ASSESSMENT OF DETERMINANTS OF CONSTRUCTION TENDER SUM

BY

Nunaya Tom MIDALA B.Sc (ABU) 2010

(M.Sc/Env-Des/4481/2011-2012)

DEPARTMENT OF QUANTITY SURVEYING, FACULTY OF ENVIRONMENTAL DESIGN, AHMADU BELLO UNIVERSITY, ZARIA NIGERIA

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DEPARTMENT OF QUANTITY SURVEYING, FACULTY OF ENVIRONMENTAL DESIGN, AHMADU BELLO UNIVERSITY, ZARIA NIGERIA

AUGUST, 2016

DECLARATION

I declare that the work in this thesis entitled "ASSESSMENT OF DETERMINANTS OF CONSTRUCTION TENDER SUM" has been carried out by me in the Department of Quantity Surveying. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at this or any other Institution.

Nunaya Tom, MIDALA	________________	____________
Name of Student	Signature	Date

CERTIFICATION

This dissertation entitled “ASSESSMENT OF DETERMINANTS OF CONSTRUCTION TENDER SUM”by Nunaya Tom MIDALA meets the regulations governing the award of the degree of Masters of Science (Project Management) of the Ahmadu Bello University Zaria, and is approved for its contribution to knowledge and literary presentation.

Prof. A**.** D. Ibrahim ____________ ____________

Chairman Supervisory committee Signature Date

Dr. K.J. Adogbo ____________ ____________

Member, Supervisory committee Signature Date

Dr.K.J. Adogbo ____________ ____________

Head of Department Signature Date

Prof. K. Bala ____________ ____________

Dean of School of Postgraduate Studies Signature Date

DEDICATION

This research work is dedicated to my Son, Usa Gavirmada Jason John, Husband, Mr. John D. Zira, My parents Arc. and Mrs. A. T. A. Midala and my siblings. Thank you for your love and support. God bless you all.

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ABSTRACT

Identification and assessment of factors influencing construction tender sum helps in building a more reliable cost models that help Quantity surveyors come up with a more accurate cost estimates. Several researches have been carried out in the UK and other developed countries with results varying on one hand based on the questions asked and on the other hand the nature of the economy. This research was undertaken to assess the factors that affect the tender sum in Nigeria. ~~Factors were identified to be peculiar to Nigeria.~~ The research was a two phase research. The first was the literature review. In this phase, a total of 73 factors affecting tender sums were identified and further grouped into six categories. There were f~~F~~actors ~~were~~ identified to ~~to~~ be peculiar to Nigeria being a developing economy. The second phase was a Questionnaire survey.Questionnaires were administered to Q~~q~~uantity S~~s~~urveyors in the FCT, Kaduna and Plateau States,~~Nigeria~~ and the data was analysed. Priority ranking of cost influencing factors was carried out using their ~~significance~~ index.~~ The average indices for the groups range from 75.2 to 63.6%.~~These factors were subjected to factor analysisso as to bring out the actual redundant factors. They include of registration with the client, working relationship with the client, project finance methods etc. the most critical factors include site conditions, tender selection methods, plant cost, labour cost etc. findings of the research indicates that Quantity Surveyors perceive that tender sums are more influenced by project characteristics. Some factors that were considered to be critical in previous research were redundant in this research. This concludes that the location and economic situation of a location influence the factors that determine tender sum in that location. It was recommended that determinants of tender sum should be examined so as to know the degree to which it affects the ~~Comparison of the outcome of this research and previous ones were presented.~~tender sum. This will help in proper tender evaluation and thus the overall success of the project.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Client Characteristic……………………………………………………………CC

Coefficient of Variation ………………………………………………COV

Consultant and Design Parameters……………………………………………CDP

Contract Procedure and Procurement Method……………………………………………CPPM

Contractor Attributes……………………………………………………………..CA

External Factors and Market Conditions………………………………………EFMC

Factor Analysis………………………………………………………………FA

Principal Component Analysis……………………………………………..PCA

Project Characteristics……………………………………………………..PC

Quantity Surveying………………………………………………………QS

SignificanceIndex……………………………………………………………SI

LIST OF APPENDICES

CHAPTERONE

1.0 Introduction

1.1 Background to the Study

Construction estimation is an experience-based process (Elhag et al., 2005). The code of estimating practice produced by the Chartered Institute of Building (CIOB, 1997) defined estimating as “the technical process or function undertaken to assess and predict the total cost of executing an item(s) of work in a given time using all available project information and resources. Based on this definition, estimators’ estimated cost is based on the time of construction or project duration, cost of material, method of construction etc. and estimators are aware that most of these factors can be readily estimated.

The estimators in the construction team are usually the Quantity surveyors. The Quantity surveyor as an expert is employed early enough in the project so as to advice the client/Architect on the probable cost implications of the design decisions and to assist in obtaining economical and efficient design (Seeley, 1996)

However, experts in construction estimation are aware of uncertainty, incompleteness and unknown circumstances of factors affecting cost of construction. As a result of various studies, several estimating techniques have been exploited and several models have been developed (Elinwa and Buba 1993; Elhag and Baussabaine, 1998;Dissanayaka and Kumaraswamy, 1999; Munns and Al-Haimus, 19992000; Ashworth, 2002;Ganiyu and Zubairu, 2010) but the limitation of these techniques and models is that they failto account for the effects of the factors that are more qualitative in nature.

The cost of construction in Nigeria has been reported to be high(Olatunji, 2010), and this has been attributed to several cost determinant variables.Olatunji (2010) reportedthat construction cost in Nigeria are often high and unpredictable and the pattern of the variability is not explained by inflationary indices of common goods and services but rather it is reactive to boom-and-burst shocks that are triggered by the oil price regimes. Elhag*et al*. (2005) identified and evaluated cost determinant variables within the UK construction industry among Quantity surveyors. Prior to the study carried out by Elhag*et al*. (2005), Okpala and Anekwu (1988) argued that underdeveloped economies tend to exert different influences on construction cost compared to developed economies such as the UK. This has a major impact upon critical determinants of construction tender sum. Windapo and Iyagba (2007) stated that the Nigerian construction industry need to map out efficient strategy for determining efficient determinants of construction cost in Nigeria, given the peculiar dynamics of the cost of finance.

1.2 Statement of the Problem

The identification of cost – determinant variables and evaluation of the degree of influence of these factorson construction cost estimates play an essential role in the building up of reliable cost estimates and enhance the competitive edge of quantity surveyors as well as the contracting organization. Elhag*et al.* (2005) identifiedand evaluated cost determinant variablesto ascertain the degree of their influence on construction cost in the UK construction industry. Although,the research evaluated the degree of influence of some cost determinants variables, the results may not be applicable to the Nigerian Construction industry based on the argument that Nigeria as a developing country has distinct behaviour and should have distinct set of cost determinants that affect construction costs (Okpala and Anekwu, 1988;Windapo and Iyagba, 2007;Olatunji, 2010). Similarly, several other factors not considered by the previous research(Elhag*et al.*, 2005) were also identified by Olatunji(2010). Olatunji (2010) argued that the oil regime in Nigeria has a way of making the factors affecting sectors in the nation differently than the way it would have normally affected other countries especially developed country. This is because Nigeria's majar source of revenue is from the export of crude oil. This makes the nation's economy unstable since the nation cannot control the demand of the crude oil.Therefore, although there have been several studies on tender sum in Nigeria, there has not been any dedicated to outline the critical determinants of construction tender sum. This is the gap that this study aims to fill.

1.3 Need for the Research

The purpose of tender estimation is to provide an indication of the probable cost of construction. The estimate will be an important factor in the clients overall strategy of the decision to build. It will also provide a basis for the clients budgeting and control of the construction cost. The single most important criterion of the estimate is its accuracy (Ashworth, 2002). Thus outlining the critical determinants of construction tender sum will help in building reliable cost models that will help estimators come up with more accurate cost estimates.

1.4 Aim and Objectives of the Study

The aim of the research is to assess the ~~critical~~ determinants of construction tendersum with the view of articulating the critical determinants.

The following are the objectives;

i. To identify factors affectingconstructiontender sum.

ii. To assess the level of significance offactors determining ~~affecting~~ tender sum.

iii. To articulate ~~determine~~ the critical factors and eliminate redundant factors

1.5 Scope and Limitations

~~**1.5**~~

~~***1.5.1 SCOPE***~~

1.5.1 Scope

Construction tender sum has been seen to be influenced by several factors. This research focused on assessing the factors that influence tender sum.This research was limited to Quantity surveyors both in public and private practice in Abuja (FCT), Kaduna State and Plateau state of Nigeria. Abuja (FCT) and Kaduna state were chosen as study area because these places are amongst major cities in Nigeria where construction firms have their headquarters while Plateau State was chosen because of the massive construction projects going on in the state at the time of the study, thus the presence of a good number of quantity surveyors. Quantity surveyors were considered since they play a measure role in the preparation of tenders.~~der sums.~~

1.5.2 Limitations~~This research was limited to Quantity surveyors both in public and private practice in Abuja (FCT), Kaduna State and Plateau state of Nigeria. Abuja(FCT) and Kaduna state were chosen as study area because these places are amongst major cities in Nigeria were construction firms have their headquarters while Plateau State was chosen because of the massive construction projects going on in the state thus the presence of a good number of quantity surveyors while Quantity surveyors were considered since they play a measure role in the preparation of tenders.~~

This research was limited to the fact that the Quantity Surveyors that responded were not necessarily registered but were the ones available at the time of research.

CHAPTER TWO

2.0 ~~Literatue~~Literature Review

2.1 Background

Effective cost planning relates the design of construction projects to their cost, so that while taking full account of quality, risks, likely scope changes, utility and appearance, the cost of a project is planned to be within the economic limit of expenditure (Kirkham*and* Brandon,~~et al.~~ 2007). This stage in a project life-cycle is particularly crucial as decisions made during the early stages of the development process carry more far-reaching economic consequences than the relatively limited decisions which can be made later in the process. This initial process may also influence the client's decision on whether or not to progress with the project. The cost planning process leads to the generation of a reliable initial project budget that sets up a cost control system to ensure that client expectations are met. For many clients, completing the project within this initial budget is a paramount determinant of client satisfaction. Despite the great importance of cost estimation, it is undeniably neither simple nor straightforward because of the lack of information in the early stages of the project (Hegazy, 2002).

Cost estimation, the determination of quantity and cost required to construct a facility or to furnish a service (Westney, 1992) forms the crux of the cost planning exercise. The approach used for cost estimation normally varies from the early strategic phase of a project to the construction phase and will depend on a number of other factors including level of accuracy required, the speed estimation required, experience level of the estimator and the level of information available at the time of estimate (Ashworth, 2002). Accurate estimation of future cost however, is a difficult task (Nicholas 2004), if not an elusive aim. This can mostly be attributed to the fact that cost estimation, which must not be confused with budgeting, occurs at the conception phase of the project, before many of the cost influencing factors about the project are available even to the client (Hegazy 2002).

2.2 Cost Estimation

"A cost estimation may be defined as a compilation of all costs of the elements of a project" (Uppal and Wang, 2003) and can be made at different phases of the building production processes (Tas and Yaman, 2005). Enshassi*et al.*(2005) indicated that cost estimation is a collection and breakdown of all items involved in a project and it contributes to the total cost of the project. Kwakye(1994), described cost estimation as a technical process undertaken to predict the total cost of all items concerned in the project by using the project resources information in the specific time given. According to Akintoye and Skitmore (1992), the main objective of the cost estimation activities at the early stage of construction project is to give the general view of the overall construction cost to the client. As noted by Akintoye(2000), the pre-contract cost estimation process is important as a starting point in providing the probable cost in the tendering stage. Thus, this process involves the use of historical projects data that are alike in the layout or method (Doloi, 2010).

The activity of cost estimation can be prepared as early as the inception stage and feasibility study of the project (Tas and Yaman, 2005; Uppal and Wang, 2003). On top of that, cost estimation is also having its important usage in the preliminary design and detailed design stage as well as in the completion stage of the project. Undoubtedly, in every stage of construction cycle, the contribution of cost estimation is crucial to the project performance in terms of cost achievement for the parties, the contractors, and the clients. However, according to Mok*et al.*(1997), at the early pre-tender stage, the preparation of cost estimation is considered a difficult task to execute due to the inadequate information available at that stage and the nature of construction project itself.

2.3 Cost Estimation Activities

The aim of cost estimation in the tender preparation process is to get the tender sum for the tender bid (Uppal and Wang, 2003). The preparation of cost estimation in the tendering process is decisive to the success of the contractor to win a tender. The construction company needs to be accountable, realistic and certain with their estimates that form the basis of their tenders (Baldwin and Thorpe, 1990). The consideration of material cost, wastage of material, material constant, labour wages, labour constant, plant and machinery output, for every item is crucial in cost estimation in the tender preparation process (Liu and Zhu, 2007; Uppal and Wang, 2003; Proverbs *et al.*, 1998~~9~~). In the preparation of cost estimation, document tender components concerned are drawings, specifications, conditions of contract, and bill of quantities (BoQ) (Akintoye, 2000). The tender sum is derived, after the cost is finalized with the addition of profit and overhead (Liu and Zhu, 2007; Akintoye and Skitmore, 1992). In the tendering process, the contractor's aim is to win the tender with maximum profit but conversely the client expects to acquire the best contractor with a minimum cost. Contractors have to put their full effort in pricing the tender to get the appropriate cost for the tender sum. Normally, in the tendering process, contractors attempt to trim down the tender sum intentionally to win the project because the client will award the project to the lowest sum (Liu and Zhu.2007). However, Baldwin and Thorpe (1990), argued that "... if their tender prices are consistently high they will fail to attract work, alternatively if their prices are too low, they will gain work at unprofitable rates..." Concerning this, the contractors should be free from miscalculation in the tender preparation process. If the contractors expect to win the tender, they need to evaluate the proposed tender sum so that it should be in the range of estimates provided by the client's representative.

2.4 Methods Of Estimating

Several methods of estimating exist in practice. These includes conference estimates, financial methods, unit methods, superficial area methods, superficial perimeter methods, cube methods, storey-enclosure methods, approximate quantities, cost engineering, resource analysis, cost engineering methods, elemental estimating, cost models, etc. some of these methods are elaborated below and are further summarised in Table2.1 (Ashworth, 2010).

2.4.1 Conference

Conference estimate is a technique that can be used for the preparation of earliest price estimates which is given to client. It is prepared by well experienced individuals and may not be qualified.(Ashworth, 2010).

2.4.2 Financial Methods

It fixes a cost limit on the building design which is usually based on either units of accommodation or rental values.

The Architect is usually required to ensure that the designs can be constructed within the cost limit.In the private sector, projects are often evaluated in terms of their selling price or rental value. Usually the builder would deduct the other development costs and profit from the total selling price and the remainder would represent the amount to be spent on building.It is usually employed so that one would not embark on a profitless venture(Ashworth, 2010:Seeley, 1996)..

2.4.3 Units Methods

It entails choosing a standard unit of accommodation and multiplying this by an approximate cost per units. The technique is based on the fact that there is usually a close relationship between the cost of a construction projects and the number of functional units it accommodates. The method of counting the number of units is extremely simple but considerable experience is necessary in order to select an appropriate rate. Rates are usually based on recently completed projects of similar type and size, however adjustments based on professional judgment will always be needed to take into account varying site condition, specification changes, market conditions regional changes and inflationIt is one of the simplest and quickest methods to implement but must be used with care (Ashworth, 2010). Seeley, (1996) said that variations in rate, stemming from differences in design and constructional method are difficult to assess and frequently there is insufficient information available to make a realistic assessment. Therefore it suffers from major lack of precision and at best can only be a rather blunt tool for establishing general guidelines, more particularly for budgetary estimation on a rolling programme covering a three to five-year period ahead.

2.4.4 Superficial Area Methods

The superficial area method is still the most common method in use for the early price estimating purposes. The area of each of the floor is measured and then multiplied by a cost per square meter. The gross internal floor area is calculated by multiplying it with the internal dimensions. It should be noted that the client may express the project only in terms of the usable space required and it is therefore necessary to add to this circulation and non-usable space to make the building function correctly. Secondly, in a project offering standards or types of accommodation it will be preferable to price independently using different rates. A variety of rates may be used and items of work which cannot be related to the floor area will need to be priced at separate all-inclusive rates (Ashworth, 2010). The weakness of this method of estimation is that, it cannot directly take account of changes in plan shape or total height of building. Similarly, difficulties are experienced in building up unit rates from known rates for existing buildings because of the need to make allowances for a number of variables including site conditions, constructional methods, materials, quality of finishings and number and quality of fittings (Seeley, 1996).

