

**CAUSES OF CONSTRUCTION DELAYS AND
EFFECTS ON CONSTRUCTION PROJECTS
DELIVERY
(A STUDY OF SELECTED PROJECTS)**

**ASIEGBU, CHUKWUDI ENYINNAYA
REG. NO.: 20045550769**

**A THESIS SUBMITTED TO THE
POSTGRADUATE SCHOOL
DEPARTMENT OF PROJECT MANAGEMENT
TECHNOLOGY
FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI.**

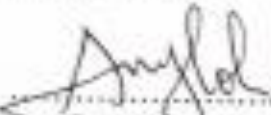
DECEMBER, 2023.

CERTIFICATION

This is to certify that this research work was carried out by ASIEGBU, **CHUKWUDI ENYINNAYA (Reg. No.: 20045550769)** of Project Management Technology Department, as a partial fulfillment of Master of Business Administration (MBA) Degree in Project Management Technology, and is hereby presented for acceptance as a contribution to knowledge and learning.


.....
Dr. I.I. Echeme
Project Supervisor

26/6/2024
.....
Date


.....
Dr. C.I. Anyanwu
Co-Supervisor


26/06/2024
.....
Date


.....
Dr. I.I. Echeme
HOD, Project Management Technology

26/6/2024
.....
Date


.....
Prof. K.U. Nnadi
Dean, SMAT

9-07-24
.....
Date


.....
Prof. B. O. Esonu
Dean, PGS

03/10/24
.....
Date


.....
External Examiner

27/03/2023
.....
Date

DEDICATION

I dedicate this write-up to God Almighty, who is my greatest inspiration and reason for living.

ACKNOWLEDGEMENTS

First of all, I am grateful to the Almighty God for His inspiration and support, which was all I needed to successfully conclude this program.

Then I most sincerely wish to thank my project supervisor, who also doubled as my HOD, Dr. I.I. Echeme, for making out time for me in the supervision of the work.

I also want to thank the Dean of our school, Prof K.U. Nnadi, and the Associate Dean of, Prof. K.A. Okorochoa, for providing the enabling environment that enabled lectures and project defense to go on smoothly.

I also thank all our PG lecturers, both those that actually lectured us and those that, in one way or the other, gave us advisement, for being dedicated to duty. These noble scholars include Prof B.C. Asiegbu, Prof C.C. Nwachukwu, Prof. K.A. Okorochoa, Associate Prof. C.I. Anyanwu, Engr. Dr. S.O. Okpighe, Dr. I.I. Echeme, Engr. Dr. U.U. Moneke, Dr. G. Eyinna, Dr. B. Amade, and the others.

I am also thankful to all the authors whose works were referred to in the course of carrying out this research work.

I want to thank my family members for all their financial support, prayers and assistance throughout the duration of the course work and this project research work. I will not forget the role of some of my colleagues in class who were like parents to me all through the program. These wonderful people include Mr. Augustine Iserhienrhien of SPDC Warri, Mr. John Emarah, my close friends Chief Nnanna Ukaegbu and Pascal.

Finally, I am grateful to all others who in one way or the other, contributed to the success of this research work. May God bless you all.

TABLE OF CONTENTS

Cover Page	i
Certification	Error! Bookmark not defined.
Dedication	ii
Acknowledgements	iv
Abstract	iv
Table of Contents	vi
List of Tables	ix
List of Figures	x
CHAPTER ONE: Introduction	
1.1 Background Information	1
1.2 Problem Statement	3
1.3 Objectives of the Study	4
1.4 Research Questions	4
1.5 Research Hypothesis	4
1.6 Justification of the Study	5
1.7 Scope of the Study	5
1.7.1 Content Scope	5
1.7.2 Unit/Time Scope	6
1.7.3 Geographical Scope	6
CHAPTER TWO: Literature Review	
2.0 Other of Review	7
2.1 Conceptual Review	7
2.1.1 Construction Projects	11
2.1.2 Construction Delays Causes	14
2.1.3 Delays from project planning and control	14
2.1.4 Delays Arising from Project Human Resource Management	16
2.1.5 Delays Arising from Project Equipment and Plant	17
2.1.6 Delays Arising from Project Risk Management	
18 2.1.7 Delays from Project Financing and Contracting Strategies	20
2.1.8 Delays Arising from Project Environment	21

2.1.9 Delays arising from Project Materials	23
2.1.10 Delays arising from Government/Authority Regulations	23
2.1.11 Delays arising from Project Scope/Design Variations	24
2.2 Theoretical Review	25
2.3 Empirical Review	25
2.4 Research Gap	26

CHAPTER THREE: Methodology

3.1 Research Design	27
3.2 Research Population	29
3.3 Population Sampling Method	29
3.4 Data Collection Methods and Instrument	30
3.5 Validity and Reliability of Research Instrument	31
3.6 Design and Administration of Data Collection Instrument	32
3.7 Procedure for Processing Data Collected	32
3.7.1 Data Processing involves the Transfer of Collected Data to Coded Data for Further Processing	32

CHAPTER FOUR: Results and Discussion

4.1 Presentation and Analysis of Data	34
4.2 Comparative Survey Evaluation and Analysis	35
4.3 Test of Hypothesis	51
4.4 Other Data	54

CHAPTER FIVE: Summary, Conclusion and Recommendations

5.1 Summary	57
5.2 Conclusion	58
5.3 Recommendation	59
5.4 Need for Further Study	60
References	62
Appendix	66

LIST OF TABLES

Table 2.1: Risk Management Manual	19
Table 4.1: Contractor Versus Owners Survey Analysis	36
Table 4.2: Contractor Versus Consultant Survey Analysis	39
Table 4.3: Consultants Versus Owners Survey Analysis	42
Tab 4.11: Table for other Data	54
Table 4.12: Summary of Project Performances, Key Delay Factors and Control Measures	56

LIST OF FIGURES

- Fig 4.1: A Graph Representing the Survey Analysis summary
(Average Severity Indices) of our respondents 65
- Fig 4.2: A line graph representing the summary of the survey analysis 66 ix

ABSTRACT

The major objective of this research work was to examine the causes of construction, projects delay and its effects on project delivery and that was to be accomplished by working at the following specific objectives: identifying the causes of delays in construction project delivery, ascertaining their effects on project delivery time project budgeted cost. To carry out the research work, a questionnaire was structured with the Likert-5-point scale and distributed to twenty-four respondents that were randomly picked. The respondents included Engrs, Architects, Surveyors, Builders, Projects Mangers, Clients, Contractors and others. The data collected was analysed by the help of the frequency Tables and percentage, while the hypothesis formulated for the study were analysed with the Multiple Regression Analysis in the SPSS software, version 23. The results and findings from the analysis showed that the major causes of delays, especially in Government owned projects are problems arising from funding, planning of the projects and their control. The study therefore concluded that clients, whether they are private or public ones, should endeavour to make funds available for project execution, so that project delivery would not be delayed.

KEYWORDS: Causes; Construction; Construction Projects; Project delays; Effects.

CHAPTER ONE INTRODUCTION

1.1 Background Information

One of most prominent problems encountered during constructions is Delay. Richard and Glemm (1994) studied the effects of delays on construction projects and found that delays had serious effects both on cost and project completion time. Contractors sometimes found delays that were necessary to make claims for delays damages and extension of time which it caused the owners, contractors or suppliers. It is important that projects are completed within the time frame scheduled for it, and also within cost. According to Chizea and Ezenwa (1991) a project is considered to have failed if any or a combination of these occurs;

1. Cost overruns: projects realized at a cost higher than the initial project cost.
2. Time overruns: projects realized at a time exceeding initial completion date.
3. Quality is unsatisfactory.
4. Contractor fails to make enough profit.
5. Project is abandoned.

From this point, the Richard and Glemm (1994) study showed that delays are an important problem and the way for reducing and avoiding them was by studying the causes.

Lee Young –Gu (1998) studied the reasons of delays in construction industries in Korea. The reasons were clients and contractors had potential causes to induce project delays.

Arditi, Trim and Gurdamar (1985) studied the causes of delays in public constructions, they found that shortages of some resources, public agencies and contractors financial difficulties, organizational deficiencies, problems in design works, frequent change order are the most important causes of delays.

According to the Institution of Civil Engineers, “the output of the construction industry in the construction United Kingdom in 1999 was valued at over £65 billion. The gross output of industry of the construction as a whole contributes 10% of the United Kingdom’s gross domestic product and provides half of all its fixed investments. The construction industry employs about 1.5 million people”.

These statistics are worthy of note when the total contribution of the construction industry in the world economy and its contribution to each nation’s gross domestic products are considered. Thus, we can deduce that delays could affect negatively these contributions to the national economy.

Problems arising from delays have their attendant cost which are borne by the stakeholders; the total cost for the project increases, making the owners spend more, reducing profit by the contractor; the final users of the facility are made to pay for the extra costs. These all cumulatively means a lot. These costs could be prevented and added to the economy if these causes have already been identified and models produced to track, prevent or reduce their impacts.

1.2 Problem Statement

According to (Vani *et al.*, 2015) construction project delay occurs when project events occur at later time than expected, due to causes related to the client, consultant, contractors, and so on. Diverse and varying factors leading to contraction delay have been identified in various studies (Egwim *et al.*, 2021). But some of these studies but some of these study areas have similarity with Nigeria as a developing Country.

The construction industry has been the provider of developmental progress in every society, Nigeria, inclusive. Cities have been developed through the provision of infrastructure like roads, buildings, both public and private, airports, sea-ports, stadiums, hospitals, industries, churches, bridges, and so on. For instance, as people work and earn salaries, they are able to meet up with all their responsibilities. In other words, commerce and industrial activities go on in facilities made available through construction executed and successful projects.

But when construction projects execution are delayed or experience time and cost overruns, or outright abandonment, a lot of cost are incurred, both by the construction industry itself, the governments, clients (both private and public), the youths, business activities, and so on. It becomes very important that construction projects execution delays, are avoided. The aim of this study therefore, is to find out the causes of delays in construction projects delivery in Nigeria.

1.3 Objectives of the Study

The aim and objectives of this study is to examine the causes of construction project delays and effect on project delivery. The specific objectives are:

- i.** To identify and study the causes of delays in construction projects and their impact on construction projects (as manifested within our case study)
- ii.** To ascertain their effects and impacts on projects life cycle and total time.
- iii.** To investigate the effects on final project cost and the perception of practitioners in the industry.

1.4 Research Questions

The following research questions were raised based on the research study. They include

- i.** What are the causes of delays in construction projects?
- ii.** What are the effects of delays on projects time execution?
- iii.** What are the effects of delays on final project cost?

1.5 Research Hypothesis

The following hypothesis have been formulated to guide this research work:

- i. HO₁:** There is no correlation between the perception and response of the project consultants and the contractors.
- ii. HO₂:** There is no correlation between the perception and responses of the project consultants and the owners.
- iii. HO₃:** There is no correlation between the perception and response of project owners and the contractors.

