Causes of Delay in Large Building Construction Project in Nigeria Construction Industry

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DECLARATION

This dissertation is submitted to the University of Central Lancashire in partial fulfilment of the degree of Masters in construction project management. I declare that this work is my own work and I have fully acknowledged and reference all secondary sources. This dissertation has never been submitted to other university.

Signature……………………

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ABSTRACT:

Many projects in Nigeria construction industry experience extensive delays thereby exceeding the project duration date which often lead to costly disputes and claims between parties. Therefore, this research presents the causes of construction delays, and the factors contributing to construction delays. The state of the art technology used in addressing the issue of delay was discussed. Based on the literature the theoretical frame work was developed.

Consequently, questionnaire survey were conducted among 93 major project stakeholders in the Nigeria construction industry which includes the contractors, consultants and clients. Relative important index of each factors were calculated and ranked, and according to the highest ranking of these factors the top important causes of construction delay influencing the Nigeria construction industry were determined. Besides, the most important technology was also determined. Kruskal Wallis test was carried out to determine the significant difference between the factors of delay on causes of construction delay.

The result of the survey revealed that financial predicament, lack of consultant site staff, poor skills and inexperience of labour are the most important factors contributing to construction delay in the Nigeria construction industry. The result further revealed that labour input tracking model is the most important state of the art technology. Subsequently, the findings in this research will contribute in improving performance in the Nigeria construction industry in terms of time and cost overrun. Further research is needed to investigate the model use in addressing delay issues in the Nigeria construction industry.

CHAPTER 1 – INTRODUCTION

1.1 BACKGROUND

Construction delay is a world-wide incidence in the construction industries, which is generally related to overrunning cost and time. Construction delays have an adverse impact on the project sponsor, client, project team member and participant involved in the entire project, which frequently result to disagreement, suspicion, financial problem and claims, lawsuit, and renegotiations (Megha and Bhatt 2013). Yang and Yin (2009) was of the view that project is generally associated with a complicated state of affairs in the course of execution. However, delay affect projects in many different ways. According to Shehu *et al*. (2014), stated that delay is a reoccurring incidence that can occur in almost every project carried out by any construction industry if appropriate project management knowledge is not employed.

Though, project delay is a precarious issue because of the numerous increase in loss and cost that is associated with project execution, it is evident that the two main reasons why delay occur are as a result of lack of adequate information and inexperience of most stakeholders in the construction industries. Furthermore, completing a project on time is a huge benefit to the company as it does not only cost but also helps the project stakeholders to be familiar with the various problems and factors that contribute to construction delay Rahsid *et al*. (2013). Patil *et al*. (2013) state that the competence of a construction industry or its project team can best be described by their ability to meet or complete the project on or before the project deadline. Nonetheless, the method of executing project is focus on a lot of difference and features that are impossible to forecast. According to Shebob *et al*. (2012) and Addo (2015), delay may differ from project to project depending on the type and magnitude of the structure. Andrew and Holt (2012) confirm that delays in project can result in increase in costs, such as direct costs that come as a result of crashed programmes and events to reach an exciting height. However, delays on any task during construction can change the programme schedule of the project with adverse effect that might lead to loss of massive capital.

Hamzah *et al.* (2011) conducted a study on the causes of delay, their study demonstrated the different causes and categories of construction delay and also reveal the diagrammatic analysis on the theoretical framework. Doloi *et al*. (2012) conducted a research on the factors influencing delays using the India construction industries as a case study. Their study identify lots of features of delay, and characterised the main factors affecting numerous structures in India and established a relation that involves the adverse qualities for producing forecast models used for the purpose of assessing the consequence of the delay factors. The methodology adopted in their study was based on questionnaire survey and interviews. Alnuaimi and Al Mohsin (2013) conducted a field study in Oman on causes of delay in completion of construction projects and identified the basis of the numerous reasons for different delay problem. Gonzalez *et al*. (2013) conducted a study on causes of time overrun in project execution. Their research was mainly based on the analysis of the relations between the different causes of project delay and their influence on project duration. The methodology used in their study was developed to discourse the issues causing delay and its impact on construction. Amoatey *et al.* (2015) and Sheet *et al.* (2011b), analysed the major causes of delay and their influences on construction project. Their analysis were based on the numerous delay factors and effects on a project using two case studies Pakistan and Ghana. Gunduz *et al*. (2012) reviewed delay factors in construction projects, through conducting one to one interview with the major project stakeholders in Turkey construction industries. The factors were then identified and analysed categorically into different group. This was analysed using ishikawa fish bone diagram in order to achieve a factor relation between the various groups of factors.

Many researchers have carried out studies on the causes of construction delay, causes and effects of construction delay, influencing factors on time and cost overrun, contributors to construction delay using different case study. However, there was a gap in the area in which this study focused which is on causes of delay in large building project and it is aimed at studying the three main stakeholders involved in a project and identifying the recent trend used to address delay in the construction industry.

1.3 AIM/OBJECTIVES

Aim

The Aim of this study is to investigate the cause of delay in large building construction projects in Nigeria construction industry.

Objectives

The main objective of this study are;

1. To investigate the types of delay influencing the construction industry
2. To investigate the major causes of delay influencing the Nigeria construction industry
3. To investigate the State of the art technology used globally to address the issue of delay in the construction industry
4. To evaluate the theoretical framework used to address the issue regarding delay in Nigeria construction industry
5. To study the difference in the view of stakeholder's perception such as the client, contractors and consultants.

1.4 RESEARCH QUESTION

1 What are the most significant difference between the clients related factors on construction delay
2 What are the most significant difference between the consultants related factors on construction delay
3 What are the most significant difference between the contractors related factors on construction delay
4 What are the most significant difference between the state of the art on construction delay

1.5 RESEARCH HYPOTHESIS

H1- there is a significant difference between the impacts of the client related factors on construction delays.

H2- there is a significant difference between the impacts of the consultant related factors on construction delays.

H3- there is a significant difference between the impacts of the contractor related factors on construction delays.

H4- there is a significant difference between the impacts of the state of the art technology used in addressing the issue of delays.

1.6 SCOPE OF STUDY

The scope of this study will be limited to;

1. Location: This research was focused on Lagos state which is the largest populated and richest state in Nigeria in terms of infrastructure, development, construction, human resources, and high population late at such it was a better place to collect data.

2. Main stakeholders: This research was focused on the three main stakeholders e.g. contractors, consultants and clients: this was because of the relevant roles they play in contract and project execution.
3. Source of knowledge: This study is focused on the participants' knowledge based on their encounter on past and recent ongoing projects: stakeholders experience on past and recent experience helped in gathering concrete and adequate information about construction delay.
4. Size: The size of the targeted organisation were large construction companies and consulting firms.

1.7 STRUCTURE OF THE DISSERTATION

This study consist of five major chapters.

CHAPTER 1: This chapter introduced the entire background of the study, enumerate the main aims and objectives for this research which has been conducted, the research question and hypothesis based on which the research analysis in this study has been illustrated.

CHAPTER 2: In this chapter the importance of the construction industries, categories of construction delays, causes of construction delays, contributing factors of delays has been illustrated. The state of the art technologies used globally to address the issues of delays was also illustrated in this chapter. Based on the literatures the theoretical frame work used globally to address the issue of delay was developed.

CHAPTER 3: Covers the research methodology used during the study. This contains the research design and approach, questionnaire design, research strategy, target population, sampling method used, data collection processes adopted and the technique used for data analysis.

CHAPTER 4: Contained the analysis of the study and the presentation of the data collected for the research. This chapter analysed the stakeholders responds, their familiarity with construction delay, their level of involvement in building project, length of experience in construction, length of time the project was delayed, and the type of construction experienced by the stakeholders. The client related factors, consultant related factors, contractors related factors and the state of the art technology were all analysed in this chapter.

CHAPTER 5: The discussion and findings of the research result were illustrated in this chapter. The conclusion, recommendation for the stakeholders, limitation, contribution, and future study were also illustrated.

CHAPTER 2- LITERATURE REVIEW

2.1 INTRODUCTION

Construction delay is a global phenomenon faced by many construction industries for this reason the magnitude of risk and unpredictability is very high in the building industries compared to other industries (Gardezi *et al* 2014). However, the problem of construction delays is a recurring issue in civil engineering practice. This occurs often in the entire project life span leading to conflict and legal proceeding (Marzouk and El-Rasas 2014).The successful completion of activities and retaining them in the roughly calculated cost and time plan rely on upon a strategy that involves good professional discernment to the aversion of client, contractors and consultants. On the other hand, numerous construction work experience broad delays and consequently run over the project end time and estimated value. This issue is more obvious in the conventional or antagonistic sort of agreement in which the agreement is recompensed to the most minimal bidder (Odeh and battaineh 2002).

This chapter is focused on the importance of the construction industry, the causes of construction delay and the factors contributing to construction delay. Furthermore, it describes the State of the art technology used globally to address the issue of delay and the theoretical framework used to address the issue regarding delay in the construction industries.

2.2 THE IMPORTANCE OF CONSTRUCTION INDUSTRY

The construction industry occupies a very significant position in the resources of many nations as it is one of the major industries contributing to the GDP of any nation. The construction industries in Palestine contribute 33% of the Palestinian GDP which is at the increase when compared to every other sectors like, the production, education, communication, vocation, and entertainment sector (Mahamid 2011, Orozco et al. 2011). Asubay and Mensah (2015) asserted that the construction sectors in many countries donate 5 to 10 percent of GDP across the globe and provide employment to about 10percent of the employed citizen in many nations. The construction industry grow at a very fast rate in the industrial sector with an average growth rate of 7 to 8 percent annually. Doloi *et al*. (2012) argued that construction industries contribute 6 to 9 percent of the India gross domestic product over the years with 8 to 10 percent growth rate per annual. However, the construction sector is the largest after agriculture. Haq *et al.* (2014) added that organizational structure and facility contribute to the vast advancement of many countries.

The Nigerian construction industries acquired a very significant position in the Nigeria economy. Although, it's contribution to the nations' economy is less than that of the production and other industries. This contribution made by the construction sectors to the country economic growth leads to improved skilfulness in the construction sectors by way of cost-benefit and timelines and may contributes to savings cost for the country as a whole. The main critique facing the construction industry of Nigeria is the growth rate of construction delays in project execution Aibinu and Jagboro (2002). According to Aibinu and Odeyinka (2006) Managing time and cost claims connected with construction delays could cause conflict and might further delay the project. Although, disagreements may occur from questions that are related to causative factors, contract explanation, and quantity of the claims. In Nigeria, the issue of construction delay is terrible especially when view from the perspective of the present condition of the economic statues of the country. Ogunsem and Jagboro (2006) Added that the Nigerian construction industry is tormented by the fact that many projects exceed their project duration period longer than initial plan as stipulated in the contract terms. Owolabi *et al*. (2014) was of similar view that the Nigeria Construction industry is passing through huge challenges in project execution. However previous studies has shown that project delay is the major setback facing lots of construction industries in Nigeria. Odusami and Olusanya (2000) in their research on client contribution to delays on construction project concluded that majority of the projects completed in Lagos metropolis go through an average delay of 51% of scheduled

Rahsid *et al*. (2013) were of the view that, delay challenges is a global problem faced by construction industries in many countries as a result of numerous reasons. Aziz (2013) argued that over the years the construction industries has had a bad record in addressing the issue of delay and the critical analysis of delay problem in the construction sectors has been disregarded and often time is been addressed with emergency plan and as such fail to meet the project completion date. According to Shehu *et al*. (2015) were of the view that, claims for damages, disagreement and cost overrun are usually imposed on delayed project in the construction industries and the more knowledge on how best it can be approached the more the chances of reducing or avoiding it from reoccurring. Al-Hazim and Salem (2015) were of the view that in high way construction project that modifying the plan and absence of good management usually result to overrunning cost and time. Though, Salunkhe and Patil (2013); Hampton *et al.* (2012) argued in their study that, project delay in the construction sector usually result in the following, termination of the project, surpassing the deadline, overrunning cost, substandard delivery, loss of production, claims and disagreement. However, Braimah (2013) was of the view that the most difficult type of dispute resolution is the construction delay dispute.

2.3 CONSTRUCTION DELAY

Construction delay is recognized as the most widely known, expensive and hazardous issue experienced in any construction project. Building projects are usually exposed to substantial threat on the time delay. Such threat situations lead to expansion of time and expense. Delay in construction projects may be brought on by one or a mix of a few reasons. It may begin with a basic reason and led to a generous arrangement of an interrelated complex question in contract understanding. A large portion of delay are brought about by variables, for example, implausible contract length of time and expense, contrasting site conditions, change requests, effect and gradually expanding influences of postponements, assessment of the quality and amount of works, client outfitted things, difference in the elucidation of plans and designs, unfulfilled obligations, speeding up, wastefulness and interruption (Na Ayudhya 2011).

Tawil *et al*. (2014), Afshari *et al.* (2011) and Acharya *et al*. (2006) defined construction delay as a situation when the client and contractor collectively contribute to the late execution of the project within the contract completion date as agreed in the contract terms. Abdullah *et al*. (2010) further defined construction delay as the time overrun or the extension of time to finish the task. Subsequently, a delay is a circumstance when the genuine advancement of a building project is slower than the arranged plan or late finish of the activities. El-razek *et al*. (2009) and Motaleb and Kishk (2010) was of the view that project delay is then characterized as "the extension of project schedule date of completion indicated in an agreement, or past the date that the pasties settled upon for conveyance of a task." However, delays in building project can lead to contract termination, lost productivity, increased costs, acceleration and late completion of project (Suresh and Kanchana 2015).

2.4 CAUSES OF CONSTRUCTION DELAY

Hampton *et al*. (2012) and Le-Hoai *et al.* (2008) in their studies enumerated some of the project-related variable that can cause delay (and influence cost overruns), such as complexness; environment; size; and scope. Although Lowsley and Linnett (2006) in their research made reference to other variables such as changing climate conditions, unanticipated ground conditions, accessibility of resources and incomplete design details. Assaf and Al-Hejji (2006) at the course of their study on the causes of delay on large projects, stated that owners and contractors can be affected by delay variable in various ways, especially monetarily. Fugar and Agyakwah-Baah (2010) in their research on delay in building construction project in Ghana enumerated numerous causes of delay and then classified them into nine distinct categories analysed them and concluded that the major causes of time overrun are delay in getting permission from council, poor estimation of project cost, underrating the complications of a projects, bank transaction challenges, inconsistency in price of materials and poor site supervision. Sweis *et al*. (2008) in their research on the causes of construction delay in Jordan and concluded that financial problem encountered by the contractor and client's inability to finalised decision are the primary causes of project delay.

Ayman (2000) in his study on construction delay, a quantitative analysis conducted to investigate the reasons for delays on construction projects. The outcome of the research shows that the major reasons for delay in the building projects are related to the design engineer, change in the used of the proposed building, bad weather condition, logistic, financial conditions, and changes in the quantity of materials needed to execute the project. The existence of these delay factors in any project have an effect on its completion date. Doloi *et al*. (2012) in their research on analysing factors affecting delays in Indian construction project were of the view that lack of dedication, incompetency of site manager, poor coordination, lack of understanding of project scope and communication problem are possible factors causing delay.

Eden *et al*. (2000) suggested that there were substantial trouble in vindicating and specifying these types of cost and time overrun. Chappell *et al*. (2006) asserted that it is some time challenging to sort out how to approach a delay threat in terms of obligation and cost.

However, Faridi and El-sayegh (2006) in their research described numerous causes of project delays in the early phase of their literature review and personal interviews conducted with a lot of construction professionals within the UAE construction industry. Forty-four fundamental causes of project delay were found to have an effect on the UAE development industry.

These causes of delay were then organized to build up a point by point survey questionnaire. The causes are assembled into eight pragmatic classes. The contractor's category comprises of causes of construction delay which are primarily caused by contractors. This incorporates the accessibility of assets, management and experience. Three main essential assets for any project execution are manpower, materials and machinery. Contractors need to guarantee that all of these assets are accessible all through the project at any time when needed for use. Al-Kharashi and Skitmore (2009) conducted a study on delay causes and classified them into seven group which include the project owner, engineers, consultant, materials, human resource, contract and relationship-related causes and focused on the prolonged nature and the diversity in the view of the different stakeholders. However, Lo *et al*. (2006) had earlier carried out a similar study on construction delay in Hong Kong and identified many causes of delay and grouped them into seven categories and used rank agreement factor, percentage agreement and percentage disagreement factors to get the difference in view of different stakeholders on causes of project delay. Construction delay were categorized as follows;

Concurrent delay

Excusable delay, Non-excusable delay

2.4.1. Concurrent Delay

According to Long (2015), the term “concurrent delay” is mainly used to identify a situation whereby two different causes of delay coincides on a project during a schedule window or period of time. That is if a delay that was caused by the client is on the same activity path with the delay caused by the contractor, such the delay is said to be concurrent. However, if the delay caused by the contractor and that caused by the client affect the same activity simultaneously or a different activity that was supposed to run the same time and result to the extension of the project completion date such delay is said to be concurrent. Hamzah *et al* (2011) was of the view that, concurrent delay is a circumstance that occur when more than one factor affect a project completion date at the same time Alaghbari (2005); Alaghbari *et al*. (2007) argued that when one factor is delaying the completion of a project it is usually easy to compute the time and resources from such situation but more complicated when is being affected by a lot of factors especially when such factors coincide on a critical part of a project in overlapping period of time.