2.4.5 Cost Models

Ferry et al. (1999) described cost models as the symbolic representation of a system, expressing the content of that system in terms of the factors which influence its costs. The models may be in the form of mathematical equations (e.g. Regression Forecasting and Decision Making models) or a set of defined steps to estimate the cost of a particular item (e.g. Storey enclosure method). Cost models can be very useful in strategic level decisions such as bid/not to bid decisions, with potential saving of time and effort on non-viable projects. They are furthermore appealing because of current harsh economic climate with tough competition and limited resources (Ashworth, 2010). However, the production of reasonably accurate, acceptable and timely parametric cost estimates can be a difficult task. For example, using only 4 different parameters for a project and considering three alternative values for each, and varying one at a time will produce 81 different project solutions or alternatives. This can be done rather rapidly using a computer-based model but will undoubted be a laborious task using traditional cost estimation (Sequeira, 1999). The time, effort and resource level required for this task would mostly be unjustifiable at planning stages of a project, perhaps a strong suggestion that detailed cost estimates at strategic level are often far from the optimal solutions because of time and resource constrains.

Cost modelling is a more modern method that can be used for forecasting the estimated cost of a proposed construction project. According to Ashworth (2010), although cost models were first suggested during the early 1970s, there is only scant evidence of their use in practice. While bills of quantities, cost plans etc., are models of cost, they are not generally considered as such in the context of modern cost modelling.

Dominic and Simon,(2012) used neural network for modelling the final target cost of water project. The research explored the knowledge acquisition, generalization and forecasting capabilities of Artificial Neural Network (ANN) to build financial cost models that incorporate the cost effect of some of the factors that affect the cost of a project that are not visible at initial stage of the project (even to the client). The research collected data on ninety-eight water-related construction projects completed in Scotland

from 2007-2011. Separate cost models were developed for normalized target cost and log of target costs. Variable transformation and weight decay regularization were then explored to improve the final model's performance. As a prototype of a wider research, the final model's performance was very satisfactory, demonstrating ANN ability to capture the interactions between the predictor variables and final cost. Ten input variables, all readily available or measurable at the planning stages for the project, were used within a Multilayer Perception Architecture and a Quasi-Newton training algorithm.

Table 2.1~~1~~: Methods of Estimating

Methods	Notes
Conference	Based on consensus viewpoint
Financial methods	Used to determine cost units or the building cost in developers budgets.
Unit	Applicable to projects having standard units of accommodation often used to fix cost units for public sector building project.
Superficial area method	Still widely used, and the most popular method of approximate estimating. Can be applied to virtually all types of buildings.
Superficial perimeter method	Never used in practice
Cube rule	Used to be popular method amongst architects, but now in disuse.
Storey– Enclosure	Largely unused in practice
Approximate quantities	Still a popular method on difficult and awkward contracts and where time permits.
Elemental estimating	Not strictly a method of approximate estimating, but more associated with cost planning; used widely in both the public and private sectors for controlling costs.
Recourse analysis	Used mainly by contractors for contract estimating and tendering purposes.
Cost engineering	Mainly used for petrochemical engineering projects
Cost models	These methods are still in the course of development

Source: Ashworth, (2010)

2.5 Cost Estimation Issues

Interest of researchers in relation to the cost estimation started in the early 1980's (Doloi, 2010).Lowe and Skitmore(1994), Akintoye and Skitmore(1992), Mudd(1984), Morrison(1984), and Flanagan and Norman(1983), are among the earliest researchers who have conducted several studies on cost estimation issues in construction industry. According to Liu and Zhu(2007), majority of the previous researchers only look into certain stage of construction process in relation to cost estimation. Previous researchers have highlighted few cost estimation issues in the construction industry. Doloi(2010), Aibinu and Pasco (2008),Hackett and Hick (2007),Lederer and Prasad (1998), Lowe and Skitmore(1994), andOgunlana(1991) discussed the cost estimation issues in relation to human factors. In a similar vein, Laryea(2010), Elhag*et al.*(2005), and Lowe and Skitmore(1994), pointed their research studies into the practical knowledge of the quantity surveyor/estimator in preparing the cost estimation. On top of that, Tas and Yaman(2005), discussed the issues of cost data/information with regards to cost estimation process. Thestudies focused on the issues of cost estimation in the construction industry and bring the interest for the present academia to further improve the cost estimation process. The following discussion focused on the cost estimation issues in relation to the accuracy in the cost estimation process.

2.5.1 Cost Estimation Accuracy

The main issue of cost estimation in the construction industry is inaccuracy (Laryea, 2010; Akintoye, 2000; Akintoye and Fitzgerald, 2000). Previous researchers discussed cost estimation accuracy in a different perspective. According to Skitmore and Wilcock(1994), the cost estimation process in the tender preparation process is "*questionable*". It is because; in the cost estimation process quantity surveyors or estimators need to understand the whole process of construction rather than to examine only the finish product. The uncertainty in the construction process might influence the overall cost of every elements involved in the construction. Aibinu and Pasco(2008), revealed that the inaccuracy of cost estimations are affected by the limited time given to prepare the tender in the preparation process and limited information at the earlier stage of project life cycle. Doloi(2010) believed that to achieve accurate cost estimation in a real world is considered "*a difficult task*". This is because , since there is a high demand from the parties involved in the construction industry and the projects are always as well as the complexexity of the project. Akintoye and Fitzgerald(2000), reported in athe survey in a United Kingdom, the inaccuracy of the tender preparation costing are due to the lack of estimator's practical knowledge, insufficient time given to prepare the costing, poor tender documentation and various subcontractors' price in relation to quotation. The importance of cost estimation accuracy gives a huge impact to the contractors and the clients in achieving the project objectives. However, according to Aibinu and Pasco (2008), and Ling and Boo (2001) the cost estimation accuracy has not been improved over time.

2.5.2 Human Factor

Quantity surveyors in the construction company are involved in the future financial planning of the company. A quantity surveyor's task is to provide cost information, prepare bills of quantity, compare bids and in charge of financial management of the construction company (Brook, 2004). The interests of academic researcher in relation to quantity surveyors/estimators and cost estimation topic have been established in a different angle. In 2005, Elhag *et al*.(2005), study the quantity surveyors' point of view for the critical determinants of construction tender sums. Lowe and Skitmore(1994), and Ogunlana(1991), discussed the estimators' learning process to achieve the cost estimation accuracy. Earlier researcher, Morrison(1984), examined the accuracy of cost estimation prepared by quantity surveyors through the design stages of construction projects.Lowe and Skitmore(1994), and Ogunlana(1991), discussed the estimators' learning process to achieve the cost estimation accuracy. In the tender preparation process, the accuracy of cost estimation is strongly related to the performance of quantity surveyors and contractors.Elhag *et al.*,(2005)studied the quantity surveyors' point of view for the critical determinants of construction tender sums. Usually, quantity surveyors or estimators are responsible for the cost estimation process throughout the tendering phase. The critical part of their role is to assist the contractors in winning the tender. In the tendering stage, the responsibility of a contractor's quantity surveyors/estimators is to estimate the cost of every single item in the bill of quantities. Hackett and Hicks (2007) believed that in producing accurate project cost, quantity surveyors or estimators need extensive knowledge, qualification, skills and ability to meet the current requirement in the construction industry. Akintoye and Fitzgerald(2000) revealed that the main factors of inaccuracy in cost estimation are the lack of quantity surveyor knowledge and insufficient time given to the quantity surveyor in preparing the cost estimation. According to Lederer and Prasad (1998), the most effective approach to improve estimating accuracy is by increasing the estimators' accountability towards the cost estimation process.

2.5.3 Practical Knowledge

Laryea,(2010) conducted a surveyin Ghana to examine and analyse the reliability of the contractors and the consultants cost estimations that involved ten construction projects. The contractors prepared half of the project cost estimation and the consultants calculated another five projects. The interesting findings revealed that the cost estimation prepared by the contractors are more accurate compared to the consultants. The comparison percentage is 40% of cost overrun for the consultants' cost estimation where only 6% of cost overrun by the contractors. The main argument concerning this issue is "*thecontractorsmay have a better understanding of the construction process*" compared to the consultants. According to Laryea(2010) one of the reasons why consultant quantity surveyors are unable to produce accurate estimate compared to the contractors is due to the lack of on-site practical experience. It was confirmed by Elhag *et al.*(2005), the cost estimation activities is "*an experience-based process*". Lowe and Skitmore(1994) proposed an "*experiential learning theory and technique*" as a mechanism for the estimators to increase the pre-tender cost estimation accuracy. The simplifications were consistent by the earlier researcher Ogunlana(1991) who studied "*learning from experience*" in the cost estimation process. The study believed that, the cost estimation accuracy could be improved through the application of these three steps; awareness of errors or mistakes in the cost estimation process; determination of what is to be learned and learning, and evaluation of the degree of learning that has been achieved. Ogunlana(1991), concluded the research with "*a learning from experience model*" which integrate the above three steps in the cost estimation process.

2.5.4 Cost Data/Information

Cost data/information plays a vital role in building up accurate estimates. Tas and Yaman(2005), researched on the constraints of the unstructured cost estimation practice in Turkey. The motivation behind this research wasthat the researchers found that in producing accurate cost estimation, Turkish contractors faced lack of guides and reference catalogues, insufficient cost data and high inflation risk in their country. Due to this, the Turkish construction industry introduceda generic computer aided building cost estimation model for their public project sector called "*building cost information* *system*" (*BMBS*). This model was based on a cost significant technique for detailed design phase and could be used by the estimators and graduate students in helping them in their cost estimation process. Tas and Yaman (2005) believed that the professionals' quantity surveyors or estimators were unable to produce an accurate estimate if theylacked databases.~~According to Said *et al*. (2010), contractor's quantity surveyor or estimators have to collect the cost information regarding construction process or construction technology in order to prepare cost estimation in the tender preparation process.~~ Tas and Yaman(2005), and Ling and Boo (2001), mentioned that the accuracy of the cost estimation will depend on the project data sources and the databases should be "*reliable and up-to-date*". To make sure that the quantity surveyors or estimators can produce accurate, consistent, and standard cost estimation, the construction companies have to develop an *in-house* database which should have current information on costs of materials, labours and machineries. The construction companies have to up-date their *in-house* databases regularly according to current market price.

2.6 Accuracy of Cost Estimate

According to Ashworth (2010) the most important criterion of the estimate is its accuracy. If it is too high it may discourage the client from proceeding further with the scheme and so the potential commission is lost while if the estimate is too low, it may result in abortive design dissatisfaction on the part of the client or even litigation. Inaccurate estimating also has a significant impact on the contracting business. Over estimated cost results in a high tender price being submitted by the contractor which could lead to the tender been unacceptable to the client while under estimated cost could lead to a situation where a contractor incurs losses on the contract awarded by the client

(Asworth, 2010). Also Al- Tabtabi and Diekmann (1992) noted that the large variances in costs or schedules will have an impact on the profitability, cash flow and in extreme cases, the viability of the projects.

El-haram et al (2007) identified that the accuracy of estimating whole life cost helps a decision maker to choose from alternatives. In the investigation of the accuracy of whole life costs, the study discovered that the methodology of estimation, availability of data, experience skill and judgment of the estimator where the major determinants of the level of accuracy of estimating whole life cost. The study also discovered that the major difficulties in applying life cycle costing in practice were related to the prediction of the future behaviours and events such as;

i. The behaviour of people in terms of their use of and in response to the project (much of which will relate to non-economic issues and will be difficult to measure).
ii. The behaviour of materials, components and the mechanical and electrical systems.
iii. The future use of the project and how the environmental conditions to which it may be exposed.
iv. The financial and economic condition that influence the relationship between present and future cost.
v. Difficulty in controlling the total costs of ownership which are affected by administrative procedures or political decisions driven by the short term gains.

However, all these factors vary each year. Some can barely be seen whilepreparing estimates while others cannot even be imagined at the time of estimation. Babalola and Adesanya (2007) investigated the level of accuracy of electrical engineering estimates in Nigeria. The study evaluated the methods used for the production of the cost estimates. The research also compared the consultants' estimates and that of the tender sums of 80 projects. Relative importance index (RII) and the coefficient of variation (CV) were used to analyse data. It was discovered that the most frequent method used was the superficial area method and that the estimator sourced their cost data through market surveys. The research concluded that since the CV gotten was 16.7% which was not in the acceptable range of 5%-9%, the methods used in estimating was inappropriate and thus the level of accuracy was low.

El-haram and Horner (2002) identified factors effecting forecasting of the physical and economic life of a project and these includes life expectancy, deterioration, rate, mean time between failures, discount rate, taxation, functional, technical social and legal regimes, location, fashion and environmental obsolescence.

Despite the factors affecting accuracy of estimates, the level of accuracy of estimates varies from project to project and from level to level of the same project.

Enshassi*et al*, (2013) evaluated factors affecting the accuracy of pretender cost estimates in Gaza strip. The study discovered that the top five (5) factors affecting accuracy of the pre-tender estimate included;

1. Material (price/availability/supply/quality/imports)
2. Closure and blockage of borders.
3. Projects team experience in the construction type.

4. The experience skills level of the consultant.

5. Clear and detailed drawings and specifications.

Munns and Al-Himus, (1999) presented a methodology for selecting work packages and recommending refinement to the technique that reduces the variability in estimate produced using cost significance.

Cost significant models have been suggested as one way of overcoming criticism of the amount of detail contained with the traditional bill of quantities, also Munns and Al-Haimus(1999) developed a cost model by selecting the effective work packages so as to reduce the bulkiness of estimate, yet having a degree of accuracy that is acceptable.

It has been established in literature (Barnes and Thompson, 1971; Ashworth, 2010; seelay, 1981; Ashworth and Skitmore, 1983~~; Harner, 1983~~) that 20% of the measured bill items contribute 80% of the total measured bill value. The findings conformed to the 80/20 rule established by Vilfredo Pareto. The 20% of the items which have the highest value are generally referred to as the cost significant items.

Munns and Al-harmus, (1999) argued that though models using cost significant items have existed, it lacked a formalized and standard methodology for selecting the number of significant item that should be included in the model. Horner and Zakieh~~'s~~ (1996) noted that the methodology for using significant models requires a rigorous set of rules to define boundaries of the technique but fail to provide suggestions for the development of such rules. The research defined two rules that should contain the search area for work packages to include within the model. It also refined the techniques for calculating the cost model factor. This was to reduce variability within individual trades, and to improve the calculation of the cost model factor, thus proposed the global cost methodology.

~~However, to establish the reliability of the research result, more categories of projects, Bills of Quantities and works have to be tested to see the level of accuracy. This is because the research did not establish the level of accuracy.~~

2.7 Review Of Related Literature

Identification of cost determinant variables and evaluation of their degree of influence play an essential role in building reliable cost models and enhance the competitive edge of quantity surveyors as well as contracting organisation (Elhag et al., 2005).

A wide range of forecasting techniques have been exploited in the construction industry. A maj or limitation of most of these models is that they only take account of significant factors that can be readily quantified. However, most of the significant factors affecting project costs are qualitative such as client priority on construction time, contractors planning capability, procurement methods and market conditions including level of construction activity. Due to the qualitative nature of these factors, they are difficult to structure and quantify. Despite their importance, most of these factors are often ignored by current forecasting techniques. Only some of these techniques which include a risk assessment element usually consider some qualitative factors. A great deal of research approaches factors affecting cost of construction projects from different angles (Elhag et al., 2005).

Carr (2005) critically evaluated public projects, bid under a condition of free, open and unfettered competition. The research developed a regression model to quantify the impacts of greater or less competition within a robust bidding exercise. The regression analysis also identified the nature of varying and discovered a strong non-linear relationship.Within the selected projects evaluated, the awarded (bid) tender and the owners pre-bid estimate were available. It was discovered by Carr (2005) that as the number of bidders (tenderers) increases, it was intuitively obvious that there will be a commensurate number of additional material suppliers and subcontractors involved with the tendering process.

As additional prime tenderers involve their favourite suppliers and subcontractors to the project, the overall competition increases at all levels. The more interaction among the prime contractors and subcontractors, the more opportunity for the cost implication of that creativity and competition to be carried out through thus responsible for ~~to~~ the low bid offered.

