construction projects in Ghana.**

This questionnaire is intended to establish delays caused by consultants in the implementation of road construction projects in Ghana. The implementation stage of a road construction project includes the executing, monitoring and controlling and closing stages. The objectives of the research work include the following:

- To identify key causes of delays caused by consultants in road construction projects in Ghana;
- To identify the effects of delays on contractors in the completion of projects;
- To outline measures to mitigate the delays caused by consultants in road construction projects in Ghana.

I would be very grateful to you if you could spend some time to participate in this survey. Your response would be highly appreciated for the success of the research.

This is purely for academic purposes and all information provided will be treated with strict confidentiality.

Kindly respond to the question by ticking the appropriate box for each item.

PART ONE: RESPONDENT PROFILE

1. Please indicate the category of profession you fall under
 - Project Manager
 - Engineer
 - Quantity Surveyor
 - Laboratory Technician
 - Land Surveyor
 - Private Consultant
 - Others (Please specify).....
2. How long have you been practicing?
 - Less than 5 years
 - 5 – 10 years
 - 11 – 15 years
 - 16 – 20 years
 - Above 20 years
3. Have you ever been involved in a road project that delayed in completion?
 - Yes
 - No
4. What was the source of funding for the project?
 - Ghana Road Fund
 - Cocobod Fund
 - Consolidated Fund
 - Donor Sponsored
 - Others (Please specify).....

PART TWO: DELAYS CAUSED BY CONSULTANTS IN ROAD CONSTRUCTION PROJECTS

Please indicate the level of severity of the causes of delay by consultants at the implementation stage of road construction projects using the following scale. [1=Not severe at all; 2=Not severe; 3=Neutral; 4= Severe; 5=Very severe]. Please tick (✓) in the space provided.

No	CAUSES OF DELAY	1	2	3	4	5
A	EXECUTING STAGE					
A ₁	SITE POSSESSION					
i	Delayed site possession					
ii	Difficulty in acquiring borrow pit					
A ₂	CO-ORDINATION AND COMMUNICATION					
i	Poor co-ordination among consultant staff					
ii	Poor communication among consultant staff and by consultant with contractors					
A ₃	CONTRACT DOCUMENTATION					
i	Discrepancies in BoQ as against ground conditions					
ii	Delayed issue of contract documents					
iii	Poor contract documentation					
A ₄	SCHEDULING AND CONTROLLING					
i	Unrealistic imposition of project duration by consultants					
ii	Award of project to bidders with unrealistic price					

Please indicate the level of severity of the causes of delay by consultants at the implementation stage of road construction projects using the following scale. [1=Not severe at all; 2=Not severe; 3=Neutral; 4= Severe; 5=Very severe]. Please tick (√) in the space provided.

No	CAUSES OF DELAY	1	2	3	4	5
B	MONITORING AND CONTROLLING STAGE					
B ₁	SUPERVISION					
i	Inadequate supervision					
ii	Bureaucracy and slow decision-making process					
iii	Inexperience among consultant staff					
iv	Conflicting site instructions from consultants' staff					
B ₂	POLITICAL INFLUENCE					
i	Political influenced on consultants' staff					
B ₃	CERTIFICATION					
i	Delays in vetting of contractor's invoice					
ii	Delays due to the use of software in certificate preparation e.g. Contract Management Systems (CMS)					
B ₄	VARIATION ORDERS					
i	Delays in issuing Variation of works					
ii	Multiple Variation Orders on same project					
B ₅	RESOURCES					
i	Lack of adequate technical staff					
ii	Inadequate fuel and logistics					
B ₆	FILING OF PROJECT DOCUMENTS					
i	Project documents missing from project files					
ii	Documents not properly filed					

Please indicate the level of severity of the causes of delay by consultants at the implementation stage of road construction projects using the following scale. [1=Not severe at all; 2=Not severe; 3=Neutral; 4= Severe; 5=Very severe]. Please tick (√) in the space provided.

No	CAUSES OF DELAY	1	2	3	4	5
C	CLOSING PROCESS GROUP					
i	Unresolved claims					
ii	Delays in undertaking final site inspection					
iii	Delays in final certificate preparation					
iv	Delays in final account preparation					

PART THREE: EFFECTS OF THE DELAYS ON CONTRACTORS IN THE COMPLETION OF PROJECTS

Please indicate the level of effects of the delays on contractors in completing construction projects using the following scale. [1=Not severe at all; 2=Not severe; 3=Neutral; 4=severe; 5=Very severe]. Please tick (√) in the space provided.

No	EFFECT ON CONTRACTORS	1	2	3	4	5
1	Cashflow challenges					
2	It leads to completing projects beyond specified completion dates					
3	Increased cost of projects					
4	Loss of other business opportunities					
5	Increase interest of loans					
6	Increase in overheads costs of contractors					
7	Bad reputation on the contractor					
8	Laying off workers					
9	Psychological and Health related challenges of contractors					
10	Sale of asserts of contractors by creditors e.g. banks					
11	Bankruptcy on the part of the contractors					
12	Poor performance of contractor on the project					
13	Refusal to co-operate with consultants					
14	Rework of already completed works					
15	Disputes with consultants and creditors					
16	Claims for extension of time and/or compensation					
17	Refusal to complete the works by contractors					
18	Disagreements leading to arbitration					
19	Conflicts leading to the law courts					

PART FOUR: OUTLINE MEASURES TO MITIGATE DELAYS CAUSED BY CONSULTANTS IN THE IMPLEMENTATION OF ROAD PROJECTS

Please indicate the level of importance of the following measures to mitigate delays caused by consultants in the implementation of road construction projects using the following scale. [1=Not important at all; 2=Not important; 3=Neutral; 4=Important; 5=Very important]. Please tick (√) in the space provided.

No.	MITIGATION MEASURES	1	2	3	4	5
1.	Consultants should produce complete design drawings and cost estimates must be based on the design considerations					
2.	Schedule model analysis for estimating project duration should be made available to consultant technical staff by the agency's head offices					
3.	Professional Bodies like GhIE and GhIS must openly stand firm for their members during threat on their jobs from politicians					
4.	Vetting of payment certificates should be done within the stipulated contract provisions					
5.	Internet connectivity and adequate in-service training of consultant staff in using softwares for certificate preparation e.g. Contract Management System (CMS)					
6.	Adequate provisional sums for provision of fuel and logistics must be made in the Bill of Quantities and Regional Managers allowed to utilize up to certain threshold without prior approval from the agency's head offices					
7.	Approval for Variation of works should be granted before the additional work (variations) commences					
8.	Funds/budget must be allocated before undertaking a project					

PART FOUR: OUTLINE MEASURES TO MITIGATE DELAYS CAUSED BY CONSULTANTS IN THE IMPLEMENTATION OF ROAD PROJECTS

Please indicate the level of importance of the following measures to mitigate delays caused by consultants in the implementation of road construction projects using the following scale. [1=Not important at all; 2=Not important; 3=Neutral; 4=Important; 5=Very important]. Please tick (√) in the space provided.

No.	MITIGATION MEASURES	1	2	3	4	5
1	Procurement process must be transparent to all stakeholders					
2	Communities must own the project					