2.4.2 Excusable Delay

An excusable delays are delay that happen as an outcome of an unforeseeable condition that is past the contractor or the subcontractor's control. Generally, in light of public service specifications on customary general acquisition, delays that happen from the circumstance below are seen as justifiable: 1. General work strikes - Strikes and work unsettling are the usual cause of delay in many industries. Although, not all strikes are seen as excusable delay. Commonly, contract articles that summarised strikes as an excusable delay will in like manner pass a warrant that the purpose behind the delay most be unpredictable and outside the capacity of contractors control. Predictable strike in the midst of agreement or bidding for a contract until the time the contract is finalised is not seen as excusable delay. 2. Fires 3. Surges 4. The Act of God – this occur naturally and is being influenced physically with no human intrusion that couldn't have been sensibly expected nor maintained with strategic plans before time. Delineations of this exhibition of God are Earthquakes, torrential slides, tornados, ocean whirlwinds, lightning and surges. 5. Sudden change in architectural design by the client (Dinakar 2014; Alaghbari *et al*. 2007; Alaghbari 2005; Iyer *et al*. 2008; and Hampton *et al*. 2012).

Compensable delay are delay where a considerable amount is given to the contractor as compensation in addition to an extension in the project completion date. However, only delays with genuine reason are considered excusable and can be compensated (Alaghbari *et al*. 2007; Alaghbari 2005; and Hampton *et al*. 2012). Although, delay can be compensable without extension of the contract time, for a party to be compensated for any delay that party must not contribute to the delay of such project. Rather the delay should be the fault of the other party (Bramble and Callahan 2011). However, Gardezi *et al*. (2014) was of the view that these delay are caused by the client or action of his agent e.g. late release of architectural drawings or engineering design. Ahmed *et al* (2002) conclude in their report that excusable compensable delay is the most occurring type of delay in US construction industries as such a cause for concern.

Non-compensable delays are delay where no compensation is given to the contractor. However, the cause of the delay may be excusable (Dinakar 2014; Alaghbari 2005; Hampton *et al.* 2012; and Gardezi *et al*. 2014).

2.4.3 Non-excusable Delays

These are delay conditions that are under the contractor's control or circumstances that are foreseeable. Some of the examples of these delays causes are as follows: 1. Sub-contractors unbefitting execution of task 2. Improper conveyance of materials 3. Structural flaw from workman 4. Labour strike caused by the contractor (Dinakar 2014; Alaghbari *et al*. 2007; Iyer *et al*. 2008; Hampton *et al*. 2012). Gardezi *et al*. (2014) was of similar view that non-excusable delays are caused by the contractor or its suppliers in this case. The contractor is not entitle to any compensation and is expected to finish the work at the specified time of the contract duration or make compensation to the client.

2.5 FACTORS CONTRIBUTING TO CONSTRUCTION DELAY

The factors contributing to construction delay are categorized into four broad categories, namely contractor- related factors, consultant-related factors, client-related factors and external factors.

2.5.1 Consultants' related factors.

Enshassi *et al.* (2009), demonstrates that the consultants positioned this group in the last place. This is by all accounts sensible as the advisors are not eager to concede or assume the liability for undertakings delay. Then again, contractors and clients have comparable perspective with respect to consultant's obligations regarding the delay. This can be followed to the way that most projects are managed by consultants. Ahmed *et al.* (2003); Gardezi *et al*. (2014); Alaghbari (2005) and Alaghbari *et al*. (2007) listed some of the possible factors of consultant delays which includes lack of consultant site engineer, lack of adequate knowledge on the part of the consultant, inexperience on the part of the consultant site staff, delayed in making decisions, insufficient documents, and slowness in passing information. However, Odeh (2002), was of the view that factors that cause consultant delay in Jordan are contract administration, planning and endorsement of structural drawings and quality control.

2.5.2 Contractors' related factors.

Enshassi *et al*. (2009). Stated that cash flow issues at the time of construction and poor site administration were the first and second positioning in this group. This shows that the cash flow issue is more discriminating than different variables in the group of contractor obligations. Not surprisingly, the contractor did not focus on the contractual elements of their work, for example, "disappointment in testing", "absence of insurance of complete work," and "insufficient contractor rivalry," so the contractor's obligations group was positioned low by contractors. Thus, it can be reasoned that all parties concur that "cash flow" or, when all is said in done, "financial issues" is the significant reason for delay in this group. Gardezi *et al*. (2014); Ahmed *et al*. (2003); Alaghbari, (2005) and Alaghbari *et al*. (2007) in their research listed some of the possible contractors related delays which are, delay in conveying materials to site, materials shortage on site, structural flaw and substandard work, poor skills and inexperience of workers, lack of site labour, poor skills of labour, financial difficulties, supervision problems with labour, lack of subcontractor’s skills, lack of site contractor’s staff, poor site management, and shortage of construction equipment. Odeh and Battaineh (2002) was of similar view that contractor related factors include poor site management, inappropriate planning of project, contractors incompetency, construction flaw and unsuitable construction techniques. Furthermore, factors caused by subcontractor include shortage of materials on sites, labour and equipment, logistic, preparation and approval of drawings, time wasted to conduct, approve test and mistakes in drawing.

Some of the contractors related factors contributing to project delays are emphasis below.

Contractors’ Financial Difficulties: According to Zagorsky (2007) defined financial difficulty as a circumstance where a respondent's credit is unfavourably affected, for example not paying the required bills when due. Ali *et al*. (2010) in their study defined Contractor’s monetary predicament as the lack of sufficient resources required to execute projects to completion. This includes purchasing of materials, payment of labour and purchasing or hiring of construction machinery for the execution of building project.

Thornton (2007) conducted a survey for construction contractors and found that the causes of contractor financial difficulties are mismanaging the business, inadequate control, imprudent risk taking, weak project execution, poor estimation, high overhead, lack of availability insurance coverage and high insurance premium. However, Arshi and Sameh (2005);

Frimpong *et al*. (2003); Assaf and Al-Hejji (2006); and Sambasivan and Yau (2007) stated that delay in instalment from the owner would finally result to financial predicament to the contractor. Therefore, many of the construction works may not be achieve. On the other hand, the contractor may accumulate overweening debt which might result to financial difficulties as they cannot pay back the debt in due time (Liu 2010).

Material shortage: According to Ali *et al*. (2010) shortages of materials on site are due to inappropriate arrangement, ineffective communication, undependable suppliers and late supply of material. Mochal (2003) affirmed that improper planning in managing a project is mistake number one. Many projects do end satisfactorily, while many projects are total disasters this reflect in the situation were improper planning by contractor could cause material shortage on construction site because of unavailability of materials. This is as a result of early mistakes in the planning phase of the project relating to the time these materials are to be used in the execution phase.

Dunkelberger (2009) affirmed that the success of a business is completely associated with the ability to pass information. Whether your business activities is to offer sales, services, consultation, or customer support you must provide a professional means of effective communication in your business. Ali *et al*. (2010) stated that Ineffective communication is, consequently, a substantial problem in managing a project because misconception of information between contractors and material suppliers might result in late conveyance of construction materials to the site. Dada *et al.* (2003, 2006, and 2007) argued that, “unreliable supplier” are vendors who deliver less amount of material to the site than the required amount expected to be delivered on site. This means that unreliable suppliers will lead to project delay because the quantity of materials ordered for was not completely delivered to the site.

Ruiz-Torres and Farzad (2006) Supplier failures to deliver materials can interrupt project operations and delay its completion date. Hence, before the project commerce it is important to decide the number of supplier to use and allocate the supply of materials across them and take the cost of failure into account. Van der Rhee *et al*. (2009) in their research, found that the major factor to consider when choosing a supplier is early delivery of material and late delivery is also an important because unreliable suppliers can affect the entire completion date of the project. This is supported by the research conducted by Aibinu and Odeyinka (2006) who found that late delivery of material to construction site is the major cause of project delay in Nigeria construction industries. This is supported by a study conducted by Sambasivan and Yau (2007) on causes and effect of delay in Malaysian, with the view that material shortage during project execution is ranked number six among the causes of delay.

Labour Shortage: According to the CFIB survey conducted by Bruce and Dulipovici (2001) on the shortage of qualified labour defined shortages of labour as the difficulty in getting the right people to fill the available job. This were supported by Healy *et al*. (2011) that labour shortage is when employers in the market is in excess of the available workers. Shah and Burke (2005) affirm that shortage of labour was a shortfall in the entire number of workers in the labour force. Although labour and job are counterpart in the economy of many nation. Ali *et al*. (2010) in his research, added that shortage of labour is a problem faced by construction industries in many countries over the World. The major causes of shortage of labour is due to the high rate of demand for service provided and cost of foreign labour Trendle (2008). Hanim (2010) asserted that the cost of recruitment of foreign labour was very high as a result of payment for the levy, health check, security bond and health charges by organisations lead to labour shortage in Malaysian construction industry. Although companies employ unskilled foreign labour in Malaysia construction industry because the price is quite cheaper than local labour. However, the increase in the cost of recruiting foreign labour will result to shortage of labour in Malaysian construction industry at such contribute to project delay. Wang (2010) and DTINews (2010) added that global economic crisis is one reason labourers refuse to live in major industrial city. Both report that labourers chose to live in a remote area because of their low wage so they could not afford the cost of accommodation and other living expenses in a large cities which result to shortage of labour in large industrial cities.

Poor Site Management: According to Kadir *et al*. (2005) effective and efficient site management group was very important to guarantee that work programme are controlled according to project completion date. Poor knowledge and coordination by site managers and contractor in planning, scheduling, material procurement and logistics contributes to project delay from its estimated completion date. The project manager should check for disagreement between architectural drawing, civil engineering design and electrical drawing to sort out all contradicting details in order to avoid alteration during construction process which may lead to delay. This is supported by Toor and Ogunlana (2008); Ahmed *et al*. (2003); Augustine and Mangvwat (2001); Yang and Ou (2008); Sweis *et al*. (2008); Arshi and Sameh (2006) and Faridi and El- Sayegh (2006) they conducted a study and found that one of the reason for construction delay is poor site management.

Equipment and Tool Shortage: Ali *et al.* (2010) in their research argued that the construction equipment and tools used during operation are owned by the contractors or leased for a particular period of time while many contractor adopt the two method. Contractor may acquire equipment on lease but should plan the usage ahead of time to meet up with the equipment duration date as hired equipment has to be returned. Joyce (2006) stated that there is high demand for high riser in develop country and as such the building of high riser structures is at the increase and as such, the need for the use of cranes and fork lift is also at a very high demand. Moreover, this contribute to shortage of tools and equipment as there is no sufficient number of crane and fork lift to lease out by suppliers to meet the high demand rate by construction industry which may lead to delay in the project completion date. This is affirmed by Joyce (2007) that booming commercial construction lead to shortage of crane in America construction industry. Wendle (2008) reported that most construction industry in Moscow experience a shortage of equipment as numerous project from other cities draw them away. However, theft is always on construction sites whereby heavy duty equipment are consistently stolen. Therefore, it appear that theft is one of the reason for shortage of equipment. Shree (2007) argued that there is an increase in the cost of renting heavy duty equipment for construction from 30% to 40% which is about 10% increment in the last few years. This sudden increase in the price of construction machineries affect the contractors and cause them to face financial challenges in hiring equipment resulting the contractors to face shortage in equipment.

Construction Mistakes and Defective Works: Gerskup (2010) asserted that poor craftsman, indiscretion and shortcut are the three major elements that has added to imperfect works. Zanis (2010) argued that poor craftsman is the primary giver to structural flaw. Further argued that, the nature of institutional structures developed in Zambia are substandard because of poor craftsman employed by the contractor. Also, Kedikilwe (2009) affirmed that poor craftsman is the fundamental element that produce maladaptive solar panels in structures**.** The utilization of low quality building materials is one sample of poor craftsman. In Turkey, some of the structures that falls in the Bingol–Karliova earthquake were because of the utilization of inappropriate mixture of concrete during constructionssss (Binici 2007). In the same study, Binici (2007) added that the steel used in the reinforcement were bad, causing the quality and strength of the concrete being incredibly diminished. Poor craftsman which prompts structural flawed must be corrected by the contractor however to do this accurately the project might need to be postponed. This will lead to delay in the completion date of the project.

Coordination Problems: Kadir *et al.* (2005) and Ali *et al*. (2008) stated that absence of good supervision will result to project delay, for instance in the circumstance that recently amended structural drawings of a particular project may be issued later by the contractors to the subcontractors. This prompts construction oversights and the work needing to be revamped. Reproduction work takes extra time, thus affecting upon the project completion date.

2.5.3 Clients' related factors

According to Enshassi *et al.* (2009) the contractor party has positioned this group in the fourth place. In any case, the consultants and the owners have positioned this group in the eleventh and twelfth spot, separately and this reflects the antagonistic relationship between the contractor, consultant and owner. It likewise demonstrates that client and consultant did not see themselves as one responsible for project delay. Gardezi *et al*. (2014); Long *et al*. (2004); Alaghbari (2005); Abd El-Razek *et al*. (2008); Ahmed *et al.* (2003) and Alaghbari *et al*. (2007) in their research listed some of the possible client related factors of delay which include, financial predicament, lack of working knowledge, suspension of work by owner, slowness in decisions making, slowness in making choice of material design to used, lack of coordination with contractors, and contract modification. However, Odeh and Battaineh (2002) were of the view that owners related factors consist of funding of project and payments of outstanding debt, owner interfering, making gradual decision and impracticable contract period inflicted by owners. Alaghbari *et al*. (2007) stated that financial predicament on the part of the client are cause as a result of numerous changes in design and material which increases the project cost of the structure. Ahmed *et al.* (2003)

was of the view that the cause of financial predicament on the part of the client is as a result of poor economic situation of the country and inflation rate.

2.5.4 External related factors

unavailability of materials on the market for purchase, unavailability of construction equipment and tools on the market for purchase or hire, bad weather conditions, poor site conditions, poor economic condition such as currency or inflation rate, changes in laws and regulations, transport and logistics delays, and external work due to public agencies such as construction of public roads leading to the building site which may delay or restrict the movement of heavy duty trucks from transporting material to the site (Ahmed *et al*. 2003; Alaghbari 2005 and Alaghbari *et al*. 2007).

2.6 THE STATE OF THE ART TECHNOLOGY USED GLOBALLY TO ADDRESS THE ISSUES OF DELAY IN THE CONSTRUCTION INDUSTRY

2.6.1 Eliminating All Contractors Related Delay Causes (EACRDC)

According to Albakri (2015) this method help to ensure that the contractors complete the project on the agreed date whether the project is being delay deliberately or unintentionally without delaying the project for a long period of time. This should be done before awarding the contract to the contractor who might be the lowest bidder. This method can protect the company from been bankrupt by ineligible contractors. However, it can best be handled by assessing contractors in order to keep away organizations who are not technically equipped for completing the project on time. Furthermore, they could be the most minimal bidder. For this reason the contractor most apply management principle during the project execution. On the other hand, the awarding company set a standard for the organisation on getting equipment and labour available to cover 25% of the project before using them for other project and most not be used to execute other project as at the bid period and a technical evaluation of the contractors past record on delay challenges encounter on different project and weight them accordingly, this are ways of warning contractors that it is imperative to complete project at the stipulated time. Nevertheless, after the selection process, the awarding company organise a seminar and invite professionals who are expert in construction project management through academic education and research work to educate qualified and eligible contractors on avoiding construction delay to enable them complete the project at a given period of time as agreed in the contract terms. These would be an advantage to many contractor who intend to finish on time but don't know how to, so they can learn from this to avoid any delay incident that might arise at the process of executing the project.

2.6.2 Applying and Improving Productivity (AIP):

Albakri (2015), found out that most managers consent that the main reason why delay occur most often in many organisation is because many companies don't practice productivity analyses and at such many construction firm fail to take accurate estimate of the duration and cost of the project. Productivity data base help to estimate the number of labour and equipment that should be made available in order to meet the project duration time. Without this data base it will be very difficult to estimate the number of labour and equipment that will be sufficient to carry out operation on site without experiencing delay resulting from shortage of labour or equipment. Lots of construction firms have closed down because of undervalue of the worth of a project and failure to meet the required time schedule as stipulated in the contract terms. Construction companies should provide such data base to save millions of dollars that would have been paid on penalty as a result of delay. There are so many methods of collecting productivity data such as Global Positioning System (GPS), Labour Inputs Tracking Model (LITM), Radio Frequency Identification (RFID), and Ultra-Wideband Positioning System (UWBPS).

Navon and sacks (2007) Global Positioning System (GPS) a well-known, broadly utilised technology originally developed for positioning and navigation. The rules of differential Global positioning system can be practically applied in two different ways for dynamic positioning: (1) the differential mode utilising reach measurements, called DGPS, and (2) the differential mode utilising stage measurements, called "kinematic GPS"—Differential GPS (DGPS). Pevret *et al*. (2000) DGPS is utilised in assessing location at a metric or sub-metric accuracy. Single DGPS receiver is insufficient to perform the operation instead pair receivers are used.