Regardless of any reason or limitation, Carr (2005)~~the study~~ demonstrated that free, open and unfettered competition will have the highest probability to achieve the goals of competitive bidding to guard against favouritism, extravagancy, fraud and corruption to prevent the waste of public funds; to obtain the best economic result for the public, to "secure the best work for the public" the best economic result for the lowest practicable and not for the enrichment of tenderers to stimulate advantageous market place competition" allowing the public owner to find the lowest responsible bidder whose offer best responds in quality fitness and capacity to the particular requirements of the required work.

Dissanayake and Kumaraswamy (1999) evaluated factors affecting time and cost performance in Hong Kong building projects. The research identified and grouped particular factors which were significantly related to time and cost performance, analysed the relationship, between procurement and non-procurement related factors with time and cost performance and developed time and cost overrun models using critical factors influencing time and cost performance. In the research it was discovered that cost overrun appears to be greatly influenced by both procurement and non-procurement related factors. In addition, the research also appears to influence cost overruns and also Artificial neural networks (in addition to multiple linear regression) are useful in forecasting time and cost escalations and it was also useful to examine patterns of differences in the average time and cost overruns between groups of project that have useddifferent procurement system, the factors associated with cost overrun can be studied to see how one can effectively estimate fora project and get it right. Below are some of the factors associated with cost overrun as outlined byDissanayaka and Kamaraswang (1999) in Hong Kong;

i. Payment modality.
ii. Level of goal difficulties (to complete the project within the client's specified program).
iii. Level of location complexity; Restrictions due to environmental factors.
iv. Level of design complexity; (innovations of the design)
v. Level of coordination complexity delays inmaking important project decisions, communication between project team members.
vi. Level of construction complexity; use of new technology.
vii. Level of complexity due to changes frequency and significance of change ordersvariation, claim due to change order.
viii. Clients confidence in construction team based on past experience
ix. Risk sharing among project team.
~~ix.~~x. Effectiveness of communicationflow, timely decision making, level of equity among the projects team, frequency of schedule adjustment, risk

of quantity variation, difficulty in obtaining payment, delays in interim payments

~~x.~~xi. Strength of management,speed/frequencies, submission of approval, response to instruction, and effectiveness of cost control.

Elhag*el al,* (2005) investigated critical determinants of construction tender cost. The study discovered that the limitation associated with most of the forecasting techniques explored in the construction industry was that they take accounts of significant factors thatcan be readily quantified, however most of the significant factors associated with project cost are qualitative such as clients priority on construction etc. due to the quantitative nature of these factors, they are difficult to structure and quantify. The study identified, assessed and ranked cost-influencing factors of construction projects at the pretender stage for building projects in the UK.

The following were the factors the research identified.

i. Type of client (private/public/developer).
ii. Financial capability/payment record.
iii. Project finance method/appropriate funding in place on time.
iv. Partnering agreements.
v. Priority in construction time/deadlines requirements.
vi. Experience of procuring construction.
vii. Client requirement on quality.
viii. Certainty of project brief.
ix. Completeness and timeliness of project information (design, drawing, specifications).
x. Buildability of design.
xi. Working relationships with client/contractors/other design team consultants present/previous.

xii. Variation order and additional works (magnitude timing and interference level).

xiii. Quality of design and specification.

xiv. Inspection, testing and approvals of completed works (toughness/requirements)

xv. Submission of early proposals for costing/cost planning.

xvi. Absence of alteration and late changes to design (no “design as you go on site” philosophy).

xvii. Management team (sustainability, experience, performance)

xviii. Management/labour relationships and confidence in work force.

xix. Financial capability.

xx. Experience on similar projects.

xxi. Current work load.

xxii. Level of communication within the contractor organization.

xxiii. Estimation method and cost control technique (accuracy and reliability)

xxiv. Planning capabilities and level of resource development/utilization/optimization.

xxv. Productivity effects (managerial, organization, labour, and technology).

xxvi. Percentage of main contractor direct work and percentage of subcontractor work

xxvii. Number of subcontractors.

xxviii. Mark up policies and percentages (general and project wise) (special or normal conditions applied).

xxix. Record of payment to subcontractor.

xxx. Previous claim record i.e. assessment of “low tender” “high tender” performance.

xxxi. Present claim (size and quantity).

xxxii. Accidents on site records.

xxxiii. Bond/warranty arrangement.

xxxiv. CDM regulations awareness.

xxxv. Type/function (residential, commercial, industrial, offices).

xxxvi. Size/gross floor area.

xxxvii. Heights/number of stories.

xxxviii. Number of basement level.

xxxix. Level of uncertainty of soil condition.

xl. Complexity.

xli. Type of structures (steel, concrete, timber, masonry).

xlii. Location (regions/rural: urban) (inner city/outskirts).

xliii. Site condition/site topography.

xliv. Type of foundation (pile/raft/pad, etc).

xlv. Access to site.

xlvi. Intensity/complexity of building services.

xlvii. Phasing requirements (areas to handed over first or initial non).

xlviii. Quality of finishing.

xlix. Type of contractor/ use PF standard form of contract.

l. Tender selection method (open, selected, negotiation, single or two stage, etc).

li. Payment modalities (fixed price, cost plus, BOT, PFI-DBTO, etc).

lii. Spread of risk between construction parties (client/consultant/contractor)

liii. Claims and dispute resolution method (litigation/arbitration/others).

liv. Interviewing of selected perspective contractors.

lv. Material prices/availability/supply/quality/imports.

lvi. Labour costs/availability/supply/performance/productivity.

lvii. Plants cost availability/supply/condition/performance.

lviii. Weather condition.

lix. Government regulation/policies (health and safety, fire CDM, etc).

lx. Level of competition and level of construction activity.

lxi. Number of bidders incompetitive projects.

lxii. Interest rate/inflation rate.

lxiii. Stability of market condition

In addition to the factor above, Olatunji, (2010) identified the following factors which influence cost estimates:

i. Organization cost
ii. Project execution cost
iii. Latent cost variables
iv. Cost of finance
v. Cost of unvitiated risks
vi. Cost of registration with client
vii. Branding of services and the services cost of managing a business model
viii. Running cost
ix. Project overhead and profits
x. Tender cost
xi. Guarantees
xii. Insurance
xiii. Proprietary cost

Prior to the study carried out by Elhag*et al*., (2005), Okpala and Anekwu (1988) argued that underdeveloped economies tend to exert different influences on construction cost compared to developed economies such as the UK. This has a major impact upon critical determinants of construction tender sum. Windapo and Iyagba, (2007) stated that the Nigerian construction industry need to map out efficient strategy for determining efficient determinants of construction cost in Nigeria, given the peculiar dynamics of the cost of finance. Olatunji, (2010) was of the opinion that construction cost in Nigeria are often high and unpredictable and the pattern of the variability is not explained by inflationary indices of common goods and services but rather it is reactive to boom-and-burst shocks that are triggered by the oil price regimes.

Source of cost information also has a way of determining the tender estimates. In developed countries where there is access to different cost information sources and services, the problem of a Quantity Surveyor in developing economy may not be easily appreciated. Akintoye*et al* (1992) carried out a survey to appreciate the sources of information the Quantity Surveyors who are key players to construction cost management in Nigeria use. It showed that the major source of information to the Quantity surveyor (QS), were analysed successful contractors tender, technical press, colleagues, market survey, quotation from specialist subcontractors, enquiries from reputable builders merchant, manufacturers catalogue or quotation and trade union agreement for labour rates. The survey found out that the priced Bills of Quantities (based on the successful contractors' tenders) were claimed to be the most effective source of cost information

CHAPTER THREE

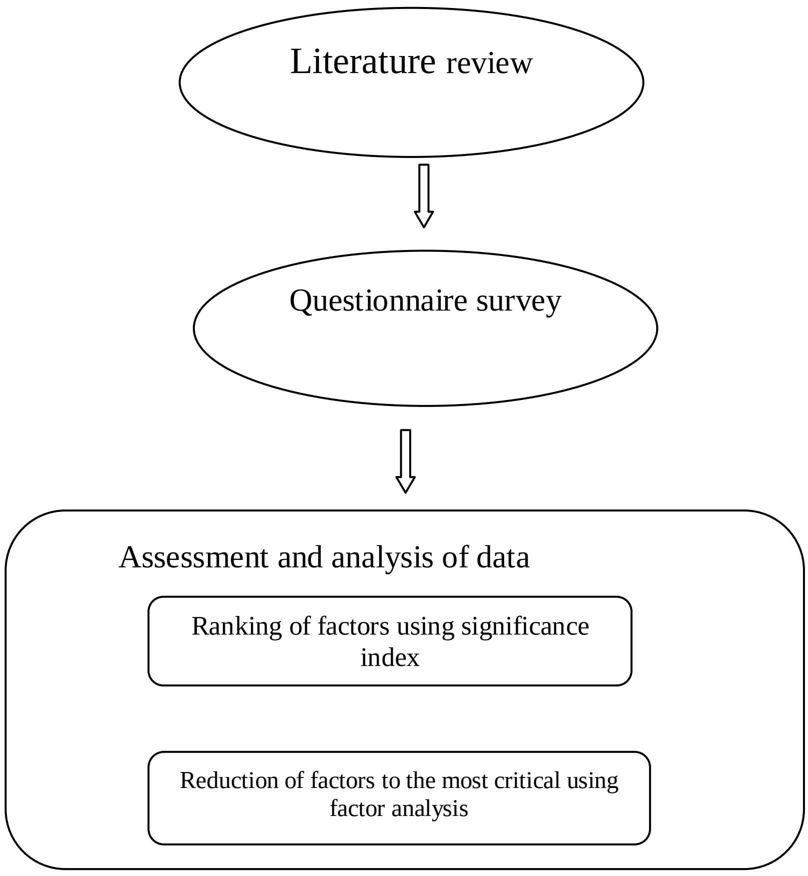
3.0 Reseach Methodology

3.1 Study Design

A research design is the programme that guides the investigator in the process of collecting, analysing and interpreting observations (Nachmias and Nachmias, 1992). The research focuses on the critical determinants of construction tender sum in Nigeria from the Quantity surveyor's standpoint. This research has two phases. The first phase of the research comprise of literature survey which was undertaken with the aim of articulating the streams of research on construction cost estimation and to identify factors affecting construction tender sum. This was then used to design the questionnaire that was used in the second phase comprising of obtaining data through the design and administration of questionnaires. The questionnaires were distributed among Quantity surveyors in the FCT, Kaduna and Plateau states of Nigeria. The questionnaires administered were aimed at evaluating and ranking of the factors obtained according to their influence and significance regarding the tender sum of construction projects

3.2 Study Area

Literature suggested that there are important aspects to be considered in making selection of a particular study area (Nachmias and Nachmias, 1992). The study covered the FCT, Kaduna and Plateau States of Nigeria. FCT and Kaduna were selected because the cities are among measure cities of Nigeria where most Quantity Surveying Firms have their Head Offices while Plateau State was selected because of the number of projects going on at the time of the research thus the presence of a good number of quantity surveyors



3.2.1

Figure: 3.1 **The Research Process**

3.3 The Study Population and Sample

~~Purposive sampling was used in selecting samples from all the population due to the nature of the study. The purposive sampling allows participants to be chosen according to preselected criteria relevant to a particular question. The participants were practicing quantity surveyors both in the public and private sectors.Quantity surveyors were chosen because they are the experts in cost estimation that leads to the arrival of tender sums.~~

~~Figure: 3.1 **the research process**~~

~~The objective of sampling is to provide a practical means of enabling the data collection and processing components of the research to be carried out while ensuring that the sample provides a good representation of the population.~~

A good sample must be as nearly as representative of the entire population as possible. The sample should be fairly homogenous and share critical similarities related to the research question(McCracken and West, 1998). There are several ways of calculating the sample required for a survey given the population these formulas include the following:

- Krejcie and Morgan (1970) formula;

$$S = \frac{2NP(1-P)}{d2(N-1)+X2P(1-P)} \quad \text{..} \quad (1)$$

Where;

S = required sample size

X2 = table of value of chi-square for 1 degree of freedom at the desired confidence level (3.841)

N = the population size

P = the population proportion (assumed to be 0.50)

d = degree of accuracy expressed as a proportion (0.05)

- Fellows and Liu (1997) formula:

$$n = \frac{\gtrsim^2 \text{ x } s^2}{(\bar{\mu}-\bar{x})} \quad \text{...} \quad (2)$$

Where:

n = sample size

$\gtrsim$ = confidence level required

s = sample standard deviation

$\bar{\mu}$ = upper and lower confidence limits of the estimate of the population mean

$\bar{x}$ = sample mean.

Using the purposive sampling adopted for this study, a researcher may have a specific group in mind, it may not be usually possible to specify the population as they would not all be known and access could sometimes be difficult, the researcher attempts to zero in on the target group interviewing whoever is available as the sample is a subset of the larger population.For the purpose of this research though, determining the sample size using any of the aforementioned formulas was not possible, due to the unknown population of quantity surveyors in these location. However, taking a cue from Mendenhall*et al*. (1993) and Leedy (1997)'s assertion that; 'a required minimal sample size of 30 was regarded as sufficiently large to provide an effective normal approximation as a general rule of thumb, regardless of the shape of the population frequency distribution. 117 Questionnaires were administer but only 80 of the questionnaires were recovered and thus was considered to be effective following the cue from Mendenhall*et al*.(1993) and Leedy (1997).

The sample frame for this research was the Qquantity Ssurveyors in Kaduna and Plateau states, and Abuja FCT.Abuja(FCT) and Kaduna state were chosen as study area because these places are amongst major cities in Nigeria were construction firms have their headquarters while Plateau State was chosen because of the massive construction projects going on in the state at the time of the research thus the presence of a good number of quantity surveyors

3.4 Sampling Technique

Purposive sampling was used in selecting samples from all the population due to the nature of the study. The purposive sampling allows participants to be chosen according to preselected criteria relevant to a particular question. .

3.5 Data Collection

3.5.1 Data Collection Instrument

Self-administered questionnaire was used as survey instrument. The survey instrument consist of two main sections (details on Appendix x). The sections are:

Section A: Background of respondents which

Section B: Assessment of construction cost determinants

1. Client characteristic:8 quantitative factors
2. Consultant and design parameters:9 quantitative factors
3. Contractor attributes: 23 quantitative factors
4. Project characteristics:17 quantitative factors
5. Contract procedure and procurement method:6 quantitative factors
6. External factors and market conditions:10 quantitative factors

Each item of cost factors are rated by the ranging from 1 to 5 as below. All items identified are considered significant as long as it has been identified as one and is capable of influencing cost except for the intensity of rating. Therefore the rating scale:

1 = Low significance

2 = Mild significance

3 = Moderate significance

4 = Strong significance

5 = Extreme significance

3.5.2 Data Collection Procedure

The study adopted a self-administration of Questionnaire. Each respondent had the questionnaire delivered to them and subsequently collected back without them having to leave the office. Due to this approach, the percentage of response in this research was higher than that of some previous researches like Elhag *et al.*,(2005) and Soutos & Lowe,(2011).

3.6 Data Analyses

~~Collations of data collected from the questionnaires weredone on Microsoft Excel spread sheet and data analysis was performed using SPSS (version 20.1) statistical software.~~

3.6.1Significance Index (SI)

In accordance with previous studies (Assaf &Al-Hejji 2006; Elhag et al.(2005);Assaf and Al-Hejji (2006); Le-Hoai et al(. 2008)), the SI was used to rank the factors affecting tender cost in order of significance. SI is expressed by the equation (3):

$$SI = \left(\sum_{i=1}^{3} w_i \times f_i \right) \times \frac{100\%}{n} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (3)$$

Where i represent the ratings 1-5, f_i the frequency of responses, n the total number of responses and $w_i$the weight of each.

3.6.2Factor Analysis (FAa)

Factor analysis is a means by which the regularity and order in phenomena can be discerned. It is a statistical technique to describe a large set of variables by means of a smaller set of composite variables called factors, hence aiding the interpretation of data. It can also be seen as a statistical method used to describe variability among observed, correlated variables in terms of a potentially low number of unobserved variables called factors. It searches for such joint variations in response to unobserved latent variables.(Wuensch, 2012). The observed variables are modelled as linear combinations of the potential factors plus "error" terms. In simple terms, it is a method of data reduction.