1.6 Justification of the Study

The study is very significant considering the huge losses which arise due to delays in construction projects. These include overrun of the cost initially budgeted for the project; conflicts which it creates between the stakeholders; it causes abandonment of projects which have gulped in so much tax payer's money. Thus, findings from our research will enable us raise solutions and recommendations which will serve as models and blue prints for projects which will be undertaken by any of the parties. It will save a lot of cost and funds for the government.

The study will also give a good place and position for experts in project management to see that construction projects are given the right attention. It will give project managers their rightful place in every construction project.

1.7 Scope of the Study

1.7.1 Content Scope

The scope of the present research was limited to selected government owned projects. The projects are:

- i. Project A:** The Uga/Akokwa flood and soil erosion control measure and structures at Uga, in Anambra state. Project cost 500 million naira, awarded in June 2006.
- ii. Project B:** The Itoikin water irrigation canal project in Itoikin, Epe LGA of Lagos State. Project cost 57million naira, awarded in May 2001, currently abandoned, 88% completed.
- iii. Project C:** Construction of 24 housing units in some selected Universities. Project cost 198 million naira, awarded in April 2007.
- iv. Project D:** Construction of 465meters long Multispan bridge by OMPADEC (Now NDDC) at Omadino, in Delta State. Project cost N494, 890,006.63, and 100% completed.

The projects are referred henceforth as projects A, B, C, D, respectively. The findings exclude construction projects owned by private individuals. The questionnaires were filled by engineers who were involved in these projects.

1.7.2 Unit/Time Scope

This research work took place under one year.

1.7.3 Geographical Scope

The locations of the case study projects are Uga in Akokwa, Epe LGA of Lagos State and Omadino, in Delta State.

CHAPTER TWO

LITERATURE REVIEW

2.0 Other of Review

The literature review of this research work is carried out as follows:

2.1 Conceptual Review 2.2 Theoretical Review 2.3 Empirical Review 2.4 Gap in Literature 2.5 Summary of Literature Review 2.1 Conceptual Review

Due to the prevalence of construction delays in Hong Kong ,inevitably resulting in contractual claims and increased project cost ,these studies were aimed first at gathering the perception of civil construction practitioners on how significant the causes of the delays were ,then secondly...”to investigate whether the suggestions as stated in the report of the report of the construction industry review committee (the committee comprises members with good standing and knowledge in the construction and related fields as well as those from other professionals who are responsible for examining the current state of the construction industry in terms of output, quality, quality of work, environmental friendliness ,safety work force and system of supervision) are applicable to and effective in mitigating the corresponding delays with reference to a ranking order established using the mean score method”...(Tommy Y.Lo, June 2006).

Ajibade and Odeyinka (July 2006) also attempted an assessment of the causes of delays by focusing on the actions and inactions of project participants or stakeholders in their article, construction delays and their causative factors in Nigeria, the analyzed data from completed building projects to assess the extent of delays. The surveyed the responses of construction managers to 44 identified factors which contributed to delays on a typical project they have been involved with. their findings showed the prioritization of the factors using the pareto analysis, their research showed an 88% of factors were responsible for 90% of the overall delays in all the projects they handled. Thus, suggesting there was no discernible difference among the different delays factors. A one sample t-testing further confirmed that most of the construction activities and roles of the participants (stakeholders) were independent in nature, thus each contributed importantly to construction delays. The research according to Ajibade and Odeyinka (July, 2006). “provides useful information for the construction industry practitioners, policy makers, and researchers when devising ways of combating delays” the results also indicate areas of construction industry practices that require improvement (ibid).

Abdul-Rahman *et al.*, (2006) also attempted a study into delay mitigation in the Malaysian construction industry; his paper describes the importance of applying proper management in dealing with delays in construction for a growing economy like theirs. The main objective of his study was to identify the management tools that

are practiced in the local construction industry in mitigating delays. It also aims to identify the main factors that lead to project delays and to suggest recommendations on how to overcome or mitigate effects of the problem. Data is gathered from questionnaires surveys and interview with those involved in construction projects. The survey and research findings indicated that delays incidents occur mainly during the construction phase of a project and one or more parties usually contribute to delays. This paper highlighted the importance of having more experienced and capable construction managers as well as skilled laborers to enable the industry to develop at a faster rate either nationally or internationally. The United Kingdom also developed a protocol for dealing with delay and disruption of construction projects in a work headed by Steve Scott of the UK society for construction law. The publication was able to recommend a protocol which will deal with delay claims and help provide good opportunity to make progress with a continuing difficulty that besets most substantial construction projects. The protocol makes recommendations on the issues that arise when delays must be managed. The report had tested how UK professionals understood some of the issues raised and how they deal with them in practice. the conclusion shows some areas of good agreement, notably in the way that early completion should be handled and the way prolongation cost should be assessed. The report however claims,... ”there are areas which give rise for concern. The methodology, ‘time impact analysis’ appears not to be well used in practice and

it also seems contractors will have difficulty with positions taken on float ownership and concurrent delays” (Scott S., August 2003). These go to show that construction delays are not peculiar to the country alone or to the sector under our case study. Delays are one of the most common problems in the construction industry (Shi J.J., Feb. 2001). This results in increased contractual claims, increased project cost and most time conflicts arising from delay claim disputes in relational contracting (Yates J.K. *et al.*, April 2006) in his article he continues, by saying that delays on construction projects and the claims which emanate from such delays are an integral part of modern construction process. the overwhelming amount of time, energy and cost devoted to delay claims does not begin when a claim is initially submitted or near the completion of a job, rather the construction delay claim process commences at the inception of the project.’ His discussion provides relatively how claims are generated, various types of delays, contract provisions which may trigger delay claims, methods of solidifying a party’s position, presentation, substantiation and justification, methods to resolve claims and most importantly a mechanism by which we can cut down the incidence of delay claims.

I would want to end this section of the literature review by assessing the work of Jonathan J Shi, who made an attempt to create a model for computing construction delays. He presents a method for computing delay and assessing their contributions to the project. The method consists of a set of equations, which can be easily coded

into a computer program that allows speedy access to project delay information and contribution. It contrasts the as-planned and as-built schedules, it is neither based on some project management tools like critical path analysis, and thus his method does not require calculating the critical path of a network schedule. It is a traditional way of analyzing delays and gaps (Okoroafor G.F, 2001). The result calculated from the proposed method includes varying the activities schedule and contribution to the overall project delay. This provides a baseline which is objective for determining responsibilities of delays. His method can be integrated into any kind of analysis system to further improve and automate construction delay. But no further mention will be made on their work in this research as we shall be making use of statistical and quantitative methods to analyze delays as done by authors and researchers we mentioned earlier in this section.

2.1.1 Construction Projects

According to Peurifoy (1996), construction is the step in which plans, specifications, and materials, permanent equipment are transformed by a contractor into a finished facility.

In Nigeria, the construction industry is most evident in the development of its infrastructure. There are over a thousand construction firms in the country with more than a million people working either as skilled or unskilled labor. Good populations

of local youths in the rural areas are involved in construction jobs as laborers, skilled men, another sizable population are involved in sales and supply of building materials e.g. timber, earth materials, steel and cement.

The industry is a \$400 billion industry in the United States, with over five million people under its employment. The industry is unique in several respects, one of such is the striving of contractors who work themselves tirelessly out of a job, the faster they perform, and the better, the sooner they complete a job the better as they go looking for other jobs.

The industry carries out a vast number of activities. These activities include but are not limited to erection and repair of urban development project with all the civil, mechanical and electrical aspects of the works.

Construction projects according to Richard H. Clough (1972) are complex undertakings. Even a structure of modest proportion involves skill, materials, and operations. These constitute a complicated pattern of individual, time requirements and restrictive sequential relationships among numerous segments.

The vagary of the construction site and the possibilities for the creative and utilitarian variation of even the most standardized construction project makes every project a unique, new and different experience.

All the parties involved in a construction project strive for a common goal. a facility meeting the expectations of both the owner and the end user. (Puerifoy, 1996). The

construction team consisting of the architects, structural and civil engineers, suppliers, sub-contractors, dealers changes at each stage of the project.

Construction projects cover building construction; highway construction; airports; pipeline laying; sand filling, dredging of water ways or swamps for further construction projects; bridge construction, subway, sub base stations for telecommunication turnkey switches, offshore rigs and facilities for oil companies, others are earthworks like dams, irrigation canals and highway canals, drainages, erosion control measures and structures, rail road construction.

There is still numerous construction activities not mentioned. These activities are all multimillion Naira activities and show the importance of our study. The oil industry has close to half of its budgets spent on construction of its facilities and on exploration. These also involve construction of permanent structures or fixed facilities which are also carried out by civil engineers. These facilities include rigs, float stations, residential buildings access roads, electrification projects, construction of plants, platforms, upgrading of infrastructure within their host communities, there is no doubt that these multibillion-naira projects encounter delays and thus the importance of our study.

The government is not left out in this. with the establishment of River basin Authorities under the ministries of Agriculture, water and natural resources, a lot of projects ranging from construction of boreholes and also provision of irrigation

works in arid areas. We will also say the government is also having a high percentage of its budget pushed into provision of infrastructure and construction. Apart from 1979 and 1985 budgets which did not commit much into this because of elections and military coup which disrupted the government respectively. We will not fail to mention the ministry of works and housing which has the tasks of providing roads, highways and also housing for the citizens.

Construction projects are thus by far the most evident manifestations of 'a Government at work' 'if the infrastructure must be improved, the industry has to be engaged.

2.1.2 Construction Delays Causes

As earlier outlined in this study the identified causes of delays have been classified into nine subgroups according to their similarities.

2.1.3 Delays from project planning and control

Poor operations management by contractors: a good knowledge will help in the management and allocation of construction facilities and equipment. This will further help mitigate unnecessary involvement of extra capacities where existing facilities are okay. Operations management helps minimize cost and maximize profits .it involves using tools of operations research like transportation models,

simplex, queuing, assignment and inventory models. These are directed to the optimal allocation of resources, equipment with minimal loss. A wide range of inventory models are available to assist managers make decisions (Nworuh). Other causes identified under project planning and control are; on computerization of project management systems, poor data management systems.

According to burke 4th edition (2006), a project scope is defined as the activities involved in a job .it involves what will be accomplished and delivered when the job is finished when the activities which make up the projects are poorly managed; the resources required will be mismanaged leading to construction delays. some contractors do not even have ideas of project management principles, while some still use manual means of project management large projects are always very complicated as they involve thousands of inter related but complex projects activities and networks which can only be monitored and controlled by using specific computer software which integrate these complex network activities with all ease, making the process of tracking, monitoring, control ling very easy. Some of these softwares include MS project TM, PrimaveraTM. When there are enough Data available on past delay problems and how they are tackled, firms would be able to face recurring problems of delays .data like old records, bill of quantities and measurement, network schedule for similar projects, reports of problems and solutions from past problem can all be stored using a computerized data management

systems. This will make it easy to locate reports, identify solutions. The system also includes having project libraries.