Navon and Goldschmidt (2002 and 2003), first investigated the usefulness of these monitoring model for measuring labour inputs by tracking the location of each workers for the purpose of project control. Labour input is a very important device for building project execution. Navon and Goldschmidt (2003) argued that the time spend by workers working with an accuracy level of roughly about 10% to 20% can be track. Sacks *et al.* (2003) further coordinated this model work control model, taking into account estimation of labourer areas utilising GPS, with a building project model (BPM). This item arranged BPM model incorporates two essential parts: an information extraction module and an area elucidation module. The information extraction model breaks down the whole activity to pending activities which is usually connected to the location of the activities and where the worker are to be engaged. (Navon *et al.* 2004; Navon and Shpatnitsky (2005) this study tracks earthmoving machines at customary interims utilising the GPS innovation to change over area information into gear efficiency and materials utilisation. An early cautioning framework was additionally created to recognise potential deviations from the arranged determination. Then again, it is obvious that observing information from any single source does not give a full ideal of a project. In this manner, asset information must be gathered from various sources all the while and handled together, which would give more important data to distinguish the asset associations, particularly when managing productivity. Hildreth *et al*. (2005) combine GPS technology into a locally available instrumentation framework to screen the location data and distinguish the start and stop of activities for figuring action lengths of time. Time identification modules (TIMs) were produced to sifter through the GPS information records with both position and speed criteria. Caldas *et al*. (2005) In their research on pilot field test to understand application of GPS technology to material tracking found that in locating correct pipe element the GPS can help workers in saving time and increase their productivity.

Navon and Goldschmidt (2002 and 2003) the labour input tracking model also called building project monitoring model is an inbuilt part of a complete approach to automation of the whole building process with high technology known as computer integrated construction (CIC). The thought here is to utilise information, collected mechanically—the location and area of worker or group member—it focus on the period it takes to complete a particular activity or action and to compute the work inputs on site.

The model, delineated in Fig. 1, utilised two wellsprings of information: (1) The 'PM', which gives information alluding to the arranged inputs, to the calendar, to the physical properties of building materials and to the office's configuration. (2) Data relating to the genuine execution in light of estimation performed by the 'ADC model'. The ADC model distinguishes the labourers and measures her/his area at standard time interims. Records containing this information are put away in the "Areas" document. The model changes over these areas to actual inputs, analyses the recent to the arranged inputs and produces the output. However, Sack *et al*. (2002) were of the view that, the data describe the actual performance pointer as observed automatically. However, the performance pointers may include project advancement, work input, material utilization, and so forth. In the particular instance of the location control and monitoring (LCM) an aberrant performance pointer is utilised- the position of every labourers and staffs in a neighbourhood building coordinate framework, measured at regular time interims. Performance indicators in this context may include project progress, labour inputs, material consumption, etc. In the specific case of the LCM, an indirect performance indicator is used - location of each worker in a local building coordinate system, measured at regular time intervals. All the work that has been completed and those which are still under execution are recorded, and those that have been confirm to be completed are excluded. The designed labour rate and the quantity of task needed to execute each activity are used to compute the likely labour input.

Yi Su (2010) Radio frequency identification (RFID) is a technology used to determine or observe a mobile tag within the limit of the effect of a reader. This technology transmit data between an RF tag and the receiver at very low frequency transmission (FM band). A distinctive RFID system comprises of receivers, antennas and a tag used as communications system. RFID technology is used in industries in many country for tracking inventories, preventing materials from theft, cost control, tracking railroad cargos, and identify vehicle and equipment. Jaselskis and El-Misalami (2003) argued that, RFID is an automatic identification technologies used to capture and detect data using radio frequency. The RFID system use transponders or tag and a reader that depend on configuration such as antenna and scanner to capture and manage data conveniently and to communicate, route instruction and control equipment, and can resist harsh weather condition.

Furthermore, a test was conducted on the RFID application on the Pipe spools prefabrication which is a collection of welded pieces of pipes that are joined together in the field. Radio frequency identification technology helps to reduced close to 30% of the time spent in locating and tracking these pieces with this technology Song *et al*. (2005). Goodrum *et al*.

(2006) built up a model device tracking framework to screen hand devices in a portable situation. Dynamic RFID tags with 915 MHz recurrence were utilized as a part of this study. Regardless of effective results, the scientists cautioned that a cool temperature would reduce the perusing scopes of the tags. The field tests also bring out the essential limitations that cut off dynamic RFID being economically connected to device tracking in the construction industry, including the expense of dynamic RFID tags, and the absence of standard rules. Yin *et al*. (2009) developed a building management system that will help in reducing the time spent in checking for accurate reinforcement in precast concrete plant by integrating the use of Personal Digital Assistants (PDA) and RFID in a wireless geographical area to improve the skilfulness of the data flow. The RFID reader and tag was developed for the purpose of collecting data, mobilising information such as quality control, material control, production quality logistic and inventory management, this data from construction site is transmitted to the manager's office through PDA wireless internet.

Figure 2.1: Components-specific drawing folder and RFID chip.

Sources: Yin *et al*. (2009)

Figure 2.2: PDA with RFID reader.

Sources: Yin *et al*. (2009)

Ergen *et al*. (2007) developed a method of tracking precast component by the combination of two technology, the RFID with GPS technology to meet the requirement of minimal labour input and to reduce the time it take workers to locate a precast concrete material in a storage yard. A GPS receiver was installed on the picking bar of a gantry crane used in moving a precast components, an RFID reader and antenna were placed on the operator cabin and a tag attached on the precast concrete component. The RFID system on the crane help to detect the information and the location of the mixed up precast concrete component.

Sardroud (2012) conducted a research on the influence of RFID technology on automated management of construction materials added that RFID technology can be applied in many industries such as the super market, production, food, defence, pharmaceutical, and hospitals. Mainly used in the supermarket to prevent items from shoplifters and in the hospital for tracking high-value materials. Rebolj *et al*. (2008) conducted a research on automated construction activity monitoring system, their integrated the RFID technology with image recognition. This monitoring system is the dynamic communication environment (DyCE) which adds skilful data to each activity that took place at every moment on-site. This data are being sent to the office by on-site staff, by communicating project related matters using mobile device. The monitoring system was used automatically to differentiate between planned and as-built structures by segmenting and identifying them from the as-built photograph this is achieved by comparing the on-site image to the 4D model of the structures. This was further incorporated into building information model to monitor the advancement of manufacturing and building of structural elements.

According to Albakri (2015); Beinat *et al*. (2007) and Fontana (2004) Ultra-wideband (UWB) refers to the partial transmission capacity of larger than 20% or a flat out data transmission of no less than 500 MHz. The term ultra-wideband alludes to the advancement, transmission and acquiring of highly short term beat of radio frequency energy, extending from a couple of hundred picoseconds to a couple of nanoseconds. Beinat *et al*. (2007) stated that grouping of these extremely short term durations, using UWB waveforms can give innate accuracy to time spend on equipment and material arrival and delivery measures. Teizer *et al*. (2007) conducted a research to demonstrate the application of UWB in the construction industry and to measure accuracy in construction resource tracking, work zone safety, productivity and material tracking. They conducted an indoor and outdoor experiment in this research. The indoor experiment utilised four mid gain receivers, one reference tag, and two asset tags at different update late, arranged in rectangular form of 6×3meters for tracking two-dimensional X and Y coordinates of two walking persons. The outdoor experiment was developed for the purpose of tracking the flow of material for the steel erection in a construction site. Nine receivers, one reference tag and six tracking tags were utilised to track the individual steel beams to determine whether these beams were moved temporarily to a storage yard or directly lifted and install in their fixed positions by a crane as they are delivered on site by delivery trucks.

2.6.3 Application of Safety Principles (ASP)

According to Behm (2005), the construction industry in United States is the most dangerous industry in terms of the collective number of fatalities that occur yearly. Albakri (2015) stated that, Safety is a great deal more than wearing a Steal toe shoes and posting a few signs on the construction site and that injuries in construction site can result to loss of workdays which might lead to project delay. However, experience alone is not sufficient to carry out safety rules on site. Hallowell and Gambatese (2009) was of the view that, contractors and subcontractors who demonstrate the ability to work safely on construction site should be considered first during the contract selection process, bidding or negotiation process this is done in order to avoid any site accident that might result to postponement of daily activity on site which might affect the contract duration date. However, once a contract is awarded to the most qualify subcontractor, it is required that the subcontractor will comply with the minimum requirements of the general safety programs. Carter and Smith (2006) conducted a research on safety hazard identification on construction projects and review that these systems is aimed at integrating safety principle into construction plans by the introduction of health and safety into the project at an early stage. This method can successfully distinguish all safety hazards and issues associated with the entire project and schedule activities and can be very useful for far in advance planning. According to Wanberg *et al.* (2013) in their research revealed that, safety, quality, cost, and project duration date are the four major component that add to project success. However, Failure to comply with safety principles and practices lead to poor quality and then would lead to rework which might require more days to complete the rework activities and at such result to project delays. Therefore, safety training should be given to trainee and employees and certificate should be awarded to ensure that they have the necessary knowledge. Furthermore, by applying safety practices correctly in construction management would not just sustain one segment but the whole construction environment including avoiding delay problem that may occur as a result of safety challenges.

2.6.4 Lean Construction Techniques

Lean construction is a method of addressing the issue of waste during construction, time overrun, and to minimise effort. This was adopted from lean production with the purpose of eliminating waste and increasing efficiency and success in the construction industry (Aziz and Hafez 2013; Koskela *et al* 2002). Abde razek *et al* (2007) and Issa (2013) conducted a research to enhance construction labour efficiency in Egypt through the use of two lean construction principle which are benchmarking, and decreasing changeability of construction labour. The first principle which is benchmarking comprises of disturbance index, performance ratio and project management index. According to Marhani *et al* (2012) added that the benefit of applying lean construction technique is to reduce the project cost by using the exact materials and also to avoid delay and reduced the construction time by setting out appropriate strategic plans. Alinaitwe (2009); Aziz and Hafez (2013) in their study explained the concept by which lean construction technique can be used within a company, this tools includes just-in-time, visual inspection, daily huddle meeting, total quality management, business process reengineering, concurrent engineering, last planner system, team work and value based management. However applying all this concept will help reduced the risk of construction waste, time overrun and also improve efficiency and eventually result to considerable reduction in project cost. Salem *et al*. (2005) and Ogunbiyi (2014) in their study asserted that project execution and evaluation of the techniques used in lean construction can be assessed using lean construction tools. The success of this tools was assessed using the lean implementation quantification and production criteria. However it was established that last planner, visual inspection, daily huddle meetings, and first run studies attain additional successful result than it's expected from the project.

2.6.5 Six-sigma in Construction

According to Stewart and Spencer (2006) and Marves (2000) Six-sigma are recently developed method of administrating business and has grown to be the most significant process for administering process effectiveness, not only in production industries but has also increased tremendously in order areas of project management such as construction project management. Six sigma is a well-controlled process used to Define, Measure, Analyse, Improve and Control (DMAIC) processes. The DMAIC form the foundation of the six sigma methodology and operate on the stage/gate method that need sure transferable to be met at the gate before the organization can move to the next phase. Antony and Banuelas (2002) asserted that six sigma is a strategy designed to enhance financial gain, reduce cost and enhance general operation in order to go beyond the client anticipations. Six sigma implementers proceed to gain qualification as a trained expert in six sigma philosophy and methodology and are known as the 'black belt'. This experts are process improvement project leaders they have in-depth understanding of the following approaches, process mapping, measurement analysis, analysis of variance and supply chain management. Pheng and Hui (2004) were of the view that proactive management, drive for perfection, boundless collaboration, Process focus, management, and improvement are the subjects within which the principle of six sigma is based. However proactive management in construction project implies putting strategies in place to take actions in advance of any occurrence that might lead to project delay. Whereas boundless collaboration implies working to restraint collective obstacle and to enhance teamwork and expands throughout the company line. Six sigma improvement process are not all about been completely free from flaw or having every operations and products at six sigma level of production. The exact level will lies on the strategic significance of the method and the cost it take to develop relative to its advantage (Linderman *et al* 2003).

2.6 THE THEORETICAL FRAMEWORK USED TO ADDRESS THE ISSUE REGARDING DELAY IN THE CONSTRUCTION INDUSTRY

This framework illustrate the approaches used in reducing the reoccurring issue of delay in the construction industries. It categorises delay and illustrate the types of delay that occur among the different categories, it also illustrate the state of the art technologies and splint it into four, this four state of the art were represented with an acronym which are Eliminating All Contractor Related Delay Causes (EACDC), Applying and Improving Productivity (AIP), Application of Safety Principle (ASP), Lean Construction (LC), and Six-Sigma. However, this were explained in a simple schematic presentation to enable it user identify and apply isst appropriately in any construction project.

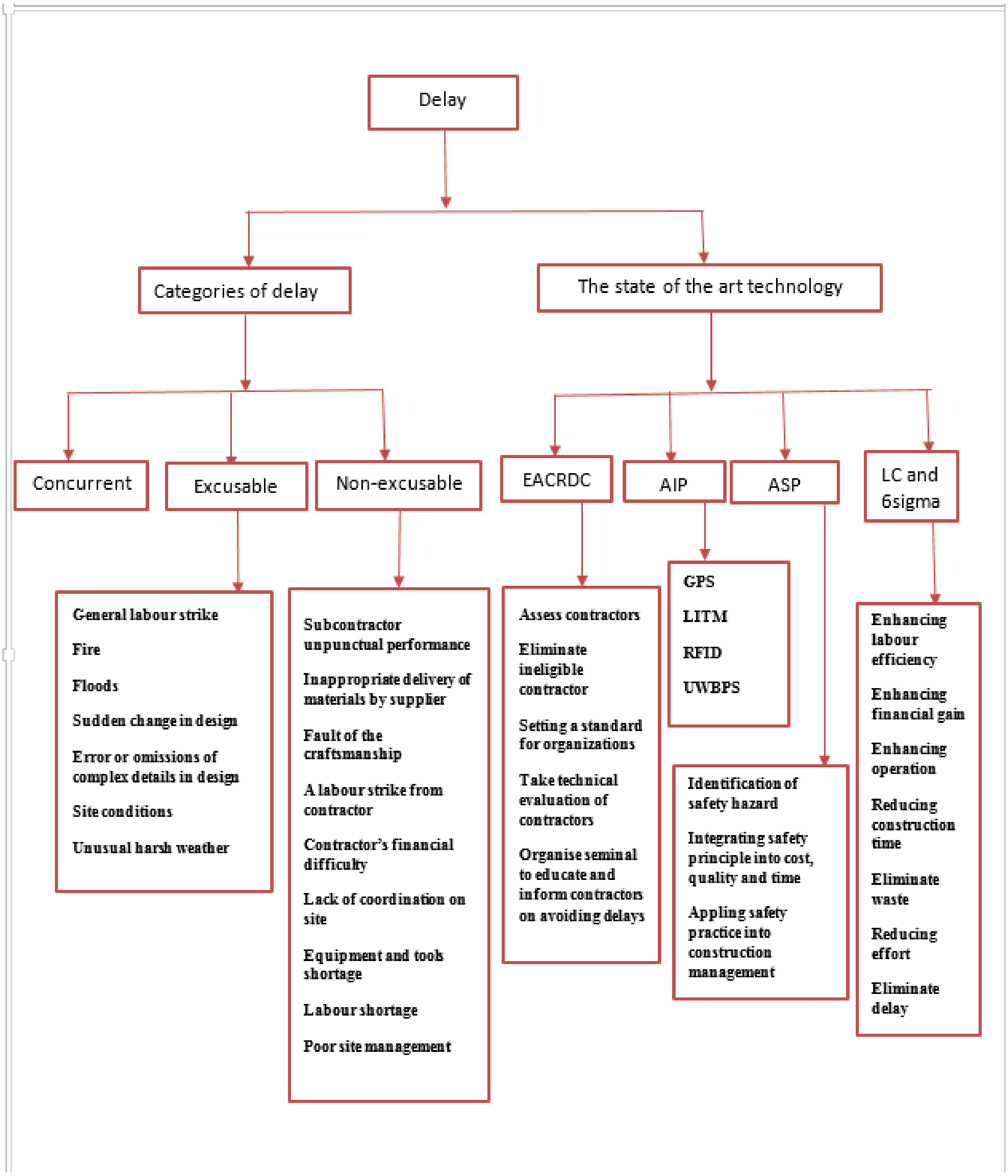

Figure 2.3: Theoretical framework

2.7 SUMMARY

The Construction industry experience a lot of delay challenges. Therefore to identify the causes of these delay challenges in the area of contractor, clients and consultants will help to reduced and improve the issue of delay in the construction industry. The theoretical framework shows above illustrates the categories of delay and the state of the art technologies. These categories are of three major type of delay which were relatively splint into various causes of delay

This chapter reviewed literature on the importance of the construction industry. It also reviewed literature on the categories of causes of construction delay, the technology used globally to address the issue of delay. In addition it concludes with the theoretical framework used to address the issue of construction delay.

CHAPTER 3 - RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter gives a clear account of the approach adopted in the data collection and exploration in order to achieve the aim and objective of this research. The chapter provides description of the research design, research strategy, study area and location, research population, techniques used in sampling, data collection processes and techniques employed for data analysis, design and development of questionnaires. This research methodology provides an over view and understanding of how the research was conducted.

3.2 RESEARCH DESIGN AND APPROACH

Research design demonstrate the plan of action used by a researcher to carry out a research. There are different type of research design that are suitable for various research project. The choice of the actual research design to use depend on the nature of the research problem and the aim of the research (Walliman 2011). However, the use of the term research methodology and research method are two different term, therefore the clarity of this two similar nomenclature is very important for this study (Greener 2008). According to Clough and Nutbrown (2012), Research methodology demonstrate how research questions are phrased with the required question asked in the field. Research methodology on the other hand deals with the understanding of the research and the strategies adopted to answer the research question (Greener 2008).