There are many methods to conduct a factor analysis and also many rotations to use. For this research the principal component analysis and varimax with Kaiser Normalization was employed for rotation methods.Principal component analysis (PCA) extracts from a set of p variables, a reduced set of m principal components or factors that accounts for most of the variance in the p variables (Wuensch, 2012).

The Eigenvalues associated with each variable in the set of p variables as well as the sreeplot is usually used as a guide to determine the reduced set of m principal components or factors that account for most of the variance in the set of p variables. The Eigenvalue associated with each variable represents the variance explained by that particular variable. Variables with Eigenvalues greater than 1, is what most authors recommend to be accepted as the reduced set of m principal components which accounts for most of the variance in the p variables. The Scree plot on the other hand is a plot with Eigenvalues on the ordinate and component number on the abscissa. The point of inflection at which this plot begins to tail off, signifies the point at which variables with Eigenvalues greater than 1 terminates/end (Field, 2005). For the purpose of this study, 20 out of the 73 qualitative factors (variables) had Eigenvalues greater than 1, signifying that a total number of 20principal components accounted for the total variance in the 73variables.

CHAPTER FOUR

4.0 Results and Discussions

4.1 Survey Response Rate

Atotal of one hundred and seventeen (117) questionnaires were distributed but questionnaires from 80respondents were returned. Therefore this study achieved a response rate of about 68.37%, which is considered sufficient

Table 4.1 Percentage of Questionnaire Returned and not Returned

Questionnaires	Number	Percentage
Completed and returned	80	63.37
Not returned	37	36.63
Total	117	100

Source: Field Survey, (2014)

4.2 Characteristics of Respondents

Table 4.2 shows the years of working experience of the respondents. In relation to the working experience of respondents, about half may be considered young in practise, 1-5years (38, 47.5%). The proportion of QS with >15 years (20, 25.0%) working experience are higher than those with 6-10year (16, 20%) and much more than those with 11-15years (6, 7.5%) respectively.this shows that more than 50% of the respondent have practiced for more than 5 years and therefore have a good judgement of the subject matter

Table 4.2 Percentage of Years of Working Experience of Respondents

Years of working experience	Number	Percentage
1-5	38	47.5
6-10	16	20
11-15	6	7.5
>15	20	25
Total	80	100

Source: Field Survey, (2014)

Table 4.3 shows the qualification of the respondents. The quantity surveyors with B.Sc/B tech were 39 in number which is 48.75%, those with HND were 22, i.e. 27.50%, and those with M.Sc were 16, i.e. 20%, ND were 2, i.e. 2.5% while one had a Ph.D i.e.

1.25%. This indicates that the majority of the respondents have attained an Educational Level that qualifies them to be good judges of the subject matter.

Table 4.3The Percentage of the Qualification of Respondents

Qualification	Number	Percentage
B.Sc/B.Tech	39	48.75
HND	22	27.50
M.Sc	16	20.00
ND	2	2.50
Ph.D	1	1.25
Total	80	100

Source: Field Survey, (2014).

4.3 Priority Ranking Using Significance Index

4.3.1 Client Characteristic

The ranking of client characteristics are presented on Table 4.4 and shows that the factorsSIranged between 50% and 83.6%. However, their overall ranking ranges between 3 and 72. On the top of this category is the "Client requirement on quality" (CC11) factor and it is ranked 3rd on the overall scale. The paramount effect of the quality needed by clients is widely understandable, and this outcome backs this view. That is why this factor is considered most crucial. The second and third ranked factors in this group are "Financial capability/payment record" and "type of client" which are ranked 14th and 28th in the overall ranking, respectively. The lowest ranking is the "partnering arrangement which ranked 72nd overall. In previous studies by Elhag*et al*.(2005), priority on construction time/deadline requirement was ranked 1st in category ranking and 3rd in the overall ranking. This was followed by certainty of project brief which ranked 10th in the overall ranking. While the lowest was financial capability/ payment record which ranked 53rd in the overall ranking.This indicated different perception on some of the factors influencing tender sum in different countries.

4.3.2 Consultant and Design Parameters

The consultant and design parameters (CDP) cost category is presented on Table 4.5.The significance indices range between 61.2% and 81.6%. The top ranked factors within this group was Completeness and timeliness of project information (design, drawings, specifications) which is the 7th overall, Quality of design and specification, was 2nd and ranked 13th overall; and Working relationship with client was 3rd and ranked 29th overall. These types of factors are considered more subjective therefore harder, costly and time consuming to extract as project data. However, from quantity surveyors' view point; they are crucial in accurate estimation of construction tender sum. The lowest ranked in this category was absence of alteration and late changes to design. This ranked 61st in the overall ranking.

Table.4.4Ranking of Client Characteristic

CODE	Factors	Significance Index	Category Ranking	Overall Ranking
CC11	Client requirement on quality	83.6	1	3
CC6	Financial capability/payment record	78	2	14
CC5	Type of client	75.2	3	28
CC10	Experience of procuring construction	72.4	4	37
CC7	Project finance method	71.6	5	40
CC9	Priority in construction	69.2	6	44
CC12	Certainty of project brief	68	7	47
CC8	Partnering arrangement	50	8	72

Source: Field Survey, (2014)

In Elhag*et al*. (2005), it was almost the opposite. Absence of alteration and late changes to design (No design as-we-go on site philosophy) was ranked 1st and also first in the overall ranking. The least in this category for them was inspection, testing and approval of completed works (toughness/requirements). It was 58th in the overall ranking.

Table 4.5 Ranking of Consultant and Design Parameters

CODE	***Factors***	***Significance Index***	***Category Ranking***	***Overall Ranking***
CDP13	Completeness and timeliness of project	81.6	1	7
CDP17	Quality of design and specification	78.0	2	13
CDP15	Working relationships with client	74.8	3	29
CDP14	Buildability of design	72.4	4	36
CDP19	Submission of early proposals for costing/cost planning	68.8	5	45
CDP21	Source of information	68.0	6	48
CDP16	Variation orders and additional works	67.2	7	49
CDP18	Inspection, testing, and approval of completed works	61.6	8	59
CDP20	Absence of alteration and late changes to design	61.2	9	61

Source: Field Survey, (2014)

4.3.2 Contractor Attributes

This category includes 23 factors. "Management team (sustainability, experience, performance)" ranked 1st as shown in Table 4.6. it ranked 4th in the overall. Nine of these factors achieved significance indices between 46% and 60%. This indicates that these variables have relatively lower degree of influence on tender sum. The remaining top-14 factors in this group gained significance indices between 61% and 82%, which indicates their higher importance."Experience on similar projects", financial capability and "estimation method and cost control ranked 2nd,3rd and 4th respectively in the category. The lowest was accident on site record. It was also the last overall. In Elhag et al. (2005), this category has 18 factors. Management team ranked 1st in this category and 2nd in the overall ranking. Accident on site record was the last in this category and 67th overall. This is very similar to the findings of this research.

Table 4.6Ranking of Contractor Attributes

CODE	*Factors*	*Significance Index(%)*	*Category Ranking*	*Overall Ranking*
CA22	Management team	82.8	1	4
CA25	Experience on similar projects	79.6	2	9
CA24	Financial capability	77.6	3	16
CA28	Estimation method and cost control	76.8	4	22
CA34	Cost of finance	73.6	5	30
CA23	Management/labour relationships	72.8	6	33
CA43	Guarantees	72.0	7	38
CA29	Planning capabilities	68.0	8	46
CA31	Percentage of main contractor direct work	64.8	9	51
CA32	Mark up policies and percentages	64.8	10	52
CA30	Productivity effects	63.6	11	53
CA27	Level of comm. within contractor org.	62.4	12	55
CA26	Current work load	62.4	13	56
CA35	Latent cost variables	61.6	14	58
CA44	Cost of unvitiated risks	59.6	15	62
CA38	Present claims (size and quantity)	58.4	16	63

CA40	Bond/warranty arrangement	58.4	17	64
CA42	Branding of services and the service cost of managing a business model	52.8	18	67
CA41	CDM regulations awareness	52.4	19	68
CA37	Previous claims record	50.8	20	69
CA32	Record of payment to subcontractor	50.8	21	70
CA36	Cost of registration with client	50.8	22	71
CA39	Accidents on site records	46.8	23	73

Source: Field Survey, (2014)

4.3.4 Project Characteristics

This category consists of 17 factors as shown in Table 4.7. The effectiveness is demonstrated by high significance indices ranging between 57.6% and 83.6%. The top ranked factors in this group is Type of foundation (pile/raft/pad/etc) which is the overall 2nd. Quality of finishing, site condition/ site topography were2nd and 3rd in the group category. These are 5rd and 10th in the overall ranking respectively.

The lowest 3 includes phasing requirements, off site prefabrication and type of cladding and external walls ranking 65th ,50th , and 42nd in the overall ranking respectively.

In Elhag et al.(. (2005), intensity/ complexity of building services, complexity and number of basement levels were 1st, 2nd and 3rd in category ranking respectively while they are 6th, 8th and 12th in the overall ranking respectively. The lowest were off site prefabrication, type of cladding, quality of finishing were the 17th, 16th and 15th respectively ranking 52nd, 51st, and 47th in the overall ranking. These also has similar ranking with this research except for the phasing requirement which was ranked low in this research but ranked high in the previous research. This indicated different perception on some of the factors influencing tender sum in different countries.

Table 4.7 Ranking of Project Characteristics

CODE	*Factors*	*Significance Index*	*Category Ranking*	*Overall Ranking*
PC54	Type of foundation (pile/raft/pad/etc.)	83.6	1	2
PC60	Quality of finishing	82.8	2	5
PC53	Site condition/ site topography	79.6	3	10
PC50	Complexity	78.8	4	11
PC46	Size/gross floor area	78.4	5	12
PC52	Location	78.0	6	15
PC47	Heights/number of stories	77.2	7	17
PC61	Project execution cost	77.2	8	18
PC51	Type of structures	76.8	9	20
PC45	Type/function	76.8	10	21
PC48	Number of basement level	75.6	11	26
PC49	Level of uncertainty of soil condition	75.2	12	27
PC58	Intensity/complexity of building services	72.8	13	35
PC57	Access to site	70.4	14	41
PC56	Type of cladding and external walls	70.0	15	42
PC55	Off-site prefabrication	67.2	16	50
PC59	Phasing requirements	57.6	17	65

Source: Field Survey, (2014)

4.3.5 Contract Procedure and Procurement Method

Table 4.8 present the results of factors in the CPPM category and shows that the significanceindices rangesbetween 57% and 76%.

The top ranked factors in this group is the type of contract/use of standard form,followed by Payment modalities (fixed price, cost plus, BOT, PFI-DBFO, etc), then Tender selection method (open, selected, negotiation, single or two stage, etc) which ranked 32nd overall. From the statistics computed, for this category, it is evident that the quantity surveyor regarded the factors contained within the category as having significant effect upon construction tender sum. In Elhag et al.(2005), the significance indices were also high ranging from 61. 83 – 78.07% with% with method of procurement as 1st, followed by tender selection method (open, selected, negotiation, single or two stage e.t.c.) and spread risk between construction parties (client/consultant/contractors) while the least was the interviewing of the prospective contractors.

Table 4.8 Ranking of Contract Procedure and Procurement Method

CODE	*Factors*	*Significance Index*	*Category Ranking*	*Overall Ranking*
CPPM62	Type of contract /use of standard form	76.8	1	23
CPPM64	Payment modalities	76.4	2	24
CPPM63	Tender selection method	73.6	3	32
CPPM65	Spread of risk between construction parties	63.2	4	54
CPPM66	Claims and dispute resolution methods	61.6	5	60
CPPM67	Interviewing of selected perspective contractors	57.2	6	66

Source: Field Survey, (2014)

4.3.6 External Factors and Market Conditions

Table 4.9 shows the significance indices obtained by the EFMC category are in the range of62% and 85%. The majority of the factors in this group are amongst the most significant variables in the overall ranking. The top variable in this category is Material prices which also ranked 1st overall. This is an indication that prices, availability, supply, quality and imports of construction material in the construction industry have a clear effect on tender prices, and particularly on mark-up and profit margins. Labour costs, stability of market conditions, and plants cost represent the remaining top ranked factors within the group.Though material prices/availability, labour costs, stability of market condition have high significance indices high level of overall ranking in this research, Elhag*et al*. (2005) considered them to exert little influence in the preparation of construction estimates

Table 4.9 Ranking of External Factors and Market Conditions

CODE	*Factors*	*Significance Index*	*Category Ranking*	*Overall Ranking*
EFMC68	Material prices/availability	85.6	1	1
EFMC69	Labour costs	81.6	2	6
EFMC79	Stability of market conditions	79.6	3	8
EFMC70	Plants cost availability	77.2	4	19
EFMC72	Level of competition	76.0	5	25
EFMC77	Change in political power	73.6	6	31
EFMC73	Government regulations/policies	72.8	7	34
EFMC75	Interest rate/inflation rate	71.6	8	39
EFMC71	Weather condition	69.2	9	43
EFMC74	Number of bidders(tenderers) in competitive projects	62.0	10	57

Source: Field Survey, (2014)

4.3.7 Overall Average Significance Indices

A comparison of average significance indices is portrayed on Figure 4.1. This shows that the top ranked category is found to be Project Characteristics with an average significance index of 75.2%. On the other hand, the Contractor Attributes group scored the least average significance index of 63.6%. This indicates that the quantity surveyors perceive that the construction tender sum is more influenced by the project characteristics than the contractors ‘attributes. This outcome is consistent with many literature views that the project cost are more determined by the components and constituents of the project which includes type, size, location, complexity, methodology,…, quality of finishing e.t.c. rather than by the later construction stages. The overall ranking is found on Table4.10.Comparing the findings of this study with other research projects, there are some agreement as well as some differences in the ranking of tender sum determinants. For instance material prices/availability, labour cost, stability of market condition has a high overall ranking in this research but in Elhag et al. (2005), it was considered to exert little influence in the preparation of construction estimates. This justifies the reasons given by Olatunji (2010) that construction cost in Nigeria are often high and unpredictable and the pattern of the variability is not explained by inflammatory indices of common goods and services but rather, it is reactive to boom and burst shocks that are triggered by the oil price regimes. This kind of divergence contributes to the complexity of evaluating the degree of influence of different factors on tender sum at diverse situation.

The significance analysis pointed out the significance of the factors as they relate to each other but did not point out the factors that are critical to determining tender sum and also it did not reveal if there is any redundant factor. Thus the research employed the use of factor analysis.

