EVALUATION OF DELAY RELATED FACTORS IN NIGER DELTA DEVELOPMENT COMMISSION CONSTRUCTION PROJECTS IN UNIVERSITY OF PROT HARCOURT

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CERTIFICATION

This is to certify that this study **"Analysis of Delay Factors of** Niger **Delta Development Commission Sponsored Project at University of Port Harcourt"**, was carried out by **Nkem, Nwaribe (Reg.** No: **20154943048)** in partial fulfilment for the award of a Master of Business Administration (MBA) in Project Management Technology of the Federal University of Technology Owerri.

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DEDICATION

This research work is dedicated to Almighty God for His infinite mercy in my Life.

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First, I give all the glory to Almighty God, without whom, I would not have attained this level of academic excellence. Sincere thanks to my supervisor, Dr. E.G. Ubani for his kindness and advice during my study.

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ABSTRACT

This study focuses on the Evaluation of Delay Related Factors in Niger Delta Development Commission Construction Projects in University of Port Harcourt. The objectives include to analyse the selected construction projects to determine their level of performance, and identify and analyse the delay factors in the face of the level of delay witnessed in the delivery of Niger Delta Development Commission hostel project in University of Port Harcourt, Rivers State. Descriptive statistics was partly used to analyze the performance data of the selected construction project from 2004 to 2012 which showed low performance due to high level of cost and time variations witnessed. The contributory factors to the low performance were identified. Based on this, five-point Likert's scale questionnaire was designed and distributed to 136 respondents for assessment on the level of effect of the contributory factors on cost and time variations. The t-test analysis of the delay factors show that all the identified factors significantly affected the performance of the NDDC hostel project with contractor related factors having the highest effect on the delay witnessed. The correlation analysis show that the delay factors also have negative significant relationship with the economic development of the people of Port Harcourt. The relative severity index also ranked contractor related factors as the highest effective factor to the level of delay witnessed in the NDDC hostel project delivery. The study therefore recommends honesty and transparency among the players in the public sector or government agencies and construction industry, maximum attention by contractors to detailed design before tendering for projects, stability in the market prices of construction materials and efficient and effective tendering process before projects are awarded.

Keywords: project delays, public sector, construction projects, contractors, clients, NDDC hostel.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Delays are one of the biggest problems in public sector construction projects. A public sector construction project can only be successful when it is completed on time, within budget and in accordance with specifications and to the satisfaction of those concerned. The measure of the success of such project can also be evaluated through its functionality, profitability, to contractors without indemnity arising from claims and court processes (Aminudin, 2016). Undoubtedly, delays occur in almost every public sector construction projects and the magnitude of these delays varies considerably from one project to another. Some projects are only a few days behind the schedule, while some are delayed over a year. Koushki, and Kartarn (2015), described delay as a situation when the contractor, consultant, and client jointly or severally contribute to the non-completion of the project within the agreed contract period. Delays give rise to disruption of work and loss of productivity, late completion of project, increased time and cost overrun, third party claims and abandonment or termination of contracts (Levy, 2016).

However, the construction industry itself continues to occupy an important position in the structure of the Nigerian economy. An efficient construction sector is a prerequisite to effective national development since building, civil and industrial engineering works are usually the major contributors to Gross Fixed

Gapital Formation, Gross Domestic Products and National Employment. The growth of construction industry in the past two decades is an indication that the sector greatly contribute to the national development.

In a study by Olaloku (2014), it was observed that the relative large investment commitment to construction makes the industry an important source of demand generation and that the 'multiplier effect' (i.e. the great capacity to generate employment, income and expenditure in other sectors of the economy) constitutes another contribution it makes to the economy. This observation is further substantiated by the fact that annual growth in the Nigerian construction industry in 1974 was 26.9% and the gross domestic product grew by only 13.1%, but in 1984, construction declined by only 27% and the GDP declined by only 11% (Aibinu & Jagboro, 2012). This highlights the fact that the construction industry continues to be a major stimulant in the country's economic growth. This strong interrelationship further strengthens the need to ensure that project planning and implementation is cost and time effective.

In a bid to improve the level of infrastructural provision in the Niger Delta areas, the Niger Delta Development Commission (NDDC) have been intervening to assist in the achievement of this noble objective. Unfortunately, the level of delays witnessed in most of the projects embarked upon by the commission left nothing to be desired as most of their projects end up either been delayed or abandoned. Consequently, arguments from various quarters has it that the

management of NDDC have relegated this objective to the contractors who see it as a means of amassing wealth at the detriment of the public welfare. Construction project is a composite variable that measures the domestic capability to achieve national development. Any nation that has a high capability to implement successful development projects is expected to achieve rapid national development and improved standard of living. The reverse goes for nations with low capability of implementing successful development projects (Akpan, Echeme & Ubani, 2017).

So the rational for this study is based on the fact that NDDC projects are being implemented in the Niger Delta States and a lot of funds are also being invested in the planning and implementation of these projects in order to aid the developmental efforts of the Federal Government of Nigeria. Despite all these investments in the NDDC construction projects, the developmental aim seems unrealizable owing to the fact that the rural poor citizens are yet to benefit from the impact of these projects. It is believed that most of these projects ended up either being failures or abandoned. Authors have investigated this as managerial and administrative related bottleneck from management of NDDC and not external related. That is why the problem of low level of implementation of NDDC construction projects in Rivers State and other states in the Niger Delta still persists.

But this study identified the external related factors based on what happens to projects that are being implemented in the state as it concerns the contractors, clients, availability of quality project materials and funding pattern of these projects.

The need to improve the rate of infrastructural development with the NDDC projects as a strategy to complement the Federal and State Government efforts towards the provision and upgrading of infrastructure in Rivers State and the University of Port Harcourt, Choba has become an issue of investigation. Building on the past related works, this study seeks to provide new insights into factors that delay the prompt realization NDDC construction projects in Niger Delta and Rivers State in particular.

Meanwhile, research has shown that excessive project cost and time overruns have been too evident in NDDC construction projects and related projects in Rivers State due to project delays. Project delay is a problem which needs a solution. Hence, this study was set to investigate the causes and effects of delays in NDDC construction project implementation for improved success and economic development of Rivers State, Nigeria.

1.2 Problem Statement

Delays in construction projects are easily noticed in most construction projects implemented in Nigeria, especially in Port Harcourt Rivers State. This is why

critics of the Nigerian Construction Industry, such as Olaloku (2014) and Aibinu and Jagboro, (2012), always emphasize on the rate of delays in construction project delivery.

Due to the level of economic, social, political and ethnic problem facing the country, research revealed that project funds are not been released promptly and adequately and this has been the major problem in the completion of construction projects within the planned duration in Nigeria, especially in Port Harcourt, Rivers state. Literature review and field study postulates that the contractors of these construction projects tend to deviate from the project plan/specifications and this has been attributed to their level of qualification, errors in the Bill of Quantities, inappropriate or insufficient funding, use of non-professionals in the planning and implementation of these projects among others. Delay in public sector construction projects could be adduced to myriad of factors and its effects usually have negative consequences on the projects such as poor business results, low return on investment, etc.

Construction project delays are consistently dynamic and uncertain. Several controllable and uncontrollable factors have adversely affected the Niger Delta Development Commission (NDDC) University hostel project schedule and cause delays (Eshett, 2012 & Nwana, 2007). These delays have definitely created negative effects on project performance. Schedule delays in the completion of public sector construction projects might be a major difficulty for contractors handling them, thus leading to costly disputes and adverse relationships between

project participants. The study intends to investigate if adequate planning and sincere budget implementation are activated, and whether construction projects would be completed and made functional within the planned duration. It is in an attempt to prove this assertion, and to also identify other variables that may be responsible for project delays that this research work was mounted.

1.3 Objectives of the Study

The main objective of this study is to investigate and evaluate delay related factors in Niger Delta Development Commission construction projects in University of Port Harcourt in University of Port Harcourt, Rivers State. To achieve this aim, the following specific objectives are to be achieved;

i. To determine the level of effect that finance related delay factors have on the quality of public sector construction project delivery.
ii. To ascertain whether material related delay factors have any significant effect on the budgeted cost and time of public sector construction project delivery.
iii. To examine the extent to which contractor related delay factors can significantly affect the performance of public sector construction project delivery.
iv. To determine the level of effect that equipment related delay factors have on the delivery of public sector construction project.
v. To ascertain whether client related delay factors can significantly affect the success of public sector construction projects.

vi. To determine the level of significant relationship between project delay factors and public sector economic development and performance objectives of such projects in Port Harcourt, Rivers State.

1.4 Research Questions

The following research questions have been designed to carry out this work:

i. What could be the level of effect that finance related delay factors have on the quality of public sector construction project delivery?
ii. What level of effect does material related delay factors have on the budgeted cost and time of public sector construction project delivery?
iii. To what extent can contractor related delay factors significantly affect the performance of public sector construction project delivery?
iv. What level of effect that equipment related delay factors have on the delivery of public sector construction project?
v. How can client related delay factors significantly affect the success of public sector construction projects?
vi. Is there any significant relationship between delay factors and public sector construction project delivery?

1.5 Research Hypotheses

In order to answer the research questions, the following hypotheses were formulated;

H_{01}: Finance related delay factors do not have significant effect on the quality of public sector construction project delivery.

H_{02}: Material related delay factors do not have significant effect on the budgeted cost and time of public sector construction project delivery.

H_{03}: Contractor related delay factors do not have significant effect on the performance of public sector construction project delivery.

H_{04}: The effect of equipment related delay factors on the delivery of public sector construction project is not significant to mar the project success.

H_{05}: Client related delay factor is not significant to affect the success of public sector construction projects.

H_{06}: There is no significant relationship between project delay factors and public sector economic development of Rivers State.

1.6 Justification of the Study

The justification for using the NDDC prototype hostel projects of UNIPORT is because of undergraduate accommodation for students in Nigerian higher institutions. The study will guide the construction companies on the avenues and needs to expedite action in students' hostel projects execution by addressing delay related factors. The six factors used for the study are perceived to be endemic to delay in construction projects in Port Harcourt, Rivers State Nigeria because of the city's vulnerability to environmental and socio-economic challenges. The research findings and recommendation will educate and enlighten construction project stakeholders on the causes and effects of delays on construction projects and the strategies for overcoming the problems so that construction projects can be successfully realized. In this way, construction firms, government and non-

governmental bodies (NGO's) who want to embark on construction projects will do that with confidence bearing in mind that the project can be realized within budget and given time frame. The ideas generated from the study can still be extended to other fields of human activities so that positive results can be achieved.

The academic scholars will derive from the exploratory dimension of the study. An attempt to establish yardsticks in averting possible delays in construction project delivery. The contribution to knowledge will also help in establishing policies that will engender speedy project completion.

1.7 Scope of the Study

This research covers the known delay related factors in the construction of NDDC hostel projects in University of Port Harcourt, Rivers State. The focus is mainly on the finance, material, contractor, equipment, and client related delay factors in implementation of NDDC Prototype hostel project in University of Port Harcourt, Choba, Rivers State. Efforts were also made to analyze the cost and time variations in the project as a result of delays in the implementation of the hostel construction project in the University by three different contractors.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Review

This study is based on the concept that projects realized behind the planned duration is considered delayed, even if the project was completed. Based on this, Schwelbe (2008) posited that project delay measured based on the failure to achieve project within planned time. There is no doubt that delayed projects attract cost overrun and poor quality of work. This is because project realization within time, cost, specification and user acceptance are known criteria for judging project success. However, Kezner (2003) added that a successful project implementation occurs if the project, comes on-time, on-budget, achieves all the goals originally set for it, and is adopted and used by the clients for whom the project is intended. It implies the successful achievement of time, cost and quality objectives, as well as the quality of the project process, Erling *et al* (2006). Turner (2004) identifies on time, within budget and to specification as the standard for judging success. The above literatures points to Steinfort (2013) conclusion that "project delays needs to be investigated from the perspective of nature of project team, stakeholders as well as from that of their client/recipient benefit and in the theoretical and empirical/practical review of related delay factors on any project". Based on the above literatures this study deemed it fit at this point in time to make a theoretical and empirical review of the delay factors and effect of delays in

public sector construction projects with reference to the NDDC Prototype University Hostel project in University of Port Harcourt, Rivers State.

