AN ASSESSMENT OF THE VARIABILITY OF COST AND TIME RELATED ITEMS OF PRELIMINARIES IN BUILDING CONTRACTS IN NIGERIA

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AHMADU BELLO UNIVERSITY, ZARIA.

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DEPARTMENT OF BUILDING

AHMADU BELLO UNIVERSITY, ZARIA.

June 2006.

DECLARATION

I declare that the work in the thesis entitled *An Assessment of the Variability of Cost and Time Related Items of Preliminaries in Building Contracts in Nigeria* has been performed by me in the Department of Building under the supervision of Dr. J.O. Kehinde.

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 any University.

Abdullahi, Gimba Mohammed	**Signature**	**Date**

CERTIFICATION

This thesis titled AN ASSESSMENT OF THE VARIABILITY OF COST AND TIME RELATED ITEMS OF PRELIMINARIES IN BUILDING CONTRACTS IN NIGERIA by ABDULLAHI GIMBA MOHAMMED meets the regulations governing the award of the degree of Master of Science, of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to my late father, **Mallam Abdullahi Ogwoni.**

ACKNOWLEDGEMENT

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ABSTRACT

Preliminaries in building construction contracts are allowed for the support services provided on to the main work. Some studies show that they account for as much as ten percent (10%) of the total cost of the contract. There has not been any precise approach to the determination of the total cost of what should consist of preliminaries. This study seeks to establish the variability in the total cost of preliminaries in building projects and that of the various items. The main objective was to establish the cost significant items of preliminaries and to provide guide to assist practitioners in the pricing and management of preliminaries in building contract. The method adopted involved the collection of primary data on completed projects and the administration of questionnaires. Sixty (60) completed projects were studied and sixty (60) questionnaires sent out. Forty five (45) of the questionnaires were completed and returned by respondents. The data collected were analysed using some statistical tools such as the measure of central tendency, test of significance and regression analysis. The results revealed that provision of preliminaries is very important in the execution of building contract and that the most appropriate method of pricing and valuing them is to consider the individual items. The study showed that there exists very high variability in the provision of preliminaries among various projects as well as among the various items of preliminaries. Strong positive relationship ($r = 0.974 – 0.999$) exist between the initial and final sums of the various preliminaries item. The study concluded that preliminaries are an indispensable part of construction contract execution for efficient delivery. The pricing of the various items that constitute the preliminaries can ensure adequate provision for this important element of a building contract. Therefore, it is recommended that consultants give detail information on the items so that they can be priced to reduce variability.

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ABBREVIATIONS

CS	-	Contract Sum
COC	-	Clearing on completion
FAB	-	First Aid Box
I & G	-	Insurance and Guarantees
PP	-	Progress photographs
SA	-	Site accommodation
S & A	-	Supervision and Administration
SS	-	Service to site
SO	-	Setting out
SB	-	Sign Board
SP & S	-	Site plant and scaffolding
TPS	-	Total preliminary sum
T & S	-	Testing and samples
WW	-	Water for works
W & L	-	Watching and lighting

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

For the successful execution of most types of construction works provision for some support services on to the main work has to be made. These support services may be required either at some particular points in time or throughout the construction period in the form of temporal buildings (for example offices and stores), equipments, services, and personnel. Though these services have come to be known and referred to as preliminaries, they are not necessarily restricted to only the initial preparations required for the commencement of the works. Items that are usually listed in the preliminaries section include site office, storage facilities, watching and lighting, temporary fencing and access roads, welfare and safety, first aid Box, temporary storm water drainage, setting out, telephone, progress photographs, performance bond, named board, licences, power, water, scaffolding, project vehicles, etc.

According to Ayeni (1997), the preliminaries section of the bills of quantities refers to all temporary works needed for the smooth execution of the main project Smith (1988), stated that the items found in the preliminaries section of a bill of quantities are difficult to price, and that the pricing are usually done arbitrarily. And agreed that if several priced bills (tenders) are examined for any one project, the preliminaries section of the tenders would produce variability in prices with each estimator/tenderer having their own idea as to the magnitude of the costs involved. Kehinde and Aiyetan (2001) examined the relationship between preliminaries cost and initial contract sum in building contracts and found that most times both consultants and contractors show

preference for the use of a percentage to cover the cost of preliminaries which may be as high as 10% or even more. What this means is that preliminaries provision represents a considerable fraction of the total cost of construction contracts.

It is pertinent to mention here, the contributions of Ogunsemi and Jagboro (2001), and Kehinde and Aiyetan (2001), they provided an insight into the various factors which influence the provision of preliminaries. While Ogunsemi and Jagboro developed a model for predicting the cost of preliminaries in residential buildings, Kehinde and Aiyetan suggested a model for predicting the cost of preliminaries in building projects generally. These studies however, did not address the variability in the cost of various elements of preliminaries in building construction projects.

Experience has shown that the provision for preliminaries depends largely on those parameters that would influence the preliminaries of the project. Some of these parameters are size of the contract, the complexity of the works, cost of construction, duration of the contract, and location of the project. To be able to assess and provide adequately for preliminaries a very sound knowledge of the detailed construction processes, techniques, programming, and management is desirable. The experience of the estimator/tenderer may have effect on the variability of the provision.

The management of the financial provision of preliminaries is as important as the management of the financial provision of the measured works of the main project. Turner (1979) affirms that there are problems with valuation of preliminaries and identified two main problems with the valuation of preliminaries as follows:

i) That a number of items of preliminaries cannot be related to progress as can be done with the measured items of work.

ii) That contractors adopt widely differing methods in presenting their prices.

Usually for the purpose of interim valuations and final account, preliminaries are broadly divided into three groups Seeley (1996):

a) Lump sum payment at defined times within the contract period. Examples include site office establishment and its removal at the end of the project, provision of access road and project signboard where applicable, the initial temporary plumbing installation for water supply to site, and setting out.

b) Time related payments. Examples include security, site management personnel, scaffold, and telephone.

c) Cost related (value of measured works). The cost of preliminaries here is fairly directly related to the expenditure on measured items. Examples include water supply for the works, and power.

This study sought to establish the variability in the time and cost related items of preliminaries with a view to understanding the magnitude of the problem and proffer solution.

1.2 Need for the study

The demand from clients for higher value on money spent has been on the increase, this is further heightened by the dwindling performance of the nation's economy. Previous studies on preliminaries have revealed that they account for as much as ten percent (10%) or more of the contract sum of building projects, Kehinde and Aiyetan (2001) however, the relationship between the various items of preliminaries and their contributions to the total of preliminaries has not been established.

The study seeks to identify those items of preliminaries that contribute significantly to the total provision of preliminaries and also to establish the strength of the relationship that exist between the various items of preliminaries and their variability. It will also appraise the provision and administration of preliminaries items in building projects in Nigeria.

1.3 Aim of the study

The study aims at determining the variability of the cost and time related items of preliminaries towards improving its application and management in building contracts.

1.4 Objectives of the study

The objectives of the study are:

i) To identify the cost significant items in the cost and time related items of preliminaries and examine their contributions to the total provision of preliminaries in building projects.

ii) To determine the relationships between initial and final preliminaries sum and the relationships between initial and final sums of the various items of preliminaries.

iii) To establish the variability of cost and time related items of preliminaries in building projects

1.5 SCOPE AND LIMITATIONS

The study is intended to cover only cost and time related items of preliminaries of completed building projects executed in the years 1994 – 2003. Additional to the set back caused by the non availability of the final accounts of some of the projects studied is the poor attitude in record keeping of some of the offices from which data were collected.

The effect of inflation on the cost of projects within the period covered by the study is not considered in this work.

CHAPTER 2

LITERATURE REVIEW

2.1 CONSTRUCTION PROCESS

The process of construction commences with the engagement by the client of a team of construction professionals to design and in most cases also determine and advise on the procurement method most suitable for the delivery of the building product being desired. According to Seeley (1996), at the inception stage of a building contract, the building client considers his building requirements and appoints an architect, and at scheme design stage the brief is completed and the design team develops the full design of the project.

Depending on the building type and its characteristics, the contractor will decide on which construction method to use. Whatever method of construction is adopted, some basic resources will be needed; an example is plant and equipment. The application of these resources will not be limited to the actualisation of only a component or element of the building; they will be used in the delivery of several other components/elements of the building. Slaughter (1998) holds the view that unlike chemical processing, construction resources can be reassigned among different activities, and retained for a

specific step in the process and that in addition; construction processes are performed simultaneously across spatial segments of the project, sharing the non-dedicated resources, rather than in a set location with a specific capacity.

Seeley (1996) explained that a contractor's constructional method can increase the effectiveness of the resources used, and that the free choice of method is constrained by the design of the building and the availability of the numbers and types of resources needed for each method.

Experience has shown that the design attributes of a building project and nature of site have a great effect on the construction process. Slaughter (1998) posited that the design attributes (e.g. type, size and number of structural members) and the site characteristics can influence the construction process through either change in the production rates or in the strategy for material delivery. According to Roy et al (2004), the masonry construction method prevalent in the industry gives rise to inherent quality problems due to the use of 'wet trades' and that the use of sub-contract labour makes quality control problematic. They further held that the shortage of well trained workforce has exacerbated the situation of quality control. Although no reference can be made to any particular study to confirm this position as it applies to our own environment, it can be safely deduced that the situation is not deferent with us. Consequently there is a high demand for competent and experienced site foremen which already constitute an item of the preliminaries.

Aside of design attributes and site limitations, other limitations exist which have effect on construction processes, again Slaughter (1998) stated that technical constraints, such as stability and access to the working surface have effect on the technical performance of the system during construction. He held further that; regulatory constraints can influence both the construction means and sequence of the processes, with the primary concern for safety of the workers and the public. While these constraints can be fixed boundaries and rules on the performance of the construction tasks, resources constraints also exist, since the resources are re-assignable to many different tasks, and often must be shared Slaughter (1998). Amongst the items spelt out in the preliminaries section of building projects bills of quantities are access to working surfaces and safety of workers and the public for which contractors are expected to price. On the list of preliminaries items also is programme of works which takes into consideration the times and durations for which the common resources shared are required.