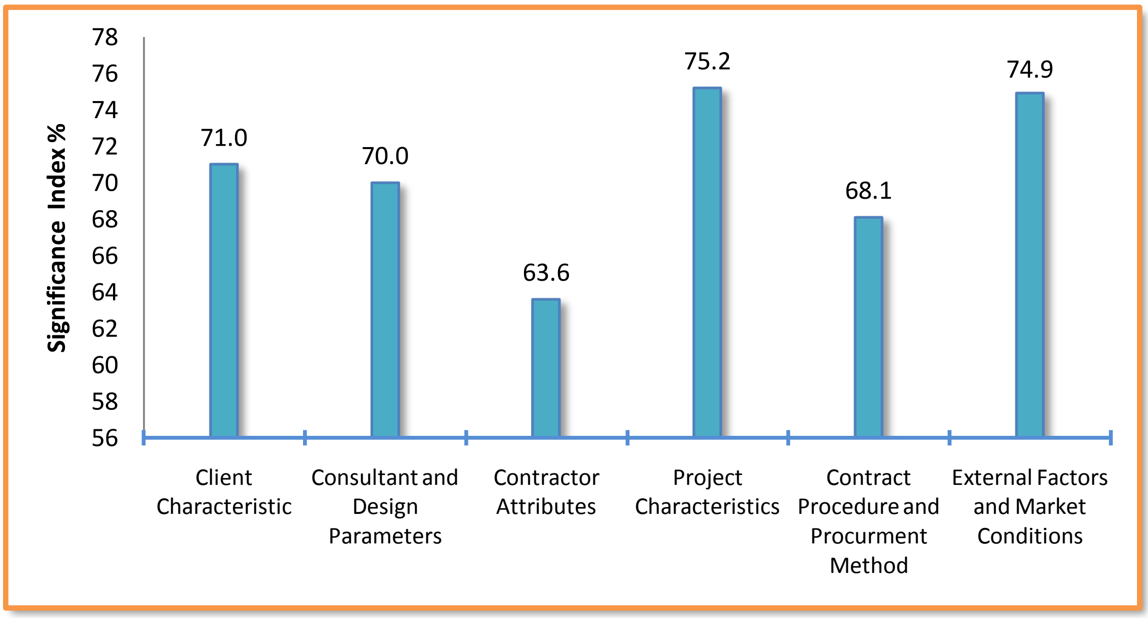


Figure 4.1 Average Significance Indices of Cost Categoriesy

Source: Field Survey, (2014)

Table 4.10 Overall Ranking and Significance Index (see Appendix ii for complete table)

S/N	Factors	Severity Index	Overall Ranking	Group Category
1	Material prices/availability	85.6	1	External Factors
2	Type of foundation (pile/raft/pad/etc)	83.6	2	Project Characteristics
3	Client requirement on quality	83.6	3	Client Characteristics
4	Management team	82.8	4	Contractor Attributes
5	Quality of finishing	82.8	5	Project Characteristics
	Labour costs	81.6	6	External Factors

6

71	Cost of registration with client	50.8	71	Contractor Attributes
72	Partnering arrangement	50	72	Client Characteristics
73	Accidents on site records	46.8	73	Contractor Attributes

S/N	Factors	Severity Index	Overall Ranking	Group Category
1	Material prices/availability	85.6	1	External Factors
2	Type of foundation (pile/raft/pad/etc)	83.6	2	Project Characteristics
3	Client requirement on quality	83.6	3	Client Characteristics
4	Management team	82.8	4	Contractor Attributes
5	Quality of finishing	82.8	5	Project Characteristics
6	Labour costs	81.6	6	External Factors
7	Completeness and timeliness of project	81.6	7	Consultant and Design
8	Stability of market conditions	79.6	8	External Factors
9	Experience on similar projects	79.6	9	Contractor Attributes
10	Site condition/ site topography	79.6	10	Project Characteristics
11	Complexity	78.8	11	Project Characteristics
12	Size/gross floor area	78.4	12	Project Characteristics

~~13~~	~~Quality of design and specification~~	~~78~~	~~13~~	~~Consultant and Design~~

Source: Field Survey, (2014)

4.4 Factor Analysis(Fa) of the Tender Sum Influencing Variables.

A number of methods have been used to determine the number of factors to be extracted from a factor analysis. Traditionally, the results of factor analysis show the number of factors that can be extracted where the Eigen value of the components is equal to or greater than 1. From the results of the factor analysis of data obtained from the survey of determinants of construction tender sum, Figure 4.2 shows that 20 factor components are extractable since they have Eigenvalues ≥ 1. The details on Table 1 shows that 20 factor components cumulatively explained up to 86% the total variability in the dataset.The principal component analysis was used to extract factors with Eigen value > 1. The Varimax rotation method was used. Table 4.11shows variables contained in each of the twenty factors. It also highlights variables that are considered to be redundant as to how these variables exert influence on the tender sum. Table 4.11 shows the rotated component matrix for the principal components extracted in Table4.12.

Table: 4.11. Extraction from Rotated Component Matrix (see complete table in appendix iii table ii)

Factor No.	Code	Variable name	Factor loading in the principal component	Factor % of variance
1	PC53	Site conditions	0.814	21.386
	PC51	Types of structures	0.788	
	PC58	Intensity/complexity of building services	0.638	

PC61	Project execution cost	0.637
CPPM65	Spread of risks between constr. Parties	0.601
PC50	Complexity	0.592
PC56	Types of cladding & external walls	0.581
PC49	Level of uncertainty of soil conditions	0.546

Source: Field Survey, (2014)

It shows the factor loadings of each variable into the extracted principal components. Factor loading refer to the correlation coefficient between each variable and a principal component. As shown in Table: 4.11, each variable loaded differently into the respective principal components. This clearly indicates that while the correlation coefficient/factor loading of a variable may be highly significant in one of the principal components, it may not be significant in the other principal components and hence, the omission/absence of its correlation coefficient/factor loading in such principal components.

Table 4.12 Extraction from Principal Component (see complete table in appendix iii tablei)

Compone	Initial Eigenvalues			Extraction Sums of Squared Loadings		
nt	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	15.612	21.386	21.386	15.612	21.386	21.386
2	6.803	9.320	30.706	6.803	9.320	30.706
3	4.475	6.130	36.836	4.475	6.130	36.836
4	3.722	5.099	41.935	3.722	5.099	41.935
5	3.281	4.494	46.429	3.281	4.494	46.429
6	3.222	4.413	50.842	3.222	4.413	50.842
7	3.126	4.283	55.125	3.126	4.283	55.125
8	2.830	3.877	59.002	2.830	3.877	59.002
9	2.417	3.310	62.312	2.417	3.310	62.312
10	2.217	3.037	65.349	2.217	3.037	65.349

Source: Field Survey, (2014)

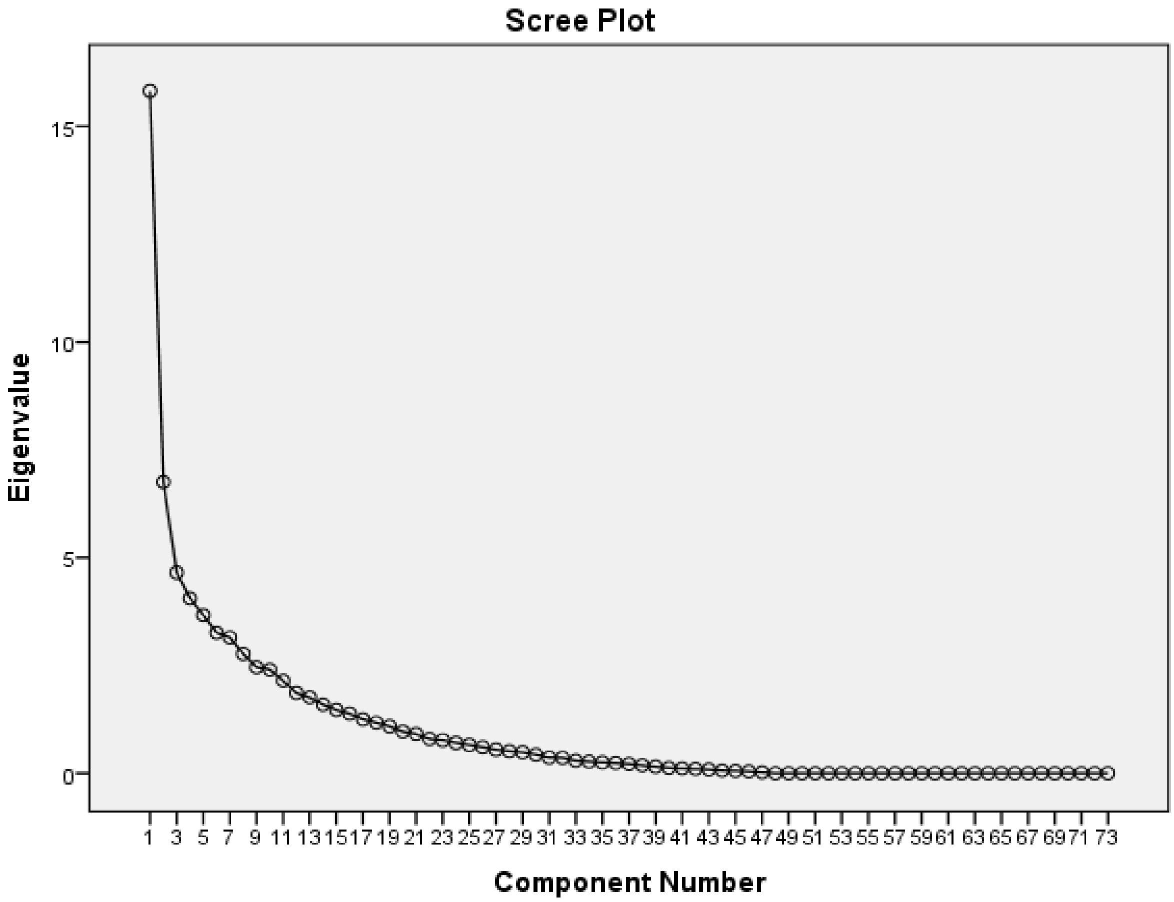


Figure: 4. 2 Scree Plot

Source: Field Survey, (2014)

Table: 4.13 Critical Determinant of Construction Tender Sum

Factor No.	Code	Variable name	Factor loading in the principal component	Factor % of variance
1	PC53	Site conditions	0.814	21.386
2	CA40	Bond/warranty agreement	0.866	9.32
3	CPPM63	Tender selection method	0.714	6.13
4	EFMC70	Plants cost/availability	0.798	5.099
5	CDP19	Submission of early proposal for costing/ cost control	0.777	4.494
6	EFMC77	Change in political power	0.823	4.413
7	CC6	Financial capabilities	0.72	4.283
8	PC47	Height /number of storeys	0.757	3.877
9	CDP17	Quality of design and specification	0.775	3.31
10	CA29	Planning capabilities	0.806	3.037
11	CC12	Certainty of project brief	0.851	2.805
12	CA22	Management team	0.77	2.749
13	CDP14	Buildability of design	0.811	2.324
14	CA34	Cost of finance	0.798	2.265
15	CA27	Level of communication within contractor organization	0.767	2.16
16	EFMC71	Weather condition	0.779	1.914
17	CDP16	Variation orders and additional works	0.84	1.828
18	CA24	Financial capabilities	0.919	1.644
19	CA25	Experience on similar project	0.838	1.587
20	CA23	Management/ labour regulations	0.771	1.494

Source: Field Survey, (2014)

CHAPTER FIVE

5.0Summary of Findings, Conclusion and Recommendation

5.1 summary Of Findings

1. Several factors were discovered from literature to have influence in determining construction tender sum that were not assessed in previous researches. While on the other hand other factors that were assessed in the previous research were not assessed again in this research.
2. The overall ranking using significance index did not show the significance based on the groupings done. Factors in each group ranked randomly in the overall ranking
3. A comparison of average significance indices showed that the top ranked category is found to be project characteristics with an average significance index of 75.2%. On the other hand, the contractors' attributes group scored the least average significance index of 63.6%. This indicates that the quantity surveyors perceive that the construction cost of projects is more influenced by the project characteristics than the contractors attributes.

4. Comparing this research with previous studies, there are certain determinants which were ranked low i.e. not significant in the previous studies which turned out to be very significant in this studies.
5. From the factor analysis, 20 factors were extracted from the 73 factors. The underlying variables in each of the factor were extracted and grouped into the 20 factors. Also variables that did not have significant loading in any of the factors were considers to be redundant variables. The variables include cost of registration with client, working relationship with client, project finance method, record of payment to subcontractor etc. These variables are considered not to have a significant influence on tender sum.

5.2 Conclusion

Factors affecting costs of construction projects were reviewed based upon research work undertaken in different countries. The analysis and findings of these studies varied on the one hand according to the different aims and objectives they addressed and on the other, according to the economic environment under which the studies were conducted.

The significance index showed the relationship that exists within the factors determining tender sum but the factor analysis was able to differentiate the factors into groups according the manner in which the factors determine tender sum. It also sieved out the redundant factors. From each of the group(factor group), the research was able to bring out the critical determinants of construction tender sum and they include site condition, Bond/warranty agreement, tender selection method, Plant cost/availability, change in political power, financial capability, submission of early proposal for costing/cost control, etc. This concludes that determinants of tender sum fall into different category of influencing factors.

5.3 **Recommendation**

Many of the cost factors in this study do not play a part in major data bases which care for construction cost analysis e.g. Building Cost information Services(BCIS) of the Royal institute of Chartered Surveyors (data bases for cost factors are not available locally). Therefore the study recommended the following;

1. A data base should be created to collect project information that will help Quantity Surveyors prepare tenders that will robust and accurate.
2. The determinants of tender sum stage should be examined while preparing to tender so as to arrive at a very appropriate figure that will enhance the success of the whole tendering process.

5.4 Suggestions For Further Studies

A research is needed for the development of instrument to collect data for project information. This project information will help Quantity Surveyors in avoiding errors that were encountered in previous projects.

REFERENCES

AibinuA. A. and Pasco T., (2008). *The accuracy of pre-tender building cost estimates in Australia*. Construction Management and Economics. 26(12):1257 - 1269.

AkintoyeA.and FitzgeraldE .,(2000). *A survey of current cost estimating practices in the UK.* Construction Management and Economics. 18(2):161 - 172.

AkintoyeA.and Skitmore M., (1992). *Pricing approaches in the construction industry.* Industrial Marketing Management. 21(4):311-318.

Akintoye A., (2000). *Analysis of factors influencing project cost estimating practice.* Construction Management and Economics. 18(1): 77 - 89.

Akintoye A.S., Ajewole O. and Olomolaiye P.O., (1992). C*onstruction cost information management in Nigeria*. Construction management and economics 10 pp107-116.

Al- Tabtabi H. and Dienkmann J E., (1992). *Judgmental forecasting in construction projects*. Construction management and economics 10pp19-30.

Ashworth A., (2004). *Cost studies of building*. 4th ed. England: Pearson Education Ltd.

Ashworth A., (2010).*Cost studies of building*. 5th ed. England: Pearson Education Ltd.

Ashworth A., (2002).*Pre-contract Studies-Development Economics, Tendering and Estimating*, Blackwell, Oxford.

Assaf S.A. and Al-Hejji S., (2006). *Causes of delay in large construction projects. International Journal of Project Management*, 24pp349–357.

Babalola O. and Adesanya D. A., (2007) *An evaluation of the level of accuracy of electrical services cost estimates in Nigeria*. Proceedings from the annual ARCON conference. pp75-83

Baldwin A.N. and Thorpe A., (1990). *Information technology for construction cost estimating.* Habitat International. 14(2-3):157-163.

BariN.A.A., (2012) *Factors Influencing the Construction Cost of Industrialised Building System (IBS) Projects*. Procedia - Social and Behavioral Sciences, 35pp689–696.

Barnes N.M.L. and Thompson P.A., (1971).*Civil engineering Bills of Quantities report 34*. Construction industry research and information association. London

Brook, M. (2004) *Estimating and Tendering for Construction Work*. Elsevier Ltd, Oxford.

Carr P.G., (2005). *Investigation of Bid price competion measured through prepaid project estimates, actual Bid prices and number of bidders.*Journal of construction Engineering and management. 131 (11). Retrieved on 3rd November2013from DOI 10.1061(ASCE) 0733-9364(2005) 131:11(1165)

Cheng, Y.M., (2013). *An exploration into cost-influencing factors on construction projects*. International Journal of Project Management.

CIOB, (1997).*Code of Estimating Practice*, 6th edition, The Chartered Institution of Building, London, Longman, Malaysia.

Dissanayaka S.M. and Kumaraswamy M.M., (1999). *Evaluation of factors affecting time and cost performance in Hong Kong building Projects*. Engineering, Construction and architectural management.6(3):287-298

Doloi H.K., (2010).*Understanding stakeholders' perspective of cost estimation in project management.* International Journal of Project Management, Vol. In Press, Corrected Proof.

Dominic D.A. and Simon D.S., (2012). *Neural network for modeling the final cost of water projects.* 28th Arcom conference. Edingburgh U.K.

Elhag T.M.S and Boussabaine A.H.(1998). *An artificial neural system for cost estimation of construction projects* In; ARCOM 14th Annual conference, Reading U.K.

El-hag T.M.S.,BoussabaineA.H., and Balla T.M.A.(2005). *Critical determinants of construction tendering costs: the quantity surveyors standpoint*. International Journal Of Project Management. 23(7):538-545

El-haram M.A., Horner R. M. W. and Marenjak S., (2007). *Accuracy of estimating whole life cost.* In Hughes W. (Ed.) proceedings CME 25 conference Reading UK. University of Reading

El-harram M.and Horner M., (1998). *Factor affecting life cycle cost in construction industry*. In: J Knezevic (Ed) proceeding of the 8th International logistic symposium, Exeter, UK, pp229-240.

Elinwa A.U., and Joshua M., (2001). *Time overrun factors in Nigerian construction industry*. Journal of construction engineering and management. 127(5): 419-425.

Elinwa A.U. and Buba S.A., (1993). *Construction Cost Factors in Nigeria*. Journal of Construction Engineering and Management, 119pp698–713.