2.1.1 Construction Project Delays

To improve the level of project success, it is necessary to understand the possible contributory factors to schedule delay, that is, the basic reason for its existence or set of conditions that stimulate its occurrence in a process. A process consists of a number of activities or operations which acting on inputs in a given sequence transforms them into outputs. A process may consist of both value adding or non-value adding activities. The former are activities that convert materials and/or information towards that which is required by the customer and the latter are activities that take time, resources or require storage and do not add value to the output.

In other words, a non-value adding activity is waste and origin of waste. According to Koskela (2012), there has never been any systematic attempt to observe all wastes in the construction process. He suggested that the figures that have been presented tend to be conservative in as much as the motivation to estimate and share these figures has been by leading companies that have leen attempting to implement best practice. Schedule delay, however, has become an accepted part of the construction process. Those involved in the procurement of buildings invariably do not realize the extent of schedule delay that actually occurs. There is an increasing need to improve the quality of operations

throughout the procurement process, and therefore reduce the incidence of schedule delay. It has been suggested that the major cause of schedule delay is uncertainty (Koskela, 2012). This uncertainty is generated by poor information, which often is missing, unreliable, inaccurate, and conflicting. The authors suggest that uncertainty is a consequence of numerous interrelated factors and not solely information. Therefore, to reduce construction schedule delay we must identify what its causes are, 'then understand how these causes are interrelated (Rodriguez & Bowers, 2016).

Construction waste was classified into three main categories by Ekanayake and Ofori (2010) as materials, labour and machinery waste. However, any effort in terms of labour, materials and machinery which is directed towards the construction of a part or element of a building and which has to be done again due to non-conformity to the design constitutes a waste which is also seen as schedule delay. Andy, Andrew and Simon (2014) viewed causes of waste at the design and construction process as: building complexity, poor coordination, fast tracking, inadequate communication, inefficient management practices and design process, poor quality management, lack of harmonious relationship among participants on the project and poor site management team. Many authors have different opinions as to the causes of schedule delay as a waste. Koskela (2012) suggested that it “sometimes seems that the wastes caused by design are larger than the cost of design itself,” and he further stated that “even if there is a lack of

data on internal waste in design, it can be inferred that a substantial share of design time is consumed by redoing or waiting for information and instructions." Rounce (2009) has suggested that much of the design-related schedule delay generated in projects is attributable to poor managerial practices of architectural firms.

Construction schedule delay costs are determined from the point where schedule delay is identified to that time when schedule delay is completed and the activity has returned to its original condition or state. The duration of the cost tracking includes the length of the standby/relocation time once schedule delay is identified, the time required to carry out the schedule delay, and the time required to gear up to carry on with the original scope of the activity (Fayek, Dissanayake & Compero, 2013).

Waste in construction is prolific. The lead article of this issue refers to the report 'Rethinking Construction which states that:

i. up to 30% of construction is schedule delay
ii. labour is used at only 40-60% of potential efficiency
iii. at least 10% of materials are wasted

Following Latham in 1998, Sir John Egan presented report of the Construction Task Force on the scope for improving quality and efficiency in UK construction. Since Latham, the industry as a whole was underachieving even with the fundamental and radical change proposed by this report. With the economic

meltdown the industry had experienced low profitability; low investments in research and development, low levels of training with too many clients were dissatisfied with the present performance of the industry (Aminudin, 2016).

In summary, the Egan report (1998) identified several shortcomings with the construction industry, and they includes;

i.) Underachievement of the industry as a whole

ii.) Lack of predictability within the industry as a whole

iii.) Unacceptable level of defects

iv.) Lack of contractor profit

v.) Lack of investment in capital, research, and development and training

vi.) Level of dissatisfaction amongst the industry's clients.

Reflecting on Nigerian experience with similar occurrence where the industry as a whole, were underachieving which is evident in the down turning nature of the industry's contribution to the nation's Gross Domestic Product (GDP).

2.1.2 Deviations in Construction Phase

Deviations that are related to the construction phase of the project and consist of those activities and tasks that take place at the project site during the construction interface. A construction change could be seen as a change in the method of construction and construction changes are usually made to enhance the constructability of the project. Deviations in construction could be seen as a

construction errors are the result of erroneous construction methods or procedures. Construction omissions are those deviations that occur due to the omission of some construction activity or task (Burati, Farrington & Ledbetter, 2012).

2.1.3 Concept of Quality Cost

Quality could be referred to as conformance to established requirement, therefore, any deviation from this requirement that affects with a severity sufficient enough to consider options on the projects to either accept or taken corrective action could also be seen as non-conformance (Burati, Farrington & Ledbetter, 2012).

Quality cost of construction work or design comprises of all costs incurred by client/contractor because the project refuses to meet the users' requirement (Davis, Ledbetter & Burati, 2012). Rounce (2009) captured quality cost in the design process "as the cost of writing procedures and obtaining quality assurance certification". In broad term, quality cost to a client is the total expenditure incurred in given client best value for money both in term of functionality of the design and aesthetic value of the project. Thus, Rounce (2009) postulated that;

Cost of Quality = cost of conformance + cost of non-conformance

Rounce (2009) went further by positing that conformance cost is the minimum expenditure incurred or required to meet an established requirement of a client on a project. Non-conformance cost on the other hand contains all total sum incurred

through redesigning and schedule delaying construction work previously executed due to non-compliance is capable causing strain relationship among the participant due to loss of profit. It is important to note that error during design mostly lead to schedule delay or fault during construction phase of projects blame is usually borne by the contractor because of the gap between the design and construction. Josephson and Hammarland (2009), asserted that averagely 32% of defect cost that either lead to schedule delay or non-conformance emanated at the design stage where briefing are not well captured or interpreted by the designers, 45% of the cost originated on site while 20% is from defective materials or machine.

2.1.4 Construction Project Planning and Scheduling

Arikan and Dikmen (2014) give the definition of planning as "Trying to anticipate what will happen and devising ways of achieving the set of objectives and targets" and point out that in planning concept there are always objectives to be reached in future. The authors describe planning as process during which efforts and decisions are made to achieve the goals the desired time in the desired way." They further line up the main objectives of a construction project as follows:

i. To complete the construction within the specified time (duration)
ii. To complete it within the budget, (with a profit)
iii. To complete it in compliance with technical and administrative specifications.

Project planning has been also defined as “the process of selecting the one method and order of work to be used on a project from among all the various methods and sequences in which it could be done” (Callahan, Quackenbush, & Rowings 2012). The authors also note that this process supplies detailed information used for time estimation and schedule; besides a baseline for project control.

Mubarak (2015) states that project planning works for several functions such as: cost estimating, scheduling, project control, safety management, etc. According to Arikan and Dikmen (2014) the main purpose of planning is to provide the primary duties of the manager, namely, direction and control. The second objective of planning is to organize all the relationships and information systems among the many parties involved in the construction object. The authors further describe the third function of planning as enabling project control and forecasting.

Smith (2002) emphasizes the importance of careful and continuous project-planning in the success of a realization of a project; and also notes that the activities of designers, producers, suppliers, workers and contractors, and their resources must be coordinated and integrated with the objectives of contractor. Oberlender (2000) agrees with Smith that planning coordinates all works of the construction to reach a completed quality project. The author determines the basic benefit of project planning and scheduling as an effective tool of preventing some of the problems like delays in work, cost overrun or decline in productivity and

principally puts in order the desired results of project planning and scheduling as indicated below:

i.) Finish the project on time.

ii.) Continuous (uninterrupted) flow of work (no delays).

iii.) Reduced amount of rework (least amount of changes).

iv.) Minimize confusion and misunderstandings.

v.) Increased knowledge of status of project by everyone.

vi.) Meaningful and timely reports to management.

vii.) You run the project instead of the project running you.

viii.) Knowledge of scheduled times of key parts of the project.

ix.) Knowledge of distribution of costs of the project.

x.) Accountability of people, defined responsibility/ authority.

xi.) Clear understanding of who does what, when, and how much.

xii.) Integration of all work to ensure a quality project for the owner.

2.1.5 Project Scheduling

The terms of project planning and scheduling are often mistakenly thought of as synonymous. However, as Mubarak (2015) indicates scheduling concentrates on the timing and sequence of operations in the project planning effort. Therefore, while project planning covers the issues of what is going to be done? where?, how? and when?, the term of project scheduling covers only the issue of when?. Trauner, Manginelli, Lowe, Nagata and Furniss (2009) agree with Mubarak and

define project schedule as “a written or graphical representation of the Contractor's plan for completing a construction project that emphasizes the elements of time and sequence”. According to the Trauner, *et al.* (2009), the project schedule should display all the construction tasks from the beginning of the project through completion, the time periods for each tasks, and the sequence of these tasks in a logical order.

Oxley and Poskitt (2016) define project scheduling as “the process of determining the actual time periods during which the activities are planned to take place: that is, start and finish dates for each activity". In order to determine the construction activities and their time periods, project planning should have been done before project scheduling. Oberlender (2000) claims that a successful project planning is more difficult to organize than scheduling. If the activities are identified in project planning, then scheduling the project will become relatively easy.

After a successful planning process, the schedule of the project is prepared. There are major objectives that are expected from good project scheduling.

According to Mubarak (2015) there are eight important objectives of scheduling as noted below:

i.) To calculate the project completion date.

ii.) To calculate the start or end of a specific activity.

iii.) To expose and adjust conflicts between trades or subcontractors.

iv.) To predict and calculate the cash flow.

v.) To evaluate the effect of changes.

vi.) To improve work efficiency.

vii.) To resolve delay claims.

viii.) To serve as an effective project control tool.

A project schedule is viewed as a valuable project control tool for Project Managers to successfully conduct construction projects (Trauner, Manginelli, Lowe, Nagata & Furniss, 2009). Trauner *et al*, (2009) further explain the basic purposes of a project schedule as effectively depicting the construction plan to the project participants, permitting management to control and measure the progression of the work, and finally accommodating the participants with information for timely decisions.

Callahan, Quackenbush, and Rowings (2012) claim that the probabilities of on-time, on-budget, and dispute free completion may be increased by means of a schedule and the purpose of the schedules is specified by the individual using the schedule. The authors further explain that the purpose to predict project completion for contractors is that they can arrange crew sizes, shifts or equipment to speed or slow progress. While, for architects or engineers the purpose is to determine how long design and construction will take for completion of the project. The authors add that subcontractors use the information of specific activities start and finish times to predict when they are needed at the site. Also, the activity completion dates are used by owners in order to decide when to

deliver owner-furnished equipment and to coordinate partial occupancy. Another purpose of scheduling for contractors is to reveal and resolve conflicts between firms or subcontractors. Both for contractors and owners schedules are used to plan cash flow.

Callahan *et al.* (2012) also indicate that schedules are used for measuring delay and time extensions. If the schedules are regularly updated including work sequences, unanticipated delays, actual activity completion dates and 'change orders, then the owner and contractor can measure the effect of additional works and unanticipated delays, thus avoiding disputes. The causes and different types of schedule delays are given in the following paragraphs.

2.1.6 Construction Project Schedule Delays

There are a number of definitions for delay. In the construction management context, the simplest definition of a delay is made by Mubarak (2015) as "an event or a condition that results in finishing the project later than stipulated in the contract." Callahan *et al.* (2012) define delay in construction claims as "the time during which some part of the construction project has been extended or not executed owing to an unexpected event".

In another study, Trauner *et al,* (2009) describe delay as "to make happen later than expected or to not act timely". It is usual for delays occur on construction projects. Callahan *et al,* (2012) claim that schedules have an important role in

construction delays; since the effects of delays on the project completion date can be displayed and future delays can be anticipated by rescheduling the project through the computer.

General, delay of a construction project is the late completion of works as compared to the planned schedule or contract schedule. It possibly could be interpreted as a loss of time. Time refers to the duration for completing the construction project. Time in a construction project is the construction period. When the project period delayed, it means the project cannot be completed as planned. Delays in construction project will lead to either extension of time, cost overrun, non-completion of contract, or a combination of two or more than the factors mentioned above.

The duration of a construction project is an important factor to set forth when entering into a construction agreement. If a contractor works with a planned parameter, he or she should be able to finish the construction project in a timely manner. However, compared to other industries, it is difficult to complete a construction project in which many constructions and numerous unknown variables exist (Koushki & Kartam, 2015). When such difficulties arise, construction schedules are delayed, and consequently delay claim occurs.