2.1.4 Delays Arising from Project Human Resource Management

Problems identified under this group are;

- a. Wrong Personnel /Human Resource Management:** Some contractors don't have human resource management policies, there are always plenty of problems arising from the way their staff are being managed. This results in some firms recording high staff turnover each year, either because these staff are unable to stay to carry on the projects. Non continuity of core staff and probable retraining of new staff who are unable to stay behind due to bad pay or working condition.
- b. Use of Inexperienced, Untrained, Unskilled Workers by Contractors:** Skills, training and experience always make a difference in every endeavor. When these are lacking, jobs are done on relatively slower paces and with poorer results poor workmanship is also a result of using inexperienced, unskilled workers. This could lead to rejection of activities, which lead to delays.
- c. Poor Performance Appraisal of Workers Skills by Contractors:** Performance appraisal helps to identify the need for training, development and also compensation or discipline of staff where necessary. When there is no appraisal,

workers work as they wish knowing they are not directly made to pay for their mistakes or rewarded for their outstanding performances.

d. Poor Motivation of Staff/Laborers: Some construction firms pay very poor remunerations to their workers; this reduces morale and motivation to work, resulting in nonchalance to work. Other causes of delays identified in this group include: wrong recruitment/selection procedure, labor unrest, lack of employee development and training, imposition of workers by external influence, which is prominent in projects handled by oil companies. Also, policies like Nigerian content of seventy percent may not be too beneficial when it comes to very technical aspects where very high skills are required and not available in the country.

2.1.5 Delays Arising from Project Equipment and Plant

The delays identified under this group are; the use of obsolete equipment and old plants; breakdown of equipment; scarcity of equipment operators; absence of the right equipment or use of wrong construction equipment (Ayodeji *et al.*, 2006).

Construction equipment planning and selection should begin long before a contractor moves into site, possibly as early as bidding and tendering process begin (Peurifoy, 1996). Construction projects require the utilization of the right construction equipment. the choice of selection are affected by the nature of products, the risks

involved in using the equipment, the cost of owning the asset compared to leasing the equipment, cost attached to repairs, operators. The mobility of such an equipment over the size of the project e.g. for pipeline projects which cover long distances. Thus, we must use efficient and working machines, not obsolete machines which would fetch more cost or breakdown easily. These cause delays as the project cannot go on until the machines are repaired or the capable operators are recruited and trained. Most literatures reviewed feel the impacts of these causes under this group are minimal and could be prevented. (Abdul rahman H *et al.*, Feb 2006).

2.1.6 Delays Arising from Project Risk Management

Lessons learnt from previous projects have a limited applicability to future projects (Peurifoy, 1996). This is due to the uniqueness of every constructive project. There are three significant risks involved in utilizing construction equipment, risks arising from losses and theft, risks to non-performance or collapse of projects, risks arising due to litigation which may arise in the process of job execution, also risks from professional negligence, and risks from financing mechanism, labor regulations and safety (Ebiringa, 2006).

PRINCE 2, (a public domain, structured methodology) the “de facto standard for Project Management in the UK defines Risk management as...’a structured proactive process to reduce the change of exposure and negative consequences of

future events that could prevent or impede the achievement of goals...’ It outlines five actions to take in response to risk. These are contingency, acceptance, prevention, reduction, transference. 5% contingency is added to contract sum in case of unforeseen occurrences which could be handled.

Acceptance means cautiously committing to risks which will not occur, or has a low occurrence e.g. civil war breaking out during a project or a natural disaster.

Reduction means creating ways of training in safety, health and environment (HSE).

Transference means insuring project so that some frequent risks are transferred when they occur to a third party when they are insured. The insurance companies bare the risks.

Akujobi A.B.C identified a technique, to be used for handling risks. A matrix developed by Rejda (1992) was used. It involved grouping risks into their frequencies of occurrence and then their severity if they occur. This gives rise to table 2.1.

Type of risk	Frequency of risk	Severity of risk
1	Low	Low
2	High	Low
3	Low	High
4	High	high

Table 2.1: (Akujobi, 2006) Risk Management Manual

According to Akujobi proposes that Risk 1, should be handled by Retention, Risk 2 is more serious than Risk 1 and should be handled by Loss control measures,

provisions could be made to cover or pay for such risks, e.g. minor injuries at the project site. Risk 3, have a high severity though they occur less frequently, it is ideal to transfer them to insurance companies. E.g. Loss and damage of materials to road accidents or during transit. Risk 4, are both very severe and occur frequently, they should be completely avoided. E. g could be risks arising due to poor supervision or use of inferior materials which only need a little time to collapse during a major stage, also non provision of scaffolds for high rise works during construction can lead to accidents. Akujobi further states that ...'if there are insurance for such risks, they may be too expensive and cannot be affordable.'

The PRINCE 2 however does not recognize "*risk avoidance*". The module claims that avoiding a risk should mean eliminating the causative condition. E.g. don't use machines if they will create risks like in Risk 4. Though it agrees that in some unique circumstances it could be used, but such circumstances may not arise in construction projects because it involves professionals.

The delay causes identified under this group include; inadequate insurance cover for equipment, labor and materials; court injections arising from poor risk management; inadequate insurance cover for losses e.g. financial losses, fatalities, environmental damages, compensation to families, etc.; Poor human safety and environmental practices; poor knowledge of risk management as outlined above.; denial of claims

by insurance companies due to default by contractors. E.g. failing to report a loss within the stipulated time or following the procedure.

2.1.7 Delays from Project Financing and Contracting Strategies

Every project requires finance. In Nigeria, most projects fail due to poor financing (Ebiringa, 2006). It is therefore necessary that there are right project financing and contracting strategies. Project financing is mainly to provide and ensure liquidity, stability and sustainability of the fund flow pattern during the project execution (Ebiringa, 2006).

When there are good financing strategies the following factors are taken care of: the financial viability of stakeholders, project scope and budget requirement, cash flow and credit control. It also recommends best financing options e.g. leasing, hire purchase, outright acquisition of assets bearing in mind the factors raised above. Contract arrangement also ensures the right contracting strategies are used e.g. lump sum contracts, unit pricing contracts, cost plus fee contracts, fixed price contracts.

This group identifies the following causes under it; delays in release of funds by owners; poor funding by owners; shortage of cash (illiquidity); cost overruns due to inflation or financial mismanagement; wrong contracting arrangements; litigation arising from court cases; inability of contractors to pay its debts to its suppliers. Wrong budgetary estimates; non prudent management of financial resources. In the

literature review of Said Assaf (April, 1995). He identified this group as the most important cause of delay in construction projects in Saudi Arabia.

2.1.8 Delays Arising from Project Environment

Local conditions in a project environment cannot be overlooked in project management. Though the impact is ranked lowest by Said Assaf (1995) in his research. It could be a very important cause in other nations. It includes both the infrastructural and socio- economic environment, including climate, security and social welfare facilities (Anya, 2005). In some Niger delta areas security of project workers are always on high risk due to activities of militants and volatility. Remedying site conditions that are materially different from those specified in contract documents are common source of delay. In his study, managing delays caused by differing site conditions, Siddiqi K and Akinhanmi a (April 2006) identified factors that would enable contractors to manage delays caused by differing site conditions. In the Nebraska, United States, the standard differing site condition clause is a primary risk allocation clause in all Federal and most State government construction contracts and provide for adjustments in the contract price. A number of schools were considered in his research and causes of delays arising from differing site conditions and environments were determined through surveys and interviews. The outcome indicated 70% of delays were due to lack of timely and adequate

communication between the parties involved. Persistent and firm follow up of change order was identified as a remedy for reducing this problem. In Nigeria too, there are provisions for differing conditions on project sites and subsequent review and revalidation of contract or project cost. This will be agreed in principle by both parties.

2.1.9 Delays arising from Project Materials

Under this group, the following causes were identified; loss of materials on transit; shortage or scarcity of materials in the market. e.g. in one of the projects under study, the non-availability of a particular brand of floor tiles in the market delayed completion of works for about two weeks; late delivery of materials to site; poor procurement practices by contractor; change in materials specs, as a result of changes met on ground.

These delay causes, could be very important cause of delays in construction industry. Most times work is delayed due to long hours or days of waiting for materials to arrive on site. E.g. in 2005, during the construction of a base station belonging to V-mobiles Nigeria Ltd, one of the components of the mast tower was missing (a 2” inch bolt). This delayed the work progress for about a month until the component, though very little was procured and flown in by air from South Africa. Work could not go on as long as the bolt was absent because the bolt was an integral part of the

base of the mast upon which the whole structure rests. Cases also exist where wrong materials are used, leading to outright demolition or rejection of the jobs, hence starting all over again. Some firms also don't have good Procurement Management policies (Abdul-Rahman, 2006).

2.1.10 Delays arising from Government/Authority Regulations

This includes problems arising from changes in the top hierarchy of the executing authorities. It also includes individual interests within the administration or authorities who own projects. Cases exist where some Directors decide to frustrate contractors due to personal conflicts or interests. e.g. Some Federal Government contracts where officials demand compensation or gratifications to enable them process certificates for contractors. Refusal causes the project to be neglected due to noncompliance of contractors. There is also excessive bureaucracy in obtaining required permits, licensing, documents, certificates, from officials of administration. There is very slow response and actions on administrative operations occurring mostly in Federal agencies. These are however not as serious as indicated above in the Oil industry where operations are computerized and bureaucracy is minimal.

2.1.11 Delays arising from Project Scope/Design Variations

We have earlier defined the project scope as given by Burke 4th edition, 2006. This project scope on its own could be faulty or differing from what is met on ground. The contractors could also misunderstand or fail to grasp the project scope. There are also cases when a contractor commits an initial underpricing of projects cost during his tendering and bidding and subsequent signing of contract only to realize it when it is late. He may wish to make changes or seek redress. This would lead to delays and subsequent disputes.

2.2 Theoretical Review

Expectance Theory

The popular expectancy theory by Victor Groom (1964) is a goal setting model which states that performance is determined by the product of motivation and ability. Motivation in turn, depends on what people expect to receive from their efforts. It is called expectancy theory because it suggests that people will lead them to outcomes or rewards which they desire. Vroom referred to the value of the outcome to a person as valence. He asserts that the valence of that outcome called first order outcome is a function of other outcome-second order outcome – to which the first might lead (Nwachukwu, 2006).

This theory is relevant to the thesis work because when the expectations of the contractor is not met, such as release of project expectation funds as at when due, project delivery may experience delay.

2.3 Empirical Review

Negotiations With Contractors

Experience has shown that contractor's proposals are either too far or too low when adequate time for bid submission is not allowed. This is because of the hastiness used in arriving at estimates and insufficient time to arrange and obtain subcontractors estimates. Government would always award contract to the lowest proposals. This is after making sure the proposals are close to the government estimates.