It is becoming increasingly desirable to involve contractors in the design process from beginning so that their expertise is employed towards an efficient delivery. Jergeas *et al* (2001) argue the inclusion of knowledge and experience into the planning and design of a project can result in reduced installed cost and improve safety during construction. Many problems arise due to a culture that is tolerant of failures, with an industry focused on completing tasks as quickly as possible and placing insufficient emphasis on quality Roy *et al* (2004).

Jergeas *et al* (2001) argued further that the full benefits of construction experts are often not realised because the clients consultants will not be responsible for the actual construction of the facilities and suggested that to capture the most significant benefits

of construction processes the traditional contracting approach had to be cast aside and construction contractor must be brought into the project from the very beginning before the design, specifications, and procurement strategy are established. The involvement of a contractor at the design stage of a project will contribute largely in the reduction of the cost of the support services required, for example in the area of site organisation and use of plant and equipments.

The situation in the industry has remained such that the demand for and pressure on the available qualified works supervisors and managers is on the increase. This is heightened by the drop in the number of skilled and trained personnel on project sites. Roy *et al* (2004) states that builders have been reluctant to make long – term investment in the workforce that may also be working for its competitors and that there has been a decline in training schemes within the construction industry as a whole which has resulted in serious skill shortage. The poor culture of the industry practitioners in documentation has not helped in the improvement of quality and standards. Unlike in the manufacturing industry 'there is a lack of any process documentation and even standards'. This does not encourage process review and, even when innovations do occur, the dissemination of new knowledge is slow due to the lack of formal mechanisms for sharing best practice. The strong regional structure in the industry also makes it difficult to develop corporate standards (Roy *et al*, 2004).

2.2 THE CONCEPT OF PRELIMINARIES IN BUILDING CONSTRUCTION

In every construction project, the builder will incur some costs in establishing the site, providing the basic and fundamental necessities in attaining smooth and effective project delivery while PMA's Inland Revenue (2005) stated that preliminaries are costs usually incurred in the process of any construction, and that some of them do not bear direct relationship with the works themselves but are vital for the effective and successful delivery

of the project. It stated further that they are indirect costs incurred over the execution of a project. According to NBS (2005), the purpose of preliminary is to describe the works as a whole, and to specify general conditions and requirements for their execution, including such things as subcontracting, approvals, testing and completion.

Much as preliminaries are necessary support services to the final product of building elements, Kehinde and Aiyetan (2000) held the view that preliminaries do not always have a direct bearing on the finished work and cannot be distinguished as part of a finished component of a building. The amounts involved in these indirect costs vary depending on the conditions within which the project is to be executed and the environment too. The NBS (2001) reported preliminaries as items, of cost significance, required by the method and particular circumstances under which the work is to be carried out, and those costs concerned with the whole of the works rather than just work sections. These costs may either be 'one off' fixed costs, such as the cost of bringing to site and erecting site accommodation (*and subsequent removal*) or time related, such as the heating, lighting and maintenance cost for that accommodation.

Although, Hall and Tomkins (2001), showed that while a substantial proportion of the preliminaries to a project may be necessary, they do not, infact, contribute to the final constructed product and, thus, were non-value adding. For example, substantial items included are: hoarding, preventing unauthorised movements of men and materials within and from the construction site; non-productive labour employed on moving materials and equipment around the site, etc; and site staff: to ensure that the works progress to plan while preventing accidents, resolving problems as they arose and ensuring that quality met prescribed specification, etc. This view, that preliminaries are non-value adding, is contestable and not likely true for all projects. Preliminaries may not be directly associated with any particular or singular item of the works, but are

essential for the successful delivery of the finished product, on time and at specified quality.

Kehinde and Aiyetan (2001) posited that the preliminaries section of the bills of quantities refers to site costs, which are relatively fixed, in that they do not vary directly with the immediate costs of labour, material and plant going into pieces of physical construction. Further, they held the view that like overheads, preliminaries are better dealt with separately, and that the term preliminary does not necessarily mean that they are performed first as some removal of temporary works may come last. They also stated that preliminaries are items of cost importance that have a direct bearing on the contract sum and affect the contractor's profitability level, even though they cannot be measured in terms of standard units of measurement. It can be deduced from this view that the items and section of preliminaries are flexible to handle and subject to easy manipulation.

According to Seeley (1996) a contractor frequently incurs very high costs in setting up his site organisation and that the recovery of such costs by monthly proportional valuation, as a quick and simple method of assessment, will be far less than the actual costs expended in the early stages of the contract that the preliminaries section of a bill of quantities gives the contractor the opportunity to price items of an organisational and general nature, which affect the cost of works that are not restricted to any particular works section.

Ayeni (1986) posit that all the works required in this section are temporary works needed for the smooth execution of the main project the preliminaries section and that

items are never presented in quantified form but itemised. In the view of Ishaya (1999), preliminaries cover items in a contract that are so general to it as not to be ascribed to any measured items of work in the contract bills of quantities. The bills of quantities set out all circumstances and conditions that may affect the estimator's price. Such items as are of a general nature and not referring to any particular trade will be set out in a 'preliminary' bill Willis and Willis (1978). Babalola and Jagboro (2002) opined that 'preliminaries can be said to include items of work that aid the erection of building structures but are not part of the main structure.

2.3 ITEMS OF PRELIMINARIES

The composition of the preliminaries section of the bills of quantities varies generally depending on the nature of project and location. However, there are some basic items, which are of common occurrence no matter the nature of the project and location, for example storage, water supply, security and supervision.

The more complex and expansive a project is the more elaborate 0will be the site establishment. According to Ayeni, (1987) preliminary items are inexhaustible because they depend on the nature, complexity and location of the site.

The report by NBS (2005) states that "these cover general things such as information about more detailed requirements on safety, security, method sequence and timing of the work, facilities and services. Items of a general nature and those not referring to any particular trade are set out in a 'preliminary' bill Willis and Willis (1978).

The Standard Method of Measurement seventh edition (1998) listed the general items of preliminaries in contract. These items are:

Project particulars, Tender and contract documents, The site/Existing building, Description of the work, The Contract/Sub-contract, Employer's requirements: Tendering/Sub-letting/Supply, Employer's requirements: Provision, content and use of documents, Employer's requirements: Management of the works, Employer's requirements: Quality standards/control, Employer's requirements: Security/Safety/Protection, Employer's requirements: Specific limitations on method/sequence/timing/use of site, Employer's requirements: Facilities/Temporary works/Services, Employer's requirements: Operation/Maintenance of the finished building, Contractor's general cost items: Management and staff, Contractor's general cost items: Site accommodation, Contractor's general cost items: Services and facilities, Contractor's general cost items: Mechanical plant, Contractor's general cost items: Temporary works, Work/Products by/on behalf of the Employer, Nominated sub-contractors, Nominated suppliers, Work by statutory authorities/undertakers, Provisional work, Dayworks, Preliminaries/General conditions for demolition contract, Preliminaries/General conditions for investigation/survey contract, Preliminaries/General conditions for piling/embedded retaining wall contract.

Kehinde and Aiyetan (2001) identified the list of common items of preliminaries, in most building contract as contained in the bills of quantities to include those items of works that ensure smooth execution of the project. These include amongst others; access road, storage facilities, offices, water, transportation of materials to site, electric power supply for site operations, security of the day and night guardsmen, security of materials, accommodation, foreman in-charge. Ishaya (1999) gave examples of items covered in the preliminaries bill to include description of the works , form of contract to be used, supervision , water for the works and insurance, Site Preliminaries (2005) listed

the components of preliminaries as site administration, cleaning, fees, hoardings and scaffolding, insurance, plant, site establishment, site accommodation and storage, site personnel, temporary services, while in wood (1986) the following basic preliminary items are considered for pricing on every contract, site supervision, temporary offices, small plant, haulage and unloading plant, cranes, passenger lifts, concreting plant and hoist, scaffolding, safety measures, code of welfare conditions, telephone, temporary roads, temporary compound, hoardings, screens, gantries and walkways, setting out, attendance on clerk of works, watching and lighting, temporary power and site lighting, pumping and baling (unless in excavation), travelling time and fares, additional overtime, notices and fees to local authorities and public undertakings, transportation, maintenance of public and private roads, weather protection and precautions, protection and casing of finished work, cleaning, testing materials, temporary water on site, insurances.

The PMA's Inland Revenue (2005) added items like management, insurance, general-purpose labour, temporary accommodation, and security as those included as preliminaries. Preliminaries can be classified further into groups, namely those that have to do with the duration of the works, those that are associated with the cost of the project and those that do not have any bearing with either of these but occur only once in the life of the contract. Sometimes some preliminary items could be both time and cost related. According to Ramus (1990) preliminaries are of four kinds, namely, Cost related, Time related, single payment or a combination of two or more of the others. Those that are cost related (e.g. water for the works) depend for their value on that of the remainder of the contract sum of its labour content.

Time related items e.g. site supervision depends for their value on the contract period. Single payment items, e.g. the provision of temporary access roads, are those whose value is not affected either by the value of the rest of the contract or by the contract period but carried out at a particular point in the progress of the works' and Seeley (1996) corroborated this statement by stating that preliminary items may be cost related, time related, or lump sum or a combination of three categories.

2.4 FACTORS THAT INFLUENCE VARIATIONS IN PRELIMINARIES

Variation to Specification

Cost of preliminaries tends to respond to changes in the content of the contract. That is to variations in specifications of works, or extension of time granted by the architect or engineer where the extension of time is as a result of consultants/clients action or inaction. According to Ramus; (1990) some contractor's surveyors have argued that if the value of the job is increased by variations, then the preliminaries should also be increased in proportion, on the grounds that by and large they are affected by the size and value of the contract. In the event where an extension has been granted by the architect on account of variations, then those preliminary items with time related content may be considered as ranking for a proportionate increase in that content, while the cost related and fixed charge elements remain unchanged. Because many preliminary items bear a certain relation to time, it will appear that the adjustment of preliminaries in relation to extension of time is straight forward Ishaya, (1999). Experience has shown that this is not true. The causes of extension of time which may entitle the contractor to a claim on preliminaries may be inter related and could entail some rigorous computation. In Ishaya's (1999) words ' in computing adjustment of preliminaries as a

result of extension of time , the effect of overlapping delays need smoothening and over assessment must be avoided'.