Quantitative method was chosen in this study because it is a social research that utilise empirical process and empirical accounts. The empirical accounts focus on issue in real world rather than what ought to be the case. However, quantitative research explain the processes by which numerical data are collected and further analysis using mathematical means (Cresswell 2009; Fellow and Liu 2008; Sukamolson 2007). Therefore, quantitative research method brake down the event by which numerical data are gathered for analysis using mathematical means. Nearly all researchers who use quantitative research method regard the earth as actual place were things can be obtained empirically **(**Fellows and Liu 2008; Creswell 2009; Sukamolson 2007). Many researchers has conducted a numerous studies relating to this topic using different research methodology. The research by Sambasivan and Yau (2007) used a qualitative approach to examine carefully the causes and effect of construction delay. Seboru (2015) also used quantitative method to investigate the major cause of delay in road construction project. For the purpose of this study a single approach is employed. However, Qualitative method was not chosen because it use collection of different empirical data, case study, experience, self-examining, life story, interview, observation, historical, interaction and visual texts which are not necessary for this study.

3.3 QUESTIONNAIRE DESIGN

The questionnaire was designed into various section that is section A to section C such that each section deals with a particular feature of the event being studied and the questions in each section are analysed individually to alive at a findings such questions are section B and C. however, the questions are linked together such that the answers from each question will collectively help to arrive at a findings. These section that are linked together are A and B such that A is the respondent background and section B is the causes of construction delay. The questions were very straight and simple to understand such that respondent are meant to tick the correct box that best describe they roles or personal interest. Section C covered the causes of construction delay such that the question were designed on a Likert scale 1-5 (1-very low, 2-low, 3-average, 4 high and 5-very high). Section D was the state of the art technology used globally to address the issue of delay which was also designed on a Likert scale 1-5 (1-very unimportant, 2-unimportant, 3-average, 4-important, 5-very important).

Batchelor et al (1994) comment that the use of Likert scale when analysing data always produce well organised valid information when compared to the single measure.

Questionnaire is a set of collective question structured out in a logical pattern that report personal respondent point of view and behaviour. The questions are usually arranged in a simple form that shows the respondent's how to answer and complete the schedule without wasting time. It could be distributed in hard copy or through e-mail. The main aim of a questionnaire survey is to help the researcher gather information from the respondents and it also help to guide the researcher who would want to ask numerous question to a lot of people the same way. However, a censorious literature review was conducted in this study to help comprehend the concept and causes of construction delay, the factors contributing to construction delay, the theoretical framework used to address the issue of delay and the state of the art technology used to address the issue of delay. The literature help in generating and designing the questionnaire that was used in this study that is a quantitative approach method (Saunders et al 2007; Sekaran 2003).

Variables: Researchers make the used of test and investigation to determine the causes and effect of a specific situation in nature. They strategize a test to suite a particular situation so as to cause changes in something to vary in an expected way. However, variable is to some extent an issue, attribute, or circumstance that can occur in different quantity or type.

Independent variables are usually been changed by researcher during experiment to make sure a reasonable test is conducted. During experiment as independent variables are changed observation is been noted to see what happen in the process. The independent variables in this study are the client related factors, consultant related factors, and contractors related factors and the state of the art technology.

The dependent variable in this study is cause of construction delay which includes concurrent delay, excusable compensable delay, excusable non-compensable delay, non-excusable delay. However, is meant to observe how it react to variations made to the independent variables.

3.4 RESEARCH STRATEGY

The findings from the questionnaire survey in this study present the need to examine problems that deals with the causes of construction delays such as client related factors, consultant related factors, contractor related factors, type of construction delay that occur most in the Nigeria construction industry and also find out the state of the art technology that is best used to address the issue of delay in the Nigeria construction industry. Quantitative methodology has numerous strategies which can be applied in any study to produce an effective in-depth research outcome.

However, the main reason of choosing Nigeria as a case study is for accessibility of construction and consulting firm, familiarity with the country culture and ethnicity, and ease of data collection, familiarity with the operating system of the construction industry, and also to produce quality study that will help to address the issue of construction delay in the Nigeria construction industries.

3.5 TARGET POPULATION

The targeted industries for data collection was mainly focused on seven big construction companies, seven consulting firms, clients of various large buildings in Lagos state of Nigeria. The targeted professionals are the engineers, architects, designers, surveyors and project managers from this construction companies and consulting firms. Five professional where considered in each of the seven organisation visited for sample. Many of these firms are member of the registered professional bodies like the Council for Regulating Engineers in Nigeria (COREN), Nigeria society of Engineers (NSE), Associate of consulting Engineers of

Nigeria (ACEN). The data collected from these source are centred on large building structures owned, supervised, or managed, by the aforementioned stakeholders in these study. These structures include shopping complex, schools, Hotels, office buildings, skyscrapers, large residential building, and estate. This was collected from both the long-time abandoned project and the one that is still under construction but may have suffered delay in the past.

3.6 SAMPLING

Sampling is an illustration of inductive rationale by which conclusion is derived on the basics of a small number of examples. Inductive thinking base on sampling is more like part of our daily activity. We sample sustenance and drink, or test another item presuming that such samples are distinctive. However, sample is a sub-group of a population, which is the totality of some category of component, human or otherwise. Sampling is used as a basis for statistical estimation, or illation from items, about the features of that population (Foreman 1991).

3.6.1 Convenient sample

Convenient sampling method was chosen because of its ease of accessibility and less expensive. In other words the clients, consultants and contractors that are accessible are used which satisfied this study. Convenient sampling is also known as accidental sampling this is simply done by getting what you want where you can get it easily and use it. For example, by approaching your friends or contemporaries, going to the market square and interview first 60 people that accept to give you attention, or by ringing a phone number, or email numbers of students and ask for volunteers (Davies 2007). However, convenient sampling method is highly exhaustive and diligent technique. This technique choose the most convenient objects and time, effort and money is being considered in this method (Matthew and Ross 2010).

3.6.2 Determination of Sample Size

Flick (2014) comment that sampling determination cannot be done in isolation, and no peculiar approach or right decision for determining sample size. The suitability of the arrangement and contents of the sample and the suitability of the approach employed for attaining both can only be measured with reverence to the study question. Saunders et al. (2007) review that, by virtue of budgetary restraints with careful deliberation of the aim and objectives of the studies. When the population is huge, it will be unusual to carry out a study to examination the whole population. However, it can be inferred that the population sample can be chosen in order to attain the objective of the study. A total of 120 respondents were deliberated as adequate and sensible for this study. A random choice of 93 experts from an overview of firms and client from Lagos state of Nigeria were considered. This signified that the sample size shows the population. These were considered on the grounds that they influenced construction and were viewed as the same for all the expert. Moreover, the respondents were viewed as liable to give comparative sentiments.

3.7 DATA COLLECTION PROCESS

During the data collection process for this research a third party was employed to collect the data at the designated location due to some constraints in the collection of primary data. The third party employed for the purpose of data collection is a project manager in a structural designing firm Integrated Advance Analysist (IAA) Lagos state of Nigeria in the person of Engr Ifeanyi Celestine was contacted. He has being in the field for over 10years and is familiar with a lot of contractor, clients, and consultants with the numerous project there have run presently and in the past that suffered delay. The content of the study was described to the third party through skype video call for better understanding of the aim and objective of the research. However, the targeted area for data collection for this study was Lagos state in Nigeria. This state was chosen because is the most industrialised state with the highest population and development in Nigeria. The targeted industries for data collection include construction firms and consulting firms in Lagos state.

Before the gathering data, the questionnaire was composed. A pilot study was conducted to test in order to guarantee the satisfaction of the substance. The questionnaire for pilot study was administered to thirty people with good background in construction among whom are lecturers, PhD students, and MSc students within the school campus. However, this was done to give a sign of the level of clarity and legitimacy.

Ninety three experts from diverse firms including engineers, surveyors, architects, project managers, designers, and clients in the field of construction were given the questionnaire to answer and their feedback was given immediately. The feedback they gave demonstrated that the questionnaire were clear and straightforward which caught the aim and objective of the research.

3.8 TECHNIQUES USED FOR DATA ANALYSIS

The questionnaire was collected and analysed by quantitative data collection method using Statistical Package for Social Science (SPSS 19.0). However, before carrying out the data analysis a preparatory check was conducted to find out uncertain responses. This was very important to ensure that the researcher is making used of the right information from the completed questionnaire. However, uncertain question were carefully considered and decision was reach.

3.8.1 Descriptive statistic

Descriptive analysis was conducted on each question using the data collected in the survey. Descriptive analysis is an essential quantity used for ranking elements in the order of their importance as seem or indicated by the participants. This is related to the study of uncomplicated statistics on samples to examine the direction of observations of some industrial practices and performances base on the view of the stakeholders. (Doloi, 2009; Field, 2005).

The mean score and standard deviation used for the analysis of this study was obtained through SPSS using descriptive data analysis method. The mean score and standard deviation was used to analyse the clients related factors, consultants related factors, contractors related factors, and the state of the art technology used to address the issue of delay.

3.8.2 Inferential Statistic

Inferential statistic was used to conduct hypothesis test on the variables to check for the difference in the relationship. However, inferential statistic is the application of data obtained from a samples to make inferences about a larger populations Black (1999).

Kruskal Wallis test was carried out on the contributing factors on construction delays to determine if independent samples are gotten from unlike populations. Kruskal Wallis test uses independent sample to compare distribution across group, consequently, all outcomes pears in a tabular form with the asymptotic significant and decision. (Burns 2000). The Kruskal Wallis is a non-parametric statistical test. Post Hoc test was also carried out on the factors to determine whether there differs significantly from each other

3.8.3 Ranking of attributes

The statistical result of the data collected for this study was ranked according to their other of significant. According to Doloi (2009) and Iyer and Jha, (2005); was of the opinion that mean and standard deviation is not the best means to rank an attribute, therefore the relative importance index (RII) is best suitable which can be calculated by application of a formula, were w is the weight of each attribute usually from the range of 1-5 according to the Likert scale used, A is highest weight, N is the total number of the respondents that participated in the survey. However, the highest RII score is usually the most critical and is assigned a rank of 1 and the RII with the least score indicate the least significant and is assigned a score of 6 or 9 depending on the number of attributes in the table. The ranking of attributes are arranged in descending order ranging from 1 which is the most critical to the least critical with score 6 or 9.

The mathematical expression for the relative importance index formula adopted in the analysis of this study is given by

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

Where

RII= relative importance index

W= weight of each attribute

∑w= summation of all weight of each attribute

A= is highest score e.g. 5

N= total number of respondents i.e. 93

3.9 SUMMARY

The above methodology was adopted for the purpose of this research and it gave details on how the various section of the questionnaire was administered and analyzed. However, it further explained the statistical tools for data analysis used in this study. The techniques elucidated in this chapter for data analyses are presented in the next chapter and analyzed in details with the data collated from Nigeria.

CHAPTER 4 - DATA ANALYSIS AND PRESENTATION

4.1 INTRODUCTION

This chapter accounts for the analysis on information obtained from the questionnaires. This data was used to achieve the objective of this study by the application of the above methodology. The data was collected through a survey questionnaire which was administered to 120 respondents but had a feedback of 93 respondents. The data analysis method used in this chapter present the statistical analysis of the responses given by the different stakeholders from the survey questions as explained in the research methodology.

4.2 BACKGROUD OF RESPONDENTS

This part comprises of the analysis of all question in section A of the questionnaire it deals with the different stakeholders involve in this study, their familiarity to construction delay, their level of involvement in building projects that was delay, their length of experience in construction industry, the length of time the project was delayed, and the type of construction delay they experienced.

4.2.1 Stakeholders Responds

The result shows that higher number of the contractors responded with about 40.9% which mean there are more of contractors in the Nigeria construction industries and lots of them where available at the time the survey was administered this was as a result of the numerous construction firm and high numbers of construction work going on in the Lagos state metropolis. However, the responds of the consultants was 35.5% which is reasonably close to that of contractors. During the survey eight construction company and eight consulting firm was considered from all the construction firm in Lagos state in each construction company and consulting firm, five professionals was chosen at random and some of their feedback was not delivered thereby living the number of available contractors 38 and consultants 33. The client was 23.7% which mark the least percentage this is because the clients are not on site and in their office several times they were visited. However, the percentage distribution shows no state of been bias but was consistently distributed among the different stakeholders. The table below shows the number of stakeholders that responded to the survey.

Table 4.1: Stakeholders responds.

Respondents	**Frequency**	**Percentage**
contractors	38	40.9
consultants	33	35.5
clients	22	23.7
Total	**93**	**100.0**

4.2.2 Familiarity with Construction Delay

On a scale of very low to very high the larger proportion of the stakeholders familiarity with construction delay were found to be high with the highest frequency rate of 30 and lots of them were on the average and very high with a frequency of 24 and 18. Few were low and the least number of them were very low. This implies that larger number of the stakeholders are familiar with construction delay at different familiarity level this means more than 70% of the respondents are familiar with construction delay on a scale of average to very high. However, some that they familiarity level were low implies that they have little experience about construction delay while those that they familiarity level is very low implies that they have heard of it either through academic studies, journals or articles, but haven’t experienced it on construction site. The figure below depict how familiar stakeholders are with construction delay.

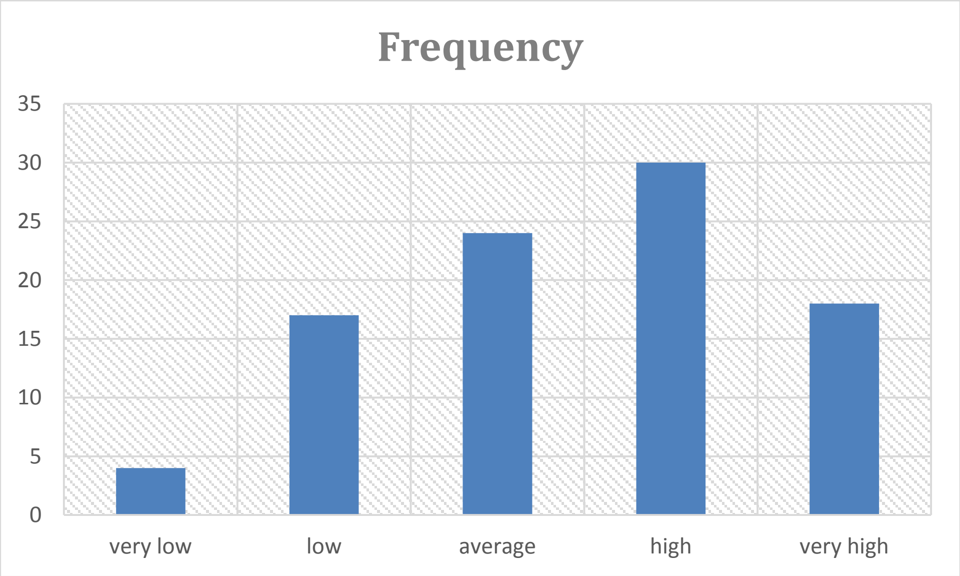

Figure 4.1: Familiarity with construction delay

4.2.3 Level of Involvement in Building Projects that was delayed

At the average level larger number of the stakeholders have been involved in project that was delay this implies that at average level the clients, consultants and contractors have been involved in buildings projects that was delay either under their supervision, consultation or owned as a client in other words they most have been involved in quite a number of structures that was delayed. Large number of them had also been involved on a low level which is relatively smaller than that of the average. Smaller number of them have been involved at high level while least number of them had been involved at very high level. While at very low level implies that the stakeholders are aware of the building project that was delayed or have been involved on one project that was either delayed for few days for some reasons and start up immediately until its completion. The figure below shows the level at which stakeholders were involved in projects delayed

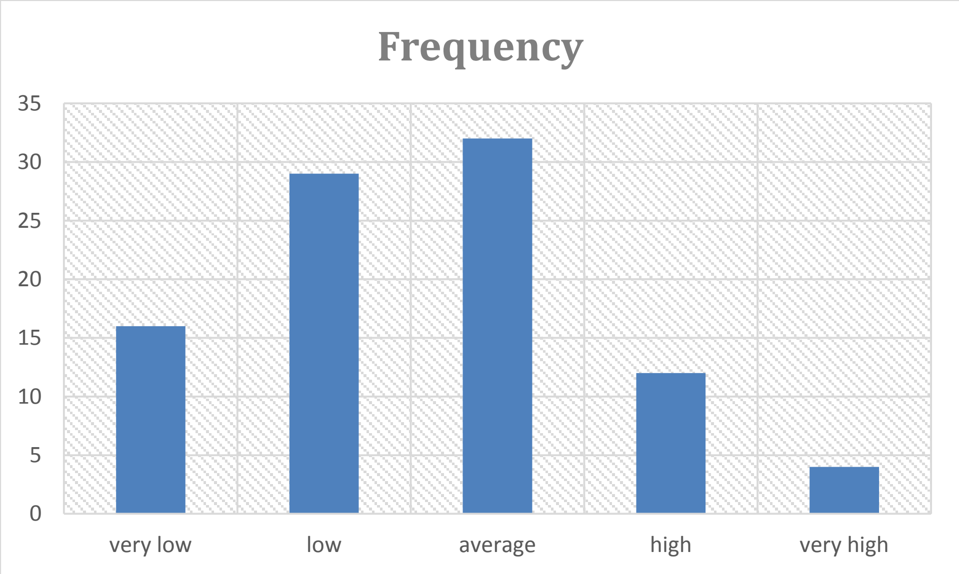

Figure 4.2: Level of Involvement in Building Projects

4.2.4 Length of Experience in Construction

The larger percentage of the stakeholders' experiences in construction industry was within the range of 1year to 5years of experience with 44.1% this shows that more of the young professionals in the construction and consultation firm were more available than the old professionals as at the time the survey was carried out, which actually influence the number of the young one to be higher than others. However, 20.4% of the stakeholders were within 6years to 10years of experience. 17.2% of the stakeholders were within the range of 11years to 15years of experience this means at this level the stakeholders are well experienced. However, at this level of experience stakeholders should be able to handle issues and challenges of any magnitude in construction or be able to find alternative ways to approach challenging situation. Furthermore, 15.1% of the stakeholders were within 16years to 20years of experience this means few of the well experienced expert participated in the survey because at this level of experience contractors and consultant tends to be well known in the industry and at such were very busy as at the time the survey was administered. The least number of the stakeholders was 3.2% with the highest level of experience of 21 years and above. The survey shows that lots of the stakeholders on this level of experience were not available when this survey was administered except for 3.2% that participated.