Delays in construction may be caused by the client, the contractor, the consultants, a third party or by the forces of nature. They may occur early or late in the job alone, or with the other delays. According to Chan and Scott, (2015)

negotiating a fair and timely damage settlement beneficial to all parties. Thus, the ascertainment of the period delay serves as basic information from the appointment of responsibility, which may be a highly complex operation in cases with concurrent causes (Shi, Cheug and Arditi, 2012). In line with this, assigning responsibility project delays is critical to the allocation of responsibility for time-related' cost (Al-Saggaf, 2012). In this respect, when a delay claim occurs; it is very important to assign responsibility and magnitude to delays that exist, and it is often difficult to analyze the ultimate liability in delay claims (Kraiem & Dieknam, 2007). Lost productivity or loss of productivity is one of the most important causes of delay among the various causes of construction delays.

2.1.7 Types of Delays in Construction Projects

According to Abd-Majid and MaCaffer, (2007), there are three basic ways to classify delays,

i. Critical or non-critical
ii. Excusable or non-excusable
iii. Compensable or non-compensable
iv. Concurrent or non-concurrent

In the study of Yang, Yin, and Kao (2007) delay classification is given in a different manner, but similar to the concept of Trauner *et al.* In another study, Kartam (1999) classified project delays into three main groups in terms of their origin, timing and comp ens ability. These groups are as given in the following:

Delays classified by their origin: Owner caused delays (OCD), contractor caused delays (CCD), and third party caused delays (TPCD)

Delays classified by their timing: These are concurrent delays (CD) and non-concurrent delays (NCD).

Delays classified by their compensability: These are excusable delays (ED) which are also classified in itself as excusable compensable delays (BCD) and excusable non-compensable delays (ENCD), and Non-excusable delays (NED).

2.1.7.1 Critical versus Noncritical Delays

While several authors (Mubarak, 2015; Kelleher, 2005; Levy, 2016) categorize delays into three groups as Excusable and Non-excusable, Compensable and Non-compensable and Concurrent and Non-concurrent; certain authors (Trauner *et al.,* 2009; Callahan *et al.,* 1992) add one more category to these three groups which is Critical and Non-critical delays.

According to Trauner *et al,* (2009) and Callahan *et al,* (1992), the primary 'focus in any study of delays in a project is to see if the delay affects the progress of the entire project or the project completion date. The authors' further state that delays which result in extended project completion are considered critical delays, and delays that do not affect the project completion date are known as non-critical delays. Trauner *et al.* (2009) further claim that the issue of critical delays emerges from the Critical Path Method (CPM) scheduling. All projects have a critical path

and if these critical activities on the path are delayed than the completion date of the project will be extended. The criteria determining the project completion date are as follows (Trauner *et al*, 2009):

The project itself

The contractor's plan and schedule (particularly the critical path)

The requirements of the contract for sequence and phasing

The physical constraints of the project- how to build the job from a practical perspective.

2.1.7.2 Excusable versus Non-excusable Delays

Construction delays are basically either excusable or non-excusable. Callahan *et al.* (1992) and Trauner *et al.* (2009) claim that whether a delay is excusable or non-excusable depends on the clauses in the contract. The authors note that standard construction contracts specify types of delay that will allow the contractor to an extension of time. For instance, in some contracts, unexpected or unusual weather conditions are not considered as excusable and so these contracts do not allow for any time extensions. According to Trauner *et al.* (2009) an excusable delay, in general, is owing to an unforeseeable event beyond the contractor's or the subcontractor's control. The authors further explain that delays resulting from the following issues are known as excusable:

i.) General labor strikes,

ii.) Fires,

iii.) Floods,

iv.) Acts of God,

v.) Owner-directed changes,

vi.) Errors and omissions in the plans and specifications,

vii.) Differing site conditions or concealed conditions,

viii.) Unusually severe weather;

ix.) Intervention by outside agencies,

x.) Lack of action by government bodies, such as building inspection.

In another study, Levy (2016) adds two more excusable delays to the above list as:

Illness or death of one or more of the contractors, Transportation delays over which the contractor has no control.

Moreover, Kelleher (2005) supplies the above list with two more delays as: Epidemics, Quarantine restrictions.

Mubarak (2015) defines non-excusable delays as "delays that are either caused by the contractor or not caused by the contractor but should have been foreseen by the contractor". He also points out that a non-excusable delay does not entitle the contractor to either a time extension or monetary compensation. Trauner *et al.* (2009) enumerate some examples of non- excusable delays as follows:

Late performance of subcontractors, Untimely performance by suppliers, Faulty workmanship by the contractor or subcontractors,

A project-specific labor strike caused by the contractor's unwillingness to meet with labor representatives or by unfair labor practices.

In another observation, Mubarak (2015) adds other examples to the above list as: Contractor cash-flow problems,

Accidents on the site caused by the contractor's negligence or lack of preparations, late delivery of the contractor's furnished materials and equipment.

As stated in the excusable delays, again, the contract is the determinant whether or not a delay is considered non-excusable. Therefore, Trauner *et al.* (2009) warn contractors that before signing the contract it should be clearly understood which delays are defined as excusable and which as non- excusable.

2.1.7.3 Compensable versus Non-compensable Delays

In some studies, Callahan *et al.* (1992), Kartam (1999) and Mubarak (2015) claim that an excusable delay can be classified as "excusable compensable" and "excusable non-compensable". As Mubarak (2015) states compensable delays are caused by the owner or the designer (engineer or architect). The contractor is typically entitled to a time extension or recovery of the costs related with the delay or both. Factors which are specified in the contract resulting in delays such as differing site conditions, changes in the work, access to the site are some

examples of compensable delays. According to Trauner *et al.* (2009) only excusable delays may be compensable.

The authors further explain non-compensable delays as those which despite being excusable do not entitle the contractor to any compensation. Many authors such as Barrie and Paulson (1992) and Mubarak (2015), point out that excusable non-compensable delays are normally beyond the control of either owner or contractor such as unusual weather conditions, natural disasters, wars, national crises, floods, fires or labor strikes. They add that usually the contractor is entitled to a time extension, but not additional compensation.

Trauner *et al.* (2009) emphasize that if a delay is compensable or non-compensable basically depends on the issues of the contract. The contract determines the types of delays in detail and for which delay the contractor, is entitled to time extension or monetary compensation.

2.1.7.4 Concurrent Delays

Mubarak (2015) states that a concurrent delay includes a combination of two or more independent causes of delay occurring within the same time frame. According to the author, a concurrent delay often includes an excusable delay and a non-excusable delay. Another definition made by Callahan *et al.* (1992) is that "more than one delay contributed to the project delay, not that the delays necessarily occurred at the same time". Although this type of 'delays seems like

a simple issue, still there is no clear definition of concurrent delays. According to Trauner *et al.* (2009) concurrent delays are simply defined as "separate delays to the critical path that occur at the same time". Levy (2016) names this type of delays as overlapping delays. Nguyen (2007) also points out that simultaneous delays, commingled delays, and intertwined delays are other names used for concurrent delays.

Levy (2016) further indicates that concurrent delays may be generated by the contractor or by the owner, but if it happens that both parties are responsible, and these delays overlap then neither party can be able to retrieve damages.

2.1.8 Possible Effect of Time Overrun (Delay) on Project Stakeholders

Time overrun have obvious effect on the major stakeholders in particular and the public construction projects in general. To the clients, time overrun/delay implies added cost. This could result in less benefit from the project. To the contractor, it implies loss of time and effort in preparing for the project. It can also mean that the inability of the contractor to deliver value to money paid to him and could tarnish their reputations which may lead to loss of confidence by the client. It could also jeopardize their chances of winning future contracts. Then to the construction industry, delay in projects could mean abandonment of project and a decline in construction project activities, bad reputation and inability to secure projects due to high risk of delay or time overrun (Nwachukwu, Echeme & Okoli, 2010). All these consequences affect the viability of construction projects and

national development. Hence, delayed construction projects and its effect on national development still remain a concern to academic scholars.

2.1.9 Forms of Related Delay Factors

Factors that contribute to construction project delays, especially in public sector projects take different forms. They include but not limited to;

2.1.9.1 Project Funding Related Delays Factor

Finance has been identified as one of the factors responsible for construction project delays. According to Abd-Majid *et al* (2014), the factor of inadequate fund allocation and delayed payment to subcontractor/suppliers are contributory to causes of delays in construction projects. Long, Ogunlana, Quang, and Lam, (2014) also identified the factor of high interest rate as a contributor to project delays. Mansfield, Ugwu, and Doran (2014) identified the factor of contractor's financial difficulties as having a high influence in causing project delays. Chan and Scott (2015), revealed that the factor of the client's financial difficulties and monthly payment difficulties to contributors cause project delays. Koushki, *et al* (2015) revealed that the factors of unreasonable constraints to client have high influence as a cause of project delay. Frimpong, Oluwoye, and Crawford (2013) identified the factor of monthly payment difficulties as the most important factor that contributes to project delays.

Based on the foregoing literature review, the list below summaries the delays related to projects due to finance as a factor responsible for project delays:

i. Error in the Bill of Quantities
ii. Inadequate fund allocation
iii. High interest rate
iv. Contractor's financial difficulties
v. Client's financial difficulties
vi. Unreasonable constraints to client
vii. Monthly payment difficulties
viii. Delay payment to suppliers and subcontractors

2.1.9.2 Material Related Delays Factor

The Category of material related delays was identified as one of the groups of causes of delays in construction projects. All factors that are related to material were categorized under this group of causes. One of the sources used to identify the factors under material groups of causes was the literature review. Several studies examined by the researcher identified the factors of material related delays to include the following ones. Abd-Majid and MaCaffer (2007) identified that factors like shortage of materials, poor quality of materials, poor procurement of material, late delivery of materials, and unreliable suppliers contribute to project of delays.

Also, according to Chan *et al,* (2015), factors of shortage of material and poor procurement of materials are contributing factor to construction delay. Mansfield, Ugwu, and Doran (2014), in their study showed that shortage of material, poor quality of material, escalation of material prices and late delivery of materials are causes of delays in construction projects. Odeh *et al,* (2012) identified the factor of poor quality of material as having a high influence on delays. Koushki *et al,* (2015) revealed that shortage of construction materials, poor quality of materials, and poor procurement of materials are causes of delays in project delivery. Frimpong *et al,* (2013) identified the factor of poor procurement of materials as contributory to delays in projects. Wiguna and Scott (2005) identified the factor of escalation of material prices as one factor that contributes to project delays. Based on these literature reviews, there are seven factors of material related delays as listed below:

i. Shortage of construction materials
ii. Poor quality of construction materials
iii. Poor procurement of construction materials
iv. Imported construction materials
v. Escalation of material prices
vi. Late delivery of materials, and
vii. Unreliable suppliers

2.1.9.3 Labour Related Delays

Several factors of delays that relate to labour can be distinguished and categorized under this group. The same method of establishing the factors of material related delays were used in this group. According to Abd-Majid *et al*, (2014) slow mobilization of labour, labour supply, absenteeisnl strike, and tow motivation and morale are the critical factors that contribute to causes of delays. Odeh *et al*, (2012) in their research identified the factors of labour productivity and labour supply as contributor to causes of delays. Chan *et al*, (2015) identified the factors of shortage of skilled labour as the most important factor that contributed to causes of delays. Based on this literature review, there are seven factors of labour related delays, and which are summarized below:

i. Slow mobilization of labor
ii. Shortage of skill labor
iii. Labour productivity
iv. Labour supply
v. Absenteeism
vi. Strike
vii. Low motivation and morale

2.1.9.4 Equipment Related Delays Factor

The methodology of establishing the factors of this group of causes was similar to that of the material related delays and labour related delays. One of the sources used to identify the factors under equipment group of causes was the literature review. There are several studies by numerous researchers that identified the factors of equipment related days. Mansfield, Ugwu and Doran (2014) identified the factors of insufficient numbers of equipment, frequent equipment breakdown, and equipment allocation problem as the most significant factors that contribute to causes of delays. Abd-Majid and McCaffer (2007) identified the factors of equipment breakdown, improper equipment, slow mobilization, and equipment allocation problem as contributors to causes of delays. Accordingly, Chan et al (2015) identified the factors of shortage of equipment and improper equipment as factors that contribute to causes of delays.