While, Turner; (1980) held the view that where the works fall behind programme the payment of preliminaries, in so far as it is related to time, should be set back by the same interval rather than spread over a long period more thinly. He stated further that if the delay leads to loss and expense claim, the contractor will receive an additional sum covering the prolongation.

Seeley (1996) argued that the value of preliminaries may be increased because of a number of the components being directly related to the contract period and listed the items of preliminaries to include the following; salaries of site staff; cost of plant and scaffolding retained on site; temporary lighting; offices and stores retained on the site and their upkeep; safety measures; protection of the works; insurance premium, telephone costs; electricity costs; and rates on site buildings. A recommendation of the valuation of additional, omitted or substituted work, allowance is to be made for any addition to or reduction of preliminaries items, where these can be properly valued by measurement. Where an extension of time is granted by the architect, then those items of preliminaries with a time related contents may be proportionately increased cost wise Seeley (1996). It is good practice to agree on the detailed breakdown of preliminaries after award of the contract (prior to the first valuation); it provides a sound basis for the valuation preliminaries during the currency of the contract Ishaya (1999). This will facilitate the evaluation of claims that has to do with preliminaries in the contract.

2.5 *PRICING OF PRELIMINARIES*

All the items of preliminaries in a building contract are expected to be priced as listed, the non pricing of some or all of the items does not relieve the contractor of his

obligation to provide them. According to Ramus; (1997), it is intended that in the preparation of bills of quantities opportunities should be given for a fixed charge and a time related charge to be included for all items of Employer's requirements and contractor's general cost item.

Pricing of preliminaries in contract is as inconsistent as it is irregular. Ramus; (1997) observed that 'sometimes a tenderer will not price most or any, of the preliminaries items, their value being included in some or all of the measured rates' and they may price preliminaries by putting amounts against all, some, one or none of the price able items in the preliminaries section. It is not uncommon to deal with the total value of the preliminaries as if the items were either all cost related or all time related, thereby calculating the total of preliminaries as a percentage of the contract sum'. Seeley (1996) revealed that a contractor often prices his on-site and contract cost in the preliminaries and that these may amount to 5-20% of the contract sum. This scenario paints a picture of jungle of ideas or practice in the pricing of preliminaries.

Kolo; (2005) reported in his study that there have been various arguments that the contractor is in the best position to estimate the cost of construction projects due to the fact that they know the amount of labour allocation to the various tasks and activities and the technicalities involved from a practical point of view. From the foregoing one will be tempted to take whatever comes from the contractor as completely reliable, however, this is arguable because the contractor has personal interest for profit in the project.

According to Kolo (2005) the conventional or traditional cost estimating technique continues to be the most favoured in the construction industry, and the technique entails pricing of construction resources in detail. This view contradicts the practice of some contractors who find it more convenient to price some of the resources as a lump sum. Pricing of preliminaries is certainly one area of contract preparation that has not received adequate attention.

When tenderers price preliminaries items at all, they either display lack of understanding and knowledge of the purpose for which preliminaries are meant or lack of enough time to adequately attend to them. In some cases, preliminaries are considered as a cushion by contractors to absorb strains in the contract or to negotiate a discount on the contract when the need arises. This can be explained by the application of a percentage on the contract sum for preliminaries, when in actual sense preliminaries should not be a factor of a percentage on contract.

According to Giwa (1982), most building contractors need to be acquainted with contract conditions, preliminaries and trade preambles section of the bills of quantities. He stated further that the section has been found to be least understood by many contractors. Additional to the understanding of the section on preliminaries, it is of utmost importance that the estimator be very experienced. Lowe (1998) observed that the single most important factor in the production of any accurate estimate is an estimator's experience and expertise.

According to Evans and Kaka (1998) a contractor might have a policy that chooses to front-end load the project or make adjustments to the preliminaries and further

explained front-end loading as the situation whereby the earlier items in the bill of quantities carry a higher margin than the later items. Gunner and Skitmore (1998) stated that the proportion to apply for preliminaries items is always expressed as a single lump sum item calculated as a percentage of the value of measured work. According to Ishaya (1999) the method of pricing preliminaries varies from one firm to another, while some price the individual items in the bills which he says is the preferred method, others price the entire preliminaries bill as a single lump sum, he stated further that 'a sound pricing strategy is that which bears in mind the fact that the contract bills and indeed the bill for preliminaries are meant to provide a firm bases for financial control of the contract'. What this simply means is that a bill of preliminaries that is badly priced will give rise to poor financial management of the contract. In another statement, Ishaya (1999) stated that the bill is placed at risk of loosing its efficacy as a vehicle for financial control where pricing is done on a lump sum basis either for individual items or for the entire preliminaries. This in his vie will create problems when valuing works in progress and in the evaluation of variations and other contractual claims at the post contract phase.

In most cases the contractor's tendering strategy will be reflected in the manner in which he prices the preliminaries as this remains the only area where the contractor has any significant liberty to adjust his tender and seek a competitive edge, Ogunsemi and Jagboro **(**2001). It can be deduced from this position that preliminaries as critical as their provisions are, they are considered as items or sections of the contract which do not pose any serious consequence with changes in the sums allocated to them. Depending on the magnitude and complexity of the contract preliminaries account for 3-5% Ishaya (1999).

2.6 POST CONTRACT MANAGEMENT OF PRELIMNARIES

If preliminaries are priced as a lump sum, or one or two items arbitrarily carry the whole value, some analysis of the figures may have to be agreed for the purposes of the interim valuations Turner (1979). According to Ramus (1997) where there is a bill of quantities, the evaluation of preliminaries will be less difficult than where there is none.

There have been several approaches to the valuation of preliminaries at the post contract stage. Three methods were identified by Seeley, (1996), they are; valuation based on the amount of work done, assessment of individual items of preliminaries, and that based on the duration of contract which has elapsed.

Two of the three methods are very simple in application, they are the method based on the amount of work executed and the duration of contract elapsed Seeley, (1996). He affirm further that these two methods are not realistic and that the more realistic and accurate approach is the third one in which the various items of preliminaries are assessed. He stated that whichever method is adopted will depend on how the preliminaries are priced and that the Quantity Surveyor will require skill in giving a fair assessment and value. According to Turner (1979), the simplest approach to valuing preliminaries at post contract is to relate payment directly to measured work by a percentage. He opined that this method will safeguard the client's interest because payments are spread while the contractor will prefer percentage application base on time because of the heavy early payments usually incurred. Three methods in all were also recognised by Turner (1979); lump sum at a defined time in contract; cost spread throughout the progress and related to time; as a cost incurred in a fairly direct relation to the expenditure on measured items.

Ramus, (1997) affirm that difficulty can still exist in valuing even where bills of quantities are priced because the contractor may not price all of the items. The methods of valuing preliminaries identified by Ramus, (1997) is similar to those of Seeley, (1996) and Turner (1979).

According to Ramus, (1997), in the application of two of the methods, that is, value of preliminaries as a percentage of work done or percentage of duration of contract elapsed, there can easily be overpayment on some of the items and underpayment on some of the items and underpayment in others. He further stated that the methods will be adequate where the contract is to be schedule and no problem has arisen.

CHAPTER 3

RESEARCH METHODOLOGY

There exist several research methodologies each peculiar to the type of research been undertaken. The methods adopted for this research work are fully discussed in this chapter. Two main areas were the focus of the research the first investigated the sums of preliminaries items used on building projects while the second sought professional opinions on issues of management of preliminaries items. The chapter is divided into two main sections discussing the methods adopted for collection of data and the subsequent analysis performed.

3.1 Data collection

3.1.1 Data for Preliminaries Sums used in Building Projects

The primary source of data for this part of the research were projects whose contract has been executed hence the purposive sampling method (a non-random sampling technique) was adopted for the research which is in line with De Vaus' (1991) suggestion. A sample size of sixty (60) projects was arrived at. Based on the central limit theorem which states that as the size of sample approaches thirty, the distribution of that sample assumes a normal or symmetrical distribution upon which generalisation of findings is possible, a sample size of sixty is considered adequate for this research particularly when related to the sampling technique adopted i.e. purposive sampling.

The projects used for the research are located in Abuja, Suleija, Kaduna, Enugu, Lagos, Lokoja, Kano and Nasarawa, while the consultant Quantity Surveying firms from whom the projects information were collected have their head offices mainly located in Kaduna, Abuja, and Lagos. Collection of the required data entailed travelling between these cities to the offices of the Consultant Quantity Surveyors involved in the projects considered. To all the offices from which the data were collected, several visits had to be made due to the fact that in most cases the officers (Quantity Surveyors) directly in charge of the various projects had to be contacted.

Though the projects considered for the survey were all completed, not all of them had their final accounts prepared. This situation made the collection of the required data a bit strenuous and time consuming. Additional to the set back caused by the non-availability of the final accounts on some of the projects is the poor record keeping culture of some practice offices. The following data were collected from the files of the various projects: initial and final contract sums, initial and final total preliminaries sums and the initial and final sums of each of the various preliminaries items. In the course of

the study, the need to collect information on the Gross Floor Area (GFA) of the projects arose. Only those of forty (40) projects were successfully extracted from the project files.

3.1.2 Data for Practice and Procedures of Preliminaries Items

Data for this part of the research were mainly sourced from practitioners in the construction industry in Nigeria, which included architects, builders, engineers (electrical, mechanical and structural), quantity surveyors and contractors. See appendix I. Again, in line with the central limit theorem, a sample size of sixty (60) was drawn based on the random sampling technique. This part of the data collection involved the administration of structural questionnaires to the respondents. Amongst the responses sourced via the questionnaire included: qualifications of respondents, years of experience, type of organisation worked for, the necessity and adequacy of the provision of preliminaries, extent to which factors influence the amount provided for preliminaries. Others include items of preliminaries that are more critical in the execution of projects, the most appropriate methods for pricing preliminaries and lastly the most appropriate method for valuing preliminaries during project execution.