Table 4.2: Length of Experience in Construction

Length	**Frequency**	**Percentage**
1-5yr	41	44.1
6-10yr	19	20.4
11-15yrs	16	17.2
16-20yrs	14	15.1
21 above	3	3.2
Total	**93**	**100.0**

4.2.5 Length of time the projects was delayed

The result shows that 93.5% of the stakeholders indicated that the project was delayed within the range of 1year to 5 years this means that many of the construction project that surfers delays in Nigeria construction industries are usually delayed within the range of 1year to 5years before completion. Although the rate at which structures are been delayed within 1years are larger in numbers than others that is the most reason why we have higher percentage rate at 1year to 5years. However, only 4.3% were delayed for 6years to 10years this means that the structures has been delayed for a very long time and have no hope of been completed either as a result of financial issue or law suit. However, 2.2 % of the stakeholders indicate that they have been involved with structure that was delayed for over 21 years which means the structure has been entirely abandoned for some time. The table below shows the duration the project was delayed.

Table 4.3: Length of time the projects was delayed

Length of time	**Frequency**	**Percentage**
1-5yrs	87	93.5
6-10yrs	4	4.3
21above	2	2.2
Total	**93**	**100.0**

4.2.6 Types of construction delay experienced by stakeholders

The figure below is a pie chart diagram with four different colours which represent the types of delay experienced by the stakeholders. The red proportion is the highest segment with 37% which implies that the percentage of stakeholders that experienced excusable compensable delay is very high. This means that either the consultant or the contractor were not the actual cause of the delay. Which affirm to the observation made by Bramble and Callahan (2011). The delay could be the fault of the client or natural occurrence which was not foreseen as at the time of bidding for the project this could be as a result of heavy rainfall, land dispute, or national labour strike which conform to the statement by Alaghbari *et al*. (2007) and Hampton *et al*. (2012). The olive green which is excusable- non compensable has the second largest proportion with 29% this means that the number of stakeholders that experienced excusable non compensable sdelay is equally very high. This could be as a result of the stakeholders' mistake or the fault they ought to have identified as at the time of contract bid which affirm with the statement by (Dinakar 2014). However, the blue proportion with 20% indicate the percentages of stakeholders that experienced concurrent delay, this could be a delay that occurred in the part of two stakeholder either by the client and consultant or client and contractor. This kind of delay occurs simultaneously. Furthermore, the purple proportion with 14% implies that few of the stakeholders experienced non-excusable delay. The least value of its percentage means that it does not occur often in the Nigeria construction industries.

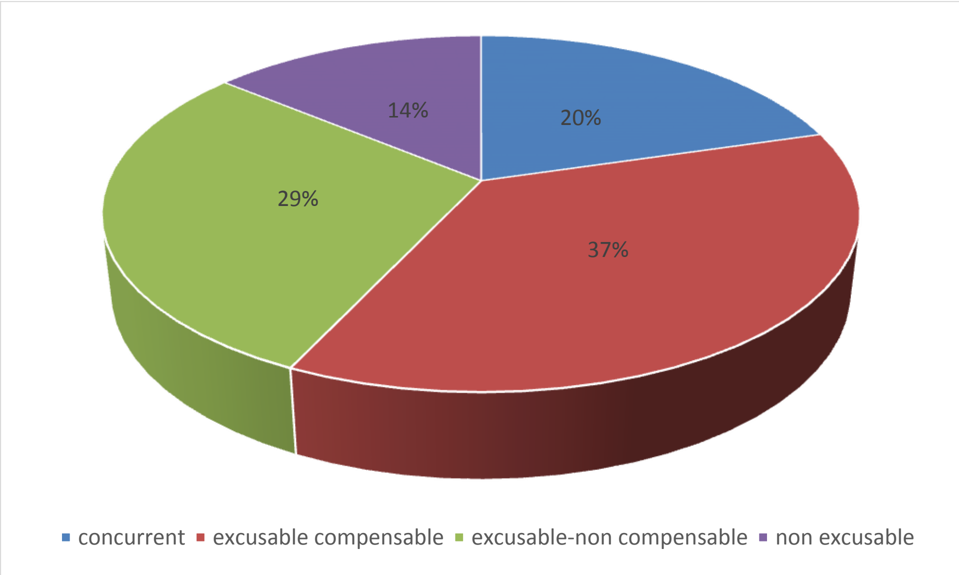

Figure 4.3: Types of construction delay experienced by stakeholders

4.3 ANALYSIS OF MAIN FINDINGS

This section deals with the section B and C of the questionnaire it discusses the causes of construction delays in relation to the stakeholders, the state of the art technology used in addressing the issues of construction delay with the view of achieving the aim and objective of this study.

4.3.1 Client related factors

This presents the mean and standard deviation of the client related factors and the calculation of the relative importance index (RII) of the statistical data and ranking of clients related factors of construction delays. The relative important index of the data shows the level of significant the factors are to construction delay. The data were rearranged according to their level of ranking for better understanding of the result and analysis. The ranking were determine by the highest value of the RII.

Table 4.4: Client related factors

Client Related Factor	**Mean**	**Std. Deviation**
Lack of working knowledge	3.1398	1.48611
Slowness in making decision	2.8710	1.39298
Slowness in making choice of material	2.7527	1.09003
Lack of coordination with contractors	2.6452	1.01773
Contract modification	2.4086	1.27890
Financial predicament	3.3978	1.16227
Funding and payment of outstanding debt	2.8710	1.49074
Owners interfering	2.7097	1.31530
Suspension of work by owner	2.8817	1.30091

TABLE 4.5: Ranking of attributes for client related factors

Client Related Factors	**Mean**	**∑W**	**A**	**N**	$RII = \frac{\sum W}{A \times N}$	**Ranking**
Financial predicament	3.3978	315	5	93	0.6774	1
Lack of working knowledge	3.1398	286	5	93	0.6150	2
Suspension of work by owner	2.8817	268	5	93	0.5763	3
Funding and payment of outstanding debt	2.8710	267	5	93	0.5742	4
Slowness in making decision	2.8065	266	5	93	0.5720	5
Slowness in making choice of material	2.7527	256	5	93	0.5505	6
Owners interfering	2.7097	245	5	93	0.5269	7
Lack of coordination with contractors	2.6452	243	5	93	0.5226	8
Contract modification	2.4086	224	5	93	0.4817	9

Table 4.5 shows that financial predicament had the highest RII of 0.6774 and was ranked first which indicate that the respondents considered financial predicament on the part of the client as the most significant factor among all the client related factors. Which is in line with the empirical findings of Abd El-Razek *et al*. (2008) and Gardezi *et al*. (2014). This implies that it is the most significant client related factor of construction delay influencing time overrun in the Nigeria construction industries. The low standard deviation of this factor indicate that the respondent were certain that financial predicament is the main cause of construction delay in this category. Lack of working knowledge was considered to be significant by the stakeholders with RII of 0.6150 and was ranked second. This implies that most of the client have not been involved in building project before and that lack of building knowledge on the part of the client in building project can contribute to delay in project delivery. This was in line with the findings of Ahmed *et al.* (2003); Abd El-Razek *et al*. (2008) and Gardezi *et al*. (2014). Suspension of work by client was also considered significant by respondents with RII of 0.5763 and was ranked third. However, all the factors are significant which agree with Long *et al*. (2004) except for contract modification which has the least RII of 0.4817 and was ranked the least in the group. This means that contract modification by client is not significant cause of construction delay. However, this did not agree with the empirical findings by Alaghbari *et al*. (2007) and Long *et al*. (2004).

The research hypothesis H1 – "There is a significant difference between the impacts of the client related factors on construction delay".

Null hypothesis Ho – "There is no significant difference between the impacts of the client related factors on construction delays".

Table 4.6: Kruskal Wallis test for client related factors on construction delays

Null hypothesis test	Sig
The distribution of client related factors is the same across categories of Group	0.000

Asymptotic significant are displayed. The significant level is 0.05

Table 4.6 shows that the P value for the client related factors is less than 0.05 significance, this means that there is significant difference between the client related factors on construction delay. It is established that, at 5% significance the null hypothesis was rejected. This implies that clients related factors differs on construction delays.

Table 4.7: Post Hoc Test for difference between clients related factors

Sample1-sample2	Std Test Statistic	Sig
Lack of Working Knowledge – Financial Predicament	0.000	1.000
Lack of Working Knowledge – Contract Modification	-3.222	0.000
Lack of Working Knowledge – Suspension of Work by the Owner	-3.726	0.000
Lack of Working Knowledge - Slowness in Making Decision	-4.661	0.000
Lack of Working Knowledge – Owners Interfering	-4.663	0.000
Lack of Working Knowledge – Lack of Coordination with Contractors	-5.452	0.000
Lack of Working Knowledge – Funding and Payment of Outstanding Debt	-5.991	0.000
Lack of Working Knowledge – Slowness in Making Choice of Material	-10.467	0.000
Financial Predicament - Contract Modification	2.222	0.001
Financial Predicament - Suspension of Work by the Owner	-3.725	0.000
Financial Predicament - Slowness in Making Decision	4.551	0.000
Financial Predicament - Owners Interfering	-4.663	0.000
Financial Predicament - Lack of Coordination with Contractors	5.452	0.000
Financial Predicament - Funding and Payment of Outstanding Debt	-5.901	0.000
Financial Predicament - Slowness in Making Choice of Material	10.467	0.000

Contract Modification - Suspension of Work by the Owner	-0.603	0.015
Contract Modification - Slowness in Making Decision	1.329	0.154
Contract Modification - Owners Interfering	-1.441	0.160
Contract Modification - Lack of Coordination with Contractors	2.220	0.026
Contract Modification - Funding and Payment of Outstanding Debt	-2.759	0.006
Contract Modification - Slowness in Making Choice of Material	7.245	0.000
Suspension of Work by the Owner - Slowness in Making Decision	0.026	0.409
Suspension of Work by the Owner - Owners Interfering	0.039	0.349
Suspension of Work by the Owner - Lack of Coordination with Contractors	1.727	0.084
Suspension of Work by the Owner - Funding and Payment of Outstanding Debt	2.257	0.024
Suspension of Work by the Owner - Slowness in Making Choice of Material	6.747	0.000
Slowness in Making Decision - Owners Interfering	-0.111	0.911
Slowness in Making Decision - Lack of Coordination with Contractors	-0.001	0.369
Slowness in Making Decision - Funding and Payment of Outstanding Debt	-1.430	0.163
Slowness in Making Decision - Slowness in Making Choice of Material	-5.916	0.000
Owners Interfering - Lack of Coordination with Contractors	0.789	0.430
Owners Interfering - Funding and Payment of Outstanding Debt	1.319	0.187
Owners Interfering - Slowness in Making Choice of Material	5.909	0.000
Lack of Coordination with Contractors - Funding and Payment of Outstanding Debt	-0.620	0.696
Lack of Coordination with Contractors - Slowness in Making Choice of Material	5.016	0.000
Funding and Payment of Outstanding Debt - Slowness in Making Choice of Material	4.480	0.000

Table 4.7 shows the result of the Post Hoc test conducted on the various client related factors. The result shows that the P value for financial predicament - slowness in making choice of material is less than 0.05 significant with the highest Standard test statistic of 10.467. Which implies that financial predicament differs significantly from slowness in making choice of

material, and the highest standard test statistic indicate that the difference between them is relatively higher than other groups.

The P value for contract modification - slowness in making choice of material is less than 0.05 significant which implies that contract modification differs significantly from slowness in making choice of material, the high standard test statistic of 7.245 indicate that the difference between these two factors is relatively higher than other groups.

The P value for suspension of work by the owner - slowness in making choice of material is less than 0.05 significant which implies that Suspension of Work by the Owner differs significantly from slowness in making choice of material, the high standard test statistic of 6.747 indicate that the difference between these two factors is high.

The P value for lack of working knowledge – slowness in making choice of material is less than 0.05 significant with the least standard test statistic of -10.467 which implies that lack of working knowledge differs significantly from slowness in making choice of material. The least standard test statistic of -10.467 indicate that the difference between these two factors is very low.

The P value for suspension of work by the owner - lack of coordination with contractors is greater than the 0.05 significant with high standard test statistic of 1.727. Which implies that there is no difference between suspensions of work by the owner from lack of coordination with contractors.

However, many of the P values is less than 0.05 significant which means there is significant difference between many of the groups.

4.3.2 Consultant related factors

The result of the mean and standard deviation of the consultant related factors and the calculation of the relative importance index (RII) of the statistical data and ranking of consultant related factors of construction delays are presented below. The relative important index of the data shows the level of significant the factors are to construction delay. The data were rearranged according to their level of significance. The ranking were determine by the highest value of the RII.

Table 4.8: consultant related factors

Consultant Related Factors	**Mean**	**Std. Deviation**
Lack of consultant site staff	3.1183	1.50253
Inexperience on the part of the consultant	2.8280	1.55776
Inexperience on the part of the consultant site staff	2.7957	1.02744
Delay in making decision	2.1828	0.84630
Incomplete documentation	1.8280	0.84215
Slowness in giving instructions	2.3333	1.08681

Table 4.9: Ranking of attributes

Consultant Related Factors	**Mean**	**∑W**	**A**	**N**	$RII = \frac{\sum W}{A \times N}$	**Ranking**
Lack of consultant site staff	3.1183	294	5	93	0.6323	1
Inexperience on the part of the consultant	2.8280	263	5	93	0.5656	2
Inexperience on the part of the consultant site staff	2.7957	260	5	93	0.5591	3
Slowness in giving instructions	2.3333	217	5	93	0.4667	4
Delay in making decision	2.1828	212	5	93	0.4559	5
Incomplete documentation	1.8280	169	5	93	0.3634	6

Table 4.9 shows that the most significant was lack of consultant site staff with the highest mean score and RII of 0.6323 and was ranked first. This means that the stakeholders considered lack of consultant site staff as a very significant factors that has impact on construction delay. Inexperience on the part of the consultant was considered significant and has a high mean score with high RII of 0.5656 and was ranked second among the factors. This means that the participant considered it as very important factor that has impact on construction delay. This is because inexperience can result to error or omission of details in the design work which might lead to corrections that will result to delay in the progress of every activities. However, inexperience on the part of the consultant site staff, slowness in giving instruction and delay in making decision were also seen as a significant factors and was ranked third, fourth and fifth which means that they have impact on construction delay. Although, the factors is in agreement with the empirical findings of Alaghbari (2005) and Alaghbari *et al*. (2007) except for incomplete documentation which was considered insignificant with the least mean score and RII of 0.3634 and was ranked the least in the table. This means that incomplete documentation has no impact on construction delay in other word even when there is incomplete documentation of any contract agreement the project can still be going on while the document is been updated by the parties involve. This disagreed with the empirical findings by Alaghbari (2005) and Alaghbari *et al*. (2007) which could be as a result of Nigeria factor.

The research hypothesis H2 – “There is a significant difference between the impacts of the consultant related factors on construction delay”.

Null hypothesis Ho - “There is no significant difference between the impacts of the consultant related factors on construction delay”.

Table 4.10: Kruskal Wallis test for consultant related factors on construction delay

Null hypothesis test	Sig
The distribution of consultant related factors is the same across categories of Group	0.000

Asymptotic significant are displayed. The significant level is 0.05

Table 4.10 shows that the P value for the consultant related factors is less than 0.05 significance, this means that there is significant difference between the consultant related factors on construction delays. It is established that, at 5% significance the null hypothesis was rejected. This implies that consultants related factors differs on construction delays.

Table 4.11: Post Hoc Test

Sample1- Sample2	Std Test Statistic	Sig
Incomplete Documentation – Delay in Making Decision	2.448	0.014
Incomplete Documentation - Slowness in Giving Instruction	-3.286	0.001
Incomplete Documentation - Inexperience on the Part of the Consultant Site Staff	6.445	0.000
Incomplete Documentation - Lack of Consultant Site Staff	7.100	0.000
Incomplete Documentation – Inexperience on the Part of the Consultant	7.261	0.000
Delay in Making Decision - Slowness in Giving Instruction	0.838	0.402
Delay in Making Decision - Inexperience on the Part of the Consultant Site Staff	3.997	0.000
Delay in Making Decision - Lack of Consultant Site Staff	4.652	0.000
Delay in Making Decision - Inexperience on the Part of the Consultant	4.813	0.000
Slowness in Giving Instruction - Inexperience on the Part of the Consultant Site Staff	3.159	0.002
Slowness in Giving Instruction - Lack of Consultant Site Staff	3.814	0.000
Slowness in Giving Instruction - Inexperience on the Part of the Consultant	3.975	0.000

Inexperience on the Part of the Consultant Site Staff - Lack of Consultant Site Staff	0.654	0.513
Inexperience on the Part of the Consultant Site Staff - Inexperience on the Part of the Consultant	0.816	0.415
Lack of Consultant Site Staff - Inexperience on the Part of the Consultant	-0.161	0.872

Table 4.11 shows that the P value for incomplete documentation – inexperience on the part of the consultant is less than 0.05 significant with the highest Standard test statistic of 7.261. Which implies that incomplete documentation differs significantly from inexperience on the part of the consultant, and the highest standard test statistic indicate that the difference between them is relatively higher than other groups.