Odeh *et al,* (2012) identified the factor of equipment allocation problem having influence on causes of construction delays. Based on the literature review, there are seven factors of equipment related delays as shown in the list below.

i. Insufficient number of equipment
ii. Frequent equipment breakdown
iii. Shortage of equipment parts
iv. Improper equipment
v. Slow mobilization of equipment

vi. Equipment allocation problem

vii. Inadequate modern equipment

2.1.9.5 Contractor Related Delay Factor

The methodology of establishing the factors of this causes was similar to that of the material related delays, equipment related delays, and finance related delays. One of the sources used to identify the factors under contractor group of causes was the literature review. Not all the possible factors could be cited. Numerous researchers identified the factors of contract related delays that contribute to causes to delays. Abd-Majid *et al,* (2007) identified the factors of inadequate contractor experience, inappropriate construction methods, and improper project planning and scheduling, and unreliable subcontractor as contributors to causes of delays. Long *et al,* (2014) identified the factors of inadequate contractor experience, inappropriate construction methods, inaccurate time estimating, inaccurate cost estimating, incompetent project team, unreliable subcontractor, and obsolete technology that contribute to causes of delay in construction projects.

According to Odeh *et al,* (2012) factors of inadequate contractor experience, inappropriate construction methods, poor site management and supervision, and unreliable subcontractor as contributors of causes of delays Chan *et al,* (2001) identified the factors of poor site management and supervision and improper project planning and scheduling that contribute to causes to delays. Mansfield,

Ugwu, and Doran (2014) identified the factor of improper project planning and scheduling as factors of contractor related delay. Based on the literature review, there are nine factors of contractor related delays and these are outlined in the list below,

i. Inadequate contractor experience
ii. Inappropriate construction methods
iii. Inaccurate time estimate
iv. Inaccurate cost estimate
v. Poor site management and supervision
vi. Improper project planning and scheduling
vii. Incompetent project team
viii. Unreliable subcontractor
ix. Obsolete technology

2.1.9.6 Client Related Delay Factor

One of the sources used to identify the factors under client group of causes was the literature review. Not all the possible factors could be cited from the literature. Based on literature review, several studies identified the factors of client related delay.

According to Odeh and Battaineh, (2012), the factors of change orders, and slow decision making by client contribute to causes of delays. Long *et al*, (2014)

identified the factors of client interference, lack of capable representative, lack of communication and coordination, and improper project feasibility study that contribute to causes of delays in construction project. Mansfield, Ugwu, and Doran (2014) identified factors of change orders and slow decision making by client as contributors to causes of delays: Koushki *et al*, (2015) identified factors of change in orders, improper project feasibility study and lack of experiences of client in construction project have high influence to the causes of delays. Based on the literature review, there are seven factors of client related delays namely:

i. Slow decision making by client
ii. Lack of experience of client in construction
iii. Change orders
iv. Client interference
v. Lack of capable representative
vi. Lack of communication and coordination
vii. Improper project feasibility study

2.1.9.7 Consultant Related Delays Factor

To identify the factors of causes of delays related to consultant responsible based on literature review; several studies identified those factors of consultant related delays. According to Long *et al*, (2014) factors of inadequate consultant experience, inadequate project management assistance, incomplete drawing and

detail design, and inaccurate, site investigations are contributors to causes of delays.

According to Odeh *et al*, (2012) factors of slow response and poor inspection are factors of consultant related delays. Mansfield *et al*, (2014) identified the factors of poor design and delay in design, slow response and poor inspection, and incomplete drawing and detailed design that contribute to causes of delays in construction project. The following list summarizes these factors:

i. Inadequate consultant experience
ii. Poor design and delays in design
iii. Slow response and poor inspection
iv. Incomplete drawing/detail design
v. Inaccurate site investigation
vi. Inadequate project management assistance

2.6.8 External Factors of Delays

The methodology of establishing the factors of this group of causes was similar to that of the material related delays, labour related delays. One of the sources used to identify the factors under external group of causes was the literature review. Several studies identified the factors that contributed to causes of delays. According to Odeh *et al*, (2012) factor of unforeseen ground condition, problem with neighbors, and weather condition are contributors to causes of delays. Long

et al, (2014) identified factors of unforeseen ground condition, inflation/price fluctuation, slow site clearance; and weather conditions are factors of external delays. Wiguna and Scott (2005) identified the factor of inflation/prices fluctuation having high influence to causes of delays. Ogunlana, Promkuntong, and Jearkjirim (2013) identified the factors of problems with neighbors that contribute to causes of delays. Al-Momani. (2000) identified the factor of weather condition as contributors to causes of delays in construction, projects. Based on the literature review, there are seven factors of external related delays.

i. Unforeseen ground condition
ii. Unexpected geological condition
iii. Inflation/prices fluctuation
iv. Slow site clearance
v. Problem with neighbors
vi. Weather condition.
vii. Conflict

2.2 Possible Strategies for Minimizing Delays in Public Sector Construction Projects

Projects are classically defined by the need to complete a task on time, within budget, and with appropriate technical performance/equity.

In recent time, projects tend to be more time constrained, and the ability to deliver a public sector construction project quickly is becoming an increasing important element in winning a bid.

According to Ntamere (1995), a project is a discrete package of investment or endeavour, policy measures and institutional and other activities designed to achieve a specific objective or set of objectives within a designated period and involving the commitment of resources. A project consists of collection of activities. An activity's completion may be delayed due to delayed start or extended activity duration. While an activity's start may be delayed due to certain reasons, its duration may be extended due to some other reasons. Activity's delayed completion may cause delays in the succeeding activities, which in turn may cause a delay in the project completion.

According to Shi, Cheung, and Arditi, (2012) delays can occur in any and all activities, and these delays can concurrently or simultaneously cause delays in the project completion.

In other words, a project delay is the accumulated effect of the delays in individual activities. Delays can give rise to disruption of work and loss of productivity, late completion of project, increased time related cost and the party claims and abandonment of termination of project. Methods of minimizing construction delays can be established when causes of delays are identified;

knowing the causes of any particular delay in a construction project would help avoiding the same.

According to Aibinu *et al.* (2002), the effects of construction delays are time overrun, cost overrun, dispute, arbitration, total abandonment and litigation as identified in their study of construction delay in Nigeria. Delay has significant effects on completion cost and time, which shows that time and cost overruns were the frequent effects of delay. Hartley *et al.* (1997), believed that construction projects experience an increase in cost of about 33% on average. To illustrate problem, in a survey of 102 completed projects with initial budget USD 302.7 million conducted by the Florida Department of Transportation, the construction cost overruns were found to be USD 28.6 million i.e. (9.5%). Okorafor (2001), posited that the engine of growth in any economy is effective project implementation and subsequent management. Nguyen (2004) identified competent project manager, multidisciplinary/competent project meeting, accurate initial cost estimate, accurate initial time estimates, and awarding bids to the right/experience consultant and contractor involvement, systematic control mechanism, comprehensive contract documentation, effective strategic planning, clear information and communication channels, use of up to date technology utilization and absence of bureaucracy and factors that can be applied as a method of minimizing construction delays.

Aibinu *et al,* (2002) pointed two methods to minimize or if possible eliminate time overrun which were: acceleration of site activities, and contingency allowance. Koushki, *et al,* (2005) revealed that the minimization of time delays and cost overruns would require: ensure adequate and available source of finance until project completion, allocation of sufficient time and money at the design phase, selection of competent consultant and a reliable contractor to carry out the work, perform a preconstruction planning of project tasks and resource needs, hire an independent supervising engineer to monitor the progress of the work and ensure timely delivery of materials. According to Odeh *et al.* (2012), enforcing liquidated damage clauses and offering incentives for early completion, developing human resources in the construction industry through proper training and classifying of craftsman, adopting a new approach to contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractor, and adopting new approaches to contracting such as design-build and construction management type of contract.

Based on the literature review, six factors were common effects of delay in construction project. Furthermore, the researcher was able to identify a total of thirty five methods of minimizing construction delays.

Hence, methods of minimizing construction delays as opined by Hartley *et al.* (1997), Aibinu and Jagboro, (2012), Nguyen (2004), Koushki, *et al* (2005), and Odeh *et al.* (2012) are as follows:

i. Competent project manager

ii. Ensure adequate and available sources of finance

iii. Multidisciplinary/competent project team

iv. Availability of resources

v. Commitment of projects

vi. Adopting a new approach to contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractor.

vii. Adopting new approach to contracting such as construction manager type of contract

viii. Complete and accurate project feasibility study and site investigation

ix. Comprehensive contract documentation

x. Acceleration of site clearance

xi. Frequent progress meeting.

xii. Project management assistance

xiii. Use of up to date technology

xiv. Use of experienced subcontractors and suppliers

xv. Complete and proper design at the right time

xvi. Competent personnel of consultant/designer

xvii. Competent and capable client's representative

xviii. Site management and supervision

xix. Use of proper and modern construction equipment

xx. Proper project planning and scheduling

xxi. Accurate initial cost estimates

xxii. Use of appropriate construction methods

xxiii. Community involvement

xxiv. Proper emphasis on past experience

xxv. Frequent coordination between the parties involved

xxvi. Absence of bureaucracy

xxvii. Clear information and communication channels

xxviii. Accurate initial time estimates

xxix. Proper material procurement

xxx. Developing human resources in the construction industry through proper training

xxxi. Allocation of sufficient time and money at the design phase

xxxii. Awarding bids to the right/experience consultant and contractor

xxxiii. Performing a preconstruction planning of tasks and resources needs

xxxiv. Systematic control mechanism xxxv. Effective strategic planning.

2.3 Empirical Review

As Abd El-Razek, Bassioni and Mubarak (2008) studied several articles on examining the causes of construction delays in many ways; some studies determined the main causes of delay in different countries, while some of them investigated the delay analysis methods in different types of construction.

Mansfield, Ugwu, and Doran (2014) discussed the causes of delay and cost overruns by examining data relating to construction projects in Nigeria. Assaf, Al-Khalil, and Al-Hazmi (2015) studied the main causes of delay in large building projects in Saudi Arabia and their relative importance. In the study undertaken by Assaf, *et al.* (2015), the largest number of causes of delay (56 causes) was listed and the respondents were asked to point out their degree of importance. The authors grouped the delay factors into nine major groups: financing, materials, contractual relationships, project changes, government relations, manpower, scheduling and control, equipment, and environmental factors. The financing group of delay factors was selected as the most significant delay factor by all parties and .that environment group was selected as least significant. In another observation, Odeh and Battaineh (2012) carried out a study to determine the most significant causes of construction delays with traditional type of contracts with regard to contractors and consultants. According to the results of the study, owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and subcontractors are among the top ten most significant causes of delays.

Another study was by Kaliba, Muya and Mumba (2009) which aimed to determine the causes and effects of cost escalation and schedule delays in road construction projects in Zambia. The authors compile the main causes of delays

in road construction projects which are determined according to their survey, as in the following: delayed payments, financial processes and 'difficulties on the part of contractors and clients, contract modification, economic problems, materials procurement, changes in drawings, staffing problems, equipment unavailability, poor supervision, construction mistakes, poor coordination on site, changes in specifications and labour disputes and strikes. In another research, Frimpong, Oluwoye, and Crawford (2013) carried out a study to determine and assess the relative importance of causes of delays and cost overruns in Ghana groundwater construction projects. The research showed that monthly payment difficulties from agencies, poor contractor management, material procurement, poor technical performances, and escalation of material prices were the main causes in the study.

Arditi, Akan, and Gurdamar (2011) examined a large number of public projects in Turkey in order to determine and grade the level of importance of the causes of construction delays in such projects. According to the results of their research, the most important reasons of these delays and their average weights were as follows:

Shortage of some resources like qualified manpower, technical personnel, construction materials and equipment (31%), Financial difficulties of contractors and public agencies (21%), Organizational deficiencies of public agencies and contracting companies such as' bureaucratic obstacles and slow decision-making

mechanism in public organizations (19%), Delays in design work, large quantities of extra work, frequent change orders (The total average weight of these three reasons is 14%). Average weight of the four reasons of construction delays mentioned above is 85%. The remaining 15% was related to other minor reasons of delays.

Odabai (2009) investigated factors affecting construction durations and models for estimating construction durations. The author selected from the literature and listed the most significant ones under eleven headings as: cost, cash flow, productivity on site, material methodology of construction, experience, coordination, weather, construction site, and the degree of completeness of design project.

In another observation, Baldwin, Manthei, Rothbart, and Harris (2009) conducted the study to determine the causes of construction delays in the United States. The authors examined the causes of delays under seventeen categories as: weather, labor supply, material shortage, equipment failure, finances, manufactured items, construction mistakes, design changes, foundation conditions, permits, shop drawings, sample approvals, building codes, subcontractors, contracts, jurisdictional disputes, and inspections.