The questionnaires were physically delivered to the respondents with the assistance of an officer in the office. It was not only costly and time consuming delivering the questionnaires physically, but also the only reliable means of administering the questionnaires. The alternative means, which is mailing would have been unsuccessful given the nature of respondents to questionnaires in our environment. Some respondents completed the questionnaires only when the administrator was physically before them. Sixty (60) questionnaires were sent out and forty-five (45) were completed and returned. Further information was collected from project files. See appendix II.

3.2 Data Analysis Methodology

Basically, data were presented in either of three forms namely tabulation, pie charts and bar charts showing frequencies, percentages as appropriate. Various analyses were performed on the data collected. Described below are the tools of analysis employed for the purpose of this study.

3.2.1 *Measures of Central tendency*

Amongst the measure of central tendency were ranges which indicate the minimum and maximum values of the categories in variables. The mean values and standard deviations of scale or ratio measurements were also computed.

3.2.2 ***Sample test of significance***

The statistics computed for tests of significance conducted on the samples i.e. pearson correlation *r* and t - test were done.

3.2.3 ***Regression analysis***

The regression coefficients, coefficient of determination F – statistics and the standard error of estimate were computed in the regression analysis.

One of the objectives of the research is to determine the current practices in the administration of preliminaries in the Nigerian construction industry; hence, this chapter discusses the outcome of the analysis of the survey data collected for this purpose. In general, the issues discussed border on the following which are presented in different subsections in this chapter: demography of the respondents, provision and pricing of preliminaries items, and lastly variations (variability) and valuing of preliminaries items.

3.3 Respondents' Demography

In ascertaining the respondents' distribution, five main variables were collected, namely the profession of the respondent, nature of occupation, respondents' years of experience and their highest attained educational qualifications and type of projects undertaken by firms. The outcome of the spread amongst the respondents are graphed in Figures 3.1 to 3.4. Figure 3.1 indicates that Engineers constituted 4.5% of the total sample size surveyed Architects – 6.8%, Builders – 11.4% and Quantity Surveyors – 77.3% thus having the highest share in the distribution. Hence, the results of the analysis may be biased towards the competences of the quantity surveyor when considered on an aggregated basis.

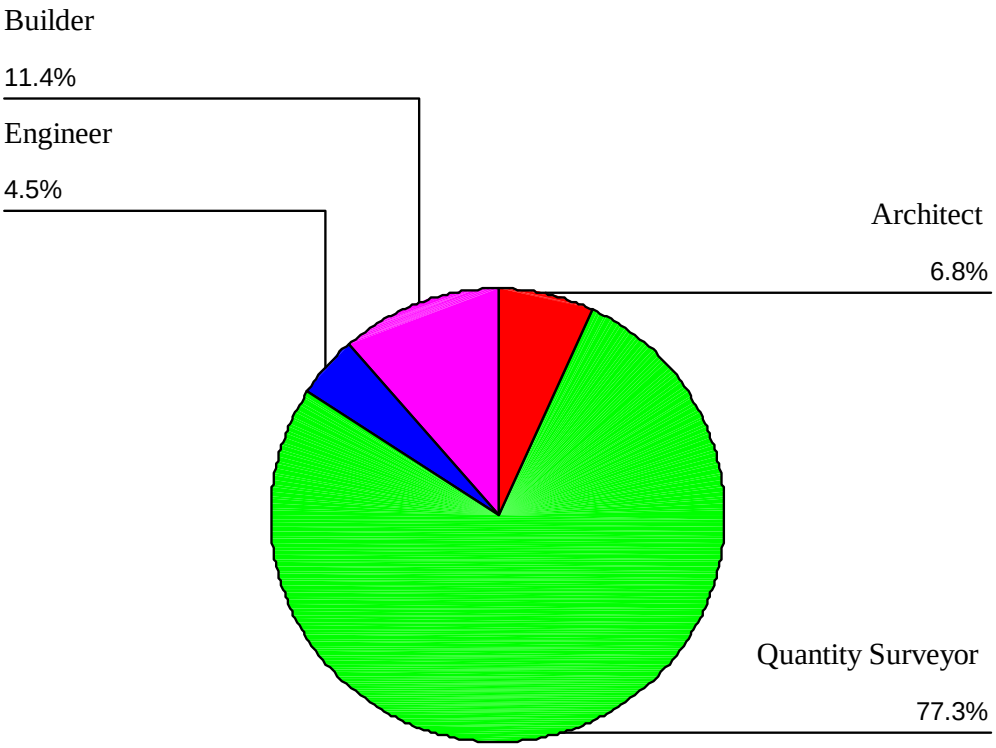


Figure 3.1 – Respondents' Profession

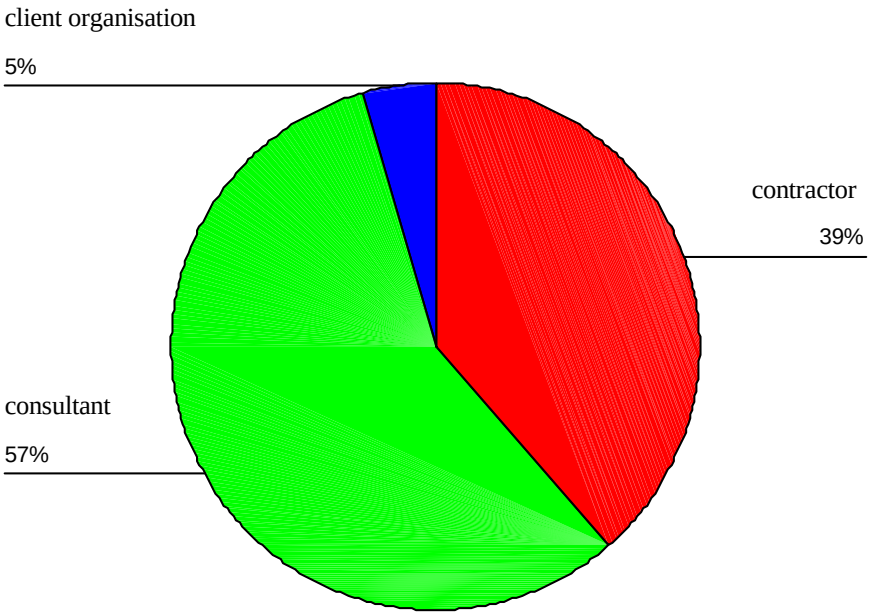


Figure 3.2 – Occupation of Respondents

As much as half the proportions of the firms surveyed are those engaged in consultancy services in the construction industry, accounting for up to 57% of the total respondents, while those in contracting firms and client organisations accounted for 39% and 5% respectively. Again, this signifies that the research responses shall be consultancy biased with a likely tendency towards contracting.

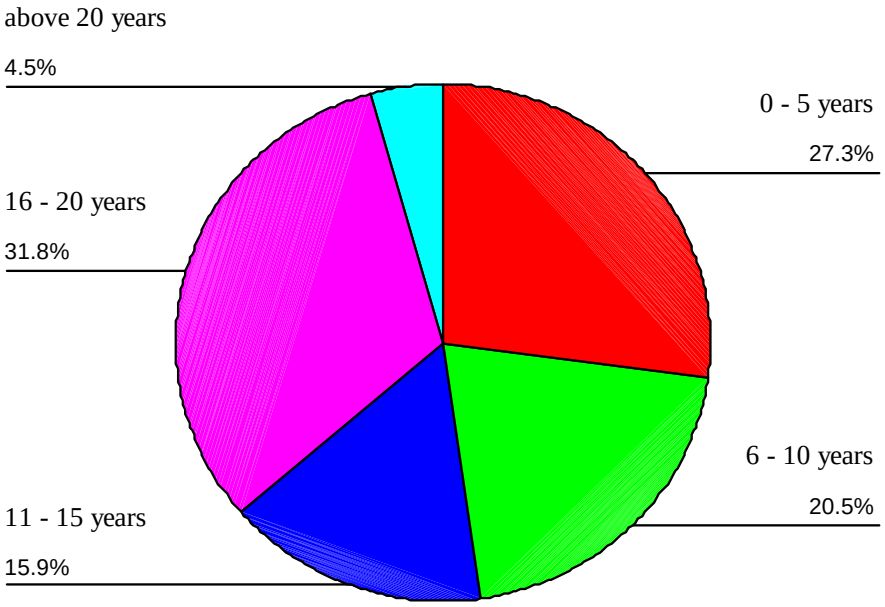


Figure 3.3 – Working Experience of Respondents

Majority of the respondents have working experience ranging between 16 – 20 years in the construction industry accounting for about 32% of the respondents, with a quarter of them having worked for up to 5 years and between 6 – 10 years separately, as shown in Figure 3.3. On the average therefore, the responses obtained could be said to come from a sample frame with adequate knowledge base for the administration of preliminaries in the construction industry having worked between 6 – 20 years.

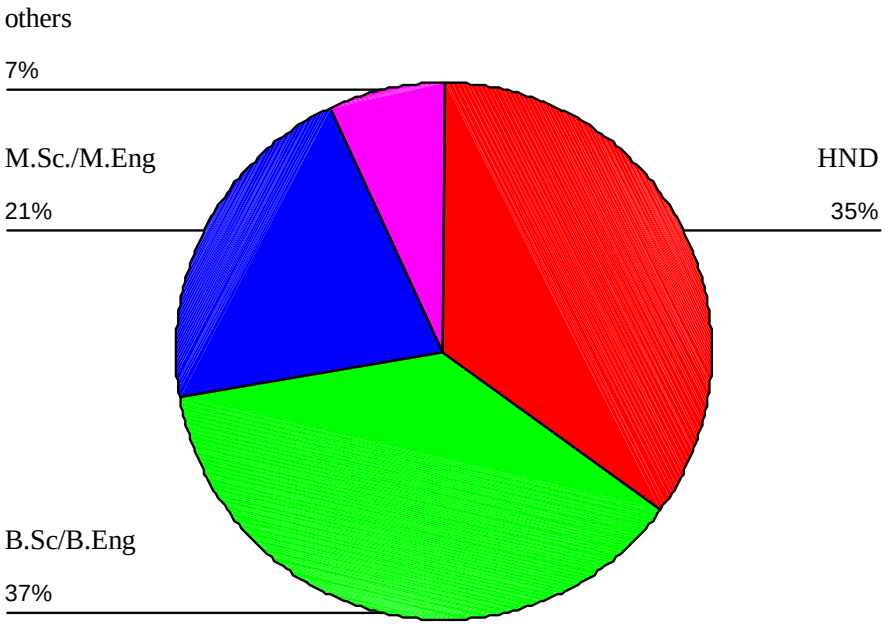


Figure 3.4 – Educational Attainment of Respondents

An almost equal proportion of the respondents do possess either a Higher National Diploma or a first degree, representing 35% and 37% respectively of the total responses sourced. Also complementary to the level of educational attainment of the respondents, a confirmation of their level of education, exposure, and professional competence, which is required for this research, 21% of them have acquired a second degree which represents as much as a quarter of the sample size. This further supports the fact that the responses collected are from a sample frame that is describable as educationally and knowledgeably capable of providing the much desired professional and judgemental opinions required for achieving the aim of the research endeavour.