The P value for incomplete documentation - lack of consultant site staff is less than 0.05 significant which implies that incomplete documentation differs significantly from lack of consultant site staff, the high standard test statistic of 7.100 indicate that the difference between these two factors is high.

The P value for incomplete documentation - slowness in giving instruction is less than 0.05 significant which implies that incomplete documentation differs significantly from slowness in giving instruction, the least value of standard test statistic of -3.286 indicate that the difference between these two factors is low.

The P value for inexperience on the part of the consultant site staff - lack of consultant site staff is greater than 0.05 significant with low standard test statistic of 0.654 which implies that there is no significant difference between inexperience on the part of the consultant site staff from lack of consultant site staff. The low standard test statistic of 0.654 indicate that the difference between these two factors is low.

4.3.3 Contractors related factors

This presents the mean and standard deviation of the contractor related factors and the calculation of the relative importance index (RII) of the statistical data and ranking of contractor related factors of construction delays. The relative important index of the data shows the level of significant the factors are to construction delay. The data were rearranged according to their level of ranking for better understanding of the result and analysis. The ranking were determine by the highest value of the RII.

Table 4.12: contractors related factors

Contractors Related Factors	**Mean**	**Std. Deviation**
Material shortage	4.0538	0.78527
structural flaw and defective work	3.8172	1.12236
Poor skills and inexperience of labour	4.1720	0.81592
delay in conveying material	3.4409	1.20201
lack of site labour	3.6129	1.02185
lack of subcontractors skill	3.4409	1.21102
poor site management	3.9032	0.96757
shortage of equipment	2.7849	1.24978
lack of site contractors staff	3.8387	1.03515

Table 4.13: Ranking of attributes

Contractors Related Factors	**Mean**	**$\sum W$**	**A**	**N**	$RII = \frac{\sum W}{A \times N}$	**Ranking**
Poor skills and inexperience of labour	4.1720	389	5	93	0.8366	1
Material shortage	4.0538	377	5	93	0.8108	2
poor site management	3.9032	358	5	93	0.7699	3

lack of site contractors staff	3.8387	357	5	93	0.7677	4
structural flaw	3.8172	351	5	93	0.7548	5
lack of site labour	3.6129	346	5	93	0.7441	6
delay in conveying material	3.4409	321	5	93	0.6903	7
lack of subcontractors skill	3.4409	307	5	93	0.6602	8
shortage of equipment	2.7849	259	5	93	0.5570	9

Table 4.13 shows that Poor skills and inexperience of labour is the most significant factor with the highest mean score and RII of 0.8366 and was ranked first among the whole contractors related factors. The least standard deviation indicate that indicate that the respondents were certain of the factor as the most significant. This implies that poor skills and inexperience of labourer have impact on construction delay. This means that worker with poor skills and inexperience could produce bad work and also could be very slow in carrying out a particular task, at such waste quality time in delivery such task which might result to delay in the entire project. Material shortage was considered the second most significant factor with RII of 0.8108 and was ranked second among the factors. This implies that material shortage has impact on construction delay. Furthermore, shortage of building materials on site can interrupt the progress of activities on-site which might result to delay in the delivery date of the project. However, poor site management, lack of site contractor staff, structural flaw, lack of site labour, delay in conveying materials, lack of subcontractors' skills and shortage of equipment were all significant at different significant level. This implies that the factors has significant impact on construction delay except for shortage of equipment which was less significant than other factors.

However, this was in agreement with Gardezi *et al*. (2014); Ahmed *et al*. (2003); Alaghbari, (2005) and Odeh and Battaineh (2002).

The research hypothesis H3 – “There is a significant difference between the impacts of the contractors’ related factors on construction delay”.

Null hypothesis Ho - “There is no significant difference between the impacts of the contractors’ related factors on construction delay”.

Table 4.14: Kruskal Wallis test for contractor related factors on construction delay

Null hypothesis test	Sig
The distribution of contractor related factors is the same across categories of Group	0.000

Asymptotic significant are displayed. The significant level is 0.05

Table 4.14 shows that the P value for the contractors related factors is less than 0.05 significance, this means that there is significant difference between the contractors related factors on construction delays. It is established that, at 5% significance the null hypothesis was rejected. This implies that contractors related factors differs on construction delays.

Table 4.15: Post Hoc Test

Sample1- Sample2	Std Test Statistic	Sig
Lack of Site Contractors Staff - Lack of Subcontractors Skills	0.185	0.853
Lack of Site Contractors Staff - Lack of Site Labour	0.708	0.479
Lack of Site Contractors Staff - Shortage of Construction Equipment	0.872	0.383
Lack of Site Contractors Staff - Delay in Conveying Materials	1.884	0.060
Lack of Site Contractors Staff - Poor Site Management	4.834	0.000
Lack of Site Contractors Staff - Material Shortage	7.821	0.000
Lack of Site Contractors Staff - Poor Skills and Inexperience of Labour	8.205	0.000
Lack of Site Contractors Staff –Structural Flaw and Defective work	9.964	0.000
Lack of Subcontractors Skills - Lack of Site Labour	0.524	0.600
Lack of Subcontractors Skills - Shortage of Construction Equipment	-0.688	0.492

Lack of Subcontractors Skills - Delay in Conveying Materials	1.700	0.089
Lack of Subcontractors Skills - Poor Site Management	-4.648	0.000
Lack of Subcontractors Skills - Material Shortage	7.637	0.000
Lack of Subcontractors Skills - Poor Skills and Inexperience of Labour	8.020	0.000
Lack of Subcontractors Skills - Structural Flaw and Defective work	9.780	0.000
Lack of Site Labour - Shortage of Construction Equipment	-0.164	0.070
Lack of Site Labour - Delay in Conveying Materials	1.176	0.240
Lack of Site Labour - Poor Site Management	-4.125	0.000
Lack of Site Labour - Material Shortage	7.113	0.000
Lack of Site Labour - Poor Skills and Inexperience of Labour	7.496	0.000
Lack of Site Labour - Structural Flaw and Defective work	9.256	0.000
Shortage of Construction Equipment - Delay in Conveying Materials	1.012	0.312
Shortage of Construction Equipment - Poor Site Management	3.962	0.000
Shortage of Construction Equipment - Material Shortage	6.949	0.000
Shortage of Construction Equipment - Poor Skills and Inexperience of Labour	7.332	0.000
Shortage of Construction Equipment - Structural Flaw and Defective work	9.092	0.000
Delay in Conveying Materials - Poor Site Management	-2.950	0.003
Delay in Conveying Materials - Material Shortage	5.937	0.000
Delay in Conveying Materials - Poor Skills and Inexperience of Labour	6.321	0.000
Delay in Conveying Materials - Structural Flaw and Defective work	8.080	0.000
Poor Site Management - Material Shortage	2.988	0.003
Poor Site Management - Poor Skills and Inexperience of Labour	3.371	0.001
Poor Site Management - Structural Flaw and Defective work	5.130	0.000
Material Shortage - Poor Skills and Inexperience of Labour	-0.383	0.702
Material Shortage - Structural Flaw and Defective work	-2.143	0.032
Poor Skills and Inexperience of Labour - Structural Flaw and Defective work	1.760	0.070

Table 4.15 shows that the P value for lack of site contractors' staff –structural flaw and defective work is less than 0.05 significant with the highest Standard test statistic of 9.964.

Which implies that lack of site contractors' staff differs significantly from structural flaw and defective work, and the highest standard test statistic indicate that the difference between them is higher than other groups.

The P value for lack of subcontractors skills - structural flaw and defective work is less than 0.05 significant which implies that lack of subcontractors skills differs significantly from structural flaw and defective work, the high standard test statistic of 9.780 indicate that the difference between these two factors is relatively higher than other groups.

The P value for lack of subcontractors skills - poor site management is less than 0.05 significant which implies that lack of subcontractors skills differs significantly from poor site management, the least standard test statistic of -4.648 indicate that the difference between these two factors is very low and relatively the least significant among the groups.

The P value for lack of site contractors staff - lack of subcontractor skills is greater than 0.05 significant which implies that there is no significant difference between lack of site contractors staff from lack of subcontractors skills.

However, many of the P values is less than 0.05 significant which means there is significant difference between many of the groups.

4.3.4. The State of the Art Technology

This section present the mean and standard deviation of the state of the art technology. The calculation of the relative importance index (RII) of the statistical data and ranking of the technology are shown below. The relative important index of the data shows the level of significant the factors are to construction delay. The data were rearranged according to their level of significant. The ranking were determine by the highest value of the RII.

Table 4.16: State of the Art Technology

State of the Art Technology	Mean	Std. Deviation
Eliminating all contractor related delay	3.9785	0.97778
Global positioning system	3.9140	1.05970
Labour input tracking model	4.4839	0.76062
Radio frequency identification	3.3118	1.30199
Ultra-wideband positioning system	2.8280	0.89228
Applying safety practice into construction	4.0215	0.75150
Lean construction	4.0108	0.81420
Six-sigma	4.0323	0.89018

Table 4.17: Ranking of attributes

State of the Art Technology	Mean	$\sum W$	A	N	$RII = \frac{\sum W}{A \times N}$	Ranking
Labour input tracking model	4.4839	417	5	93	0.8968	1
Six-sigma	4.0323	379	5	93	0.8151	2
Applying safety practice into construction	4.0215	373	5	93	0.8022	3
Lean construction	4.0108	371	5	93	0.7978	4
Eliminating all contractor related delay	3.9785	370	5	93	0.7957	5
Global positioning system	3.9140	364	5	93	0.7828	6
Radio frequency identification	3.3118	308	5	93	0.6624	7
Ultra-wideband positioning system	2.8280	263	5	93	0.5656	8

The mean of the statistical data indicate the technologies that are more significant and has better control on reducing construction delay. The ranking was used to arrange the factors according to their order of significant starting with the more significant which was assigned a ranked of 1 to the least significant with a rank of 8. Labour input tracking model is the most significant factor with the highest mean score and highest RII of 0.8968 and was ranked first among the whole technologies with the least value of standard deviation which indicate that the respondents were very certain of the technology as the most significant. This implies that labour input tracking model have impact on construction delay. This means that the use of labour input tracking model on construction site to monitor the activities of worker has impact on the types of construction delay, this agree with Navon and Goldschmidt (2001 and 2002).

Six-sigma was ranked second with high mean score and high RII of 0.8151 in the list and low standard deviation which indicate that the respondent were certain of the technology. This means that six-sigma has impact on construction delay. In other words the application of six-sigma approaches to construction project such as proactive management, enhancement of financial gain, reduction in cost, drive for perfection, boundless collaboration, Process focus, management, and improvement has impact on of construction delay that occur on a project. This agree with Antony and Banuelas (2002); Pheng and Hui (2004).

The application of safety practice into construction has a high mean score with high RII of 0.8022 and was ranked third with the least standard deviation which indicate that the respondent were very confident and certain that the technology is very significant. This implies that it has significant impact on construction delay. However, incorporating health and safety principle into construction plans at an early stage of a project have influence on the quality, cost and duration of the project which agree with Carter and Smith (2006) and Wanberg *et al*. (2013). Lean construction has high significant level with RII of 0.7978 and was ranked fourth, the low standard deviation also indicate the level of certainty by the respondent. This implies that lean construction has significant impact on construction delay which agree with Marhani *et al* (2012) and Aziz and Hafez (2013). Eliminating all contractor related delay is significant with RII of 0.7957 and was ranked fifth with the low standard deviation indicating its level of certainty. Application of this technique helps to ensure that project are complete at the required time. This means that eliminating all contractor related delay has significant impact on construction delay which agree with Albakri (2015). Global positioning system, Radio frequency identification and Ultra-wideband positioning system were also significant and was ranked sixth, seventh and eighth in the table. Although there are the least significant among the factors but has impact on construction delay this agree with Albakri (2015) and Navon and sacks (2007).

The research hypothesis H4 –"There is a significant difference between the impacts of the state of the art technology on construction delay".

Null hypothesis Ho - "There is no significant difference between the impacts of the state of the art technology on construction delay".

Table 4.18: Kruskal Wallis test for the state of the art technologies on construction delay

Null hypothesis test	Sig
The distribution of state of the art is the same across categories of Group	0.000

Asymptotic significant are displayed. The significant level is 0.05

Table 4.6 shows that the P value for the state of the art technology is less than 0.05 significance, this means that there is significant difference between the state of the art technologies on construction delays. It is established that, at 5% significance the null hypothesis was rejected. This implies that the state of the art technologies differs on construction delays.

Table: 4.19: Post Hoc Test

Sample1- Sample2	Std Test Statistic	Sig
Ultra-Wideband Positioning System - Radio Frequency Identification	0.818	0.413
Ultra-Wideband Positioning System - Lean Construction	-7.790	0.000
Ultra-Wideband Positioning System - Applying Safety Practice Into Construction Management	-7.834	0.000
Ultra-Wideband Positioning System - Six-sigma	-8.077	0.000
Ultra-Wideband Positioning System - Eliminating All Contractor Related Delay Causes	8.831	0.000
Ultra-Wideband Positioning System - Global Positioning System	9.701	0.000
Ultra-Wideband Positioning System – Labour Input Tracking Model	11.444	0.000
Radio Frequency Identification - Lean Construction	-6.972	0.000
Radio Frequency Identification - Applying Safety Practice Into Construction Management	-7.016	0.000
Radio Frequency Identification - Six-sigma	-7.259	0.000
Radio Frequency Identification - Eliminating All Contractor Related Delay Causes	8.013	0.000
Radio Frequency Identification - Global Positioning System	8.882	0.000
Radio Frequency Identification - Labour Input Tracking Model	10.525	0.000
Lean Construction - Applying Safety Practice Into Construction	0.044	0.965
Lean Construction - Six-sigma	-0.287	0.774
Lean Construction - Eliminating All Contractor Related Delay Causes	1.041	0.298
Lean Construction - Global Positioning System	1.910	0.056
Lean Construction - Labour Input Tracking Model	3.653	0.000
Applying Safety Practice Into Construction Management - Six-sigma	-0.243	0.808
Applying Safety Practice Into Construction Management - Eliminating All Contractor Related Delay Causes	0.997	0.319
Applying Safety Practice Into Construction Management - Global Positioning System	1.867	0.062

Applying Safety Practice Into Construction Management - Labour Input Tracking Model	3.610	0.000
Six-sigma - Eliminating All Contractor Related Delay Causes	0.754	0.451
Six-sigma - Global Positioning System	1.624	0.104
Six-sigma - Labour Input Tracking Model	3.367	0.001
Eliminating All Contractor Related Delay Causes - Global Positioning System	-0.870	0.384
Eliminating All Contractor Related Delay Causes - Labour Input Tracking Model	-2.613	0.009
Global Positioning System - Labour Input Tracking Model	-1.743	0.081

Table 4.19 shows that the P value for Ultra-wideband positioning system – labour input tracking model is less than 0.05 significant with the highest Standard test statistic of 11.444 Which implies that Ultra-wideband positioning system differs significantly from labour input tracking model, and the highest standard test statistic indicate that the difference between them is higher than other groups.

The P value for Radio frequency identification - labour input tracking model is less than 0.05 significant which implies that Radio frequency identification differs significantly from labour input tracking model, the high standard test statistic of 10.525 indicate that the difference between these two factors is relatively higher than many others.

The P value for Ultra-wideband positioning system - Six-sigma is less than 0.05 significant which implies that Ultra-wideband positioning system differs significantly from Six-sigma, the least standard test statistic of -8.077 indicate that the difference between these two factors is very low and relatively the least significant among the groups.

The P value for applying safety practice into construction management - Eliminating all contractor related delay causes is greater than 0.05 significant which implies that there is no significant difference between applying safety practice into construction management from eliminating all contractor related delay causes.

CHAPTER 5 - DISCUSSION, CONCLUSION AND RECOMENDATION

5.1 INTRODUCTION

This chapter discourse the key findings in this research, conclusion and recommendations for the three main stakeholders. It also state the limitation of the study, contribution and future study.

5.2 DISCUSSION AND FINDINGS

The findings in this section includes

- Findings on background and knowledge of respondents
- Findings on types of delay influencing the construction industry
- Findings on causes of delay influencing the Nigeria construction industry
- Findings on State of the art technology used globally to address the issue of delay in the construction industry

5.2.1 Findings on background and knowledge of respondents

The result of the data shows that stakeholders with long length of experience in the Nigeria construction industries determines the number of construction delay they have experienced. However, stakeholders with low work experience has no vast knowledge about construction delay except for those who fall within the range of three years to five years who has been involved in numerous project shows high level of familiarity to construction delay. However, many of the stakeholders above five years were very familiar with construction delay.

5.2.2 Findings on types of delay influencing the construction industry

The results shows that the type of construction delay that occur most in the Nigeria construction industries is usually excusable compensable followed by excusable non-compensable and concurrent. Which is in line with the empirical findings by Ahmed *et al* (2002) in their study on construction delays in Florida and conclude that excusable compensable delay is the most occurring type of delay in Florida. However, excusable compensable is very much on the high side compared to other types of delay. This indicate that this type of delay that occur most in the

Construction delay in Nigeria construction industries is becoming a usual phenomenon that is synonymous with overrunning time and cost. Therefore the need for a practical approach has been employed to provide timely advice to decrease this reoccurring issues in the Nigeria construction industry.