Negotiations are carried out with proposals which fall in within range. At the end, the contractors in the competitive range are requested to submit their final offers. After their revisions, award is made to the best bidder if his proposals are within the planned estimate. If no proposal meets government estimates, the bid is reopened and advertised until what the authority wants is achieved.

Upon approval of the contractor, the contract is awarded it takes the two parties, the owning agency and the contractor to sign the contract award documents.

2.4 Research Gap

The findings of this work will serve as a model and blue print for projects which will be undertaken by any organization, including governments. A lot of funds will be saved from project execution.

CHAPTER THREE METHODOLOGY

3.1 Research Design

The severity index is a descriptive statistical methodology which measures the weights of each response according to how respondents assess the intensity or severity of attitude towards the variables being studied. i.e. from a “very severe attitude value to a not severe” attitude value just like the Likert’s model which uses strong attitude to a weak indifferent attitude. Numerical values are assigned to each scale value as will be outlined in the chapter four of the study. e.g. very severe is weighed as 3.

According to Ebiringa (2005) the spearman’s correlation coefficient is used to assess the extent of association between the rankings of experts to a specific issue.

The mathematical model for this relationship or assessment is given by

$$r_s = \frac{6d^2n(n^2 - 1)}{n^3 - n}$$

Where d is the difference in the ranking, n is the number of pairs of values (x, y) in the data (M. Spiegel, 1972).

The decision rule:

$r_s = +1$ implies a perfect positive correlation, while $r_s = -1$ implies a perfect negative correlation. $r_s = 0$ implies no correlation.

The above coefficient can be tested for significance at a 0.05 level. The values of γ also lies between -1 and +1 and provides an estimate of the population rank correlation (Nworuh,2001). According to Inyama *et al.*, (1995), $-1 \leq p \leq 1$, if $p=1$ the order of x values and corresponding values and correspondingly y values are ranked in the exact opposite order ,where x and y are the considered variables.

The following assumptions were made: the variables in x and y have a normal distribution. Thus, it can be shown that:

$$\sqrt{\frac{(n-2)}{1-n^2}}$$

Has a student t distribution with n-2 degree of freedom.

H_0 is accepted at the 5% significance level if positive $d < t_{0.05} (n-2)$ otherwise the null hypothesis is rejected in favor of the alternative hypothesis H_a . (Nworuh, 2001).

There would be tests for t_1, t_1, t_2, t_3 .

t_1 is to test the correlation between x, y variables where they represent the project contractors and project owners respectively.

t_2 is to test the correlation between x, y variables where they represent the project contractors and project consultants respectively.

t_3 . Is to test the correlation between x, y variables where they represent the project consultants and project owners respectively.

3.2 Research Population

The population of a study is the totality of all members of a group that is being studied. A population therefore is the theoretical specified aggregation of elements (Ebiringa). The population of this study covers government owned construction projects, in this case four multimillion-naira projects were studied. The projects are:

1. Project A: The Itoikin Water Irrigation Canal Projects Itoikin, Lagos state.

The executing agency is the Ogun/Osun River Basin Authority, for the Federal Ministry of Water Resources

2. Project B: The Uga/Akokwa Erosion Control Structure and Measures, Uga, Aguatta, Anambra state. Executed by Anambra/Imo River basin authority for the ministry of water resources.

3. Project C: Construction of 24 Housing Units in Some Selected Universities.

4. Project D: Construction Of 465meters Long Multispan Bridge across Omadino River by Oil Mineral Producing Area Development Commission (OMPADEC, now NDDC) at Omadino, in Delta State.

3.3 Population Sampling Method

For the purpose of this study, the type of method used is a non-probabilistic sampling method. A sample is a non-probabilistic sample if the chance of including any unit of the population in the sample is not known and cannot be determined (Oyeka,

1996). All items being studied have a chance of being selected. The non-probability sampling is judgmental sampling as the elementary units are chosen according to the discretion of an expert who is familiar with the relevant characteristics of the population. A very small sample is chosen because of limitations like extreme heterogeneity of the population.

3.4 Data Collection Methods and Instrument

Data can be defined as a set of information .data search may be classified into two categories; Primary and Secondary data. Both have been utilized for this study.

The literature search involved reading through relevant materials, articles, manuals, journals, and lectures from experts, professionals in the field. The materials include textbooks, unpublished papers, seminar papers, lecture manuals. These materials were fully digested and a lot of data drawn from them. The interviews were conducted with inputs from project engineers, consultants, contractors who handle federal government projects. This also includes resident engineers employed by the federal government to supervise the contractors.

The secondary data consists of data compiled from project offices (covering contract agreements documents, copies of payment certificates, project cost and time reports. n/b; these documents however aren't attached because of their confidential nature.) Also helped us evaluate the level of capacity attainment (cost and time optimization)

in the execution of the selected construction projects, whereas the primary data re used in the analysis of the severity of the delay causes.

The questionnaire is used as the major instrument for primary data.

3.5 Validity and Reliability of Research Instrument

According to G.E. Nworuh (2001), validity concerns if the instrument measures what it is supposed to measure, whereas reliability is concerned with the consistency obtained from the results of the application of the instrument. An instrument is reliable if it gives the same or similar results.

Seltiz (1976) opines that all measuring instruments particularly in the social sciences contain some degree of error no matter how precise and careful the efforts of observation. Our research instrument (questionnaire) was duly evaluated and approved for use by my erudite professor supervisor before it was administered. The instrument and interview was carried out engaging experts who are experienced in the industry and taken part in the projects. The literatures reviewed include journals which are standards all over the world when it comes to management and engineering of construction projects. Some of the literature are also proceedings from world class institutions and associations sponsored by government overseas, our experts are drawn from the right departments of the industry.

Reliability also is the degree to which an instrument used for measuring will produce, according to Zellar and Canaries (1979), similar outcomes if the research is repeated over time. This will be proven as a result of the semblance and similarity in the outcome of our research findings to that carried out in our literature review for other countries .in other words the degree of the measuring instrument potency is High.

3.6 Design and Administration of Data Collection Instrument

The questionnaire consists of fifty-three questions with five alternative answers.

They were administered to three categories of the people.

1. Contractors: these include the representatives, engineers who handle the actual construction project.
2. Consultants: these are also called project engineers or managers. They designed the projects and supervise the contractors on behalf of the agencies who own the projects. They work in association with the resident engineers.
3. Resident engineers: these are government engineers and under the employment of the government agencies, here they are our project owners or client representatives.

3.7 Procedure for Processing Data Collected

3.7.1 Data Processing involves the Transfer of Collected Data to Coded Data for Further Processing

In the analysis of the data collected from the survey, the severity indices (SI) was used, the spearman's correlation coefficient was used to assess the extent of association between the rankings of experts and respondents to each specific delay causing factor. The mathematical model for this relationship is given by $r_s = 1 - (6d^2/n)$

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Presentation and Analysis of Data

The chapter consists of the presentation of data and the survey analysis carried out firstly using the three categories of respondents respectively according to the research questions. This is followed by a comparative analysis of two each of the respondents preceding the final survey analysis according to the test of hypothesis. Presented below in tab 4.1 to 4.3 are the results of the survey conducted based on the construction delays identified. Each factor has a severity index (Is) which can be calculated as (Al Hasmi,1987)

$$\text{Severity index (Is)} = \sum_{i=0} \frac{a_i X_i}{3 \sum X_i} \times 100\%$$

Where a_i = constant expressing the weight given to the i^{th} response. where $a_i = 0,1,2,3$ for $i = 1,2,3,4$. respectively. $a_0 = 0$ is equivalent to “not severe” $a_1 = 1$ is equivalent to “fairly severe” $a_2 = 2$ is equivalent to “severe” $a_3 = 3$ is equivalent to “very severe”,
 X_i = Variables expressing degree of importance of each factor. X_1 = frequency for “not severe”

X_2 = frequency for “fairly severe” X_3 = frequency for “severe”

X_4 = frequency for “very severe”

To measure the degree of agreement in ranking of agreement in ranking of contractor, consultant and owners differently. The spearman's rho (ρ) can be computed as follows. $P = \frac{6 \sum D^2}{N(N^2-1)}$

$$\frac{6 \sum D^2}{N(N^2-1)}$$

Where D=difference between the ranking being considered,

N = number of ranked variables (8).

As stated earlier, $-1 \leq \rho \leq 1$ if $\rho = 1$ then there is perfect agreement else there is disagreement ($\rho = -1$)

4.2 Comparative Survey Evaluation and Analysis

This section consists of an evaluation of the data (tab 4.1 to tab 4.3) involving the responses involving two parties each. It also includes a general ranking (g. rank) of each delay cause comparatively with the remaining 53 delay causes.

Table 4.1: Contractor Versus Owners Survey Analysis

A	CONTRACTORS		OWNERS	
	INDEX	G.RANK	INDEX	G.RANK
A1	70.8	11	79.2	5
A2	83.3	3	58.3	14
A3	20.8	40	8.3	53
A4	37.5	35	33.3	35
Average(x)	53.1	7th	44.8	5th
B				

B5	70.8	11	79.2	5
B6	83.3	3	91.7	2
B7	62.5	19	66.7	12
B8	62.5	19	66.7	12
B9	62.5	19	41.7	27
B10	58.3	20	41.7	27
B11	37.5	35	12.5	51
B12	37.5	35	16.7	50
Average(x)	59.5	5th	52.1	3rd
C				
C13	87.5	2	58.3	14
C14	75	10	83.3	4
C15	66.7	17	29.2	41
C16	70.8	11	79.2	5
Average(x)	75	2nd	62.5	1st
D				
D 17	83.3	3	29.2	41
D18	70.8	11	62.5	13
A4	37.5	35	33.3	35
Average(x)	53.1	7th	4.8	5th
B				
B5	70.8	11	79.2	5
B6	83.3	3	91.7	2
B7	62.5	19	66.7	12
B8	62.5	19	66.7	12
B9	62.5	19	41.7	27

B10	58.3	20	41.7	27
B11	37.5	35	12.5	51
B12	37.5	35	16.7	50
Average(x)	59.5	5th	52.1	3rd
C				
C13	87.5	2	58.3	14

C14	75	10	83.3	4
C15	66.7	17	29.2	41
C 16	70.8	11	79.2	5
Average(x)	75	2nd	62.5	1st
D				
D17	83.3	3	29.2	41
D18	70.8	11	62.5	13
D19	100	1	45.8	13
D20	79.2	7	45.8	22
D21	83.3	3	25	46
D22	75.5	10	100	1
D23	37.5	35	87.5	3
D24	79.2	7	70.8	9
D25	79.2	7	54.2	19
D26	79.2	7	87.5	3
Average(x)	76.7	1st	60.8	2nd
E				
E 27	41.7	33	20.8	47
E 28	50	29	54.2	19
E 29	54.2	27	33.3	35
E 30	54.2	27	33.3	35
E 31	45.8	30	37.5	32
E 32	45.8	30	29.2	41
Average(x)	48.6	9th	34.7	8th
F				
F33	62.5	19	54.2	19
F34	66.6	17	58.3	14
F35	66.6	17	58.3	14
F36	58.3	20	16.7	49
F37	41.7	33	83.3	41
Average(x)	49.2	8th	40.8	6th
G				