Nevertheless, and according to Ogunlana, Pronkonjong and Jearkjirim (2013) problems of the construction industry in the developing economies can be said to be on three layers namely, problems caused clients and consultants; problem of

shortages or inadequacies in industry infrastructure, mainly those of supply of resources, and problems caused by incompetence contractors. They were classified source and causes of delays into six groups:

i. Resources supplier related factors include shortage of construction materials, late delivery, price escalation, low quality of materials, shortage of site workers, shortage of technical personnel, insufficient number of equipment, and frequent equipment breakdown.
ii. Contractors' related factors include materials management problem, deficiencies in organization, coordination deficiencies, planning and scheduling problems, equipment allocation problems, financial difficulties, and inadequacy of site inspection.
iii. Inspector related factors include deficiencies in organization, deficiencies in coordination and uncompromising attitude.
iv. Owners related factors include changes Orders and slow decision making
v. Designer's related factors include incomplete drawings and low response
vi. Other factors include confined site, and slow permits by government agencies.

Al-Momani (2000), conducted a quantitative analysis on one of construction delays by examining the records of 130 public building constructed in Jordan during the period of 1990-1997. The researcher presented regression models of the relationship between 1ual planned project duration for different causes of

delays. The researcher concluded that the main causes of delays in construction related to designers, user changes, weather, site conditions, deliveries, economic conditions and increase in quantities.

Odeh and Battaineh (2012) studied causes of construction delays in Jordan. In their study, results of survey indicate that contractors and agreed that owner interference, inadequate contractor experience, financing and payments, labour productivity, slow decision rig, improper planning, and subcontractors are among the top ten important factors. They classified the causes of delays into the following seven groups:

i. Contractor related factor include subcontractors, site management, construction methods, improper planning, mistakes during construction and inadequate contractor experience.
ii. Material related factors include quality of material and shortage in material,
iii. Labour and equipment related factors include labour supply, labour productivity, equipment availability and failure.
iv. Client related factors include finance and payments of completed work, owner interference, slow decision making by owners, and unrealistic imposed contract duration.

v. Consultant related factor include contract management, preparation and approval of drawings, quality assurance/control, and waiting time for approval of test and inspections.

vi. Contract related factors include change orders, mistakes and discrepancies in contract document, contractual relationship related factor include: major dispute and negotiations, inappropriate overall organization structure linking all parties to the project, and lack of communication between the parties.

vii. External factors include weather condition, regulatory changes and building code, problems with neighbors and unforeseen, ground condition.

Mezher and Tawilo (2005) conducted a survey of the causes of delays in; the construction industry in Lebanon from the viewpoint of owners, contractors and architectural/engineering firms. It was found that owners had more concerns with regard to financial issues; contractors regarded contractual relationship the most important, while consultants considered project management issues to be the most important causes of delay. Chan *et al,* (2015) surveyed the causes of construction delays in Hong Kong as seen by clients, contractor and consultants. They examined the factors affecting productivity. The results of their research indicate that the five principal and common causes of delays are: poor site management and supervision, unforeseen ground condition, low speed of decision making

involving all projects team, client initiated variations, and necessary variation of works. These causes were categorized into the following eight groups:

i. Project related factors project characteristics, necessary variations, communication among the various parties, speed of decision making involving all project teams, and ground conditions,
ii. Design team related factors include design team experience, project design complexity and mistakes as well as delays in design documents.
iii. Material related factors include shortages, material charges, procurement, programming, and proportion of off-site prefabrication.
iv. Client related factors include those concerned with client characteristics, project financing, their variations and requirements, and interim payments to contractors.
v. Contractor related factors include contractor experience in planning and controlling and project, site management and supervision, degree of subcontracting and their cash flow,
vi. Labour related factors include labour shortages, low skill levels, weak motivation, and low productivity,
vii. Plant/Equipment related factors include shortages, low efficiency, breakdowns and wrong selection.
viii. External factors include waiting time for approval of drawings and test samples of materials and environment concerns and restrictions.

Frimpong, Oluwoye and Crawford (2013) revealed the main causes of delays in construction of ground water projects in Ghana. They included monthly payment difficulties from agencies, poor contract management, material procurement, poor technical performances, and escalation of material prices. Koushki, Al-Rashid and Kartam (2015) identified the main causes of delays in the construction of private residential projects in Kuwait. They included: changing orders, owner's financial constraints, and owner's lack of experience in the construction business, contractor related problem, and material related problem.

Long *et al.* (2014) studied the problems in large construction projects in developing countries. They revealed that the problems could be grouped under five major factors which includes incompetent designers/contractors, poor estimation and change management, social aid technological issues, site related issues and improper techniques and tools.

However, others range from factors inherent in the technology and its management, to those resulting from the physical, social, and financial environment. Assaf, Al-Khalil and Al-Hazmi (2015) identified that the most important causes of delay include: approval of drawings, delays in payments to contractors and the resulting cash problems during construction, other include design changes, conflicts in work schedules of subcontractors, slow decision making and executive bureaucracy in owners organizations as well as design errors, labour & shortage and inadequate labour skills.

All these delay related factors agree with what Okorafor, (2001) commented that "the slow pace of growth and development in many developing countries of the third world nations, Nigeria inclusive could not but be attributed to misuse and mismanagement of available scarce resources".

2.4 Summary of Literature Review

A lot of factors have been identified based on the literature review which contributed to delays in construction project delivery. The authors did a lot of work on construction projects which could be private or public sector projects. They failed to specifically consider factors of delays in public sector construction projects which is a major index for measuring budget performance and national development. This study was done specifically to identify and evaluate the variables of delays in public sector construction projects. For the purpose of this study, effort were focused on factors that can cause delays in public sector construction projects, especially the NDDC University Hostel projects in University of Port Harcourt, Choba Rivers State. They include;

a. Finance related factors, (X_1)
b. Material related factors, (X_2)
c. Contractor associated delays, (X_3)
d. Equipment/ technical related delays, (X_4)
e. Client associated delays, (X_5)

The variables under the above identified delay factors and the research authors (sources) associated with the factors are displayed in the tables below;

A. Finance Related Factors

Associated Variables	**Authors and Year**
Error in the initial Bill of Quantities	Nwana (2007)
Inadequate fund allocation	Eshett (2012)
High interest rate	Frimpong, Oluwoye and Crawford (2013)
Contractor's financial difficulties	Frimpong, Oluwoye and Crawford (2013)
Client's financial difficulties	Mansfield, Ugwu, and Doran (2014)

B. Materials Related Factors

Shortage of construction materials	Abd-Majid and MaCaffer (2007)
Poor procurement of construction materials	Odeh and Battaiineh (2012)
Escalation of material prices	Mansfield, Ugwu, and Doran (2014)
Unreliable suppliers	Mansfield, Ugwu, and Doran (2014)
Poor quality of construction materials	Koushki, Al-Rashid and Kartam (2015)

C. Contractor Related Delay Factors

Inadequate contractor experience	Abd-Majid and MaCaffer (2007)
Inaccurate time estimate	Abd-Majid and MaCaffer (2007)
Inaccurate cost estimate	Long *et al* (2014)
Obsolete technology	Long *et al* (2014)
Poor site management and supervision	Chan and Scott (2015)

D. Equipment Related Factors

Frequent equipment breakdown	Mansfield, Ugwu, and Doran (2014)
Slow mobilization of equipment	Abd-Majid and MaCaffer (2007)
Improper equipment	Abd-Majid and MaCaffer (2007) Chan and Scott (2015)
Insufficient number of equipment	Mansfield, Ugwu, and Doran (2014)
Shortage of equipment parts	Chan and Scott (2015)

E. Client Related Delay Factors

Slow decision making by client	Odeh and Battaiineh (2012)
Change orders	Odeh and Battaiineh (2012) Mansfield, Ugwu, and Doran (2014) Koushki, Al-Rashid and Kartam (2015)
Improper project feasibility study	Koushki, Al-Rashid and Kartam (2015)
Lack of communication and coordination	Long *et al* (2014)
Lack of capable representative	Long *et al* (2014)

However, Hinze (2016) posited that the causes of construction delays are numerous, including strikes, adverse weather, late decisions by the owner, unforeseen changes affecting construction duration and so on. He asserts that delays affect unfavorably all the contracting parties, the owners get their buildings later than planned, contractors are affected adversely due to increased construction costs. But the study focused on the five (5) above identified major

construction delay factors for data collection and analysis. This is based on the fact that these factors corroborate with the findings of the field survey and information gathered from the NDDC University Hostel Project in University of Port Harcourt, Rivers State (the project under study).

2.5 Literature Gap

Many studies have been carried out on the delay factors or success factors of hostel projects, but without evaluating the extent of variations of the key performance indicators and reasons for such variations. Also, the contributions of the individual delay related factors on the performance level of NDDC hostel project implementation and the relationship between these delay factors and the economic development of Rivers State has not been ascertained. Hence, the study intended to study and fill these existing gaps as per NDDC construction projects in Rivers State, Nigeria.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The method of research design adopted is the survey technique. This study is designed to be observational as well as exploratory. The observational method is aimed at obtaining a better understanding of the delay factors that inhibit the successful implementation of the public sector construction projects in Port Harcourt, Rivers state through the evaluation of their past performances. The aim is to make better suggestions on the best way to improve future performances based on the analysis.

To this end, questionnaires were designed using 5-point Likert's scale to determine the effects of these identified delay factors on the performance of public sector construction projects in Port Harcourt. The Likert summated scale involves a list of statements, related to the nature of the factors and which respondents are required to indicate the degree of agreement or disagreement with each of the statement. A numerical score is assigned to each degree of agreement or disagreement. The scores from all the statements are added up to obtain the total score of each respondent.

On the other hand the exploratory design was adopted to see the extent to which the multivariate techniques of student t-test and correlation analyses which has found wide application in the field of sciences and management can be applied in

the public construction projects. In the light of the above, it is considered critical responsibility of the academia to probe into problem situations possibly to establish the causal factors and the nature of the association existing between these factors. It is believed that a problem whose causal factors have been identified is at least half solved.

3.2 Study Population and Sample

The population of the study is estimated at two hundred and thirty seven (237) personnel directly involved in the planning and execution of the NDDC Prototype University Hostel project, UNIPORT comprising of the site supervisors, craftsmen (foremen), Contractors, Consultants, clients (mostly the Federal (NDDC, UNIPORT staff).

By applying the sample size formula ($n = N/l+Ne^2$), the study sampled one hundred and fifty (150) respondents out of the 237 estimated participants (population) of public sector construction projects to assess the questionnaire developed for data collection on the identified delay factors. This was also done using stratified random sampling technique.

The choice of Port Harcourt was chosen purely based on judgmental sampling and also based on the numerous public construction project activities going on coupled with the availability of relevant data for the successful execution of this research.

3.3 Method of Data Collection

The data used in this research are both primary and secondary data. The primary source is the questionnaire, while the secondary data were collected from various sources which include the project performance reports from contractors and consultants of NDDC Prototype University Hostel project, River state Ministry of Works and Housing. Other sources of secondary data (literature) are project management textbooks, journals, internet, and research projects, etc. Also efforts were made to collect data from workshops/conferences and seminar presentations. To a large extent, these formed the major sources of most of the literature evidences used as the basis for the analysis carried out in this study.

3.3.1 The Questionnaire

The questionnaire used to collect" primary data were designed as follows;

3.3.1.1 Preliminary design

It was important for a pool of experts to contribute to the development of the research questions: To do this a brief write-up stating the research topic, the objectives of the research and target respondents was prepared. Respondents drawn from relevant professionals in academic, private and public sectors were given the write-up and requested to answer a minimum of five relevant questions on each aspect of the objectives of the research. Their responses formed the basis for the designing of the main questionnaire.

3.3.1.2 Main Design

From the outcome .of the preliminary survey, the main questionnaire for data collection was designed. The objective of the main questionnaire was to obtain experts opinion on the identified delay factors that are critical to the success rate of public sector construction project implementation in Port Harcourt, Rivers state, Nigeria. Forty-two relevant statements/questions which are based on Likert's five-point scale, were formulated such that respondents could indicate how strongly they agree or disagree with each of the statements in the questionnaire. The draft questionnaire was distributed to twenty respondents to detect and correct any defects and ambiguities before final administration.