This study was aimed at finding the causes of delay in large building construction project in Nigeria construction industries. However, a theoretical framework was developed, 24 factors of delay and 8 technologies used in addressing the issue of delay was identified in this study. The 24 factors were grouped into three main categories which are client related factors, consultant related factors and contractors related factors. The results revealed that the most important factors that causes delay in the Nigeria construction industries are financial predicament, lack of working knowledge, lack of consultant site staff, suspension of work by owner, inexperience on the part of the consultant, inexperience on the part of the consultant site staff, poor skills and inexperience of labour, material shortage, poor site management and lack of site contractors staff. The results further revealed that the most important state of the art technology are labour input tracking model, six-sigma, application of safety practice into construction and lean construction. However, the objective of this study was satisfied.

5.4 RECOMMENDATIONS

The following recommendations should be considered by all major stakeholders involve in construction project to reduces and control the reoccurring issues of construction delays in Nigeria construction industries.

For clients

- Clients should ensure that all debt and instalment are paid to the contractors on time as stipulated in the contract terms in order to avoid all delay that might arise as a result of payment of labour and material procurement.
- Client should ensure that they have well established consistent cash flow net before starting a massive project.
- Client should ensure that they do not consistently interrupt the activity of the contractors by too much change orders.
- Client should not be too concerned on awarding the contract to the lowest bidders but to ensure that their bid can complete the project without calling for renegotiation, to avoid troubles and law suits that will lead to delay in their project.
- Clients should always check they financial capacity, before embarking on any project.
- Client should ensure that they award contract to trustworthy and honest contractors who will comply with the contract terms and conditions and complete their project on time without diverting their part payment on another project.
- Clients should ensure that all site document and approval from state, local government and council are complete to avoid interruption from government or its agent.
- Clients should ensure that their work is given to experienced consultants to avoid delay that might occur as a result of error or omission of important design details.

For consultants

- Consultant architect should ensure that all architectural work are well scaled to its appropriate dimensions, and well checked before its final submission.
- Consultant Engineers should always double check their design details as it is the most sensitive part of the structure, because unclear design parameter can lead to

suspension of work which might result to delay. On the other hand, if neglected by the contractor can lead to structural failure in future.

- Consultant should ensure that they have site staff that will always visit the construction site at regular interval to check the activities of the contractor i.e. check for the mixture rate, compatibility and strength of materials, check for accurate reinforcement of bars, and the quality of materials on site.
- Consultants should ensure that inexperience staff are not given the most sensitive or technical part of the structure to work on to avoid complication that will lead to delay in the entire project.
- Consultant should ensure that inexperienced staff are not sent to construction site alone to inspect or make corrections on an ongoing project.
- Consultants should always establish an arrangement to check, control and assess variation order.

For contractors

- Contractors should ensure that materials are always on site, at least a day before its use to avoid delay in conveying materials to site as a result of traffic.
- Contractors should always take inventory of the quantity of materials on site so as to know when it is due for replacement to avoid delay on shortage of material
- Contractors should check for all complication in design details with their expert and call the attention of the consultant were needed before the building of the structure commerce to avoid delay as a result of error in omission of design details.
- Contractors should ensure that they employ well skilled and experienced labour to avoid defective work.

- Contractors should ensure that they apply good project planning and scheduling technique in order to avoid cost and time overrun.
- Contractors should ensure that they apply good safety principles in project execution to avoid any site accident that might lead to delay.
- Contractors should ensure that they apply the use of good technologies in other to monitor the affair of every worker on site such as labour input tracking model so as to avoid delay that will occur as a result of workers reluctance to do work.
- Contractors should always aim to finish their project at least two weeks before the stipulated date to enable them take care of any lapses.
- Contractor should ensure that they make the use of well qualified and honest subcontractors with good reputation.
- Contractors should ensure that workers are motivated to enable them put in their best in meeting the project deadline.
- Good financial planning and cash flow net is required to enable any contracting firm to meet up with project deadline.

5.5 LIMITATION OF THE RESEARCH

This research did not cover all the construction and consulting firms in Lagos state as a result of the high rate of massive traffic jam-pack on daily basis in Lagos state, at such eight large construction and eight consulting firms with high operational standard were considered in this study. Self-employed contractors were not considered to avoid unreliability of data.

5.6 CONTRIBUTIONS

The theoretical framework that categorised the different types of delay and the state of the art, provides an organised tools to improve delay issues in the construction industries. However, the findings in this research will contribute in improving project performance in the Nigeria construction industry in terms of time and cost overrun.

5.7 FUTURE STUDY

Further research is needed to investigate the model use in addressing delay issues in the construction industry, model use in identifying delay causes, to improve the theoretical framework. However, ten causes of delay was identified in this study more research should be carried out in this area to determined other causes of delay in the Nigeria construction industry other than the stakeholders related factors.

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APPENDIX 1

SECTION A- Background and Knowledge of Respondents on construction delay

1. Which of the stakeholder are you? (Please choose one).

A) Contractor ( )

B) Consultant ( )

C) Client ( )

Please use the following table to answer question 2 to 5

		1 Very low	2 low	3 average	4 high	5 very high
2	How familiar are you with construction delay in large structural project?					
3	To what level have you been involved in building projects that was delayed?					

		1-5yr	6-10yrs	11-15yrs	16-20yrs	21 above
4	What is your length of experience in construction?					
5	How long was the projects delayed?					

6. What type of construction delay did you experience?

A) Concurrent ( )

B) Excusable-compensable ( )

C) Excusable-non compensable ( )

D) Non excusable ( )

SECTION B – Causes of construction delay

7.) Please tick the extent to which you believe that the following client related factors can contribute to construction delay. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high

	Client related factors	very low	low	average	high	very high
a	Lack of working knowledge					
b	Slowness in decision making					
c	Slowness in making choice of material design					
d	Lack of coordination with contractors					
e	Contract modification					

f	Financial predicament					
g	Funding and payment of outstanding debt					
h	Owners interfering					
I	Suspension of work by the owner					

8.) Please tick the extent to which you believe that the following Consultant related factors can contribute to construction delay. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high

	Consultant related factors	**very low**	**low**	**average**	**high**	**very high**
a	Lack of consultant's site staff					
b	Inexperience on the part of the consultant					
c	Inexperience on the part of the consultant's site staff					
d	Delay in making decisions					
e	Incomplete documents					
f	Slowness in giving instructions					

9.) Please tick the extent to which you believe that the following contractors related factors can contribute to construction delay. Using the following scale: 1 very low; 2 Low; 3 Average; 4 High and 5 very high

	Contractor related factors	**very low**	**low**	**average**	**high**	**very high**
a	Material shortage					
b	Structural flaw and defective work					
c	Poor skills and inexperience of labour					
d	Delay in conveying materials					
e	Lack of site labour					
f	Lack of subcontractor's skill					
g	Poor site management					
h	Shortage of construction equipment					
I	Lack of site contractors staff					

SECTION C – The state of the art technology used in addressing the issue of delay

10.) Please tick the extent to which you believe that the following statement can contribute in reducing construction delay. Using the following scale*:* 1 very unimportant; 2 unimportant; 3 average; 4 important; and 5 very important

	State of the art technology	**very unimportant**	**Unimportant**	**Average**	**Important**	**very Important**
a	Eliminating All Contractor Related Delay Causes					
b	Global Positioning System					
c	Labour Input Tracking Model					
d	Radio Frequency Identification					
e	Ultra-Wideband Positioning System					
f	Appling safety practice into construction management					
g	Lean construction					
h	Six-sigma					

Thank you very much for your contribution to this study.

APPENDIX 2

SPSS RESULT

Question 1

```
FREQUENCIES
VARIABLES=Q1
  /ORDER=ANALYSIS.
```

Statistics

stakeholders

N	Valid	93
	Missing	0

stakeholders

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	contractor	38	40.9	40.9	40.9
	consultant	33	35.5	35.5	76.3
	client	22	23.7	23.7	100.0
	Total	93	100.0	100.0	

Question 2

```
FREQUENCIES
VARIABLES=Q2
  /ORDER=ANALYSIS.
```

Statistics

familiar

N	Valid	93
	Missing	0

familiar

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very low	4	4.3	4.3	4.3
	low	17	18.3	18.3	22.6
	average	24	25.8	25.8	48.4
	high	30	32.3	32.3	80.6
	very high	18	19.4	19.4	100.0
	Total	93	100.0	100.0	

sssssssss

Question 3

```
FREQUENCIES
VARIABLES=Q3
  /ORDER=ANALYSIS.
```

Statistics

involved

N	Valid	93
	Missing	0

involved

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	very low	16	17.2	17.2	17.2
	low	29	31.2	31.2	48.4
	average	32	34.4	34.4	82.8
	high	12	12.9	12.9	95.7
	very high	4	4.3	4.3	100.0
	Total	93	100.0	100.0	

Question 4

```
FREQUENCIES
VARIABLES=Q4
  /ORDER=ANALYSIS.
```

Statistics

experience

N	Valid	93
	Missing	0

experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5yr	41	44.1	44.1	44.1
	6-10yr	19	20.4	20.4	64.5
	11-15yrs	16	17.2	17.2	81.7
	16-20yrs	14	15.1	15.1	96.8
	21 above	3	3.2	3.2	100.0
	Total	93	100.0	100.0	

Question 5

```
FREQUENCIES
VARIABLES=Q5
  /ORDER=ANALYSIS.
```

Statistics

length of delay

N	Valid	93
	Missing	0

length of delay

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5yrs	87	93.5	93.5	93.5
	6-10yrs	4	4.3	4.3	97.8
	21aove	2	2.2	2.2	100.0
	Total	93	100.0	100.0	

Question 6

```
FREQUENCIES
VARIABLES=Q6
  /ORDER=ANALYSIS.
```

Statistics

type of delay

N	Valid	93
	Missing	0

type of delay

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	concurrent	19	20.4	20.4	20.4
	excusable compensable	34	36.6	36.6	57.0
	excusable-non compensable	27	29.0	29.0	86.0
	non excusable	13	14.0	14.0	100.0
	Total	93	100.0	100.0	

Question 7

Client Related Factors

```
DESCRIPTIVES VARIABLES=Q7a Q7b Q7c Q7d Q7e Q7f Q7g Q7h Q7i
  /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
working knowledge	93	1.00	5.00	3.1398	1.48611
decision making	93	1.00	5.00	2.8065	1.39298
choice of material	93	1.00	4.00	2.7527	1.09003
coordination	93	1.00	4.00	2.6452	1.01773
modification	93	1.00	5.00	2.4086	1.27890
financial	93	1.00	5.00	3.3978	1.16227
outstanding debt	93	1.00	5.00	2.8710	1.49074
owners interfering	93	1.00	5.00	2.7097	1.31530
suspension of work	93	1.00	5.00	2.8817	1.30091
Valid N (list wise)	93				

Hypothesis Test

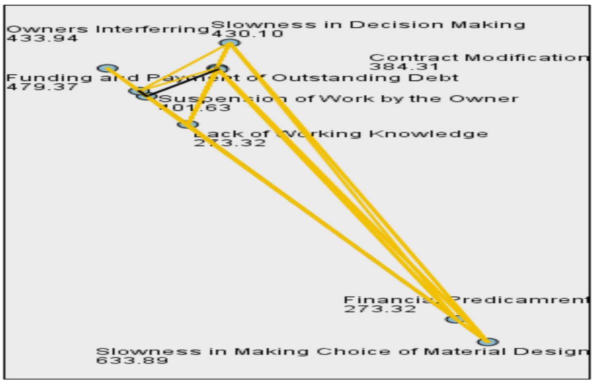
Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of VAR00003 is the same across categories of Group.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

POST HOC

Pairwise Comparisons of Group



Each node shows the sample average rank of Group.

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Lack of Working Knowledge-Financial Predicamrent	.000	34.447	.000	1.000	1.000
Lack of Working Knowledge-Contract Modification	-110.989	34.447	-3.222	.001	.046
Lack of Working Knowledge-Suspension of Work by the Owner	-128.312	34.447	-3.725	.000	.007
Lack of Working Knowledge-Slowness in Decision Making	-156.774	34.447	-4.551	.000	.000
Lack of Working Knowledge-Owners Interferring	-160.613	34.447	-4.663	.000	.000
Lack of Working Knowledge-Lack of Coordination with Contractors	-187.796	34.447	-5.452	.000	.000
Lack of Working Knowledge-Funding and Payment of Outstanding Debt	-206.043	34.447	-5.981	.000	.000
Lack of Working Knowledge-Slowness in Making Choice of Material Design	-360.570	34.447	-10.467	.000	.000
Financial Predicamrent-Contract Modification	110.989	34.447	3.222	.001	.046
Financial Predicamrent-Suspension of Work by the Owner	-128.312	34.447	-3.725	.000	.007
Financial Predicamrent-Slowness in Decision Making	156.774	34.447	4.551	.000	.000
Financial Predicamrent-Owners Interferring	-160.613	34.447	-4.663	.000	.000
Financial Predicamrent-Lack of Coordination with Contractors	187.796	34.447	5.452	.000	.000
Financial Predicamrent-Funding and Payment of Outstanding Debt	-206.043	34.447	-5.981	.000	.000
Financial Predicamrent-Slowness in Making Choice of Material Design	360.570	34.447	10.467	.000	.000
Contract Modification-Suspension of Work by the Owner	-17.323	34.447	-.503	.615	1.000
Contract Modification-Slowness in Decision Making	45.785	34.447	1.329	.184	1.000
Contract Modification-Owners Interferring	-49.624	34.447	-1.441	.150	1.000
Contract Modification-Lack of Coordination with Contractors	76.806	34.447	2.230	.026	.928
Contract Modification-Funding and Payment of Outstanding Debt	-95.054	34.447	-2.759	.006	.208
Contract Modification-Slowness in Making Choice of Material Design	249.581	34.447	7.245	.000	.000
Suspension of Work by the Owner-Slowness in Decision Making	28.462	34.447	.826	.409	1.000
Suspension of Work by the Owner-Owners Interferring	32.301	34.447	.938	.348	1.000
Suspension of Work by the Owner-Lack of Coordination with Contractors	59.484	34.447	1.727	.084	1.000
Suspension of Work by the Owner-Funding and Payment of Outstanding Debt	77.731	34.447	2.257	.024	.865
Suspension of Work by the Owner-Slowness in Making Choice of Material Design	232.258	34.447	6.742	.000	.000
Slowness in Decision Making-Owners Interferring	-3.839	34.447	-.111	.911	1.000
Slowness in Decision Making-Lack of Coordination with Contractors	-31.022	34.447	-.901	.368	1.000
Slowness in Decision Making-Funding and Payment of Outstanding Debt	-49.269	34.447	-1.430	.153	1.000
Slowness in Decision Making-Slowness in Making Choice of Material Design	-203.796	34.447	-5.916	.000	.000
Owners Interferring-Lack of Coordination with Contractors	27.183	34.447	.789	.430	1.000
Owners Interferring-Funding and Payment of Outstanding Debt	45.430	34.447	1.319	.187	1.000
Owners Interferring-Slowness in Making Choice of Material Design	199.957	34.447	5.805	.000	.000
Lack of Coordination with Contractors-Funding and Payment of Outstanding Debt	-18.247	34.447	-.530	.596	1.000
Lack of Coordination with Contractors-Slowness in Making Choice of Material Design	172.774	34.447	5.016	.000	.000
Funding and Payment of Outstanding Debt-Slowness in Making Choice of Material Design	154.527	34.447	4.486	.000	.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Question 8

Consultant Related Factors

```
DESCRIPTIVES VARIABLES=Q8a Q8b Q8c Q8d Q8e Q8f
  /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
lack of site staff	93	1.00	5.00	3.1183	1.50253
consultant inexperience	93	1.00	5.00	2.8280	1.55776
site staff inexperience	93	1.00	5.00	2.7957	1.02744
delay in making decision	93	1.00	4.00	2.1828	.84630
incomplete documentation	93	1.00	4.00	1.8280	.84215
slowness in instruction	93	1.00	5.00	2.3333	1.08681
Valid N (list wise)	93				

Hypothesis Test

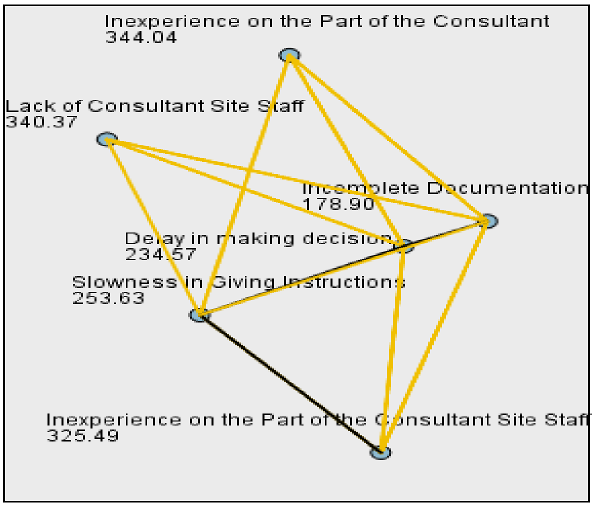
Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of VAR00002 is the same across categories of Group.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Post Hoc

Pairwise Comparisons of Group



Each node shows the sample average rank of Group.