G38	58.3	20	12.5	51
G39	70.8	10	20.8	47
G40	58.3	20	45.8	22
G41	45.8	30	37.5	32
Average(x)	49.2	8th	40.8	6th
H				
H 42	58.2	20	29.2	41
H 43	66.6	17	33.3	35
H 44	79.2	7	58.3	14
H 45	58.3	20	45.8	22
H 46	66.6	17	54.2	15
H47	45.8	30	29.2	41
H48	62.5	19	16.7	49
Average(x)	62.5	4th	38.1	7th
I				
I49	50	29	33.3	35
I 50	79.2	7	70.8	9
I 51	41.7	33	41.7	27
I 52	79.2	7	29.2	41
I 53	70.8	10	70.8	9
Average(x)	64.2	3rd	49.2	4th

Source: Field Survey, 2003 Table 4.2: Contractor Versus Consultant Survey Analysis

	CONTRACTORS		CONSULTANTS	
	INDEX	G. RANK	INDEX	G. RANK
A1	70.8	11	20.8	7
A2	83.3	3	45.8	30
A3	20.8	40	45.8	30
A4	37.5	35	54.2	18
Average(x)	53.1	7th	44.2	6th
B				

B5	70.8	11	66.7	10
B 6	83.3	3	79.2	2
B7	62.5	19	41.7	35
B8	62.5	19	79.2	2
B9	62.5	19	66.7	10
B 10	58.3	20	29.2	48
B11	37.5	35	70.8	7
B12	37.5	35	37.5	41
Average(x)	59.5	5th	58.9	2nd
C				
C13	87.5	2	54.2	18
C14	75	10	66.7	10
C15	66.7	17	41.7	35
C16	70.	11	58.3	15
Average(x)	75	2nd	54.3	3rd
D				
D17	83.3	3	95.8	1
D18	70.8	11	79.2	2
D19	100	1	62.5	10
D20	79.2	7	58.3	15
D21	83.3	3	62.5	10
D22	75.5	10	29.2	48
D23	37.5	35	20.8	50

D24	79.2	7	41.7	35
D25	79.2	7	62.5	10
D26	79.2	7	79.2	2
Average(x)	76.7	1st	59.2	1st
E				
E27	41.7	33	33.3	46

E28	50	29	16.7	51
E29	54.2	27	37.5	41
E30	54.2	27	29.2	48
E31	45.8	30	16.7	51
E32	45.8	30	33.3	46
Average(x)	48.0	9th	27.8	9th
F				
F 33	62.5	19	45.8	30
F34	66.6	17	37.5	41
F35	66.6	17	29.2	48
F36	58.3	20	45.8	30
F37	41.7	33	54.2	18
Average(x)	49.2	8th	42.5	4th
G				
G38	58.3	20	41.7	35
G39	70.8	10	54.2	18
G40	58.3	20	54.2	18
G41	45.8	30	54.2	18
Average(x)	58.3	6th	51.1	4th
H				
H42	58.2	20	25	48
H43	66.6	17	50	25
H44	79.2	7	20.8	50
H45	58.3	20	50	25
H46	66.6	17	37.5	41
H47	45.8	30	50	25
H48	62.5	19	62.5	10
Average(x)	62.5	4th	42.3	8th
I				
I49	50	29	50	25

I50	79.2	7	79.2	2
I51	41.7	33	41.7	35
I52	79.2	7	58.3	15
I53	70.8	10	70.4	7
Average(x)	64.2	3rd	49.9	5th

Source: Field Survey, 2003

Table 4.3: Consultants Versus Owners Survey Analysis

	CONTRACTORS		CONSULTANTS	
	AVERAGE INDEX	RANK	AVERAGE INDEX	RANK
A	44.2	6th	44.8	5th
B	58.9	2nd	52.1	3rd
C	54.3	3rd	62.5	1st
D	59.2	1st	60.8	2nd
E	27.8	9th	34.7	8th
F	42.5	7th	40.84	6th
G	51.1	4th	29.2	9th
H	42.3	8th	38.1	7th
I	49.9	5th	49.16	4th

Source: Field Survey, 2003

A graph is shown in fig 4.1 and 4.2 to describe pictorially the perception of the practitioners on these factors outlined. From our line graph, we could see that the movement of our line graph suggests that there is a bit similarity by the respondents on the severities of the delay causes. The contractors and consultants both had rated funding and financing problems as very severe delay causing problems. The pattern of the severity of the factors tends to suggest that each party identifies any problems arising particularly from their own direction as not being severe, whereas

apportioning a higher severity to problems from other practitioners. An example is the severity of problems arising from government agency regulations, which it has rated as not severe. No practitioner wants to blame himself solely for delays.

Question Three

What Relationship exists between the Project Final Cost and the Project Total Time?

In response to this question we have decided to employ the regression analysis to check the extent of relationship which exists between the Project Total Time which varies because of the extra time imposed on it arising from the delays which occurred in the project and Project Total cost.

According to Nworuh, (2001) the regression analysis is a statistical tool which helps to predict one variable from the other variable on the basis of assumed nature of relationship between these variables. One attempts to determine how given changes in certain variables affect some other variables. Thus, in response to our research question on whether there is any impact or effect on the Project Final Cost and Total Time.

The relationship can be written as

$Y = a_0 + a_1x + e$. The values of a_0 , a_1 , and e are unknown parameters to be estimated. The simple regression model describing the relationship between x and y can be expressed as **$y_i = a_0 + a_1x + e$** for $i=1, 2, 3, 4 \dots n$. where there are n numbers of

observation for x and y with y, being the ith observation from the table. **Table 4.11a Relationship between Project Final Cost and Total Cost**

Project	% Time Variation	% Cost Variation
A	75%	18%
B	100%	5%
C	50%	1.5%
D	92.4%	98.4%

Using the least square method we obtain the following as in table

Table 4.11b Summary of Table 4.11a

Y	X	Xy	Y ²	X ²
18	75	1350	324	5625
5	100	500	25	10000
1.5	50	75	2.25	2500
98.4	92.4	9092	9682	8538
$\sum y=123.9$	$\sum x=317$	$\sum xy=11,017$	$\sum y^2=10033$	$\sum x^2=26663$

First we calculate the coefficient of correlation between our variables Using the

Product – moment Correlation coefficient $r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2] [n\sum y^2 - (\sum y)^2]}}$

$$\sqrt{[n\sum x^2 - (\sum x)^2] [n\sum y^2 - (\sum y)^2]}$$

$$= 5077/\sqrt{154 \times 10^6} = 5077/12413$$

$$= 0.41$$

This shows a positive relationship, though not a very strong one but its positivity is of immense importance to our research question, we shall further find the regression equation for the two variables under investigation.

$$a_1 = \frac{n \sum xy - \sum y \sum x}{n \sum x^2 - (\sum x)^2}$$

$$= \frac{(4 \times 11017) - (123 \times 317)}{(4 \times 26663) - (317)^2}$$

$$= 0.824$$

$$a_0 = \frac{\sum y - a_1 \sum x}{N}$$

$$= \hat{y} - a_1 x$$

$$= 30.75$$

-ai

79.25 a0

= -

34.6 $y = -34.6 + 0.824x$ a_i is the coefficient of regression and very important in the regression function. It is a measure of the average change in the variable y as a result of a unit change in x . $a_i = 0.824$, which means with a unit increase of the Time Variation, the Cost Variation increases on the average by 0.824 y . This is also in agreement with our proposition above that both Variations in Cost and Time tend to change (increase) in the same direction because our relationship is positive.

Finally, we will calculate the value of ϵ which is the average coefficient of elasticity

$$a_i / \hat{y} = 0.824 \times 79.25 / 30.75 = 2.12$$

This means that a 1% variation in Time (caused by delays) causes an average of 2.12% variation in the Cost of the project. In conclusion we have been able to prove the positive relationship of both variables.

When projects are delayed leading to Variation in Total Time for Construction

Projects there would be a corresponding Variation in the Total Cost of Projects.

Question Four

Is there any agreement in the perception of practitioners (our respondents) on these severities?

To ascertain the extent of agreement in the perception of the practitioners on the severities of these delays causes, the spearman's correlation analysis was employed to measure the correlation. This measure according to Nworuh (2001:151) is based on the ranks of the measurements of each variable (in this case our subgroups) rather than on the value assumed by the variables themselves.

From the Tab 4.4 the following are obtained. The simple computational formula is given by the value of x,y.

For the contractor versus owners

Table 4.5: Contractors Versus Owners

Delay factors	Contractors ranking	Owners ranking	Difference(d)	d²
A	7	5	-2	4
B	5	3	2	4
C	2	1	1	1
D	1	2	-1	1
E	9	8	1	1
F	8	6	2	4
G	6	9	-3	9
H	4	7	-3	9
I	3	4	-1	1
				$\sum d^2 = 34$

From Tab 4. 8, n

$$= 9, \Sigma$$

$$\Sigma \frac{d^2}{ys = 1 -$$

$$6d^2$$

$$n(n^2 - 1)$$

$$= 1 - 6*34/9*(81 - 1)$$

$$= 1 - 204/720$$

$$= 0. 72$$

There is a high level of agreement between the contractors and the owners, since our value is positive.

For the contractor verse the consultants we have the following From Tab 4.5 the following are obtained

Delay factors	Contractors ranking	Owners ranking	Difference(d)	d2
A	7	6	-2	1
B	5	2	2	9
C	2	3	-1	1
D	1	1	0	0
E	9	9	0	0
F	8	7	1	1
G	6	4	2	4
H	4	8	-4	16
I	3	5	-2	4
				Total 36

From Tab 4.9,

$$n = 9,$$

$$\sum \frac{d^2}{n} = 1 -$$

$$6d^2$$

$$= 1 - \frac{6 \cdot 36}{9 \cdot (81 - 1)}$$

$$= 1 - \frac{216}{720}$$

$$= 0.7$$

There is a high level of agreement between the two parties. This is called a perfect correlation because it is positive

Consultants versus Owners

From the Tab 4.6 the following are obtained

Delay Factors	Contractors ranking	Owners ranking	Difference(d)	d ²
A	6	5	1	1
B	2	3	-1	1
C	3	1	2	4
D	1	2	-1	1
E	9	8	1	1
F	7	6	1	1
G	4	9	5	25
H	8	7	1	1
I	5	4	1	1
				Total 36

From Tab 4.10,

$$n = 9,$$

$$\sum \frac{d^2}{ys} = 1 -$$

$$6d^2$$

$$N(n^2-1)$$

$$= 1 - \frac{6 \cdot 36}{9 \cdot (81 - 1)}$$

$$= 1 - \frac{216}{720}$$

$$= 0.7$$

There is a high level of agreement between the two parties. This is called a perfect correlation since it is positive. In conclusion and in response to our research question, we've been able to prove from our analysis that there is a high level of agreement existing between the respondents on the severity of the delay causing factors.