The Likert Five-Point Scale

According to Gujarati (2007), the Likert summated scale involves a list of statements, related to the attitude of question for which respondents are required to indicate the degree of agreement or disagreement with each of the statement. A numerical score is assigned to each degree of agreement or disagreement. The scores from all the statements are added up to obtain the total score of each respondent. Kassarjin & Nakanishi (1967) argue that attitude are complex and difficult to measure, and that individuals tend to make inaccurate judgment under difficult circumstances, therefore a scale such as Likert, which improves the measurement of attitude, is ideal.

In this research, “a 5-point scale” was used to design the questionnaire. For each statement, respondents were requested to select any one position from among a scale that has five categories as follows:

Highly Effective (HE), Effective (E), Neutral (N), Ineffective (I), Highly Ineffective (HI). Each category was assigned a numerical value, for example, Highly Effective = 5, Effective = 4, Neutral = 3, Ineffective = 2, Highly Ineffective = 1.

Users of the survey must recognize the problem of validity. It is believed that the Likert scale is an adequate measurement tool in this study.

3.3.2 Questionnaire Allocation

The research focused on the public sector building construction projects and their constraining delay factors during planning and implementation project stages in Port Harcourt, Rivers state Nigeria. The target respondents were categorized as shown in table 3.1. The distribution of questionnaire was purely exclusive because the respondents are expected to be knowledgeable and directly involved in the activities of the public sector building construction projects in the study area. Questionnaire allocation was based on stratified random sampling method, considered appropriate in view of the time constraints. The questionnaire allocation is shown below,

Table 3.1: Allocation of Questionnaires to Respondent Groups.

Category of Respondent	**Allocation**
Contractors	30
Consultants	30
site supervisors	30
craftsmen (foremen)	30
clients (NDDC project support staff)	30
Total	150

3.4 Pilot Study

Pilot studies are conducted to pre-test the study instruments which are validated in the process (Kothari, 2004). The pilot study for this study was carried out in Obiakpo Local Government Area of Rivers State. The drafted questionnaire was administered twenty (20) respondents from the respondents' group in the area. The data collected from them were analyzed and tested for validity and reliability of the research instruments.

3.4.1 Validity Test

Our research instrument (via questionnaires) was duly evaluated by the research supervisors and its administration in the selected area under study. Besides, the instrument was also sent to research professionals outside the pressure audience, and the result also confirms the genuineness and authenticity of the research instrument both in framing and content.

3.4.2 Reliability Test

Reliability according to Nworuh (2007) referred to the degree to which it is measuring; meaning that instrument should generate similar results when repeated overtime. Several methods of ascertaining reliability of data exists, but for the purpose of this study, the test-retest method was adopted after the instrument has been retrieved from the sample used for the pilot study. Hence, the research instrument was administered to a certain group of the respondents, the result collected and after a month, the same instrument was also given to the same respondent group. The two results were correlated and a result of **r = 0.889** confirms the reliability of the research data.

3.5 Method of Data Analysis

Most of the data collected from the NDDC prototype hostel construction project performance reports were analyzed using descriptive statistics involving tables, charts and diagrams. This was done in order to determine the level of effect of delays in the planning and construction stages of the project since it serve as the reference in this study. Based on the findings, questionnaire were designed and served to the respondents directly involved in the NDDC prototype hostel project in UNIPORT, Port Harcourt, Rivers State.

The data collected were analyzed using t-test to determine the effect of each category of causative factors on the cost and quality of the NDDC prototype hostel project. While the correlation analysis was adopted in ascertaining the level

of relationship existing between each category of delay causative factors and public sector economic development of Rivers state.

Also, Relative Severity Index (RSI) was adopted in ranking the categories if these factors in order to determine their level of severity or effectiveness in causing delay in public sector construction projects with particular reference to NDDC Hostel construction project used as a case for this study. To apply the formula for RSI, the respondents' ranking were multiplied together to determine the Critical Factor Index (CFI) as shown in equation 3.1;

$$CFI = \sum w = [(F_1*n_1) + (F_2*n_2) + (F_3*n_3) + (F_4*n_4) + (F_5*n_5) + \ldots + (F_n*n_n)] \ldots\ldots\ldots\ldots (3.1)$$

Where; Σw = summation of the weight given to each category of the causative factor

F_n = Score ranking, n_n = Corresponding number of responses.

$$\text{Hence, RSI} = \frac{100\sum(Fx)}{A_F} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.2)$$

Where; F = the frequency of the score (x) for the factor under consideration; A = highest weighting factor (i.e. 5); F = total number of sample.

3.5.1 Decision Rule for Testing Hypotheses

The null hypothesis (Ho) i.e. b = 0 is accepted at α level of significance and n-k-1 degree of freedom, if $t^*_{cal} < t_{1-\alpha}$; n-k-1 degree of freedom. Otherwise the null hypothesis (Ho) is rejected. $T_{1-\alpha}$; k, n-k-1 is the critical value obtainable from the

standard t - distribution table, and α = the chosen level of significance, which for the purposes of this study is 0.5 or 5%.

Alternatively, the null hypothesis is accepted if the p-value is less than 0.05 the level of significance.

3.6 Definition of the Acronyms

The following acronyms were used to represent the five identified delay factors in construction projects in Port Harcourt, Rivers State Nigeria.

S/No.	**Identified Construction Project Delay Factors**	**Acronyms**
a.	Finance related factors	X_1
b.	Material related factors	X_2
c.	Contractor associated delays	X_3
d.	Equipment/ technical related delays	X_4
e.	Client associated delays	X_5

CHAPTER FOUR

RESULTS AND DISCUSIONS

4.1 NDDC Prototype Hostel Construction Project in University of Port Harcourt, Rivers State

The table below presents the problem confronting the NDDC hostel project being constructed in UNIPORT, Choba.

Table 4.1: Analysis of the Performance of NDDC Prototype Hostel Construction Project

Year of Contract Award	Name of Contractor	Contract Sum (N)	Additional Contract Sum (N) (Variation)	% Variation	Project Duration
2004	Mosaf Nig. Ltd	427,000,000	-	-	72 weeks (18 months)
2007	Fezinat Services Ltd.	730,785,409.20	303,785,409.20	32.25	72 weeks (18 months)
2012	Fezinat Services Ltd.	1,369,090,667.25	638,305,258.05	67.75	72 weeks (18 months)
Total			942,090,667.25		

Source: NDDC Prototype University Hostel Project Document (Appendix IV)

From Table 4.1, the project experience high level of delay from 2004 to 2012 (8 years). It also show the level of cost variation from 2004 to 2007 is 32.25%. However during this period, no work was done on site. Between 2007 and 2012

there was another increase in cost to the tune of 67.75%. These cost overrun happened because of the delay Inherent in this NDDC Prototype Hostel project in UNIPORT, Choba. According to the performance report (Appendix IV), the project was delayed because of the following reasons;

i. there was major error in the Bill of Quantities (BOQ) submitted by Messrs Mosaf Nig. Ltd. The quantity of the floors were omitted in the BOQ before the award. It was later discovered and this contributed to the level of delay initially witnessed in the project commencement date after 25% mobilization fee has been released to the contractor. Hence the site was abandoned for 3 years (from 2004 to 2007).
ii. the contract was re-awarded to Fezinat Services Ltd. At an upward review of N730, 785,409.20 in 2007. The NDDC hostel project was also delayed when Fezinat could not get the due payment for the milestone achieved according to the contract agreement. This is due to the amortization of the mobilization paid w Messrs. Mosaf Nig. Ltd. (former contractor). This made the contractor to move out of site for 5 years (from 2007 to 2012).
iii. in 2012, the hostel project was re-awarded to Fezinat Services Ltd at an upward review of N1,369,090,667.25.

However, the delay from 2004 to 2012 attracted a cost of N942, 090,667.25.

This cost overrun could have been avoided if the project was not delayed for eight years.

Based on the analysis of the project performance data and some related literatures, the study identified finance, materials, contractor, equipment and client related issues as the contributory factors to the delays experienced in the successful implementation of the NDDC prototype hostel construction project in UNIPORT, Choba. In order to determine the level of effect posed to the project by these identified predetermined factors, questionnaire was designed and served to the personnel directly involved in the planning and implementation processes of the project.

4.2 Analysis of the Reponses from the Questionnaire Distributed

The following table show the statistics of the questionnaire distribution and response rate for the one hundred and fifty (150) respondents selected for assessment of the drafted questionnaire.

Table 4.2: Statistics of Questionnaire Distribution to Respondent Groups.

Category of Respondent	**No. of Questionnaire Distribution**	**No. of Questionnaire Retrieved**
Contractors	30	24
Consultants	30	30
Site supervisors	30	28
Craftsmen (foremen)	30	27
Clients (NDDC project support Staff)	30	27
Total	**150**	**136**

Table 4.2 show that a total of 150 questionnaire were distributed and 136 returned representing 90.67% response rate. This form the basis for any subsequent analysis on the primary data collected for this study. The t-test and the correlation analysis results were displayed in the following tables as follows;

Table 4.3: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
X_1	136	5.00	25.00	19.7794	3.98272
X_2	136	5.00	29.00	16.7721	4.35459
X_3	136	12.00	27.00	19.9779	3.29414
X_4	136	5.00	29.00	16.4412	3.81569
X_5	136	5.00	29.00	17.5882	4.86175
Y	136	27.00	46.00	37.0294	4.27732
Valid N (Listwise)	136				

From the Table 4.3, the average success achieved in public sector construction project (NDDC University Hostel project in UNIPORT) given the identified project delay factors is 37.0294. The study believe that this is low and warranted this study.

4.2.1 Hypothesis Testing

The hypothesis formulated were tested using the t-test and correlation analysis at 5% level of significance and the result are as follows;

Hypothesis One

H_{01}: Finance related delay factors do not have significant effect on the performance of public sector construction project delivery.

Table 4.4: T-test Result

	Test Value = 0					
					95% Confidence interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
X_1	52.060	135	.000	17.77941	17.1040	18.4548
X_2	44.917	135	.000	16.77206	16.0336	17.5105
X_3	70.726	135	.000	19.97794	19.4193	20.5366
X_4	59.418	135	.000	16.44118	18.7941	20.0883
X_5	42.189	135	.000	17.58824	16.7638	18.4127
Y	100.959	135	.000	37.02941	36.3040	37.7548

The t-test result of the computer printout show that the t-calculated value of 52.060 imply that finance related factors (X_1) are significant at 0.05. This implies that finance related delay factors significantly affected NDDC University Hostel construction project performance in UNIPORT.

Hypothesis Two

H_{02}: Material related delay factors do not have significant effect on the budgeted cost and time of public sector construction project delivery.

From Table 4.4, a t-value of 44.917 is significant at 0.000 level of significance, implying that at 0.05 level of significance, the identified materials related delay factors (X_2) are significant to the success of public sector construction project in Port Harcourt. Hence we conclude that material related delay factors have significant effect on the budgeted cost and time of public sector construction project delivery.

Hypothesis Three

H_{03}: Contractor related delay factors do not have significant effect on the performance of public sector construction project delivery.

The t-test result of the computer printout in Table 4.4 show that the t-calculated value of 70.726 imply that contractor related factors (X_3) are significant at 0.05. This implies that contractor related delay factors significantly affected NDDC University Hostel construction project performance in UNIPORT. Therefore we accept the alternative hypothesis and conclude that contractor related delay factors have significant effect on the performance of public sector construction project delivery.

Hypothesis Four

H_{04}: The effect of equipment related delay factors on the delivery of public sector construction project is not significant to mar the project success.

From Table 4.4, a t-value of 59.418 is significant at 0.000 level of significance, implying that at 0.05 level of significance, the identified equipment related delay factors (X_4) are significant to the success of public sector construction projects in UNIPORT, Rivers State. Hence we accept the alternative hypothesis and conclude that the effect of equipment related delay factors on the delivery of public sector construction project is significant to mar the project success.

Hypothesis Five

H_{05}: Client related delay factor is not significant to affect the success of public sector construction projects.

The t-test result of the computer printout in Table 4.4 show that the t-calculated value of 42.189 imply that client related factors (X_5) are significant at 0.05. This implies that clients related delay factors significantly affected NDDC University Hostel construction project performance in UNIPORT. Therefore we accept the alternative hypothesis and conclude that client related delay factor is significantly affected the success of public sector construction projects.