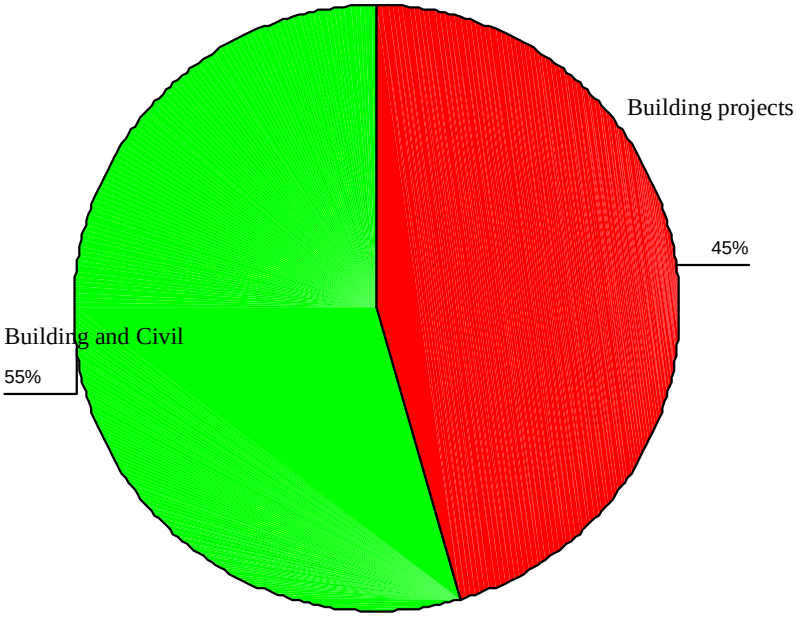


Figure 3.5 – Type of Projects handled by Firm

As much as half of the respondents handle building projects only (45% of the respondents) while 55% handle both building and civil works. It therefore follows that all of the respondents at the least handle building projects, thus signifying that the responses collected adequately cover for the study area i.e. building projects. None of the respondents solely engage in civil engineering works hence the sample frame is fully biased towards building projects only. Therefore the results arrived at for this research can not be generalised for projects that fall outside building works.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

This chapter presents and discusses the analysis carried out on the data obtained from project files of some building projects as described in chapter 3. Since the tools of analysis adopted were discussed in chapter 3, only the results of the analysis are presented in this section and inferences drawn there from discussed. Generally the chapter is subdivided into seven subsections consisting of data presentation which gives a general description of the data collected and discusses their adjustments; analysis of adjusted data which describes the determination of relationships and test of significance in the differences between initial and final sums, and determination of relationship amongst the various preliminaries items; cost significant preliminaries items, their contributions and influence of change; the establishment of variability which includes studies on variability in the various preliminaries items and total preliminaries sums; development of model for predicting preliminaries sums and lastly, the chapter presents a summary of the findings and discussions accruing there from.

4.1 Data Presentation

4.1.1 General Description of Data Collected

Data extracted from the BOQs and project files of building projects surveyed were the initial and final amounts of the following: contract sums, total preliminary sums, and the amounts of the various preliminaries items for each project. Table 4.1 shows the summary of descriptive statistics for both the initial and final sums. From the results of the analysis presented in table 4.1, the difference between the preliminaries is not much hence the initial sums only are discussed in this section.

Table 4.1 Descriptive Statistics of Initial and Final Preliminaries building projects.

Sums Item	N	Minimum	Maximum	Mean	Std. Dev
Initial contract Sum	60	3,700.00	286,601.00	57,042.19	63,217.06
Final Contract Sum	60	3,236.20	278,328.00	57,675.26	61,415.25
Initial Total Preliminaries Sum	60	200.00	23,874.50	2,559.43	4,106.43
Final Total Preliminaries Sum	60	200.00	23,307.70	2,738.18	4,045.65
Initial Site Accommodation	37	0.00	2,400.00	398.38	486.86
Final Site Accommodation	36	0.00	2,500.00	414.93	495.46
Initial Water for Works	37	0.00	1,350.00	261.45	312.92
Final Water for Works	37	0.00	1,400.00	274.91	315.10
Initial Site Plant & Scaffolding	36	30.00	4,037.50	421.60	778.98
Final Site Plant & Scaffolding	35	30.00	4,137.50	448.63	802.61
Initial Testing & Samples	13	0.00	300.00	50.38	79.73
Final Testing & Samples	9	0.00	100.00	40.56	37.12
Initial Insurance & Guarantee	34	0.00	1,800.00	215.27	344.90
Final Insurance & Guarantee	28	20.00	1,455.00	254.05	325.71
Initial Supervision & Administration	37	40.00	5,650.00	660.64	1,080.48
Final Supervision & Administration	37	120.00	5,660.00	667.72	1,054.86
Initial Watching and Lighting	37	19.44	900.00	212.83	227.93
Final Watching and Lighting	37	19.44	950.00	221.43	228.19
Initial Service site	36	0.00	1,720.00	256.51	357.13
Final Service site	36	0.00	1,750.00	262.15	353.61
Initial First Aid Box	36	0.00	300.00	60.69	70.54
Final First Aid Box	36	0.00	400.00	62.07	77.73
Initial Progress Photograph	37	2.00	200.00	51.45	43.22
Final Progress Photograph	37	5.00	250.00	53.40	47.80
Initial Setting Out	37	0.00	370.00	70.37	85.11
Final Setting Out	35	0.00	450.00	76.82	94.83
Initial Sign Board	34	0.00	250.00	42.13	47.37
Final Sign Board	32	0.00	300.00	41.70	51.52
Initial Cleaning on Completion	37	5.00	618.00	117.86	137.62
Final Cleaning on Completion	37	0.00	350.00	89.48	76.22

Source: Field Survey (2005)

From the Table 4.1, which shows the initial sums allowed in the BOQs (i.e. the awarded figures), the 'Contract Sum' of the sixty (60) projects considered ranges between ₦3,700,000.00 and ₦286,601,000.00. Though, the mean 'Contract Sum' of all the projects is ₦57,042,190.00, the high standard deviation (₦63,217,060.00) indicates that there exist wide spread difference in the contract sums of the various projects. The wide spread difference is observed in the data table shown in the appendix. The awarded 'Total Preliminaries Sum' of the projects also exhibited a similar pattern with that of the 'Contract Sum', ranging between ₦200,000 and ₦23,874,500 with a mean value of ₦2,559,430.00 and a standard deviation of ₦4,100,430.00.

Three categories of preliminary items have been identified in literature, namely **cost related** (*site accommodation, water for works, site plants and scaffolding, testing and samples and insurance and guarantee*), **time related** (*supervision and administration, watching and lighting, site services, first aid box, and progress photographs*) and **lump sum** (*setting out, sign board, and cleaning on completion*) preliminaries items. The statistics of the items under each of these categories are discussed below.

4.1.2 Cost Related Preliminary (CRP) Items

Of all the sixty (60) projects studied only thirty seven (37) of them representing 61.7% had valid data for the *'Site accommodation'* item. The item ranges between 0 and ₦2,400,000, with mean value of ₦398,380.00 and standard deviation of ₦486,860.00. In some of the projects studied, no amount was indicated for *'Site accommodation'* hence the 0 minimum value. Study of some of the BOQs revealed that the preliminaries section was not priced by the contractor but rather a lump sum provision was allowed for the items. This however, is not uncommon in practice as revealed by earlier studies

(Kehinde and Aiyetan, 2001). Similar to Site accommodation, only thirty seven (37) data set were valid for *'Water for works'* preliminary item having its value ranging between 0 and ₦1,350,000.00, mean value of ₦261,450.00 and standard deviation of ₦312,920.00. There were thirty six (36), 60% valid data cases for *'Site plant and scaffolding'* having sums ranging between ₦30,000.00 and ₦4,037,500.00, a mean amount of ₦421,000.00 and standard deviation of ₦778,980.00.

However, a very low data set was observed for *'Testing and samples'* preliminary item having only thirteen (13) valid cases representing 21.7%, with sums ranging between 0 and ₦300,000.00, a mean value of ₦50,380.00 and standard deviation of ₦79,730.00. The last cost related preliminary item considered is the *'Insurance and guarantee'* item. There were thirty four (34), 57% data cases for this item from the project files studied having values ranging between 0 and ₦1,800,000.00 with a mean value of ₦215,270.00 and a standard deviation of ₦344,900.00. The implication is that contractors do not adequately price these items but just indicate lump sum which makes administration of preliminaries difficult and cumbersome.

4.1.3 Time Related Preliminary (TRP) Items

Five items fall under the TRP items, amongst which is *'Supervision & Administration'*. Out of the sixty (60) projects studied, only thirty seven (37) of them had this item priced representing 61.7%. The sums allowed for in the BOQs range between ₦40,000.00 and ₦5,650,000.00 with a standard deviation of ₦1,080,480.00. This is the preliminary item with the highest amount amongst all the other items as shown in Table 4.1. The next TRP item is *'Watching and Lighting'* of which in only thirty seven projects were the items priced out of the sixty (60) projects studied. With a minimum and maximum value

of ₦19,440.00 and ₦900,000.00 respectively, a mean value of ₦212,830.00 and standard deviation of ₦227,930.00, this item exhibits a consistent distribution having its mean value approximating to its standard deviation.