4.3 Test of Hypothesis

The hypotheses of this research work are tested under this section:

H₀₁: There is no correlation between the perception and response of project owners and the contractors.

To test the hypothesis that Contractors and Owners do not agree on the perception raised.

1. The decision rule states that at 0.05 level of significance, if the score of statistics lies outside $-t_{\alpha/2}$ and $+t_{\alpha/2}$, accept the Null hypothesis, otherwise reject it. In other words, If $t > t_{\alpha/2}$ or $t < -t_{\alpha/2}$: reject H_0
2. Accept the hypothesis if it lies between $-t_{\alpha/2}$ and $+t_{\alpha/2}$ Using the t test $t =$

$$t = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}}$$

$$= 0.72\sqrt{7/0.4816}$$

$$= 2.74$$

At a $(n-2)$, 7 degree of freedom, $t_{0.05} = 2.365$
 t calculated = 2.74 $t > t_{0.05}$; we reject

H_0 and accept H_a

Decision: Since our value for t lies outside our range. We reject the null hypothesis and accept the alternate hypothesis.

Thus: contractor's and owners agree on the severity of the defects

H_{02} : There is no correlation between the perception and response of the project consultants and the contractor.

$$t = r\sqrt{\frac{2}{1-r^2n}}$$

$$= 0.72\sqrt{7/0.51}$$

$$= 2.6$$

At a (n-2), 7 degree of freedom, $t_{0.05} = 2.365$

t calculated = 2.4 $t > t_{0.05}$; we reject H_0 and

accept H_a

Decision: There is agreement between the two parties on the severity of the causes.

The spearman's correlation proves a high level of agreement.

H_{03} : There is no correlation between the perception and responses of the project consultants and the owners.

Using the t test $t = r$

$$= 0.72 \sqrt{7/0.51}$$

$$= 2.6 \text{ } t \text{ calculated}$$

$$= 2.6$$

$$\sqrt{\frac{n-1}{2}} \\ 1-r$$

$t > t_{0.05}$; we reject H_0 and accept H_a

Decision: There is agreement between the two parties on the severity of the causes.

In conclusion our test of hypothesis also falls in line with what our results have been showing so far i.e a positive agreement by all the parties analyzed

4.4 Other Data

Tab 4.11: Table for other Data

	Project A	Project B	Project C	Project D
Initial contract sum	N500 million	N57 million	N198 million	N495 million, DM46,000
Final contract sum	N590 million	N60 million	N201 million	N982,166,438 DM15,000
Variation	N90 million	N 3 million	N3 million	N487 million
% variation	18%	5%	1.5%	98.4%
Proposed completion date	Feb 2007	Mar 2002	Aug 2007	Jan 1996
Actual completion date	Still on going	Abandoned	Oct 2007	Nov 1997
Time variation	Above 6 months	Abandoned	2 months	22months
% Variation	75%	-	50%	92.4%

Source: Field Data 2023

This data which is the secondary data were extracts from cost and time schedule of the sampled projects. It could be seen that the variations in the period of project lifetime also caused variations in the project cost.

The longer the variation in time, the more the cost variation. This shows that projects delays have a direct impact on project cost (either borne by the contractor or owners). There is a direct proportional relationship as can be seen in our third research question.

The table below is a summary of the project performances, key delay factors and control measures.

Table 4.12: Summary of Project Performances, Key Delay Factors and Control Measures

	Performance	Key delay factors	Suggested control measures
Project A	Cost overrun, Project is behind schedule	Poor planning and control, project environment, project financing	Demand for credit worthiness all risk insurance and performance bon of contractor, introduce contingency cost for contractor
Project B	88% permanent work completed, currently abandoned	Project funding poor project planning and control, government regulations.	Outstanding, bulk purchase of materials.
Project C	Completed, time overrun	Project materials. Project financing strategies, project planning and control	Bulk purchase of materials. Outsourcing supplies, regular supervision.
Project D	Completed behind the schedule. Cost overestimation	Poor scope management, design variations, project planning and control.	Cost project in detail using BEME (BOQ). Statistical tools, software should be used to monitor, track progress of projects of such magnitude.

Source: Field Data 2023

Nonetheless, all factors are very crucial towards the achievements of a construction project without having delays and extension of time period for project completion. These findings to a large extent depict and conform to the expected similarity with other findings by experts and authors on this same issue.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The growth of a nation is normally predicated on successful execution of developmental projects. Failed or delayed projects throw a nation backwards through three different ways

1. Financial loss

2. Loss of alternative forgone

3. Mortgaging of future projects through debts servicing used in funding projects from sources other than projects internally generated funds. The panacea for the under development of our economy through failed or delayed project completion is the institution of sound project management practices.

It is very clear that all our respondents had ranked problems arising from project financing and contracting strategies as the most severe of all the delay causes, though it may be surprising that the owners slightly disagreed, rating it as the second most severe. The owners seem to opine that the effects of project equipment and machinery on the projects were more pronounced than problems arising from project funding and financing. This may seem as a shifting of the blames on delay causing factors which have to deal directly with the other stakeholders' i.e. the contractors.

The contractors and consultants seem to share a similar view on all the defects. They both agree that financing problems are the most severe than all other factors.

Project risk management was judged as having the least effects on project delays than all other factors. This is probably because risk problems do not surface in the projects under investigation. It is clear that risk problems could be very severe if they arise. In both cases the two parties agree it is not severe.

The owners however feel the problems arising from Government regulations are the least. Again, trying to exonerate themselves from delay causing factors which deal directly with them. However surprisingly, defects arising from project control and planning, project human resource management were weighed as "fairly severe" and severe respectively by our respondents.

5.2 Conclusion

The following conclusion can be drawn in addition to what we have already stated before.

It appears from the research that improperly drawn contracts and financing arrangements fuel delays in projects, these cause disputes. Terms of contracts should clearly state cost, financing and funding arrangements. Some of the causes of delays are interdependent, e.g. some of the projects were similarly affected though in varying degrees by problems arising from materials (supply, procurement), cost of variations and government regulations. Construction projects should be well planned and scope defined, this will help reduce the incidences of variation, inflation and subsequent abandonment of the projects.

Some of the projects were not thoroughly supervised. In some cases, quality control and measurement which are responsibilities of the project manager approved by the owners are left to the contractors alone. Thereby making a contractor his own umpire. e.g. project D.

5.3 Recommendation

There is urgent need of experienced managers to handle those projects using Project Management approach, where a person is appointed with the responsibility to handle the project from the inception to completion. The Project Manager should

be well trained and aware of techniques in Project Management, Critical Cost Factors, and time factors which may create problems as the project is being executed.

Software are required for the application of Modern Project Management techniques such as CPM, PERT. Software like Primavera, MS Project should be encouraged. The uses of these software are nonexistent especially among the indigenous contractors and personnel. This militates against project performance, these should be a pre requisite for awarding contracts.

There must be right attitude of all the stakeholders, project participants in delivering projects within cost.

It is recommended that no public contracting agency should ever engage in construction operations without putting in place a Project Management System that complies with normative practice by complying with the provisions of "The National Construction Policy" turnkey projects should be discouraged.

Nigeria professionals involved in construction and project management should submit themselves to regular refreshment and updating of skills in Project Management.

There are international professional bodies which offer training and exchange of latest ideas for the enhancement of the profession.

The field of project management should be seen as a field which is independent and hence requires skills peculiar to it. Project managers should be independent professionals different from contractors and construction managers.

5.4 Need For Further Study

Some of the findings of this research still need further study. Whereas construction Costs increases and funding problems are universally acknowledged as key factors in incidence and effects, other factors such as problems arising from equipment appear novel. The novelty may be due to the peculiarity of the selected projects or the peculiarity of the Nigerian project environment. More studies will clarify why some delay causing factors are very interdependent and they need to be analyzed as such.

There is a relationship between time and cost variables as can be seen from our study, this need to be investigated further than we have done in this research.

Our study covered only Government/public owned projects. There is need to carry out an all-encompassing study on projects not limiting it to a particular type of project.

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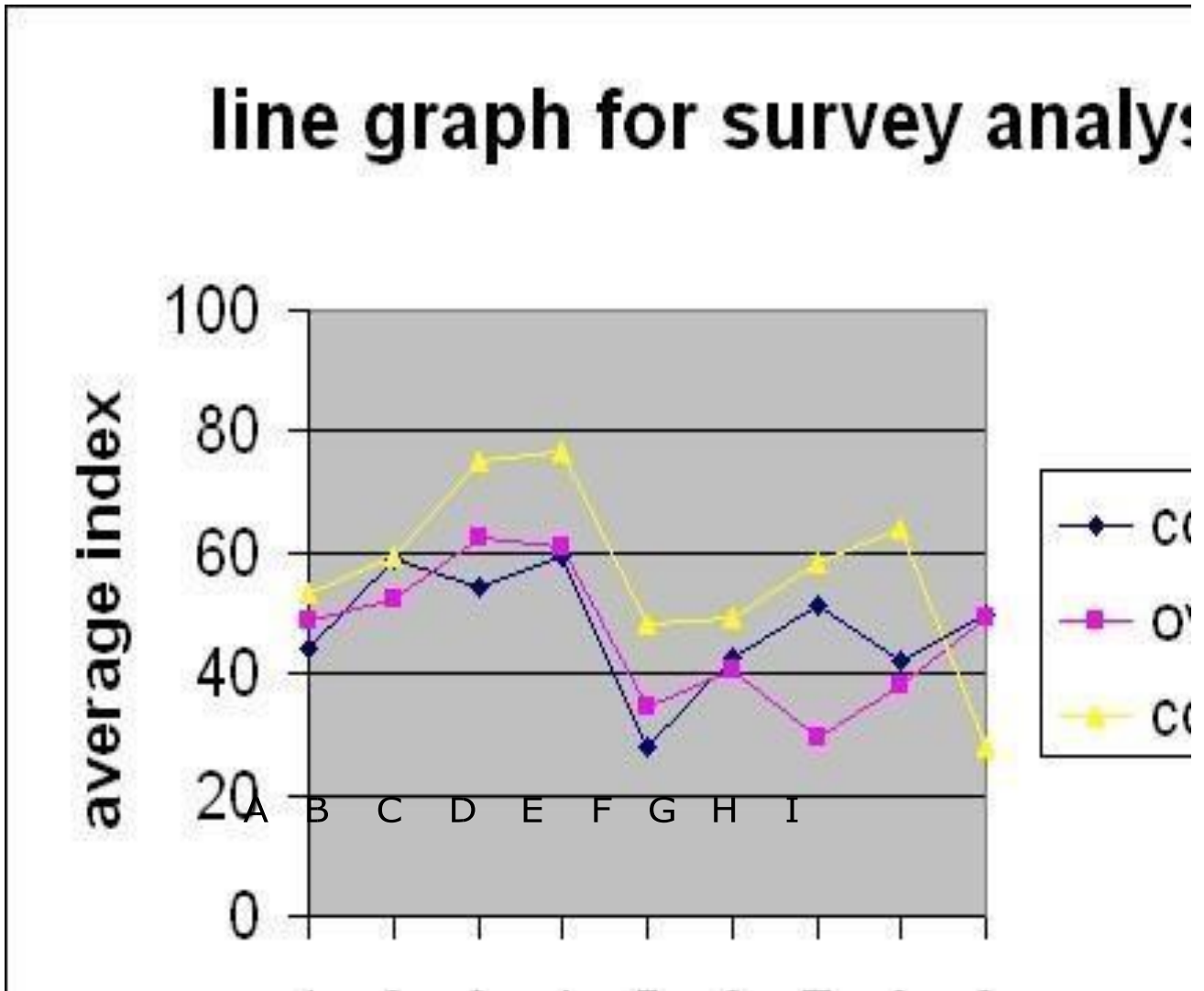
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APPENDIX

Fig 4.2: A line graph representing the summary of the survey analysis.