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Incomplete Documentation-Delay in making decision	55.672	22.744	2.448	.014	.517
Incomplete Documentation-Slowness in Giving Instructions	-74.737	22.744	-3.286	.001	.037
Incomplete Documentation-Inexperience on the Part of the Consultant Site Staff	146.591	22.744	6.445	.000	.000
Incomplete Documentation-Lack of Consultant Site Staff	161.473	22.744	7.100	.000	.000
Incomplete Documentation-Inexperience on the Part of the Consultant	165.140	22.744	7.261	.000	.000
Delay in making decision-Slowness in Giving Instructions	-19.065	22.744	-.838	.402	1.000
Delay in making decision-Inexperience on the Part of the Consultant Site Staff	90.919	22.744	3.997	.000	.002
Delay in making decision-Lack of Consultant Site Staff	105.801	22.744	4.652	.000	.000
Delay in making decision-Inexperience on the Part of the Consultant	109.468	22.744	4.813	.000	.000
Slowness in Giving Instructions-Inexperience on the Part of the Consultant Site Staff	71.855	22.744	3.159	.002	.057
Slowness in Giving Instructions-Lack of Consultant Site Staff	86.737	22.744	3.814	.000	.005
Slowness in Giving Instructions-Inexperience on the Part of the Consultant	90.403	22.744	3.975	.000	.003
Inexperience on the Part of the Consultant Site Staff-Lack of Consultant Site Staff	14.882	22.744	.654	.513	1.000
Inexperience on the Part of the Consultant Site Staff-Inexperience on the Part of the Consultant	18.548	22.744	.816	.415	1.000
Lack of Consultant Site Staff-Inexperience on the Part of the Consultant	-3.667	22.744	-.161	.872	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Question 9

Contractors Related Factors

```
DESCRIPTIVES VARIABLES=Q9a Q9b Q9c Q9d Q9e Q9f Q9g Q9h Q9i
  /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
material shortage	93	3.00	5.00	4.0538	.78527
structural flaw	93	1.00	5.00	3.8172	1.12236
poor skills	93	2.00	5.00	4.1720	.81592
delay in conveying material	93	1.00	5.00	3.4409	1.20201
lack of site labour	93	1.00	5.00	3.6129	1.02185
lack of subcontractors skill	93	1.00	5.00	3.4409	1.21102
poor site management	93	2.00	5.00	3.9032	.96757
shortage of equipment	93	1.00	5.00	2.7849	1.24978
lack of site contractors staff	93	2.00	5.00	3.8387	1.03515
Valid N (list wise)	93				

Hypothesis Test

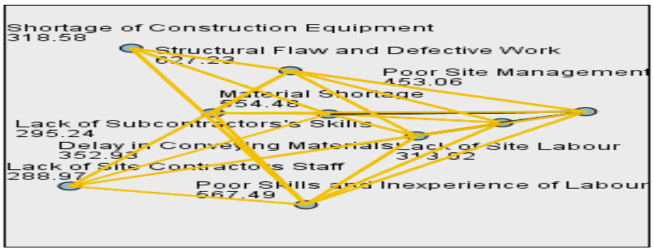
Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of VAR00001 is the same across categories of Group.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Post Hoc

Pairwise Comparisons of Group



Each node shows the sample average rank of Group.

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Lack of Site Contractors Staff-Lack of Subcontractors's Skills	6.269	33.947	.185	.853	1.000
Lack of Site Contractors Staff-Lack of Site Labour	24.048	33.947	.708	.479	1.000
Lack of Site Contractors Staff-Shortage of Construction Equipment	29.613	33.947	.872	.383	1.000
Lack of Site Contractors Staff-Delay in Conveying Materials	63.962	33.947	1.884	.060	1.000
Lack of Site Contractors Staff-Poor Site Management	164.097	33.947	4.834	.000	.000
Lack of Site Contractors Staff-Material Shortage	265.516	33.947	7.821	.000	.000
Lack of Site Contractors Staff-Poor Skills and Inexperience of Labour	278.527	33.947	8.205	.000	.000
Lack of Site Contractors Staff-Structural Flaw and Defective Work	338.258	33.947	9.964	.000	.000
Lack of Subcontractors's Skills-Lack of Site Labour	17.780	33.947	.524	.600	1.000
Lack of Subcontractors's Skills-Shortage of Construction Equipment	-23.344	33.947	-.688	.492	1.000
Lack of Subcontractors's Skills-Delay in Conveying Materials	57.694	33.947	1.700	.089	1.000
Lack of Subcontractors's Skills-Poor Site Management	-157.828	33.947	-4.649	.000	.000
Lack of Subcontractors's Skills-Material Shortage	259.247	33.947	7.637	.000	.000
Lack of Subcontractors's Skills-Poor Skills and Inexperience of Labour	272.258	33.947	8.020	.000	.000
Lack of Subcontractors's Skills-Structural Flaw and Defective Work	331.989	33.947	9.780	.000	.000
Lack of Site Labour-Shortage of Construction Equipment	-5.565	33.947	-.164	.870	1.000
Lack of Site Labour-Delay in Conveying Materials	39.914	33.947	1.176	.240	1.000
Lack of Site Labour-Poor Site Management	-140.048	33.947	-4.125	.000	.001
Lack of Site Labour-Material Shortage	241.468	33.947	7.113	.000	.000
Lack of Site Labour-Poor Skills and Inexperience of Labour	254.478	33.947	7.496	.000	.000
Lack of Site Labour-Structural Flaw and Defective Work	314.210	33.947	9.256	.000	.000
Shortage of Construction Equipment-Delay in Conveying Materials	34.349	33.947	1.012	.312	1.000
Shortage of Construction Equipment-Poor Site Management	134.484	33.947	3.962	.000	.003
Shortage of Construction Equipment-Material Shortage	235.903	33.947	6.949	.000	.000
Shortage of Construction Equipment-Poor Skills and Inexperience of Labour	248.914	33.947	7.332	.000	.000
Shortage of Construction Equipment-Structural Flaw and Defective Work	308.645	33.947	9.092	.000	.000
Delay in Conveying Materials-Poor Site Management	-100.134	33.947	-2.950	.003	.115
Delay in Conveying Materials-Material Shortage	201.554	33.947	5.937	.000	.000
Delay in Conveying Materials-Poor Skills and Inexperience of Labour	214.565	33.947	6.321	.000	.000
Delay in Conveying Materials-Structural Flaw and Defective Work	274.296	33.947	8.080	.000	.000
Poor Site Management-Material Shortage	101.419	33.947	2.988	.003	.101
Poor Site Management-Poor Skills and Inexperience of Labour	114.430	33.947	3.371	.001	.027
Poor Site Management-Structural Flaw and Defective Work	174.161	33.947	5.130	.000	.000
Material Shortage-Poor Skills and Inexperience of Labour	-13.011	33.947	-.383	.702	1.000
Material Shortage-Structural Flaw and Defective Work	-72.742	33.947	-2.143	.032	1.000
Poor Skills and Inexperience of Labour-Structural Flaw and Defective Work	59.731	33.947	1.760	.078	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

Question 10

```
DESCRIPTIVES VARIABLES=Q10a Q10b Q10c Q10d Q10e Q10f Q10g
Q10h
  /STATISTICS=MEAN STDDEV MIN MAX.
```

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
eliminating	93	2.00	5.00	3.9785	.97778
GPS	93	1.00	5.00	3.9140	1.05970
LITM	93	2.00	5.00	4.4839	.76062
RFI	93	1.00	5.00	3.3118	1.30199
UWPS	93	2.00	5.00	2.8280	.89228
ASP	93	2.00	5.00	4.0215	.75150
LC	93	2.00	5.00	4.0108	.81420
6sigma	93	2.00	5.00	4.0323	.89018
Valid N (list wise)	93				

Hypothesis Test

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of VAR00005 is the same across categories of Group.	Independent-Samples Kruskal-Wallis Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Post Hoc

Pairwise Comparisons of Group

Each node shows the sample average rank of Group.

Sample1-Sample2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj.Sig.
Ultra- Wideband Positioning System-Radio Frequency Identification	24.667	30.148	.818	.413	1.000
Ultra- Wideband Positioning System-Lean Construction	-234.855	30.148	-7.790	.000	.000
Ultra- Wideband Positioning System-Applying Safety Practice into Construction Management	-236.172	30.148	-7.834	.000	.000
Ultra- Wideband Positioning System-Six-Sigma	-243.505	30.148	-8.077	.000	.000
Ultra- Wideband Positioning System-Eliminating All Contractors Related Delay causes	266.231	30.148	8.831	.000	.000
Ultra- Wideband Positioning System-Global Positioning System	292.452	30.148	9.701	.000	.000
Ultra- Wideband Positioning System-Labour Input Tracking Model	345.000	30.148	11.444	.000	.000
Radio Frequency Identification-Lean Construction	-210.188	30.148	-6.972	.000	.000
Radio Frequency Identification-Applying Safety Practice into Construction Management	-211.505	30.148	-7.016	.000	.000
Radio Frequency Identification-Six-Sigma	-218.839	30.148	-7.259	.000	.000
Radio Frequency Identification-Eliminating All Contractors Related Delay causes	241.565	30.148	8.013	.000	.000
Radio Frequency Identification-Global Positioning System	267.785	30.148	8.882	.000	.000
Radio Frequency Identification-Labour Input Tracking Model	320.333	30.148	10.625	.000	.000
Lean Construction-Applying Safety Practice into Construction Management	1.317	30.148	.044	.965	1.000
Lean Construction-Six-Sigma	-8.651	30.148	-.287	.774	1.000
Lean Construction-Eliminating All Contractors Related Delay causes	31.376	30.148	1.041	.298	1.000
Lean Construction-Global Positioning System	57.597	30.148	1.910	.056	1.000
Lean Construction-Labour Input Tracking Model	110.145	30.148	3.653	.000	.009
Applying Safety Practice into Construction Management-Six-Sigma	-7.333	30.148	-.243	.808	1.000
Applying Safety Practice into Construction Management-Eliminating All Contractors Related Delay causes	30.059	30.148	.997	.319	1.000
Applying Safety Practice into Construction Management-Global Positioning System	56.280	30.148	1.867	.062	1.000
Applying Safety Practice into Construction Management-Labour Input Tracking Model	108.828	30.148	3.610	.000	.011
Six-Sigma-Eliminating All Contractors Related Delay causes	22.726	30.148	.754	.451	1.000
Six-Sigma-Global Positioning System	48.946	30.148	1.624	.104	1.000
Six-Sigma-Labour Input Tracking Model	101.495	30.148	3.367	.001	.027
Eliminating All Contractors Related Delay causes-Global Positioning System	-26.220	30.148	-.870	.384	1.000
Eliminating All Contractors Related Delay causes-Labour Input Tracking Model	-78.769	30.148	-2.613	.009	.323
Global Positioning System-Labour Input Tracking Model	-52.548	30.148	-1.743	.081	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is .05.

APPENDIX 3

Dissertation Supervisor Tutorial Record – MSc Dissertation (BN4609)

Before meeting you MUST e-mail this record sheet to your supervisor listing in the 'Meeting Agenda' box items to be discussed. The other boxes will be filled in after the meeting and a final copy needs to be sent to your supervisor before submitting it on e-Learn. Record sheets will be kept by supervisors as part of the final submission. The expectation is that there will be a minimum of four tutorials throughout the year. The student then has to then attach the supervision record forms as an APPENDIX in the dissertation, so that there is evidence of engagement during the dissertation research process.

Student: ONUZULIKE JUDE EMEKA G20655078	**Date: 4th May 2015**	**Tutorial Number: 1**

Meeting Agenda

- Dissertation topic briefing
- Amendment and approval of overall topic

Summary of discussion

Dissertation topic was announced to my supervisor

- I was asked to explain my view about my topic in order to know if I understood the concept of my dissertation, after brief explanation the tutor further explained clearly and restructured the topic
- I was asked to use Nigeria construction industries as my case study

Action by next tutorial

- Gap in the knowledge area to be identified
- Research aim and objectives to be identified
- Scope of the dissertation to be identified

Reflective Log

- How do I achieve my aim and objective
- What will be the gap in my topic

Date of next tutorial: 12th April 2015	**Supervisor's Signature:**

Dissertation Supervisor Tutorial Record – MSc Dissertation (BN4609)

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Student: ONUZULIKE JUDE EMEKA G20655078	**Date: 12th April 2015**	**Tutorial Number: 2**
Meeting Agenda Discussion on research proposal • Discussion and amendment of research aim and objectives • Discussion on research scope • Discussion on the gap in the knowledge area		
Summary of discussion The research proposal was submitted to my tutor • I was asked to use a more advanced terms when writing my aims and objective such as, to investigate rather than using to evaluate • I was ask to make sure that the gap in the knowledge area will make the research work more unique from other research work. • I was asked to ensure that the limitation of the study is stated in my scope of study. • I was asked to make the necessary corrections before final submission of research proposal		
Action by next tutorial • I was ask to submit a Literature review (chapter 2)		
Reflective Log • What will be the content of my literature review		
Date of next tutorial: **19th Oct 2015**	**Supervisor's Signature:**	

Dissertation Supervisor Tutorial Record – MSc Dissertation (BN4609)

Before meeting you MUST e-mail this record sheet to your supervisor listing in the 'Meeting Agenda' box items to be discussed. The other boxes will be filled in after the meeting and a final copy needs to be sent to your supervisor before submitting it on e-Learn. Record sheets will be kept by supervisors as part of the final submission. The expectation is that there will be a minimum of four tutorials throughout the year. The student then has to then attach the supervision record forms as an APPENDIX in the dissertation, so that there is evidence of engagement during the dissertation research process.

Student: ONUZULIKE JUDE EMEKA G20655078	**Date: 19th Oct 2015**	**Tutorial Number: 3**

Meeting Agenda

- Literature review

Summary of discussion

Brief on the causes of delay, the state of the art technology used globally to address the issue of delay and the theoretical framework used to address the issue of delay.

- I was asked to remove the global construction industry and the Nigeria construction industry under introduction and write on the importance of the construction industries
- I was asked to always make the use of past tense in my literatures.
- I was asked to always use correct citations such as Hampton et al.(2012) or Linnett (2006) Instead of Hampton et al.,(2012) or Linnett, (2006) to avoid lots of punctuation marks
- I was asked to include lean construction techniques and six-sigma construction in the state of the art technology used globally to address the issue of delay and my tutor gave brief explanation on lean and six-sigma construction.
- I was asked to develop the theoretical framework used to address the issue of delay. My tutor stressed that this should be developed from my literature and should not be lifted from any source and that if well-developed they wouldn't be need to reference it.

Action by next tutorial

- Submission of literature review correction
- Discussion on questionnaire

Reflective Log

- How would I develop the theoretical framework used to address delay issues
- What will be the content of my questionnaire and how would it be arrange in order to cover the objectives of this study.

Date of next tutorial: 23rd Oct 2015	**Supervisor's Signature:**

Dissertation Supervisor Tutorial Record – MSc Dissertation (BN4609)

Before meeting you MUST e-mail this record sheet to your supervisor listing in the 'Meeting Agenda' box items to be discussed. The other boxes will be filled in after the meeting and a final copy needs to be sent to your supervisor before submitting it on e-Learn. Record sheets will be kept by supervisors as part of the final submission. The expectation is that there will be a minimum of four tutorials throughout the year. The student then has to then attach the supervision record forms as an APPENDIX in the dissertation, so that there is evidence of engagement during the dissertation research process.

Student: ONUZULIKE JUDE EMEKA **G20655078**	**Date: 23rd Oct 2015**	**Tutorial Number: 4**
Meeting Agenda • Literature review correction • Discussion on questionnaire		
Summary of discussion After a brief review of my literatures • I was asked to explain the theoretical framework in my summary to enable the reader get the proper view of the framework • I was asked to avoid the use of too many subsections • I was asked to use consistent spacing between headings • I was asked to remove any diagram that is not well explained in the literature After a brief tutorial on questionnaire survey • I was asked to give descriptive and write down the hypothesis base on my questionnaire • I was asked to remove questions that are not relevant to my study such as gender. • I was asked to restructure the questionnaire and come along with the hypothesis		
Action by next tutorial • Further discussion on questionnaire • Submission of the hypothesis and descriptive.		
Reflective Log Hypotheses are missing. The student is tasked to work on them by next meeting		
Date of next tutorial: **26th Oct 2015**	**Supervisor's Signature:**	

Dissertation Supervisor Tutorial Record – MSc Dissertation (BN4609)

Before meeting you MUST e-mail this record sheet to your supervisor listing in the 'Meeting Agenda' box items to be discussed. The other boxes will be filled in after the meeting and a final copy needs to be sent to your supervisor before submitting it on e-Learn. Record sheets will be kept by supervisors as part of the final submission. The expectation is that there will be a minimum of four tutorials throughout the year. The student then has to then attach the supervision record forms as an APPENDIX in the dissertation, so that there is evidence of engagement during the dissertation research process.

Student: ONUZULIKE JUDE EMEKA G20655078 | **Date: 4th Jan 2016** | **Tutorial Number: 5**

Meeting Agenda

- Discussion on methodology
- Discussion on data analysis

Summary of discussion

After a brief review of my methodology and data analysis

- I was asked to restructure my work orderly such that research design will come first followed by questionnaire design, research strategy, targeted population, sampling, data collection process and techniques used for data analysis.

After a brief tutorial on data analysis

- In the data analysis I was asked to analyse the data first before presenting table
- I was asked to use consistent spacing between headings
- I was asked to remove every vertical lines in my table
- I was asked to repeat the hypothesis test on construction delays i.e. for concurrent, excusable compensable, excusable non-compensable, non-excusable and put all the result on one table to avoid too many tables.
- I was asked to put discussion in chapter 5

Action by next tutorial

- Submission of collections

Reflective Log

Date of next tutorial: N/A | **Supervisor's Signature:** [signature]