Enhassi A. Mohamed S. and Madi I.,(2007). *Cost Estimating Practice in the Gaza strip. a case study*. Islamic university journal

Fellows R.F. and Liu A., (1997) *Research Methods for Construction*. Blackwell Science Ltd. Oxford

Ferry D. J., Brandon P. S. and Ferry J. D., (1999) *Cost planning of buildings*. Vol. 7, Ox=ford, UK: Blackwell Science Ltd.

Field A.P., (2005). *Discovering statistics using SPSS (2nd Ed)*. London Sage.

Flanagan, R. and Norman G., (1983). *The accuracy and monitoring of quantity surveyors' price forecasting for building work*. Construction Management & Economics.1(2):157-180.

Ganiyu B.O and Zubairu I.K., (2010). *Cost prediction model using principal component regression for public building projects in Nigeria*. Journal of building performance. 1(1):21-28.

Gorsuch, R. L., (1983). *Factor Analysis*.Work Study, Retrieved on 8th June, 2015 *42*pp10–11. doi:10.1108/EUM0000000002688.

Hackett, J.A.and Hicks C.M., (2007). *Estimating as a profession in UK construction*. Engineering, Construction and Architectural Management. 14(1): 26-51.

Hegazy T., (2002) *Computer-based construction project management*. Upper Saddle River, NJ: Prentice Hall Inc.

Horner R.M.W. and Zakieh R., (1996). *Characteristic items." a new approach to pricing and controlling construction projects*.Construction Management and Economics. 14: 241-252

Kasimu M.A., (2012) *Significant Factors that Causes Cost Overruns in Building Construction Project in Nigeria*. Interdisciplinary Journal of Contemporary Research in Business, 3pp775–780.

Kirkham R. and Brandon P. S. (2007) *Ferry and Brandon's Cost Planning of Buildings*. 8th Ed. John Wiley and Sons.

Krejcie R. V. and MorganD. W., (1970). *Determining sample size for research activities.* Educational and Psychological measurement.

Kwakye A. A., (1994) *Understanding Tendering and Estimating*, Gower, London.

Laryea S., (2010). *Contractor project estimates vs. consultant project estimates in Ghana.* The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors.

LedererA.L and Prasad J., (1998). *A causal model for software cost estimating error.* Software Engineering, IEEE Transactions on. 24(2) 137-148.

Leedy P.D., (1997). *Practical research: Planning and design* (6th Ed). Merrill, New Jersey. USA

Legendre P., (2005). *Species Association: The Kendall Coefficient Of Concordance Revisited*. Journal of Agricultural, Biological and Environmental Statistics. 10(2): 226-245

Le-Hoai L., Lee Y.D. and Lee J.Y., (2008). *Delay and cost overruns in Vietnam large construction projects: A comparison with other selected countries.*KSCE Journal of Civil Engineering, 12pp367–377.

Ling and Y.Y.and Boo J.H.S., (2001), *"Improving the accuracy estimates of building of approximate projects.* Building Research & Information. 29(4):312-318.

Liu L.and Zhu K., (2007).*Improving Cost Estimates of Construction Projects Using Phased Cost Factors.* Journal of Construction Engineering & Management. 133(1):91-95.

Lowe D.and Skitmore M., (1994), *"Experiential learning in cost estimating",* Construction Management & Economics. 12(5):423-432.

Marsh S. N., (2001). Factor Scores, Structure Coefficients, and Communality Coefficients: It's All One General Linear Model. In *Paper presented at the Annual Meeting of the Southwest Educational Research Association (New Orleans, LA, February 1-3, 2001).* . Retrieved on 8th of June, 2015 from http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED450150

Mbachu J., (2008). *Improving time management of construction project*. Institute of technology and engineering, college of sciences, Massey University, Wellington New Zealand.

McCraken M.W. and West K. D., (1998). *Regression-based tests of predictive ability.* International Economic Review. 39(4):817-840.

Mendenhall W., Reinmuth J. E. and Beaver R., (1993). *Statistics for management and economics (7th Ed).* Duxbury Press Belmont California, USA.

Mok C.K., Tummala V.M.R.and Leung H.M., (1997).*Practices, barriers and benefits of risk management process in building services cost estimation.* Construction Management and Economics. 15(2):161-175.

MorrisonN. (1984). *The accuracy of quantity surveyors' cost estimating.* Journal of Construction Management & Economics. 2(1):57-75.

MuddD.R., (1984), *Estimating and tendering for construction work.* Butterworths, London ; Boston.

Munns A. K. and Al-Haimus K.M., (1999). *Estimating using cost significant global cost models.* Construction management and economics 18(1):575-585Nachmias C. and Nachmias D., (1992). Research Methods in Social Sciences. 4th Edit. St. Martin's press. New York

Nachmias C. and Nachmias D., (1992). *Research Methods In The Social Sciences*. 4th Edit. St. Martin's press. New York

Nicholas O., (2004). *A Statistical framework for the analysis of productivity and sustainable development.* CEPDP 629, centre for economic performance, London school of Economics and Political Sciences. London U.K.

Ogunlana O., (1991). *Learning from experience in design cost estimating. Construction Management & Economics*, 9(2):133.

Okpala D.C. and Anekwu A.N., (1988). *Causes of high costs of construction in Nigeria*. Journal of Construction Engineering and Management114:2(233-244).

Olatunji O. A., (2010). *The impact of oil regimes on construction cost in Nigeria.* Journal of construction management and Economics. 28(7):747-759.

Paul G. and Carr P.E., (2005). *Investigation of bid price competition measure through pre bid project estimates, actual bid prices, and number of bidders*. Journal of Construction Engineering and Management 131(11)1165-1172.

Proverbs D.G., Holt G. D and Olomolaiye P.O.,(1998). A comparative evaluation of planning engineers' formwork productivity rates in European construction. Building and Environment. 33:181-187

Rahman M., Miller C., Packham G., Sawakhroon N. and Meng J., (2007). *Project Manager Performance.* Journal of Construction Engineering and Management 131(13)1275-1284.

Seeley I. V., (1996). Building Economics; appraisal and control of building design cost and efficiency. 4th Edit. Macmillan U.K.

Sequeira I., (1999) *Neural network based cost estimation*, Masters, Department of Building, Civil and Environmental Engineering, Concordia University.

Skirtmore R.M., (1989). Contract bidding in construction. Strategic management and modelling. Longman. London

Soutos M. and Lowe D.J., (2011). Elemental cost estimating: current UK practice and procedure. *Journal of Financial Management of Property and Construction*, 16 pp147–162.

Sunil M., Dissanayaka and Mohan M.K.,(2007). *Evaluation Of Factors Affecting Time And Cost Performance In Hong Kong Building Projects*. Engineering Construction and Architectural Management. 6(4):287-298.

Tas E. and Yaman H.,(2005). *A building cost estimation based on cost significance work package*. Engineering, Construction and Architectural Management. 12(3): 251-263

TurnerA., (1990). *Building procurement*.London: Macmillan education Ltd.

Uppal R. and Wang T.,(2003). *Model misspecification and under diversification.* Journal of Finance 58(6):2465-2486

Westney R. E., (1992) *Computerized management of multiple small projects*. Marcel Dekker, Inc.

Windapo A.O. and Iyagba R.O.A., (2007). *Modelling the determinants of housing construction cost in Nigeria* in Brown S. (ed) COBRA conference, the Royal Institution of Chartered Surveyors (RICS) Georgia institute of technology, 6-7 September.

Wuensch K.L., (2012).*Principal component analysis-SPSS*. Retrieved March, 2014, from http://core.ecu.edu/psyc/wuenschk/wuensch.html

Yanai H.and Ichikawa M., (1990). New lower and upper bounds for communality in factor analysis. *Psychometrika*, *55*(2), 405–409. Retrieve on 12th June, 2015 doi:10.1007/BF02295295

ZhuM. and Ghodsi A., (2006). Automatic dimensionality selection from the scree plot via the use of profile likelihood. *Computational Statistics and Data Analysis*, *51*, 918–930. Retrieve on 8th June, 2015 doi:10.1016/j.csda.2005.09.010

~~Aibinu, A. A. & Pasco, T (2008). *The accuracy of pre-tender building cost estimates in Australia*. Construction Management and Economics. 26(12):1257 - 1269.~~

~~Akintoye, A & Fitzgerald, E (2000). *A survey of current cost estimating practices in the UK*.Construction Management and Economics. 18(2):161 - 172.~~

~~Akintoye, A & Skitmore, M (1992). *Pricing approaches in the construction industry*.Industrial Marketing Management. 21(4):311-318.~~

~~Akintoye, A (2000). *Analysis of factors influencing project cost estimating practice.* Construction Management and Economics. 18(1): 77 - 89.~~

Akintoye, A.S., Ajewole, O. and Olomolaiye P.O., (1992). C*onstruction cost information management in Nigeria*. Construction management and economics 10 pp107-116.

Al- Tabtabi, H. and Dienkmann, J E. (1992).*Judgmental forecasting in construction projects*. Construction management and economics 10pp19-30.

Assaf, S.A. & Al-Hejji, S., (2006). *Causes of delay in large construction projects. International Journal of Project Management*, 24pp349–357.

Ashworth, A. (2002) *Pre-contract Studies-Development Economics, Tendering and Estimating,* Blackwell, Oxford.

Ashworth A. (2004). *Cost studies of building*. 4th ed. England: Pearson Education Ltd.

Ashworth A. (2010).*Cost studies of building*. 5th ed. England: Pearson Education Ltd.

Babalola O. and Adesanya, D. A., (20007) *An evaluation of the level of accuracy of electrical services cost estimates in Nigeria*. Proceedings from the annual ARCON conference. pp75-83

Baldwin, AN & Thorpe, A (1990). *Information technology for construction cost estimating*. Habitat International. 14(2-3):157-163.

Bari, N.A.A. et al., (2012)*Factors Influencing the Construction Cost of Industrialised Building System (IBS) Projects*. Procedia - Social and Behavioral Sciences, 35pp689–696.

Brook, M. (2004) *Estimating and Tendering for Construction Work*. Elsevier Ltd, Oxford.

Carr R. I., (1989). *Cost estimating principles*. Journal of construction engineering and management. 115(4):545-551

Cheng, Y.M., 2013. *An exploration into cost-influencing factors on construction projects*. International Journal of Project Management.

CIOB (1997), *Code of Estimating Practice*, 6th edition, The Chartered Institution of Building, London, Longman, Malaysia.

Dissanayaka S.M. and Kumaraswamy M.M (1999). *Evaluation of factors affecting time and cost performance in Hong Kong building Projects*. Engineering, Construction and architectural management.6(3):287-298

Doloi, HK (2010).*Understanding stakeholders' perspective of cost estimation in project management*. International Journal of Project Management, Vol. In Press, Corrected Proof.

El-hag T.M.S.,BoussabaineA.H., Balla T.M.A.(2005). *Critical determinants of construction tendering costs: the quantity surveyors standpoint*. International Journal Of Project Management. 23(7):538-545

El-haram M.A., Horner R. M. W., and Marenjak S., (2007). *Accuracy of estimating whole life cost.* In Hughes W. (Ed.) proceedings CME 25 conference Reading UK. University of Reading

El-harram M., and Horner M., (1998). *Factor affecting life cycle cost in construction industry*. In: J Knezevic (Ed) proceeding of the 8th International logistic symposium, Exeter, UK, pp229-240.

Elhag T.M.S and Boussabaine A.H.(1998). *An artificial neural system for cost estimation of construction projects* In; ARCOM 14th Annual conference, Reading U.K.

Elinwa A.U., and Joshua M., (2001). *Time overrun factors in Nigerian construction industry*. Journal of construction engineering and management. 127(5): 419-425.

Elinwa, A.U. & Buba, S.A., 1993. *Construction Cost Factors in Nigeria*. Journal of Construction Engineering and Management, 119pp698–713.

Field, A.P. (2005). *Discovering statistics using SPSS (2nd Ed).* London Sage..

Fellows, R.F. and Liu, A. (1997) *Research Methods for Construction*. Blackwell Science Ltd. Oxford

Ferry, D J, Brandon, P S and Ferry, J D (1999) *Cost planning of buildings*. Vol. 7, Oxford, UK: Blackwell Science Ltd.

Flanagan, R & Norman, G (1983). *The accuracy and monitoring of quantity surveyors' price forecasting for building work.* Construction Management & Economics.1(2):157-180.

Ganiyu B.O and Zubairu I.K (2010). *Cost prediction model using principal component regression for public building projects in Nigeria*. Journal of building performance. 1(1):21-28.

Gorsuch, R. L. (1983). *Factor Analysis.*Work Study, 42pp10–11. doi:10.1108/EUM0000000002688.

Hackett, JA & Hicks, CM (2007). *Estimating as a profession in UK construction.* Engineering, Construction and Architectural Management.14(1): 26-51.

Hegazy, T (2002) *Computer-based construction project management*. Upper Saddle River, NJ: Prentice Hall Inc.

Kasimu, M.A.(2012)*Significant Factors that Causes Cost Overruns in Building Construction Project in Nigeria*. Interdisciplinary Journal of Contemporary Research in Business, 3pp775–780.

Kirkham, R and Brandon, P S (2007) *Ferry and Brandon's Cost Planning of Buildings*. 8th Ed. John Wiley & Sons.

Krejcie, R. V. and Morgan, D. W.(1970). *Determining sample size for research activities.* Educational and Psychological measurement.

Kwakye, A. A. (1994) *Understanding Tendering and Estimating*, Gower, London.

Laryea, S (2010). *Contractor project estimates vs. consultant project estimates in Ghana.* The Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors.

Lederer, AL & Prasad, J (1998). *A causal model for software cost estimating error.* Software Engineering, IEEE Transactions on. 24(2) 137-148.

Leedy, P.D. (1997). *Practical research: Planning and design* (6th Ed). Merrill, New Jersey. USA

Legendre P., (2005). *Species Association: The Kendall Coefficient Of Concordance Revisited*. Journal of Agricultural, Biological and Environmental Statistics. 10(2): 226-245

Le-Hoai, L., Lee, Y.D. and Lee, J.Y.(2008). *Delay and cost overruns in Vietnam large construction projects: A comparison with other selected countries.*KSCE Journal of Civil Engineering, 12pp367–377.

Ling, YY & Boo, JHS (2001), *"Improving the accuracy estimates of building of approximate projects.* Building Research & Information. 29(4):312-318.

Liu, L & Zhu, K (2007).I*mproving Cost Estimates of Construction Projects Using Phased Cost Factors.* Journal of Construction Engineering & Management. 133(1):91-95.

Lowe, D & Skitmore, M (1994), *"Experiential learning in cost estimating",* Construction Management & Economics. 12(5):423-432.

Marsh, S. N. (2001). Factor Scores, Structure Coefficients, and Communality Coefficients: It's All One General Linear Model. In *Paper presented at the Annual Meeting of the Southwest Educational Research Association (New Orleans, LA, February 1-3, 2001).* . Retrieved from http://www.eric.ed.gov/ERICWebPortal/contentdelivery/servlet/ERICServlet?accno=ED450150

Mbachu J. (2008). *Improving time management of construction project*. Institute of technology and engineering, college of sciences, Massey University, Wellington New Zealand.

McCraken, M.W. and West K. D. (1998). *Regression-based tests of predictive ability.* International Economic Review. 39(4):817-840.

Mendenhall, W., Reinmuth, J. E. and Beaver, R. (1993). St*atistics for management and economics (7th Ed).* Duxbury Press Belmont California, USA.

Mok, CK, Tummala, VMR & Leung, HM (1997).*Practices, barriers and benefits of risk management process in building services cost estimation.* Construction Management and Economics. 15(2):161-175.

Morrison, N (1984).*The accuracy of quantity surveyors' cost estimating.*Journal of Construction Management & Economics. 2(1):57-75.

Mudd, DR (1984), *Estimating and tendering for construction work.*Butterworths, London ; Boston.

Munns A. K. and Al-Haimus K.M. (1999). *Estimating using cost significant global cost models*. Construction management and economics 18(1):575-585

Nicholas O. (2004).*A Statistical framework for the analysis of productivity and sustainable development*. CEPDP 629, centre for economic performance, London school of Economics and Political Sciences. London U.K.

Ogunlana O (1991). *Learning from experience in design cost estimating. Construction Management & Economics*, 9(2):133.

Okpala D.C. and Anekwu A.N. (1988). *Causes of high costs of construction in Nigeria*. Journal of Construction Engineering and management114:2(233-244).