Similar in character to *'Watching and lighting'* is *'Services to Site'*, having a minimum and maximum value of 0 and ₦1,720,000.00 respectively, a mean value of ₦256,510.00 and standard deviation of ₦357,130.00. Also showing similar character amongst the TRP items is *'First Aid Box'* which had thirty six (36) BOQs pricing the item out of the sixty (60) investigated representing 62% of the contractor's pricing this item. The awarded figures for the item range between 0 and ₦300,000.00, with a mean value of ₦60,690.00 and standard deviation of ₦70,540.00. The last TRP item sourced is *'Progress Photograph'* having thirty seven (37) valid cases from the sixty (60) projects surveyed, and also showing similar pattern with *'Watching and Lighting'*. The statistics for *'Progress Photograph'* are as follows: minimum value – ₦2,000.00; maximum value – ₦200,000.00; mean value – ₦51,540.00 and standard deviation – ₦43,220.00.

4.1.4 Lump Sum Based (LSB) Items

Preliminary Items which fall under the LSB category includes setting out, sign board and cleaning and clearing on completion. From Table 4.1 *'Setting out'* have thirty seven (37) valid cases with its values ranging between 0 and ₦370,000.00, having a mean value of ₦70,370.00 and a standard deviation of ₦85,110.00. Again, just as the case of the other preliminary items considered, *'Setting Out'* also shows a wide spread between its mean value and standard deviation. The second LSB item considered was 'Sign Board'. This item has a minimum value of 0 and maximum value of ₦250,000.00 from the thirty four (34) valid cases of the sixty (60) projects studied. On the average, the

value of 'Sign Board' allowable in the projects considered is ₦42,130.00 with a standard deviation of ₦47,370.00 showing wide spread difference between these two statistics. Last in the LSB category is the 'Cleaning and Clearing on Completion' preliminary item which has a minimum value of ₦5,000.00 and a maximum value of ₦618,000.00 allowed in the BOQs. From the Table, the mean value of this item is ₦117,800.00 with a standard deviation of ₦137,620.00.

4.1.5 Adjustment of Data for Analysis

The data set described in Table 4.1 are raw data collected during the field survey which are the naira worth of items extracted from BOQs and project files. Emsley et al. (2002) established that the use of raw data, especially monetary values, gives a poor representation for analytical purposes. They suggest that rather than use the raw data, converting them to either cost per gross floor area (GFA) or the log of cost per GFA gives a more accurate results with the former being preferred. This study adopted the cost per GFA approach.

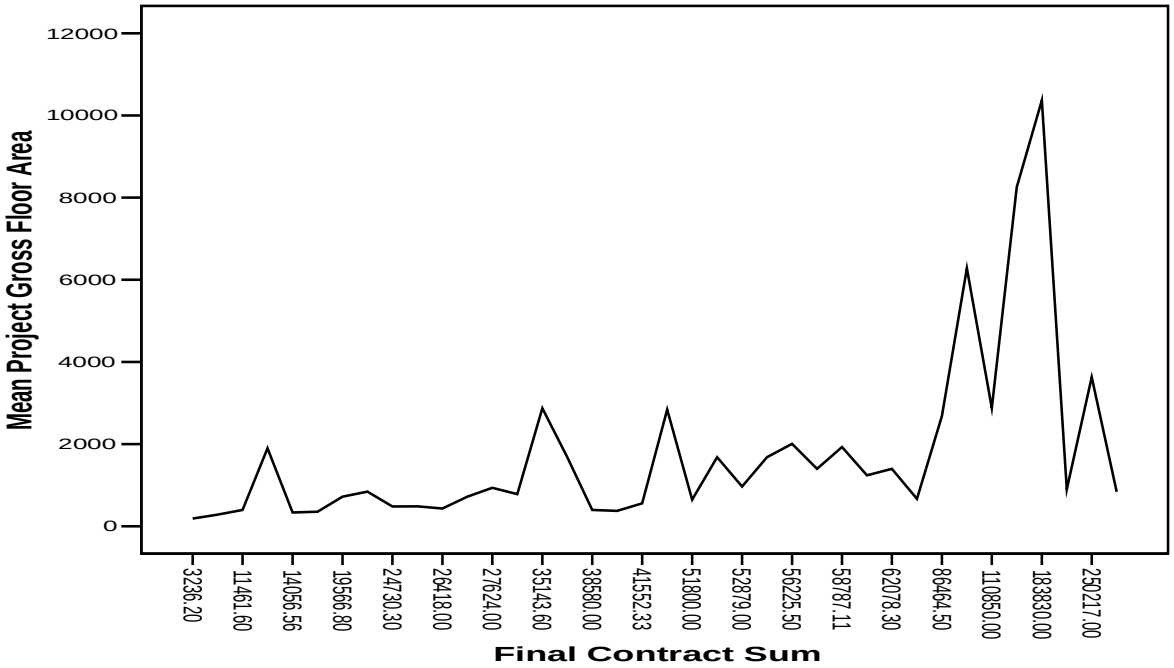


Figure 4.1 Line Graph of GFA against Final Contract Sum

A study of the raw data (see appendix I) and the statistics shown on Table 4.1 reveals high the difference in the values of the data. This high difference is further confirmed by the very high standard deviation value of the contract sums. The mean project GFA and their contract sums, were graphed as shown in Figure 4.1. The line graph indicates that projects ranging between N3m – N86m have GFAs ranging between 100 – 3,000; those ranging between N90m – N200m have GFAs between 3,000 – 11,000; while those ranging between N200m – N280m have GFAs between 800 – 3,600.

Apart from the last range i.e. projects between N200m – N280m, the other ranges indicate that as the GFA increases, the contract sums also increase. The decrease in GFA of projects shown in the last range, which have the highest contract sums, is not unusual since the projects studied greatly differ in sizes, contract durations, periods of award, construction details and specifications. Hence to bring them to a seemingly common base, the GFA was used to convert the data set to their respective cost per GFA equivalent. Each of the items extracted from the BOQs e.g. contract sums, total preliminary sums, site accommodation, water for the works etc, was adjusted to their respective cost per GFA. This adjustment therefore reduces all the items to a common and comparable term. Tables 4.2 and 4.3 show the descriptive statistics of the adjusted data.

Table 4.2 Descriptive Statistics of Adjusted Initial Preliminaries of building projects.

Items	N	Minimum	Maximum	Mean	Std. Dev
Project Gross Floor Area	40	100.000	10368.000	1689.875	2147.317
Initial contract Sum	40	7.123	331.343	52.817	58.958
Initial Total Preliminaries Sum	40	0.145	14.936	2.011	2.565
Initial Site Accommodation	25	0.000	0.889	0.234	0.239
Initial Water for Works	24	0.000	0.002	0.000	0.000
Initial Site Plant & Scaffolding	23	0.013	4.486	0.311	0.919
Initial Testing & Samples	7	0.000	0.035	0.008	0.013
Initial Insurance & Guarantee	24	0.000	0.295	0.080	0.082
Initial Supervision & Administration	24	0.018	6.278	0.516	1.248
Initial Watching and Lighting	24	0.010	0.333	0.122	0.101
Initial Service site	23	0.000	0.733	0.139	0.171
Initial First Aid Box	24	0.000	0.104	0.030	0.026
Initial Progress Photograph	24	0.002	0.139	0.032	0.029
Initial Setting Out	25	0.000	0.333	0.052	0.081
Initial Sign Board	23	0.000	0.278	0.030	0.058
Initial Cleaning on Completion	24	0.004	0.611	0.082	0.128

Source: Field Survey (2005)

Table 4.3 Descriptive Statistics of Adjusted Final Preliminaries Sums of building projects.

Items	N	Minimum	Maximum	Mean	Std. Dev
Project Gross Floor Area	40	100.000	10368.000	1689.875	2147.317
Final Contract Sum	40	7.123	331.343	54.475	60.433
Final Total Preliminaries Sum	40	0.148	14.936	2.205	2.653
Final Site Accommodation	24	0.000	0.944	0.252	0.251
Final Water for Works	24	0.000	0.589	0.184	0.166
Final Site Plant & Scaffolding	22	0.018	4.597	0.341	0.959
Final Testing & Samples	4	0.000	0.037	0.019	0.020
Final Insurance & Guarantee	19	0.012	0.295	0.099	0.075
Final Supervision & Administration	24	0.018	6.289	0.525	1.247
Final Watching and Lighting	24	0.010	0.389	0.127	0.108
Final Service site	23	0.000	0.756	0.149	0.182
Final First Aid Box	24	0.000	0.104	0.030	0.027
Final Progress Photograph	24	0.002	0.139	0.033	0.030
Final Setting Out	24	0.000	0.389	0.058	0.090
Final Sign Board	22	0.000	0.333	0.035	0.070
Final Cleaning on Completion	24	0.000	0.278	0.063	0.069

Source: Field Survey (2005)

4.2 Analysis of Adjusted Data

For each of the preliminary items extracted from the BOQs and project files two (2) categories of sums were available – their initial and final sums, the former being the awarded figure while the latter the sum at completion of the project. There exist, from the data collected, examples of between the initial and final sums. Based on the aforementioned, tests of significance were carried out to determine if there exist any significant difference between the initial sums allowable for items of preliminaries in BOQs and the final sums at which they are executed. The results of these tests are shown in Table 4.4 which gives the statistics of both the paired correlations and paired tests. Each of these analyses is discussed separately below.

4.2.1 Determination of Relationships between Initial and Final Sums

The paired samples correlation statistics of the preliminaries sums components indicates that most of the pairs (i.e. the correlation between the initial and final sums of each preliminary item) are highly correlated as shown in Table 4.4. This signifies that for most of the pairs, there exist a very strong relationship between the initial sums and their final sums with all of them being positive. The components that exhibit this relationship include: contract sums, total preliminaries sums, site accommodation, site plants and scaffolding, insurance and guarantee, supervision and administration, watching and lighting, service to site, first aid box, progress photographs, setting out and sign board. These components' initial sums correlated with their final sums at values ranging between 0.974 – 0.999 and that the relationships that exist between them are significant at 99% confidence interval, all having a p – value of 0.000. Two (2) pairs also exhibited fairly strong, positive relationships i.e. Testing and Samples ($n = 3$, $r = 0.646$, $p = 0.553$) and Cleaning on Completion ($n = 24$, $r = 0.783$, $p = 0.000$). Though,

the ‘Testing and Sample’ preliminary item showed the existence of a positive relationship between their initial and final sums but this relationship is not significant, having a p – value greater than 0.05. This is not unexpected since the sample size for testing and sample (i.e. valid cases used for the test) was too small.