The test result reveal that all the identified delay factors show high level of significance to the performance of public sector construction projects in Port Harcourt, Rivers state. Contractor related factors mostly affected the performance of project of construction projects in Port Harcourt, Rivers State with respect to delay witnessed in the delivery of NDDC Hostel projects in UNIPORT. The client contributed least to the level of delay in the construction of the public sector NDDC Hostel projects in Port Harcourt, Rivers State.

Hypothesis Six

Hoe: There is no significant relationship between project delay factors and public sector economic development of Rivers State.

Table 4.5a: Correlations Result between X_1 and Y

		X_1	**Y**
X_1	Pearson Correlation	1	-.205
	Sig. (2-tailed)		.005
	N	136	136
Y	Pearson Correlation	-.205	1
	Sig. (2-tailed)	.005	
	N	136	136

There is a negative significant correlation between finance related delays and public sector economic development in Rivers state.

Table 4.5b: Correlations Result between X_2 and Y

		X_2	Y
X_2	Pearson Correlation	1	-.131
	Sig. (2-tailed)		.039
	N	136	136
Y	Pearson Correlation	-.131	1
	Sig, (2-tailed)	.039	
	N	136	136

The study observe a negative significant correlation between materials related factors and economic development of Rivers State.

Table 4.5c: Correlations Result between X_3 and Y

		X_3	Y
X_3	Pearson Correlation	1	-.307
	Sig. (2-tailed)		.001
	N	136	136
Y	Pearson Correlation	-.307	1
	Sig. (2-tailed)	.001	
	N	136	136

There is also a negative significant relationship between contractors' related delay factors and the economic development of Rivers state.

Table 4.5d: Correlations Result Between X_4 and Y

		X_4	Y
X_4	Pearson Correlation	1	-.222
	Sig. (2-tailed)		.010
	N	136	136
Y	Pearson Correlation	-.222	1
	Sig. (2-tailed)	.010	
	N	136	136

Equipment related delay factors also exhibits a negative significant correlation with the economic development of Rivers state.

Table 4.5e: Correlations Result between X_5 and Y

		X_5	Y
X_5	Pearson Correlation	1	-.273
	Sig. (2-tailed)		.007
	N	136	136
Y	Pearson Correlation	-.273	1
	Sig. (2-tailed)	.007	
	N	136	136

There is a significant negative correlation between clients' related delay factors and economic development of Rivers state, Nigeria.

Based on these, we reject the null hypothesis and conclude there is significant relationship between project delay factors and public sector economic development of Rivers State. The negative relationship imply that as these construction delay factors increase, the public sector economic development decrease. The result show that finance related delay factors exhibit the highest correlation with economic development of Rivers state.

4.2.2 Ranking of the Factors

This was done using Relative Severity Index (RSI) technique.

Table 4.6: Priority Ranking of the Identified Delay in Construction Projects

S/N	Delay Factors	Respondents' Score					Total	ΣW	Mean	RSI	Rank
		HE 5	E 4	N 3	I 2	HI 1					
1	Finance Related (X_1)	37	39	17	22	21	136	457	3.36	0.79	2nd
2	Materials Related (X_2)	39	30	21	26	20	136	450	3.30	0.72	3rd
3	Contractor Related (X_3)	53	32	12	19	20	136	487	3.58	0.83	1st
4	Equipment Related (X_4)	27	22	11	36	39	136	367	2.69	0.56	5th
5	Client Related (X_5)	37	11	18	31	39	136	384	2.82	0.60	4th

The priority ranking above show that contractor related delay factors contributed the most in the level of delay experienced in NDDC Prototype hostel construction project in UNIPORT, Rivers State. This is followed by finance related delay factors. The least delay factor that contributed to the level of delay experienced in the hostel project is the equipment related factors. The findings made here is consistent with the findings made in any part of the analysis in this study. This finding also depicts reality as the delay in this study were practically caused by the wrong activities of the first contractor (Messrs. Mosaf Nig. Ltd.).

4.3 Discussion of the Result

From the above analysis the following can be deduced;

The activities of most construction project contractors' causes a lot of delay in delivering projects to clients as planned. The mistake of the contractor in omitting some important aspect of the projects in the BOQ coupled with the delay in retrieving the mobilization fee from the first contractor (Mosaf) to the second contractor (Ferzinat) [see Table 4.1]. This result depicts reality as it reflects the true situation of most failed and abandoned projects across the Nigeria and other developing countries. Nwachukwu, Echeme & Okoli, (2010) also commented similar result in the work on Project Management Factor Indexes; A Constraint to Project Implementation Success in the Construction Sector of a Developing Economy.

The descriptive statistics show that the mean success achieved in public sector construction project (NDDC University Hostel project in UNIPORT) given the identified project delay factors is low and warranted this study (see Table 4.2). There is no doubt that a project which suffered this high level cost and time overrun will not perform magic and be successful. The reason behind this abysmal performance were examined critically.

The hypotheses testing show that all the identified variables are significantly effective and hence contributed in the delay which affected this NDDC hostel projects negatively. It also show that Contractor related factors contributed most

to the low level of performance achieve in public sector construction projects, especially the NDDC hostel project, in Port Harcourt, Rivers state. The implication is that in an area like Port Harcourt, most contractors that exist there are not qualified and based on the prevalent corruption rate witnessed, any contractor can win contract in public sector. This is a canker worm in the survival of indigenous contractors in Nigeria.

All the identified delay factors show high level of significance to the cost of public sector construction projects. Materials related factors mostly affected the cost of project materials use for construction projects in Port Harcourt, Rivers State (see Section 4.2.1: hypothesis II analysis). This implies that variables such as shortage of construction materials, poor procurement of construction materials, and escalation of material prices, unreliable suppliers and poor quality of construction materials collectively increased the cost of construction materials, hence increasing the contract sum of NDDC Prototype University Hostel projects in UNIPORT, Rivers State.

There is a significant negative correlation between clients' related delay factors and economic development of Rivers state, Nigeria (see Section 4.2.1: hypothesis VI analysis). The negative relationship imply that as these construction delay factors increase, the public sector economic development decrease. That is there is an inverse relationship between the construction delay factors and national economic development of Nigeria, especially Rivers State. Finance related delay

factors exhibit the highest correlation with economic development of Rivers State. This result have gained support from many scholars like Onwuagba (2014), Anyadiegwu, (2012).

The ranking through Relative Severity Index (RSI) show that contractor related problem created a lot of delay witnessed in the execution of the NDDC hostel construction under investigation in UNIPORT, Rivers state. The least contributory factor is the equipment related factors. This depicts reality because when a contractor deliberately omitted costly and important work item from the BOQ, such project is deemed to have failed as there will eventually be delays at one point or the other. Most authors like Echeme and Nwachukwu, (2011) refer to this as the dilemma of the lowest bidder in tendering and the owners of a project should beware of it before awarding contract to the lowest bidder.

The researcher can therefore say that the findings made in this study had to a large extent empirically justified the call for effectiveness and honesty on the side of the Nigerian contractors to forestall construction project failure and abandonment.

The study believe that education for all in the 21st century will be realized if these findings are carefully considered and applied in planning and implementing projects in Rivers state and other neighboring states in the area. The study concludes with some recommendations on how to minimize construction project

delay in Port Harcourt, Rivers State and improve the level of construction project implementation in Nigeria and Rivers state in particular.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

It is obvious that effective implementation of projects contribute meaningfully to the economic growth and development of any nation. The success in project implementation can only take place under a favorable internal and external environment. There have been arguments from various quarters that Nigeria economy is stagnant and that public projects are not properly implemented due to some critical delay factors that could mar successful implementation of construction projects in the country and Rivers State in particular.

Hence, this research therefore examined the extent of cost and time variations in the implementation of NDDC Hostel construction projects using the descriptive analysis method and the nature and scope of the critical delay factors that could have contributed to the variations and possibly hinder the success rate of the implementation of NDDC Prototype Hostel projects in UNIPORT, Choba, Port Harcourt in the state. The identified critical delay factors are identified finance, materials, contractor, equipment and client related issues as the contributory factors to the delays experienced in the successful implementation of the NDDC prototype hostel construction project in UNIPORT, Choba.

One hundred and thirty six respondents with direct experience on the NDDC hostel project expressed their opinions on these critical delay related factors for that that affected the NDDC hostel construction projects.

Student t-test analysis technique was used to determine delay factors that contribute to fatigue experienced in the implementation of NNDC prototype hostel project under consideration. Correlation analysis was employed in the analysis of the relationship between project success and the economic development of Rivers State, Nigeria. Discussions and conclusions were made base on the findings.

5.2 Conclusions

Numerous factors are contributory to delay experienced in most public sector construction projects in Port Harcourt, Rivers state, Nigeria. These factors have significant effect and relationship on quality, time and cost variations witnessed during the planning and implementation of NDDC University Prototype Hostel construction project in University of Port Harcourt (UNIPORT), Rivers state. The general treatment of the related variables is enough evidence of thorough research to determine the influence of the identified factors causing construction delays in public sector project execution. Again, the knowledge of the varieties in the behaviour of these factors calls for concern and policy change as well as total reform of our construction industry for better executions that can translate into positive economic development.

Given these results, among others, one can conclude that activities of most contractors towards public sector construction projects cannot help economy to grow. Government and private contractors need a sound rethink towards their ugly activities which has frustrated and is still frustrating the efforts of the Government at all level in developing all sectors of the economy for national development. It is obvious that government cannot achieve this noble objective without the positive contribution of the construction industry. Based on the findings of this study, construction project contractors should readjust and be honest in dealing with the public and private clients in order to avoid possible delays which can negatively affect the project cost and quality. The government on the other hand should restructure the economy to be economically stable as this will help minimize unnecessary fluctuation in the prices of construction materials. Timely and adequate funding is also necessary to enable contractors to implement and complete construction projects successfully, especially in Rivers state.

5.3 Recommendations

Based on our finding and conclusions for the study, the following recommendations which involved public sector construction project delays, and their causative factors, were made;

Generally, public or government contractors should study and articulate all the project activities and their related costs before submitting their quotations. This

will help in minimizing omission of any construction project item and ensure accurate estimation of construction project costs.

The study also advocate efficient and effective tendering process. This will be made possible by making a thorough in-house examination of the tenders before awarding contracts. NDDC and other related government agencies should do away with corruption and approach rendering with utmost honesty in order to select effective contractor who will be able to honour contract terms and deliver projects successfully.

Government should also intensify efforts to ensure stability in the market prices of construction materials. This will enable contractors manage the project funds released to them without attempting to cut corners which may compromise the quality of the project, if eventually completed. This can be achieved by looking at ways of minimizing the cost of factor inputs (materials, labour, etc.).

More so, contractors should pay more attention to detailed design of project for accurate estimation of cost and time to avoid or minimize the incidence of public sector construction projects in Rivers state and its environment.

Lastly, for enhanced economic growth and national development, construction projects must be successfully planned and implemented. For this to happen, there is urgent need for honesty and transparency among the players in the public sector or government agencies and construction industry.

If all the findings and recommendations made in this study is considered, there will rapid delivery of public and private construction projects which will trigger rapid economic development by eradicating waste (costs) incurred whenever projects fail or abandoned. This costs can be channeled into other economic development activity.

5.4 Contributions to Knowledge

In this study effort has been made to empirically analyze the NDDC Prototype hostel project performance data (secondary data) with the data from questionnaire responses (primary data) using an advanced multivariate techniques analysis. The study established that Contractor Related factors are the most critical factor that delayed NDDC hostel project in UNIPORT, Rivers State, Nigeria.

It has also been established in this study that these delay related project factors exhibited negative relationship with economic development of Rivers State. As the magnitude of these delay factors increase, project success decline and the economic development also decrease. It means that the effects of these factors have the capability of hindering economic development.

Above all the study empirically confirmed a view that has been widely held by many project experts and organizations though not previously empirically verified by any research, that Contractor, Finance, and Materials Related delay factors should be monitored to in order to meet the cost and time criteria for

project success since cost and time are critical to NDDC construction project success. This is based on the fact that cost and time overrun are difficult to recover, especially in the type of project under consideration.

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APPENDIX I

QUESTIONNAIRE

INSTRUCTION: Please indicate the level of effectiveness or otherwise of the causative delay factors according to your perception of the factors and their effects on the delivery of public sector construction projects.