B						
B5	3	5	-	-	79.2	2 ND
B6	6	2	-	-	91.7	1 ST
B7	2	4	2	-	66.7	3 RD
B8	-	8	-	-	66.7	3 RD
B9	-	2	6	-	41.7	5 TH
B10	1	3	1	3	41.7	5 TH
B11	-	-	3	5	12.5	8 TH
B12	-	1	2	5	16.7	7 TH
C						
C13	-	6	2	-	58.33	3 RD
C14	6	-	2	-	83.33	1 ST
C15	-	2	3	3	29.2	4 TH
C16	3	5	-	-	79.2	2 ND
D						
D17	1	4	-	3	29.2	9 TH
D18	4	1	-	3	62.5	5 TH
D19	3	-	2	3	45.8	7 TH
D20	1	2	2	3	45.8	7 TH
D21	-	1	4	3	25	10 TH
D22	8	-	-	-	100	1 ST
D23	5	3	-	-	87.5	2 ND
D24	1	7	-	-	70.8	4 TH
D25	-	5	3	-	54.2	6 TH
D26	5	3	-	-	87.5	2 ND
E						
E27	-	2	1	5	20.8	6 TH

E28	1	3	4	-	54.2	1 ST
E29	1	1	3	3	33.3	3 RD
E30	1	1	3	3	33.3	3 RD
E31	-	4	1	3	37.5	2 ND
E32	-	2	3	3	29.2	5 TH
F						
F33	1	4	2	-	54.2	3 RD
F34	1	4	3	-	58.3	2 ND
F35	-	2	6	-	41.7	4 TH
F36	-	1	2	5	16.7	5 TH
F37	4	4	-	-	83.3	1 ST
G						
G38	-	1	1	6	12.5	4 TH
G39	-	1	3	4	20.8	3 RD
G40	1	4	-	3	45.8	1 ST
G41	1	2	2	3	37.5	2 ND
H						
H42	-	3	1	4	29.2	5 TH
H43	-	3	2	3	33.3	4 TH
H44	3	2	-	3	58.3	1 ST
H45	-	3	5	-	45.8	3 RD
H46	-	5	3	-	54.2	2
H46	-	3	1	4	29.2	5
H48	-	-	4	4	16.7	7 TH
I						
I 49	-	-	8	-	33.3	4 TH
I 50	2	5	1	-	70.8	1 ST

I51	2	2	-	4	41.7	3 RD
I53	5	1	-	2	70.8	1 ST

Tab 4.1

4.2.2 CONSULTANTS SURVEY ANALYSIS

A	VERY SEVERE	SEVERE	FAIRLY SEVERE	NOT SEVERE	INDEX %	RANK
A1	2	5	1	-	70.8	1 ST
A2	2	-	5	1	45.8	3 RD
A3	2	2	1	3	45.8	3 RD
A4	4	-	1	3	54.2	2 ND
B						
B5	2	5	-	1	66.7	4
B6	3	5	-	-	79.2	1 ST
B7	-	5	-	1	41.7	6 TH
B8	5	2	-	1	79.2	1 ST
B9	2	5	-	1	66.7	4 TH
B10	-	2	3	3	29.2	8 TH
B11	1	7	-	-	70.8	3 RD
B12	-	2	5	1	37.5	7 TH
C						
C13	-	5	3	-	54.2	3 RD
C14	4	1	2	2	66.7	1 ST
C15	-	5	-	3	41.7	4 TH
C16	2	2	4	-	58.3	2 ND
D						
D17	7	1	-	-	95.8	1 ST
D18	4	3	1	-	79.2	2 ND

D19	1	5	2	-	62.5	4 th
D20	3	-	5	-	58.3	7 th
D21	1	5	2	-	62.5	4 th
D22	1	1	2	4	29.2	9 th
D23	-	1	3	4	20.8	10 th
D24	-	5	-	3	41.7	8 th
D25	3	2	2	-	62.5	4 th
D26	3	5	-	-	79.2	2 nd
E						
E27	1	2	1	4	33.3	2 nd
E28	-	1	2	5	16.7	5 th
E29	-	3	3	2	37.5	1 st
E30	-	1	5	2	29.2	4 th
E31	-	1	2	5	16.7	5 th
E32	1	-	5	2	33.3	2 nd
F						
F33	3	1	-	4	45.8	2 nd
F34	-	2	5	-	37.5	4 th
F35	-	-	7	1	29.2	5 th
F36	-	3	5	-	45.8	2 nd
F37	3	1	2	2	54.2	1 st
G						
G38	-	4	2	2	41.7	4 th
G39	2	1	5	-	54.2	1 st
G40	3	1	2	2	54.2	1 st
G41	-	5	3	-	54.2	1 st

H						
H42	1	-	3	4	25	6 th
H43	2	2	2	2	50	2 nd
H44	-	1	3	4	20.8	7 th
H45	-	4	4	-	50	2 nd
H46	1	2	5	-	37.5	5 th
H47	-	4	4	-	50	2 nd
H48	3	1	4	-	62.5	1 st
I						
I49	-	4	4	-	50	4 th
I50	3	5	-	-	78.2	1 st
I51	-	5	-	3	41.7	5 th
I52	3	5	-	-	58.3	3 rd
I53	3	3	2	-	70.8	2 nd

Tab 4.2

4.2.3 CONTRACTORS SURVEY ANALYSIS

A	VERY SEVERE	SEVERE	FAIRLY SEVERE	NOT SEVERE	INDEX %	RANK
A1	3	3	2	-	70.8	2 nd
A2	6	-	2	5	83.3	1 st
A3	1	-	2	5	20.8	4 th
A4	3	-	-	5	37.5	3 rd
B						
B5	3	3	2	-	70.8	2 nd
B6	6	-	2	-	83.3	1 st
B7	3	3	-	1	62.5	3 rd

B8	1	5	2	-	62.5	3 rd
B9	1	5	2	-	62.5	3 rd
B10	4	-	2	2	58.3	6 th
B11	-	3	3	2	37.5	7 th
B12	-	3	3	2	37.5	7 th
C						
C13	5	3	-	-	87.5	1 st
C14	2	6	-	-	75	2 nd
C15	-	8	-	-	66.7	4 th
C16	3	5	-	-	70.8	3 rd
D						
D17	6	2	-	-	83.3	2 nd
D18	6	1	-	1	70.8	9 th
D19	8	-	-	-	100	1 st
D20	3	5	-	-	79.2	4 th
D21	6	2	-	-	83.3	2 nd
D22	4	2	-	2	75	8 th
D23	-	3	3	2	37.5	10 th
D24	5	1	2	-	79.2	4 th
D25	5	1	2	-	79.2	4 th
D28	5	1	2	-	79.2	4 th
E						
E27	1	-	7	-	41.5	5 th
E28	-	4	4	-	50	3 rd
E29	1	3	4	-	54.2	1 st
E30	1	3	4	-	54.2	1 st
F31	-	3	5	-	45.8	4 th

E32	1	3	2	2	45.2	4 th
F						
F33	2	3	3	-	62.5	3 rd
F34	-	8	-	-	66.6	1 st
F35	3	2	3	-	66.6	1 st
F36	-	6	2	-	58.3	4 th
F37	1	7	-	-	41.7	5 th
G						
G38	-	6	2	-	58.3	2 nd
G39	1	7	-	-	70.8	1 st
G40	2	4	-	2	58.3	2 nd
G41	1	3	2	2	45.8	4 th
H						
H42	-	6	2	-	58.3	5 th
H43	-	8	-	-	66.6	2 nd
H44	5	1	2	-	79.2	1 st
H45	-	6	2	-	58.3	5 th
H46	2	4	2	-	66.6	2 nd
H47	-	3	5	-	45.8	7 th
H48	-	7	1	-	62.5	4 th
I						
I 49	-	4	4	-	50	4 th
I 50	3	5	-	-	79.2	1 st
I 51	-	5	-	3	41.7	5 th
I 52	3	5	-	-	79.2	1 st
I 53	3	3	2	-	70.8	3 rd

Tab 4.3

QUESTIONNAIRE

SECTION ONE

Name Of Respondent (Optional) _____

Name Of Establishment: _____

Office/Designation _____

Are you a stakeholder in the construction industry, where would you classify yourself?
(Please tick [x] where applicable)

- | | |
|--|-----|
| <input type="checkbox"/> Project Owner/Client | [] |
| <input type="checkbox"/> Contractor | [x] |
| <input type="checkbox"/> Project Engineer/Consultant | [] |

SECTION TWO

As a stakeholder, how would you rate the severity of the following under listed delay-causing problems as they affect the construction projects, which your establishment undertakes? Use the following: Very severe [1], Severe [2], Fairly severe [3], Not severe [4]

1. Poor operations management by the contractors [4] [2] [3] [4]
2. Mismanagement of Project scope [1] [2] [3] [4]
3. Non computerization or automation in project management systems for construction project e.g. lack of software [3] [2] [3] [4]
4. Poor Data Management systems [1] [2] [3] [4]
5. Wrong Personnel and Human resource management [3] [2] [3] [4]
6. Use of inexperienced, untrained, unskilled workers by contractors

[4] [2] [3] [4]

7. Poor performance appraisal of skills of workers by contractors

[1] [2] [3] [4]

A Graph Representing the Survey Analysis summary
(Average Severity Indices) of our respondents.