Table 4.4 Paired Samples Test Statistics of Preliminaries Sums Components

Pairs	Items	Correlation			Paired Differences Test			
		n	R	Sig.	Mean	Std. Dev	T	Sig.
Pair 1	Initial contract Sum - Final Contract Sum	40	0.996	0.000	-1.66	5.59	-1.88	0.068
Pair 2	Initial Total Preliminaries Sum - Final Total Preliminaries Sum	40	0.974	0.000	-0.19	0.60	-2.06	0.046
Pair 3	Initial Site Accommodation – Final Site Accommodation	24	0.988	0.000	-0.01	0.04	-1.00	0.327
Pair 4	Initial Water for Works - Final Water for Works	24	0.569	0.004	-0.18	0.17	-5.42	0.000
Pair 5	Initial Site Plant & Scaffolding - Final Site Plant & Scaffolding	22	0.999	0.000	-0.02	0.04	-1.98	0.061
Pair 6	Initial Testing & Samples – Final Testing & Samples	3	0.646	0.553	-0.01	0.02	-1.03	0.410
Pair 7	Initial Insurance & Guarantee - Final Insurance & Guarantee	19	0.983	0.000	0.00	0.02	0.25	0.806
Pair 8	Initial Supervision & Administration - Final Supervision & Administration	24	0.997	0.000	-0.01	0.09	-0.49	0.631
Pair 9	Initial Watching and Lighting - Final Watching and Lighting	24	0.993	0.000	-0.01	0.01	-1.73	0.097
Pair 10	Initial Service site - Final Service site	23	0.994	0.000	-0.01	0.02	-2.17	0.041
Pair 11	Initial First Aid Box - Final First Aid Box	24	0.976	0.000	0.00	0.01	0.08	0.936
Pair 12	Initial Progress Photograph – Final Progress Photograph	24	0.992	0.000	0.00	0.00	-1.33	0.197
Pair 13	Initial Setting Out - Final Setting Out	24	0.993	0.000	0.00	0.01	-1.15	0.261
Pair 14	Initial Sign Board - Final Sign Board	22	0.997	0.000	0.00	0.01	-1.31	0.205
Pair 15	Initial Cleaning on Completion - Final Cleaning on Completion	24	0.783	0.000	0.02	0.09	1.05	0.303

Of all the thirteen (13) pairs in Table 4.4, the preliminaries sum with the weakest relationship is 'water for the works' drawn from a sample size of twenty four (24) with and a correlation coefficient of 0.569. Though the relationship between the initial and final sums of this item is describable as positive and fairly weak, it is significant at 99% confidence interval having a *p – value* of 0.004.

Three (3) major inferences are drawn from the results of the correlation coefficients contained in Table 4.4 and the analysis described above. These are as follows:

i. There exist strong relationships between the initial sums and final sums of the items of preliminaries for the samples used for this study, except for 'water for the works' which showed a rather weak relationship.

ii. The relationships that exist between the initial and final sums of preliminary items are positive and that these relationships are significant at 99% confidence interval except for 'Testing and Samples' whose relationship was not significant.

iii. The sample sizes of the inclusive pairs (except pairs 1 and 2) ranging between 19 – 24, are not large enough to be representative of the study population, hence the results derivable from this study only adequately describes the samples from which they were drawn.

4.2.2 Test of Significance in Difference between Initial and Final Sums

Both the initial and final sums are contextually different, the former being the awarded amount while the latter is the total amount which was paid at the end of the contract for a specific item. But as observed from Tables 4.1 – 4.3 there appears to be no noticeable

difference between the initial and final sums of the various preliminaries sums. To test the falsity of this statement, t – test was performed, with the results tabulated in Table 4.4 under the 'paired difference test'.

Out of the 15 pairs of preliminaries sums components studied, only three (3) of these have a difference between their initial and final sums being statistically significant at 95% confidence level, with another two (3) at 90%. Those falling under the former include – total preliminaries Sum (TPS) having a mean difference of -0.19 and p – value of 0.046, Water for the Works (WfW) mean difference of -0.18 and p – value of 0.000 and Services to Site (StS) with mean difference of -0.01 and p – value of 0.041. Those of the latter category i.e. those that are statistically significant at 90% include – Contract Sum (CS) having a mean difference of -1.66 and a p – value of 0.068, Site Plant and Scaffolding (SPS) mean difference -0.02 and p – value 0.061, and Watching and Lighting (W&L) with a mean difference of -0.01 and a p – value of 0.097.

The result exhibited by the paired sums of six preliminary items in the test of significance between 90-95% confidence levels is an indication that the differences between the initial and final sums do not occur by chance. The implication of this revelation is that there was an average increase of some certain amount per GFA for each of these preliminary items over their initial sums in each of the projects, as follows: CS experienced an average increase of ₦1,660.00/m^2, TPS ₦190.00/m^2, WfW ₦180.00/m^2, SPS ₦20.00/m^2, W&L ₦10.00/m^2, and StS ₦10.00/m^2.

Some preliminary items did not show the evidence of a statistically significant difference between their initial and final sums. Amongst these items are Site

Accommodation (with an average increase of ₦10.00/m^2 per project), Supervision and Administration (₦10.00/m^2), and Cleaning on Completion (₦20.00/m^2). Others are Insurance and Guarantee, First Aid Box, Progress Photographs, Setting Out, and Sign Board, all not showing any noticeable increases in their initial sums.

4.2.3 Determination of Relationships amongst the Various Preliminary Items.

Previous studies have suggested that there exists some form of relationship between the contract sum of projects and their respective preliminaries sums Ogunsemi and Jagboro (2001) and Kehinde and Aiyetan (2001); however, none of them gave account of the nature of these relationships. The nature of the relationships are explored and presented in this section.

A. Cost Related Preliminary Items

Table 4.5 shows the correlation coefficients of the relationships that exists between some of the various sums and cost related preliminaries sums.

Table 4.5 Correlations of Cost Related Preliminaries Sums of some completed projects.

	GFA	FConSum	FPrelSum	Cost Related Charges			
				FSiteAcc	FWateWrk	FPlanSca	FInsuGua
GFA	1.000	-0.240	-0.226	-0.417	-0.479	-0.161	-0.345
		0.136	0.162	0.043	0.018	0.475	0.148
	40	40	40	24	24	22	19
FConSum	-0.240	1.000	0.733	0.731	0.653	0.939	0.508
	0.136		0.000	0.000	0.001	0.000	0.026
	40	40	40	24	24	22	19
FPrelSum	-0.226	0.733	1.000	0.834	0.716	0.918	0.552
	0.162	0.000		0.000	0.000	0.000	0.014
	40	40	40	24	24	22	19
FSiteAcc	-0.417	0.731	0.834	1.000	0.945	0.673	0.665
	0.043	0.000	0.000		0.000	0.001	0.002
	24	24	24	24	24	22	19
FWateWrk	-0.479	0.653	0.716	0.945	1.000	0.611	0.708
	0.018	0.001	0.000	0.000		0.002	0.001
	24	24	24	24	24	22	19
FPlanSca	-0.161	0.939	0.918	0.673	0.611	1.000	0.475
	0.475	0.000	0.000	0.001	0.002		0.046
	22	22	22	22	22	22	18
FInsuGua	-0.345	0.508	0.552	0.665	0.708	0.475	1.000
	0.148	0.026	0.014	0.002	0.001	0.046	
	19	19	19	19	19	18	19

Top figures are Pearson correlation coefficient, middle figures correlation significance level and bottom figures sample size

The results of the analysis presented in Table 4.5, reveals interesting findings that there exist a negative relationship between GFA and all the preliminaries sums. This means that as the area of a building increases the cost per unit area of each of the preliminaries sums decreases. All of the sums exhibit rather weak relationships with only two (2) of them having relationships that are statistically significant i.e. FSiteAcc – Final sum of site accommodation (*p – value = 0.043*) and FWateWrk – Final sum of water for works (*p – value = 0.018*). Importantly however, are the relationships that exist between the GFA on one side and the contract sum and total preliminaries sums on the other thus r = *-0.240* and r = *-0.226* respectively. Though showing no significance in their

relationships, the finding shows that as the GFA of a building is increased by one unit its contract sum per GFA decreases proportionally by 0.240 units, and its total preliminaries sum decreases by 0.226.

Another set of relationships established were those existing between contract sum and the various cost related preliminaries sums on the one hand, and those between total preliminaries sums and the cost related preliminaries sums on the other hand. Both sets of relationships shows that there exists positive relationships and that these relationships are strong, with those of the total preliminaries sums having higher correlations than those of the contract sums thus: FConSum/FPrelSum Vs FSiteAcc (*r = 0.731/0.834*), FConSum/FPrelSum Vs FWateWrk (*r = 0.653/0.716*), FConSum/ FPrelSum Vs FPlanSca (*r = 0.939/0.918*) and FConSum/FPrelSum Vs FInsuGua (*r = 0.508/0552*). Further to the existence of strong positive relationships between these preliminary items, their relationships are statistically significant with all of them having p – values less than 0.05.

These findings suggest that where there is a unit increase in the cost per GFA of the cost related preliminary items in a building project, there will be increases in the contract sums per GFA by units ranging between 0.508 – 0.939, while that for total preliminaries sum per GFA ranges between 0.552 – 0.918, as appropriate. For example, if the cost per GFA of site accommodation is increased by one (1) unit, the cost per GFA of the total preliminaries sum of that project will increase by 0.716 units while its contract sum per GFA will increase by 0.653 units.

B. Time Related Preliminary items

Relationships that exist between the time-related preliminary items were also established. These relationships are contained in Table 4.6.