Olatunji O. A. (2010). *The impact of oil regimes on construction cost in Nigeria.* Journal of construction management and Economics. 28(7):747-759.

Paul G., and Carr P.E., (2005). *Investigation of bid price competition measure through pre bid project estimates, actual bid prices, and number of bidders*. Journal of construction engineering and management 131(11)1165-1172.

Rahman M., Miller C., Packham G., Sawakhroon N. and Meng J., (2007). *PROJECT MANAGER PERFORMANCE.*

Seeley I. V (1996). Building Economics; appraisal and control of building design cost and efficiency. 4th Edit. Macmillan U.K.

Sequeira, I (1999) *Neural network based cost estimation,* Masters, Department of Building, Civil and Environmental Engineering, Concordia University.

Skirtmore R.M. (1989). Contract bidding in construction. Strategic management and modelling. Longman. London

Soutos, M. & Lowe, D.J., 2011. Elemental cost estimating: current UK practice and procedure. *Journal of Financial Management of Property and Construction*, 16 pp147–162.

Sunil M., Dissanayaka and Mohan M.K.,(2007). *Evaluation Of Factors Affecting Time And Cost Performance In Hong Kong Building Projects*. Engineering Construction and Architectural Management. 6(4):287-298.

Turner, A (1990). *Building procurement*.London: Macmillan education Ltd.

Westney, R E (1992) *Computerized management of multiple small projects*. Marcel Dekker, Inc.

Windapo A.O. and Iyagba R.O.A., (2007). *Modelling the determinants of housing construction cost in Nigeri*a in Brown S. (ed) cobra conference, the Royal Institution of Chartered Surveyors (RICS) Georgia institute of technology, 6-7 September.

Yanai, H., & Ichikawa, M. (1990). New lower and upper bounds for communality in factor analysis. *Psychometrika*, *55*(2), 405–409. doi:10.1007/BF02295295

Zhu, M., & Ghodsi, A. (2006). Automatic dimensionality selection from the scree plot via the use of profile likelihood. *Computational Statistics and Data Analysis*, *51*, 918–930. doi:10.1016/j.csda.2005.09.010

APPENDIX I

QUESTIONNAIRE

ASSESSMENT OF THE DETERMINANTS OF CONSTRUCTION TENDERCOST.

Department of Quantity Surveying,

Faculty of Environmental Design,

Ahmadu Bello University,

Zaria.

13-01 -2014

Dear respondent,

The identification of cost – determinant variables and evaluation of the degree of influence of these factors play an essential role in the building up of reliable cost models and enhance the competitive edge of quantity surveyors as well as the contracting organization. There have been several studies on tendering cost in Nigeria but there is none dedicated to outline the critical determinants of construction tender sum.

We are carrying out this research in other to identify the cost determinant variables in Nigeria and evaluate them. We are confident that the outcome will help determine the critical determinant of construction tender sum and would help Quantity surveyors to prepare more accurate estimates.

Please complete and return the attached questionnaire. All information will be treated confidentially and will not be used for any purpose other than what is herein stated. Thank you in anticipation

Yours faithfully

Nunaya Tom Midala

Note: Please tick where appropriate

SECTION A

GENERAL INFORMATION

i) Working experience: 1-5 ( ) 6-10 ( ) 11-15 ( ) Above 15 ( ).

ii) Qualification: PhD ( ) M.Sc. ( ) B.Sc./B.Tech ( ) HND ( ) ND ( ) others ( ).

iii) Type of organisation: Consultancy ( ) Construction ( ) Client ( ) others ( )

iv) Specific Nature of your organisation: Architectural ( ) Quantity Surveying ( ) Engineering ( ) Project Management ( ) Government organization ( ) others ( ).

SECTION B

Cost – determinant variables have been identified from literature and grouped into six. You are to rate the extent to which each of the variables determines construction tender costs. On a 5 level scale. 1=not significant, 2= significant, 3=fairly significant, 4=very significant, 5= highly significant

TABLE 2~~2~~: CLIENT CHARACTERISTIC

S/N	**Factors**	**1**	**2**	**3**	**4**	**5**
1	Type of client (private/public/developer)					
2	Financial capability/payment record					
3	Project finance method/appropriate funding in place on time					
4	Partnering arrangement					
5	Priority in construction time/deadlines requirements					
6	Experience of procuring construction					
7	Client requirement on quality					

8	Certainty of project brief					

TABLE 33: CONSULTANT AND DESIGN PARAMETERS

S/N	FACTORS	1	2	3	4	5
1	Completeness and timeliness of project information (design, drawings, specifications)					
2	Buildability of design					
3	Working relationships with client/contractors/other design team consultants present/previous					
4	Variation orders and additional works (magnitude timing and interference level)					
5	Quality of design and specification					
6	Inspection, testing, and approval of completed works (toughness/requirements)					
7	Submission of early proposals for costing/cost planning					
8	Absence of alteration and late changes to design (no "design as you go on site" philosophy)					
9	Source of information					

TABLE 44: CONTRACTOR ATTRIBUTES

S/N	FACTORS	1	2	3	4	5
1	Management team (sustainability, experience, performance)					
2	Management/labour relationships and confidence in work force					

3	Financial capability					
4	Experience on similar projects					
5	Current work load					
6	Level of communication within the contractor organization					
7	Estimation method and cost control technique (accuracy and reliability)					
8	Planning capabilities and level of resource deployment/utilization/optimization					
9	Productivity effects (managerial, organizational, labour, technology)					
10	Percentage of main contractor direct work and percentage of subcontractor work Number of subcontractors					
11	Mark up policies and percentages (general and project wise)(special or normal conditions applied)					
12	Record of payment to subcontractor					
13	Cost of finance					
14	Latent cost variables					
15	Cost of registration with client					
16	Previous claims record i.e., assessment of “low tender” -“high tender” performance					
17	Present claims (size and quantity)					
18	Accidents on site records					
19	Bond/warranty arrangement					
20	CDM regulations awareness					
21	Branding of services and the service cost of managing a business model					
22	Guarantees					
23	Cost of unvitiated risks					

TABLE 5~~5~~: PROJECT CHARACTERISTICS

S/N	FACTORS	1	2	3	4	5
1	Type/function (residential, commercial, industrial, offices)					
2	Size/gross floor area					
3	Heights/number of stories					
4	Number of basement level					
5	Level of uncertainty of soil condition					
6	Complexity					
7	Type of structures (steel, concrete, timber, masonry)					
8	Location (regions/rural: urban) (inner city/outskirts)					
9	Site condition/ site topography					
10	Type of foundation (pile/raft/pad/etc)					
11	Off-site prefabrication					
12	Type of cladding and external walls (brick, double glazing, etc)					
13	Access to site					
14	Intensity/complexity of building services					
15	Phasing requirements (areas to handed over first or initial non availability)					
16	Quality of finishing					
17	Project execution cost					

TABLE 6~~6~~ CONTRACT PROCEDURE AND PROCUREMENT METHOD

S/N	FACTORS	1	2	3	4	5
1	Type of contract /use of standard form of					

	contract					
2	Tender selection method (open, selected, negotiation, single or two stage, etc)					
3	Payment modalities (fixed price, cost plus, BOT, PFI-DBFO, etc)					
4	Spread of risk between construction parties (client/consultant/contractor)					
5	Claims and dispute resolution methods (litigation/arbitration/others)					
6	Interviewing of selected perspective contractors					

TABLE 7~~7~~ EXTERNAL FACTORS AND MARKET CONDITIONS

S/N	FACTORS	1	2	3	4	5
1	Material prices/availability/supply/quality/imports					
2	Labour costs/availability/supply/performance/productivity					
3	Plants cost availability/supply/condition/performance					
4	Weather condition					
5	Government regulations/policies (health and safety, fire, CDM, etc)					
6	Level of competition and level of construction activity					
7	Number of bidders in competitive projects					
8	Interest rate/inflation rate					
9	Stability of market conditions					
10	Change in political power					

APPENDIX II :. Overall Ranking and Significance Indices Table

Table1.Overall ranking and significance indices

S/N	Factors	Severity Index	Overall Ranking	Group Category
1	Material prices/availability	85.6	1	External Factors
2	Type of foundation (pile/raft/pad/etc)	83.6	2	Project Characteristics
3	Client requirement on quality	83.6	3	Client Characteristics
4	Management team	82.8	4	Contractor Attributes
5	Quality of finishing	82.8	5	Project Characteristics
6	Labour costs	81.6	6	External Factors
7	Completeness and timeliness of project	81.6	7	Consultant and Design
8	Stability of market conditions	79.6	8	External Factors
9	Experience on similar projects	79.6	9	Contractor Attributes
10	Site condition/ site topography	79.6	10	Project Characteristics
11	Complexity	78.8	11	Project Characteristics
12	Size/gross floor area	78.4	12	Project Characteristics
13	Quality of design and specification	78	13	Consultant and Design
14	Financial capability/payment record	78	14	Client Characteristics
15	Location	78	15	Project Characteristics
16	Financial capability	77.6	16	Contractor Attributes
17	Heights/number of stories	77.2	17	Project Characteristics
18	Quality execution cost	77.2	18	Project Characteristics
19	Plants cost availability	77.2	19	External Factors
20	Type of structures	76.8	20	Project Characteristics
21	Type/function	76.8	21	Project Characteristics
22	Estimation method and cost control	76.8	22	Contractor Attributes

23	Type of contract /use of standard form	76.8	23	Contract Procedure
24	Payment modalities	76.4	24	Contract Procedure
25	Level of competition	76	25	External Factors
26	Number of basement level	75.6	26	Project Characteristics
27	Level of uncertainty of soil condition	75.2	27	Project Characteristics
28	Type of client	75.2	28	Client Characteristics
29	Working relationships with client	74.8	29	Consultant and Design
30	Cost of finance	73.6	30	Contractor Attributes
31	Change in political power	73.6	31	External Factors
32	Tender selection method	73.6	32	Contract Procedure
33	Management/labour relationships	72.8	33	Contractor Attributes
34	Government regulations/policies	72.8	34	External Factors
35	Intensity/complexity of building services	72.8	35	Project Characteristics
36	Buildability of design	72.4	36	Consultant and Design
37	Experience of procuring construction	72.4	37	Client Characteristics
38	Guarantees	72	38	Contractor Attributes
39	Interest rate/inflation rate	71.6	39	External Factors
40	Project finance method	71.6	40	Client Characteristics
41	Access to site	70.4	41	Project Characteristics
42	Type of cladding and external walls	70	42	Project Characteristics
43	Weather condition	69.2	43	External Factors
44	Priority in construction	69.2	44	Client Characteristics
45	Submission of early proposals for costing/cost planning	68.8	45	Consultant and Design
46	Planning capabilities	68	46	Contractor Attributes
47	Certainty of project brief	68	47	Client Characteristics
48	Source of information	68	48	Consultant and

				Design
49	Variation orders and additional works	67.2	49	Consultant and Design
50	Off-site prefabrication	67.2	50	Project Characteristics
51	Percentage of main contractor direct wrk	64.8	51	Contractor Attributes
52	Mark up policies and percentages	64.8	52	Contractor Attributes
53	Productivity effects	63.6	53	Contractor Attributes
54	Spread of risk btw construction parties	63.2	54	Contract Procedure
55	Level of comm. within contractor org.	62.4	55	Contractor Attributes
56	Current work load	62.4	56	Contractor Attributes
57	Number of bidders in competitive projects	62	57	External Factors
58	Latent cost variables	61.6	58	Contractor Attributes
59	Inspection, testing, and approval of completed works	61.6	59	Consultant and Design
60	Claims and dispute resolution methods	61.6	60	Contract Procedure
61	Absence of alteration and late changes to design	61.2	61	Consultant and Design
62	Cost of unvitiated risks	59.6	62	Contractor Attributes
63	Present claims (size and quantity)	58.4	63	Contractor Attributes
64	Bond/warranty arrangement	58.4	64	Contractor Attributes
65	Phasing requirements	57.6	65	Project Characteristics
66	Interviewing of selected perspective contractors	57.2	66	Contract Procedure
67	Branding of services and the service cost of managing a business model	52.8	67	Contractor Attributes
68	CDM regulations awareness	52.4	68	Contractor Attributes
69	Previous claims record	50.8	69	Contractor Attributes

70	Record of payment to subcontractor	50.8	70	Contractor Attributes
71	Cost of registration with client	50.8	71	Contractor Attributes
72	Partnering arrangement	50	72	Client Characteristics
73	Accidents on site records	46.8	73	Contractor Attributes

APPENDIX III TABLES OF FACTOR ANALYSIS

Table I: extraction of principal components

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	15.612	21.386	21.386	15.612	21.386	21.386
2	6.803	9.320	30.706	6.803	9.320	30.706
3	4.475	6.130	36.836	4.475	6.130	36.836
4	3.722	5.099	41.935	3.722	5.099	41.935
5	3.281	4.494	46.429	3.281	4.494	46.429
6	3.222	4.413	50.842	3.222	4.413	50.842
7	3.126	4.283	55.125	3.126	4.283	55.125
8	2.830	3.877	59.002	2.830	3.877	59.002
9	2.417	3.310	62.312	2.417	3.310	62.312
10	2.217	3.037	65.349	2.217	3.037	65.349
11	2.048	2.805	68.154	2.048	2.805	68.154
12	2.007	2.749	70.903	2.007	2.749	70.903
13	1.697	2.324	73.228	1.697	2.324	73.228
14	1.653	2.265	75.492	1.653	2.265	75.492
15	1.577	2.160	77.652	1.577	2.160	77.652
16	1.397	1.914	79.566	1.397	1.914	79.566
17	1.335	1.828	81.395	1.335	1.828	81.395
18	1.200	1.644	83.039	1.200	1.644	83.039
19	1.159	1.587	84.626	1.159	1.587	84.626
20	1.091	1.494	86.120	1.091	1.494	86.120
21	.913	1.251	87.372			
22	.821	1.125	88.496			
23	.816	1.118	89.615			
24	.747	1.023	90.638			
25	.703	.963	91.600			
26	.632	.865	92.466			
27	.607	.831	93.297			
28	.541	.741	94.039			

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
29	.522	.715	94.753			
30	.449	.615	95.368			
31	.416	.570	95.938			
32	.395	.542	96.480			
33	.341	.467	96.946			
34	.309	.424	97.370			
35	.302	.414	97.784			
36	.270	.370	98.154			
37	.223	.305	98.460			
38	.216	.295	98.755			
39	.171	.234	98.989			
40	.144	.197	99.186			
41	.136	.187	99.373			
42	.125	.171	99.543			
43	.108	.148	99.691			
44	.073	.100	99.790			
45	.063	.087	99.877			
46	.057	.078	99.955			
47	.032	.045	100.000			
48	9.488E-16	1.300E-15	100.000			
49	7.567E-16	1.037E-15	100.000			
50	6.315E-16	8.650E-16	100.000			
51	5.529E-16	7.574E-16	100.000			
52	4.474E-16	6.129E-16	100.000			
53	3.453E-16	4.730E-16	100.000			
54	2.618E-16	3.586E-16	100.000			
55	1.621E-16	2.220E-16	100.000			
56	1.437E-16	1.968E-16	100.000			
57	2.563E-18	3.511E-18	100.000			
58	-2.206E-17	-3.022E-17	100.000			
59	-7.636E-17	-1.046E-16	100.000			
60	-1.326E-16	-1.817E-16	100.000			

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
61	-1.781E-16	-2.439E-16	100.000			
62	-2.615E-16	-3.582E-16	100.000			
63	-3.442E-16	-4.716E-16	100.000			
64	-3.914E-16	-5.362E-16	100.000			
65	-4.657E-16	-6.380E-16	100.000			
66	-4.994E-16	-6.841E-16	100.000			
67	-6.483E-16	-8.881E-16	100.000			
68	-7.696E-16	-1.054E-15	100.000			
69	-8.333E-16	-1.141E-15	100.000			
70	-9.156E-16	-1.254E-15	100.000			
71	-1.002E-15	-1.372E-15	100.000			
72	-1.102E-15	-1.509E-15	100.000			
73	-1.364E-15	-1.869E-15	100.000			

Extraction Method: Principal Component Analysis.