Fig 4.1

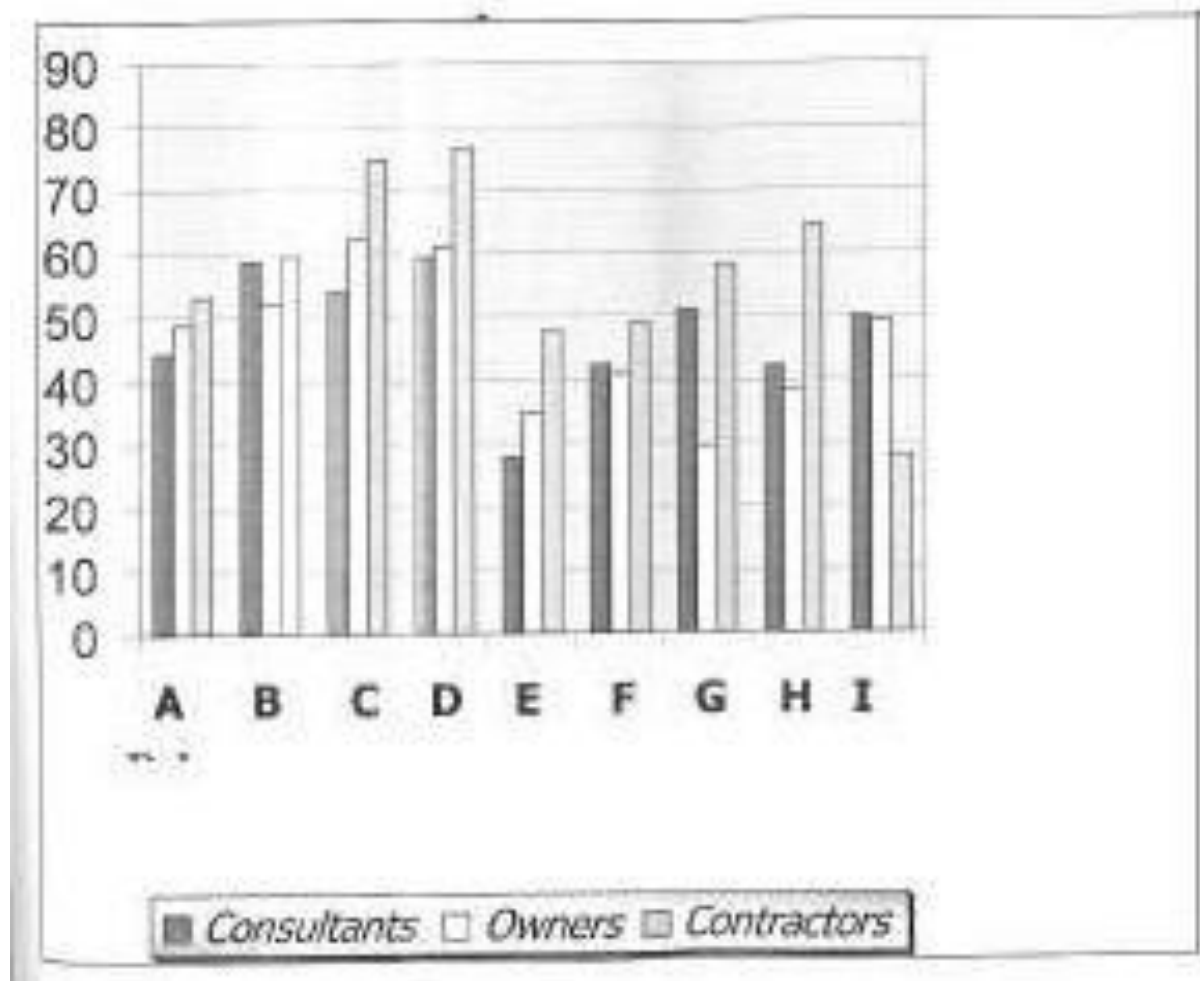
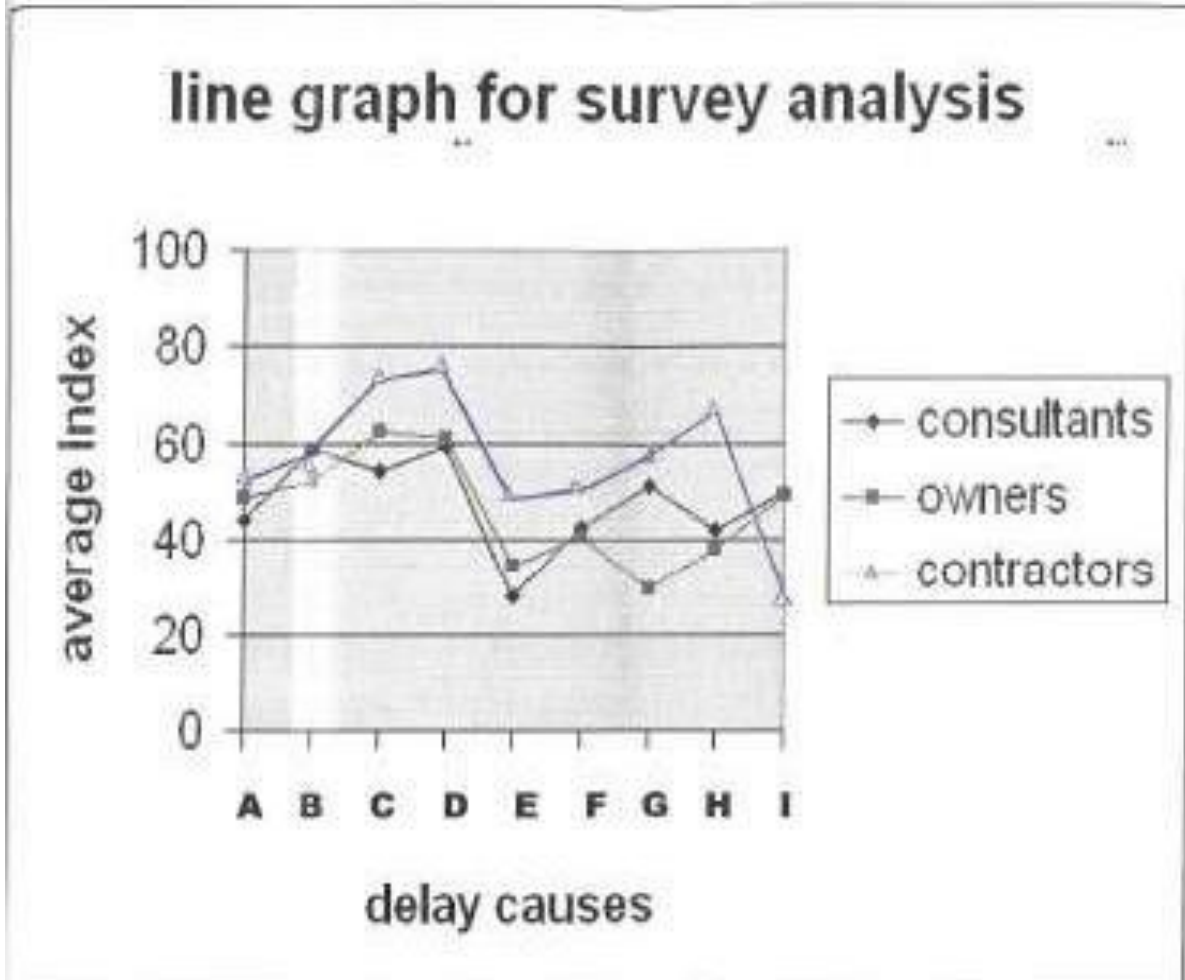


Fig 4.2

A line graph representing the summary of the survey analysis.



- 9 Wrong recruitment /selection procedures [1][2] [3] [4]
- 10 Labour unrest by the contractor's workers [2][2] [3] [4]
- 11 Lack of employee development /training for staff by contractors [3][2] [3] [4]
- 12 Imposition of workers on contractors by authorities or external influences [1] [2] [2] [4]
- 13 Use of obsolete equipment. [1] [2] [3] [4]
- 14 Breakdown of equipment. [1] [2] [3] [4]
- 15 Shortage of equipment operators [1] [2] [3] [4]
- 16 Absence of the right equipment [2][2] [3] [4]
- 17 ~~bu~~ Bureaucratic Delays in release of funds by owners [2][2] [3] [4]
- 18 Inadequate /poor funding of projects by owners [1] [2] [3] [4]
- 19 Shortage of cash (liquidity) [2][2] [3] [4]
- 20 Cost overrun due to inflation or financial mismanagement [2][2] [3] [4]
- 21 Wrong contract financing strategies and arrangements [2][2] [3] [4]
- 22 Bankruptcy by either contractor or Owner [2][2] [3] [4]
- 23 Litigation arising from court cases [1][2] [3] [4]
- 24 Insolvency or inability of contractor to pay debts e.g. to suppliers [1] [2] [3] [4]
- 25 Wrong budgetary estimates [1][2] [3] [4]
- 26 Non-prudent management of financial resources [1] [2] [3] [4]
- 27 Inadequate insurance cover for equipment, labor, and materials [2][2] [3] [4]
- 28 Court injunctions arising from poor risk management [1] [2] [3] [4]
- 29 Inadequate insurance cover arising from losses, accidents e.g. financial losses, professional negligence, environmental damage, compensations [2][2] [3] [4]
- 30 Poor human, safety and environment (HSE) standards and Practices [1] [2] [3] [4]
- 31 Denial of Claims by insurance companies by default [1] [2] [3] [4]
- 32 Wrong strategies and poor financing against risks. [2][2] [3] [4]

34. Accidents or disputes arising due to environmental changes. [1] [2] [3] [4]
35. Unforeseen geological changes and discoveries (uncovered during construction) [1] [2] [3] [4]
36. Insufficient fixed utilities in areas of construction activity. [1] [2] [3] [4]
37. Hostilities by host communities. [1] [2] [3] [4]
38. Changes in the top hierarchy of authorities overseeing projects. [1] [2] [3] [4]
39. Individual interest within the administration or authorities that own projects. [1] [2] [3] [4]
40. Changes in Government policies/administrative policy. [1] [2] [3] [4]
41. Excessive bureaucracy in obtaining required permits, certificates, licenses, documents, and general administrative operations. [1] [2] [3] [4]
42. Loss of materials on-trail during construction. [1] [2] [3] [4]
43. Shortage of materials in the market. [1] [2] [3] [4]
44. Wrong materials specifications. [1] [2] [3] [4]
45. Late delivery of materials to site. [1] [2] [3] [4]
46. poor procurement practices by the contractors. [1] [2] [3] [4]
47. Damage of materials on site during construction. [1] [2] [3] [4]
48. Changes in materials specifications as a result of changes met on ground. [1] [2] [3] [4]
49. Variation in the project scope as a result of changes met on ground. [1] [2] [3] [4]
50. Misunderstanding of the project scope by the contractor. [1] [2] [3] [4]
51. Wrong project scope outlined by the owners or consultants. [1] [2] [3] [4]
52. Communication problems between the major stakeholders i.e., contractors, consultants and project owners. [1] [2] [3] [4]
53. Initial under pricing of project cost by contractor during tendering and bidding. [1] [2] [3] [4]

Thanks for your cooperation, sir.