Factor I (X_1) FINANCE RELATED DELAY FACTORS		**HE**	**E**	**N**	**I**	**HI**
1	Error in the Bill of Quantities					
2	Inadequate fund allocation					
3	Delay due to amortization period					
4	Contractor's financial difficulties					
5	Client's financial difficulties					

Factor II (X_2) MATERIALS RELATED DELAY FACTORS		**HE**	**E**	**N**	**I**	**HI**
1	Shortage of construction materials					
2	Poor procurement of construction materials					
3	Escalation of material prices					
4	Unreliable suppliers					
5	Poor quality of construction materials					

Factor III (X_3) CONTRACTOR RELATED DELAY FACTORS		**HE**	**E**	**N**	**I**	**HI**
1	Inadequate contractor experience					
2	Inaccurate time estimate					
3	Inaccurate cost estimate					
4	Obsolete technology					
5	Poor site management and supervision					

Factor IV (X_4) EQUIPMENT RELATED DELAY FACTORS		**HE**	**E**	**N**	**I**	**HI**
1	Frequent equipment breakdown					
2	Slow mobilization of equipment					
3	Improper equipment					
4	Insufficient number of equipment					
5	Shortage of equipment parts					

Factor V (X_5) CLIENT RELATED DELAY FACTORS		**HE**	**E**	**N**	**I**	**HI**
1	Slow or bureaucratic decision making by client					
2	Frequent change orders					
3	Improper project feasibility study					
4	Lack of communication and coordination					
5	Lack of capable representative					

INSTRUCTION: Rank the following categories of delay factors based on their level of effectiveness (on a scale of 1 for "low effect" to 5 for "high effect") in causing delay in the economic development of public sector projects in Port Harcourt Rivers State.

S/N	**Categories of Delay Related Factors**	**Ranks**
1	Finance related factors	
2	Materials related factors	
3	Contractor related factors	
4	Equipment related factors	
5	Client related factors	

Thank You for your time.

APPENDIX II

DATA COLLECTED FROM THE 136 RESPONDENTS

RESP.	X_1	X_2	X_3	X_4	X_5	Y
1	13.00	13.00	22.00	20.00	11.00	36.00
2	18.00	17.00	20.00	20.00	10.00	46.00
3	20.00	25.00	23.00	20.00	17.00	35.00
4	13.00	15.00	22.00	17.00	21.00	37.00
5	14.00	19.00	22.00	25.00	12.00	42.00
6	19.00	24.00	23.00	13.00	20.00	38.00
7	17.00	24.00	16.00	17.00	13.00	35.00
8	21.00	21.00	19.00	25.00	14.00	36.00
9	18.00	17.00	20.00	15.00	19.00	38.00
10	14.00	20.00	23.00	19.00	17.00	37.00
11	18.00	18.00	20.00	24.00	21.00	28.00
12	11.00	15.00	14.00	24.00	20.00	31.00
13	10.00	21.00	16.00	21.00	22.00	42.00
14	17.00	21.00	24.00	17.00	21.00	38.00
15	21.00	19.00	16.00	20.00	10.00	37.00
16	12.00	17.00	22.00	18.00	10.00	46.00
17	20.00	25.00	23.00	15.00	11.00	35.00
18	13.00	15.00	22.00	21.00	16.00	37.00
19	14.00	19.00	22.00	21.00	16.00	42.00
20	19.00	24.00	23.00	19.00	19.00	38.00
21	17.00	24.00	16.00	17.00	14.00	35.00
22	21.00	21.00	19.00	25.00	16.00	40.00
23	20.00	20.00	20.00	15.00	9.00	37.00
24	22.00	19.00	21.00	19.00	12.00	36.00
25	21.00	21.00	19.00	14.00	11.00	30.00

26	10.00	20.00	18.00	14.00	14.00	33.00
27	10.00	19.00	20.00	21.00	17.00	30.00
28	11.00	12.00	17.00	20.00	17.00	34.00
29	16.00	21.00	16.00	19.00	22.00	31.00
30	16.00	16.00	15.00	21.00	24.00	32.00
31	19.00	24.00	12.00	20.00	18.00	40.00
32	14.00	23.00	22.00	19.00	25.00	39.00
33	16.00	19.00	21.00	12.00	13.00	39.00
34	14.00	18.00	23.00	21.00	25.00	38.00
35	17.00	22.00	24.00	16.00	25.00	40.00
36	17.00	9.00	25.00	24.00	25.00	38.00
37	12.00	18.00	24.00	23.00	25.00	41.00
38	16.00	15.00	22.00	19.00	25.00	38.00
39	16.00	10.00	23.00	18.00	20.00	38.00
40	13.00	21.00	23.00	22.00	23.00	38.00
41	23.00	19.00	16.00	9.00	24.00	40.00
42	17.00	20.00.	18.00	18.00	14.00	27.00
43	5.00	5.00	21.00	15.00	16.00	39.00
44	16.00	20.00	24.00	10.00	23.00	36.00
45	13.00	5.00	25.00	21.00	20.00	32.00
46	9.00	29.00	19.00	19.00	21.00	40.00
47	13.00	16.00	20.00	20.00	22.00	43.00
48	19.00	20.00	24.00	5.00	20.00	38.00
49	16.00	19.00	21.00	20.00	20.00	39.00
50	14.00	16.00	24.00	5.00	21.00	45.00
51	18.00	20.00	25.00	29.00	16.00	35.00
52	10.00	15.00	25.00	16.00	23.00	32.00
53	9.00	20.00	19.00	20.00	20.00	38.00

54	14.00	20.00	21.00	19.00	14.00	40.00
55	25.00	13.00	16.00	25.00	16.00	43.00
56	25.00	19.00	20.00	17.00	24.00	38.00
57	21.00	16.00	19.00	23.00	16.00	39.00
58	25.00	14.00	16.00	21.00	22.00	45.00
59	25.00	18.00	20.00	18.00	23.00	35.00
60	19.00	10.00	15.00	25.00	15.00	32.00
61	14.00	9.00	20.00	19.00	22.00	38.00
62	18.00	14.00	20.00	21.00	23.00	40.00
63	20.00	16.00	20.00	21.00	9.00	36.00
64	14.00	16.00	27.00	21.00	19.00	42.00
65	22.00	15.00	25.00	22.00	20.00	33.00
66	16.00	13.00	13.00	22.00	21.00	36.00
67	18.00	18.00	17.00	20.00	19.00	38.00
68	21.00	14.00	20.00	23.00	18.00	37.00
69	20.00	18.00	18.00	20.00	14.00	28.00
70	14.00	11.00	15.00	14.00	17.00	31.00
71	18.00	10.00	21.00	16.00	17.00	42.00
72	24.00	17.00	21.00	24.00	12.00	38.00
73	23.00	21.00	19.00	16.00	16.00	37.00
74	22.00	12.00	17.00	22.00	16.00	46.00
75	23.00	20.00	25.00	23.00	13.00	35.00
76	20.00	13.00	15.00	22.00	23.00	37.00
77	19.00	14.00	19.00	22.00	17.00	42.00
78	19.00	19.00	24.00	23.00	5.00	38.00
79	20.00	17.00	24.00	16.00	16.00	35.00
80	15.00	21.00	21.00	19.00	13.00	40.00
81	19.00	20.00	20.00	20.00	9.00	37.00

82	17.00	22.00	19.00	21.00	13.00	36.00
83	16.00	21.00	21.00	19.00	19.00	30.00
84	14.00	10.00	20.00	18.00	10.00	33.00
85	18.00	10.00	19.00	20.00	10.00	30.00
86	18.00	11.00	12.00	17.00	11.00	34.00
87	18.00	16.00	21.00	16.00	16.00	31.00
88	18.00	16.00	16.00	15.00	16.00	32.00
89	12.00	19.00	24.00	12.00	19.00	40.00
90	21.00	14.00	23.00	22.00	14.00	39.00
91	24.00	16.00	19.00	21.00	16.00	39.00
92	21.00	16.00	19.00	21.00	9.00	45.00
93	25.00	14.00	16.00	24.00	12.00	35.00
94	25.00	18.00	20.00	25.00	18.00	32.00
95	19.00	10.00	15.00	25.00	22.00	38.00
96	14.00	9.00	20.00	19.00	9.00	40.00
97	18.00	14.00	20.00	21.00	18.00	36.00
98	20.00	16.00	20.00	21.00	15.00	42.00
99	14.00	16.00	27.00	21.00	10.00	33.00
100	22.00	15.00	25.00	22.00	21.00	36.00
101	16.00	13.00	13.00	22.00	19.00	38.00
102	18.00	18.00	17.00	20.00	20.00	37.00
103	21.00	14.00	20.00	23.00	5.00	28.00
104	20.00	18.00	18.00	20.00	20.00	31.00
105	14.00	11.00	15.00	14.00	5.00	42.00
106	18.00	10.00	21.00	16.00	29.00	38.00
107	24.00	17.00	21.00	24.00	16.00	37.00
108	23.00	21.00	19.00	16.00	2.0.00	46.00
109	22.00	12.00	17.00	22.00	19.00	35.00

110	23.00	20.00	25.00	23.00	16.00	37.00
111	20.00	13.00	15.00	22.00	20.00	42.00
112	19.00	14.00	19.00	22.00	15.00	38.00
113	19.00	19.00	24.00	23.00	20.00	35.00
114	20.00	17.00	24.00	16.00	20.00	40.00
115	15.00	21.00	21.00	19.00	20.00	37.00
116	19.00	20.00	20.00	20.00	27.00	36.00
117	17.00	22.00	19.00	21.00	25.00	30.00
118	16.00	21.00	21.00	19.00	13.00	33.00
119	14.00	10.00	20.00	18.00	17.00	30.00
120	18.00	10.00	19.00	20.00	20.00	34.00
121	18.00	11.00	12.00	17.00	18.00	42.00
122	18.00	16.00	21.00	16.00	15.00	46.00
123	21.00	14.00	20.00	23.00	21.00	35.00
124	20.00	18.00	18.00	20.00	21.00	37.00
125	14.00	11.00	15.00	14.00	19.00	42.00
126	18.00	10.00	21.00	16.00	17.00	38.00
127	24.00	17.00	21.00	24.00	25.00	35.00
128	23.00	21.00	19.00	16.00	15.00	36.00
129	22.00	12.00	17.00	22.00	19.00	38.00
130	23.00	20.00	25.00	23.00	24.00	37.00

131	20.00	13.00	15.00	22.00	24.00	28.00
132	19.00	14.00	19.00	22.00	21.00	31.00
133	19.00	19.00	24.00	23.00	20.00	42.00
134	20.00	17.00	24.00	16.00	19.00	38.00
135	15.00	21.00	21.00	19.00	21.00	37.00
136	19.00	20.00	20.00	20.00	20.00	46.00

T-TEST RESULT

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
X_1	136	5.00	25.00	19.7794	3.98272
X_2	136	5.00	29.00	16.7721	4.35459
X_3	136	12.00	27.00	20.9779	3.29414
X_4	136	5.00	29.00	16.4412	3.81569
X_5	136	5.00	29.00	17.5882	4.86175
X_6	136	27.00	46.00	37.0294	4.27732
Valid N (listwise)	136				

T-Test

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
X_1	52.060	135 135	.000 .000	19.77941	17.1040	18.4548
X_6	100.959			37.02941	36.3040	37.7548

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
X_2	44.917	135	.000	16.77206	16.0336	17.5105
X_6	100.959	135	.000	37.02941	36.3040	37.7548

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
X_3	70.726	135 135	.000	20.97794	19.4193	20.5366
X_6	100.959		.000	37.02941	36.3040	37.7548

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
X_4	42.418	135	.000	16.44118	18.7941	20.0883
X_6	100.959	135	.000	37.02941	36.3040	37.7548

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
X_5	49.189	135	.000	17.58824	16.7638	18.4127
X_6	100.959	135	.000	37.02941	36.3040	37.7548

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
X_1	136	17.7794	3.98272	.34152
X_2	136	16.7721	4.35459	.37340
X_3	136	19.9779	3.29414	.28247
X_4	136	19.4412	3.81569	.32719
X_5	136	17.5882	4.86175	.41689
X_6	136	37.0294	4.27732	.36678

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
X_1	52.060	135	.000	17.77941	17.1040	18.4548
X_2	44.917	135	.000	16.77206	16.0336	17.5105
X_3	70.726	135	.000	19.97794	19.4193	20.5366
X_4	59.418	135	.000	19.44118	18.7941	20.0883
X_5	42.189	135	.000	17.58824	16.7638	18.4127
X_6	100.959	135	.000	37.02941	36.3040	37.7548