Table:II. Extraction from rotated component matrix

Factor No.	Code	Variable name	Factor loading in the principal component	Factor % of variance
1	PC53	Site conditions	0.814	21.386
	PC51	Types of structures	0.788	
	PC57	Access to site	0.761	
	PC55	Off site fabrication	0.709	
	PC52	Location	0.707	
	EFMC72	Level of competition	0.707	
	CPPM62	Type of contract/use of standard form	0.659	
	PC60	Quality of finishing	0.655	
	PC58	Intensity/complexity of building services	0.638	
	PC61	Project execution cost	0.637	
	CPPM65	Spread of risks between constr. Parties	0.601	
	PC50	Complexity	0.592	
	PC56	Types of cladding & external walls	0.581	
	PC49	Level of uncertainty of soil conditions	0.546	
2	CA40	Bond/warranty agreement	0.866	9.32
	CA44	Cost of unvitiated risks	0.833	
	CA43	Gaurantess	0.724	
	CA42	Branding of services & the service cost of managing business model	0.616	
	CA38	Present claims(size and quantity)	0.587	
	CA41	CDM regulations awareness	0.586	
	CA37	Previous claim records	0.578	
	CA39	Accident on site records	0.56	
3	CPPM63	Tender selection method	0.714	6.13
	CA30	Productivity effect	0.649	
	PC59	Phasing requirement	0.625	
	CA32	Mark up policies	0.582	

	EFMC74	Number of bidders(tenderers) in a competition	0.57	
4	EFMC70	Plants cost/availability	0.798	5.099
	CC11	Client requirement on quality	0.574	
	EFMC69	Labour cost	0.557	
	EFMC68	Material prices/availability	0.533	
5	CDP19	Submission of early proposal for costing/ cost control	0.777	4.494
	CDP21	Source of information	0.723	
	CC8	Partnering arrangement	0.525	
6	EFMC77	Change in political power	0.823	4.413
	EFMC76	Stability of market condition	0.682	
	CPPM64	Payment modalities	0.598	
	EFMC75	Interest rate/inflation rate	0.532	
7	CC6	Financial capabilities	0.72	4.283
	CC5	Type of client	0.696	
8	PC47	Height /number of storeys	0.757	3.877
	PC46	Size; gross floor area	0.73	
	PC48	Number of basement levels	0.531	
9	CDP17	Quality of design and specification	0.775	3.31
	PC54	Type of foundation	0.544	
10	CA29	Planning capabilities	0.806	3.037
11	CC12	Certainty of project brief	0.851	2.805
12	CA22	Management team	0.77	2.749
	CC9	Priority in construction	0.668	
13	CDP14	Buildability of design	0.811	2.324
	CDP20	Absence of alteration and late changes to deign	0.609	
14	CA34	Cost of finance	0.798	2.265
	CA35	Latent cost of variables	0.667	
15	CA27	Level of communication within contractor organization	0.767	2.16
	CA26	Current work load	0.586	
16	EFMC7	Weather condition	0.779	1.914

	1 CDP13	Completeness and timeliness of project	0.606	
17	CDP16	Variation orders and additional works	0.84	1.828
18	CA24	Financial capabilities	0.919	1.644
19	CA25	Experience on similar project	0.838	1.587
20	CA23	Management/ labour regulations	0.771	1.494
Redundant variables	CA36	Cost of registration with client		
	CDP15	Working relationship with client		
	CC7	Project finance method		
	CA33	Record of payment to subcontractor		
	CDP18	Inspection, testing, approval of completed works		
	CC10	Experience of procuring construction	<0.5	
	CPPM66	Claims and dispute resolution method		
	EFMC73	Government regulations/ policies		
	CA28	Estimation method and cost control		
	PC45	Type/function		
	CA31	Percentage of main contractor direct work		
	CPPM67	Payment modalities		

APPENDIX

Rotated Component Matrix[a]

	Component																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
PC53	.814	.061	-.061	.070	.025	.104	.218	.073	.233	.011	.086	-.033	.032	.128	.032	.183	-.063	.005	.122	-.020
PC51	.788	-.095	.183	.272	.075	.043	.031	.248	.046	-.013	.135	-.075	-.018	.138	.112	-.051	.054	-.085	-.111	.038
PC57	.761	.074	.020	.152	.190	.186	-.044	.145	.167	-.076	.002	.022	-.011	-.035	.163	.214	-.133	.086	.028	.011
PC55	.709	.153	.072	.069	-.377	.003	.064	-.092	-.201	.038	.031	-.217	.242	.007	.185	-.042	.133	-.060	.059	.158
PC52	.707	-.032	.258	-.003	.151	.121	.117	.092	.306	.026	.108	-.039	.096	-.246	.141	-.041	-.212	-.110	-.111	.135
EFMC72	.707	-.206	-.250	-.031	.195	.160	-.012	-.046	-.143	.009	.102	.280	.144	.046	-.109	.287	.018	.035	.026	-.090
CPPM62	.659	.044	.147	.062	-.029	.028	.122	.131	-.009	.114	-.185	.174	-.021	.384	-.288	.005	.010	.214	.066	.137
PC60	.655	.092	.132	.239	-.031	.047	.079	.098	.192	-.029	-.299	-.002	.023	.086	-.169	-.054	.068	.046	.232	.093
PC58	.638	.303	.225	.307	-.059	-.064	-.095	.000	-.135	-.026	.202	.196	-.006	-.019	.084	.017	-.115	-.037	-.023	-.236
PC61	.637	.162	.122	.275	.206	.235	.152	-.015	.178	.025	-.081	.028	-.053	.235	-.105	.166	.114	.159	.131	-.042
CPPM65	.601	.228	.176	-.139	.279	.349	.020	.178	-.087	.254	.024	.165	-.123	-.074	-.009	-.060	-.092	-.009	.106	-.139
PC50	.592	.039	.387	.158	-.112	.005	-.043	.321	.007	.265	.149	.184	.075	.034	-.049	.054	-.001	-.204	.072	-.032
PC56	.581	.117	.179	.452	-.217	.182	-.044	.153	.051	-.083	-.216	.061	.032	.144	.162	.160	.165	-.106	-.133	-.001
PC49	.546	.064	.082	-.179	-.076	.145	.318	-.056	.251	.326	.370	-.141	-.040	.146	.012	.107	.127	-.064	-.024	.019
CA40	.047	.866	.175	.033	.077	.028	.070	.071	.127	-.137	.035	.091	.070	.058	.047	.011	.012	.146	-.024	.111
CA44	.006	.833	.001	-.112	-.220	.078	.224	.019	-.098	.135	-.006	.033	-.029	.071	.046	.053	.041	-.135	.037	-.003
CA43	.077	.724	-.025	.089	-.102	-.138	-.162	.257	-.028	.038	-.005	-.069	.100	-.012	.043	-.020	-.103	.437	-.117	.032
CA42	.094	.616	.168	.004	.221	-.137	-.354	.038	-.003	.033	.018	.116	.237	.153	.005	-.120	.299	.082	.078	.004
CA38	.126	.587	.001	.230	.102	.035	-.063	.064	.000	.067	.258	-.158	-.276	.112	-.270	.228	.213	-.211	-.091	-.060
CA41	.100	.586	.315	.132	.484	.068	-.067	-.081	.084	-.020	.145	.061	.235	-.151	.128	-.146	.106	-.054	.050	-.036
CA37	.190	.578	-.081	-.034	.155	-.005	-.021	-.087	-.320	.332	-.002	-.083	-.210	.084	-.021	-.355	.231	-.100	.037	.174
CA39	.069	.560	.140	-.065	.359	-.105	-.108	.015	.077	.317	.025	-.119	-.219	.083	.285	.185	.046	-.062	-.303	-.051
CPPM63	.329	.122	.714	.034	-.128	.174	-.019	.100	.171	.012	.196	.210	-.107	.114	-.017	-.023	-.141	.170	-.043	.017
CA30	.040	.308	.649	.008	.061	.069	.239	-.048	.002	.286	.083	.070	.211	.014	-.141	.051	.196	.112	.237	-.052
PC59	.013	.397	.625	.064	.146	.056	.165	.228	-.075	-.014	-.160	-.182	.083	-.038	.316	-.032	.011	-.115	.037	.072
CA32	.292	.282	.582	.015	-.224	-.052	.096	.227	-.045	-.027	.188	-.351	.248	.084	-.076	.052	-.032	-.169	.087	.160

EFMC74	.335	-.041	.570	.305	.180	.049	-.002	-.173	.001	.079	.164	.034	.058	.052	.320	-.231	-.254	.015	-.044	-.060
EFMC70	.360	-.053	.019	.798	-.071	.252	.114	.046	.072	.019	.097	.030	.044	.107	.050	.091	.008	-.042	-.001	.084
CC11	.213	.001	.013	.574	.004	.064	-.064	.143	.351	.146	-.115	.239	.195	-.111	-.060	.155	.140	.068	-.243	-.066
EFMC69	.409	.036	-.003	.557	-.027	.086	.348	-.006	.176	.283	.033	.114	-.001	-.078	-.042	.063	-.021	.231	.322	-.015
EFMC68	.330	.014	.139	.533	.033	-.033	.247	.116	.345	-.083	.147	.117	.046	.148	.072	.157	-.201	.333	.203	.065
CDP19	.239	.091	.039	.033	.777	-.020	-.155	.137	-.093	.279	-.122	.090	-.019	.062	.057	.208	.185	-.058	.041	.110
CDP21	.101	.058	-.102	-.039	.723	.058	.281	-.160	.173	-.089	-.052	-.021	-.059	-.170	.323	-.042	-.083	-.028	-.016	.103
CC8	-.099	.263	-.133	-.086	.525	.083	.027	.158	.200	.109	.403	.339	.209	.168	.061	-.023	-.094	-.113	-.101	-.156
EFMC77	.199	-.026	.057	-.020	.033	.823	-.045	.076	.065	.148	.114	-.069	-.047	.095	.219	-.105	.201	-.128	-.049	.036
EFMC76	.271	-.049	-.018	.371	-.010	.682	.073	.141	-.083	.165	-.015	-.073	.071	-.034	-.095	.158	-.014	.135	.101	.012
CPPM64	.232	-.046	.175	.277	.036	.598	.246	.111	.169	-.104	.054	.092	.041	.374	-.160	.028	-.142	.198	.093	-.068
EFMC75	.333	.040	.055	.129	-.146	.532	.083	-.170	-.206	-.019	.048	-.123	.483	-.091	.053	-.038	.151	-.125	.251	.002
CC6	.186	-.167	.155	.031	.121	.225	.720	.142	.173	.062	.012	.083	-.135	.075	-.025	.147	-.059	.119	-.002	-.068
CC5	.230	.065	.038	.174	-.057	-.091	.696	-.058	-.173	-.154	.020	.170	.211	.209	.106	.138	-.136	-.040	-.005	.073
PC47	.279	.045	.075	.111	.068	.228	-.080	.757	.262	.004	.030	.150	.177	-.024	.034	.038	-.007	.016	-.044	.130
PC46	.282	.221	.058	.099	-.054	.012	.255	.730	-.162	-.066	-.061	.011	.066	.189	-.157	.133	.237	.102	.110	.048
PC48	.418	-.083	.110	.010	.001	.151	.010	.531	.346	-.128	.104	-.150	.304	.030	.162	-.089	.006	.032	-.086	-.215
CDP17	.337	-.030	.065	.248	.192	-.048	-.011	.066	.775	.057	.167	-.013	.095	.014	.036	.030	-.022	.030	.023	.107
PC54	.344	.029	-.139	.108	-.356	.063	.091	.139	.544	.183	-.174	.104	.081	.073	-.150	-.089	.097	-.093	-.209	.196
CA29	.024	.089	.077	.159	.093	.190	.008	-.059	.112	.806	.003	.093	-.014	.111	.176	.021	.012	-.009	.102	.051
CC12	.127	.164	.144	.133	-.052	.094	-.008	.031	.053	.010	.851	.000	-.043	.063	.048	-.001	.078	-.037	-.131	.044
CA22	.042	.096	-.022	.203	.046	-.074	.124	.125	.048	.065	-.148	.770	-.059	.227	.113	.206	.081	-.006	.157	.117
CC9	.194	-.086	.147	.090	.099	-.010	.186	-.019	.020	.120	.420	.668	.019	-.026	.017	-.105	.135	.087	-.156	-.070
CDP14	-.017	-.024	.169	.099	-.001	-.011	.038	.210	.153	-.077	.021	.024	.811	.110	.042	.121	.067	.064	.054	.091
CDP20	.275	.025	-.051	.004	.124	.071	-.132	.165	.000	.197	-.466	-.131	.609	.135	.117	-.047	-.090	-.158	-.250	-.074
CA34	.129	.136	.117	.171	-.055	.096	-.008	.169	.004	.173	.053	.135	.024	.798	.137	-.015	-.037	.157	-.012	.135
CA35	.404	.125	-.084	-.105	-.007	.052	.267	-.120	.022	-.025	.083	.015	.228	.667	.103	-.038	-.001	-.124	.046	-.051
CA27	.051	.092	.035	-.015	.311	-.012	.120	-.093	-.027	.163	-.038	.180	.061	.162	.767	-.038	.201	-.008	-.010	.002
CA26	.196	.137	.315	.021	.034	.206	-.117	.258	.029	.057	.292	-.016	.140	.107	.586	.212	-.052	.054	.104	.087

EFMC71	.329	-.008	-.134	.134	.144	.106	.152	.073	-.066	-.104	.040	.072	.037	-.005	.072	.779	-.144	.004	.121	.115
CDP13	.377	.018	.179	.107	.004	-.139	.248	.009	.122	.221	-.020	.101	.090	-.030	-.101	.606	.194	.081	.062	-.009
CDP16	-.042	.129	-.057	.006	.020	.097	-.095	.100	-.021	.035	.113	.105	.066	-.045	.095	-.044	.840	.003	.069	.053
CA24	-.041	.035	.040	.066	-.033	.038	.067	.032	.012	-.020	-.026	.035	-.027	.074	-.004	.038	.031	.919	.041	.079
CA25	.160	-.103	.081	-.022	-.012	.067	-.028	.011	-.051	.089	-.145	.001	.017	.032	.037	.114	.085	.019	.838	.161
CA23	.058	.126	.018	.092	.077	.100	-.008	.119	.173	.092	.016	.045	.128	.153	.079	.082	.110	.179	.315	.771
CA36	.091	.497	.179	-.180	.194	-.095	-.055	-.312	.066	-.233	.210	-.093	-.148	-.129	-.153	.074	-.101	-.087	-.157	.425
CDP15	-.005	.190	-.002	.145	.153	-.162	.353	.276	-.119	.053	-.088	.303	-.214	-.114	.141	.243	.245	.169	-.067	.331
CC7	-.123	.084	.119	-.142	.149	.448	.267	.194	.220	.097	.024	.078	.050	.359	.136	.358	-.098	.272	.016	.270
CA33	-.123	.488	.238	-.096	.375	.021	-.010	-.142	-.154	.247	.128	.077	-.295	.268	.007	.139	-.056	.084	-.182	.215
CDP18	-.108	.357	-.224	.056	.195	.160	-.214	-.212	.301	.060	-.132	.278	-.157	.151	.175	.240	.406	.034	.079	.186
CC10	.049	.037	.178	.484	-.015	-.077	-.111	-.018	-.015	.386	.232	.221	.134	.095	-.234	-.305	.013	.290	-.136	.128
CPPM66	.366	.323	.183	.013	.052	.425	-.205	.068	-.158	.416	-.073	.202	-.106	-.062	-.202	-.009	.042	-.045	-.077	.063
EFMC73	.380	.048	.463	.076	-.111	-.058	-.073	-.104	-.189	.126	-.023	.343	.057	.058	.075	.092	-.364	.331	-.070	.044
CA28	.001	.408	.192	.433	.160	.113	-.235	.139	-.017	.339	.217	.213	-.150	.112	.013	-.281	-.033	-.074	.224	-.051
PC45	.341	.242	.201	.389	.035	-.129	.324	.259	-.084	.170	.187	.010	.020	-.302	-.327	.090	-.141	-.051	-.165	-.055
CA31	.265	.451	.337	.174	-.415	.130	-.233	-.079	.088	.226	.082	-.010	-.102	-.044	.173	-.152	-.092	-.045	.124	-.222
CPPM67	.100	-.080	.416	-.013	.387	.307	-.002	.108	.024	-.163	-.161	-.053	.101	-.096	.254	.115	.329	.180	-.008	-.366

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 29 iterations.