Table 4.6 Correlation Coefficient of Time Related Preliminary Items

	Time Related Charges				
	FSupeAdm	**FWatcLig**	**FServSit**	**FFirsAid**	**FProgPho**
GFA	-0.198	-0.484	-0.342	-0.469	-0.425
	0.353	0.017	0.111	0.021	0.038
	24	24	23	24	24
FConSum	0.937	0.716	0.836	0.539	0.576
	0.000	0.000	0.000	0.007	0.003
	24	24	23	24	24
FPrelSum	0.936	0.775	0.853	0.610	0.666
	0.000	0.000	0.000	0.002	0.000
	24	24	23	24	24

Top figures are Pearson correlation coefficient, middle figures correlation significance level and bottom figures sample size

As was the case of the Cost related preliminary items, there exist negative relationships between the GFA of building projects and the various time-related preliminary items with only three (3) of the items having their relationships statistically significant, namely Watching and lighting ($r = -0.484$, $p = 0.017$), First aid ($r = -0.469$, $p = 0.021$) and progress photograph ($r = -0.425$, $p = 0.038$). Though these relationships are slightly weak, they interpret to mean that as the GFA of a building project increases by one unit its supervision and administration cost per GFA (which is not significant as it were) decreases by 0.198 units, its cost per GFA of watching and lighting decreases by 0.484 unit, first aid decreases by 0.469 while progress photograph decreases by 0.425.

Although there are no previous studies to compare with, these results are unexpected. To some extent, it is expected that as the GFA increases, the economy of scale will set in also thereby giving a reduction in the cost of preliminaries items.

A study of the relationship between contract sums and time related items of preliminaries of the projects studied reveals that while in some the relationship is very strong in others they are moderate. The strongest relationship exist between contract sums and supervision and administration preliminary item having a correlation coefficient of 0.937 followed by services to site with 0.836, the least been first aid with 0.539. All the relationships within this group are statistically significant. Relationships existing between total preliminary sums and the various time related preliminary items are similar to those existing with the contract sums thus: supervision and administration ($r = 0.936, p = 0.000$), watching and lighting ($r = 0.775, p = 0.000$), services to site ($r = 0.853, p = 0.000$), first aid ($r = 0.610, p = 0.002$) and progress photographs ($r = 0.666, p = 0.000$).

A comparison of relationships (i.e. the coefficients of correlation) existing between the various time related preliminary items on the one hand and the contract sums and total preliminaries sums on the other indicates that total preliminaries sums correlated better than contract sums except for site supervision and administration preliminary item which shows a slightly greater correlation coefficient of 0.937 with contract sums as against 0.936 with total preliminaries sums.

C. Lump Sum Preliminary (LSP) Items

Table 4.7 shows the relationships that exist between the different LSP items and the GFA, contract sums and total preliminaries sums. The results showed similar trend as those of the CRP items and TRP items, there exist negative relationships between GFA and the various LSB items which can generally be described as weak : Setting out (r = -0.325), Sign board (r = -0.247) and cleaning on completion (r = -0.395). However, none

of these relationships are statistically significant, all having p – values greater than 0.05 signifying that they (the existing relationships) might have occurred by chance. This notwithstanding, it is nonetheless expected that as the GFA of building increases there should be an accompanying decrease in the cost per GFA of the various LSP items. The result here is consistent as the items in LSP do not necessarily, usually, have close relationship with contract size/value.

Table 4.7 Correlations of Lump Sum Preliminaries Items

	Lump Sum Payments		
	FSettOut	**FSignBoa**	**FCleaCom**
GFA	-0.325	-0.247	-0.395
	0.121	0.268	0.056
	24	22	24
FConSum	0.858	0.940	0.607
	0.000	0.000	0.002
	24	22	24
FPrelSum	0.940	0.959	0.775
	0.000	0.000	0.000
	24	22	24

Top figures are Pearson correlation coefficient, middle figures correlation significance level and bottom figures sample size

Source: Field Survey (2005)

Relationships between contract sums and the various LSP items are positive and statistically significant. It is very strong for both Setting out *(r = 0.858)* and Sign Board *(r = 0.940)* while it is slightly strong for Clearing up on Completion *(r = 0.609)*. This means that if the cost per GFA of Setting out is increased by 1 unit there will be an anticipated increase of 0.838 units in the cost per GFA of the contract sum. Investigating the relationships that exist between Total preliminaries sum and the various LSP item indicates that Sign board exhibits the strongest of these relationships with *r = 0.959*, followed by Setting out, *r = 0.940* then Clearing on Completion, *r = 0.775*. The LSP item correlates more aggressively with their total preliminaries sums than they do with their contract sums, signifying that changes in the various LSP items bring about higher changes in the total preliminaries sum than in the contract sum. The

reason for this may not be far fetched, as lump sum preliminaries items do not necessarily change with the changes in the contract value.

4.3 Identification of Cost Significant Preliminary Items and their Contributions.

Having determined the relationships that exist amongst the various categories of preliminary items, the study further identified the various cost significant preliminary items for each of the categories been investigated i.e. the CRP, TRP and LSP items. There may be several approaches to determining cost significance amongst the various items, with each having a different interpretation. For the purpose of this study, cost significance is viewed in two fronts, the first being preliminary items which exhibit the greatest correlation with the cost per GFA of the Total Preliminaries Sums. The second approach view cost significance in terms of those items that contribute up to 80% of the total preliminaries sum, as suggested by the Pareto 20/80 rule, which assumes that 20% of the total preliminary items contribute as much as 80% of the total cost of the preliminaries.

For the first view, i.e. preliminary items having the greatest correlation, Total Preliminaries Sums was chosen as against Contract Sums because it has been established in the previous section that the various preliminary items studied correlates better with the former than they do with the latter, as is also evident from Figure 4.2.

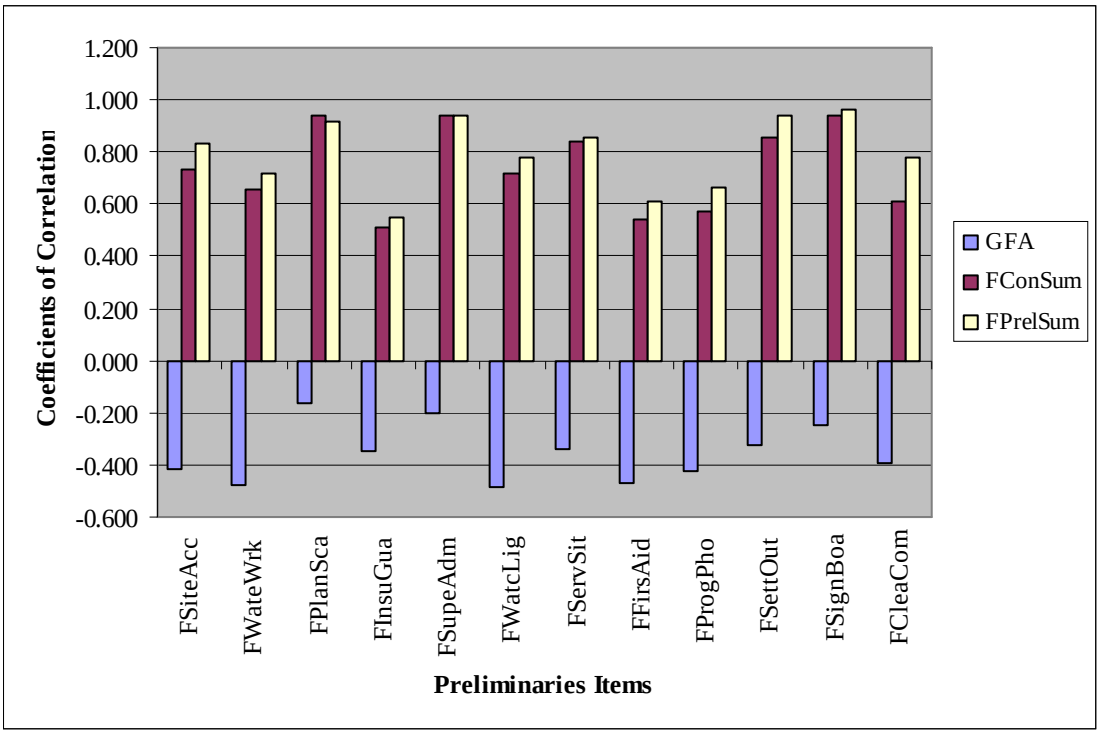


Figure 4.2 – Correlation Coefficients of the Various Preliminary Items of some completed project.

Figure 4.2 shows the breakdown of the various preliminary items plotted against their respective correlation coefficients for the relationships existing between them (i.e. their cost per GFA) and their GFAs, Contract Sums and Total Preliminaries Sums. From the Figure, the three preliminary items having the highest correlation with cost per GFA of Total Preliminaries Sums are: Plant and Scaffolding ($r = 0.918$), Site Supervision and Administration ($r = 0.936$), and Sign Board ($r = 0.959$) for the CRP, TRP and LSB items respectively.

The second approach to establishing the cost significant preliminary items is to apply the Pareto rule on the mean values of the preliminary items studied (haven arranged them in descending order). The results of these analyses are shown in Table 4.8 which

reveals that there exist great similarity in the results obtainable when the analysis is performed on the four data categories i.e. using raw data of the initial sums, raw data of the final sums, adjusted data of the initial sums and adjusted data of the final sums.

Table 4.8 Items of Preliminaries Contributing up to 80% of Total cost of Preliminaries

Preliminaries Sums Items	**Mean**	Cumulative up to 80%	**Preliminaries Sums Items**	**Mean**	Cumulative up to 80%
Initial Sums (Raw Data)			***Final Sums (Raw Data)***		
Supervision & Administration	660.64	660.64	Supervision & Administration	667.72	667.72
Site Plant & Scaffolding	421.60	1,082.24	Site Plant & Scaffolding	448.63	1,116.35
Site Accommodation	398.38	1,480.62	Site Accommodation	414.93	1,531.28
Water for Works	261.45	1,742.06	Water for Works	274.91	1,806.18
Service site	256.51	1,998.57	Service site	262.15	2,068.33
Insurance & Guarantee	215.27	2,213.85	Insurance & Guarantee	254.05	2,322.39
Watching and Lighting	212.83		Watching and Lighting	221.43	
Cleaning on Completion	117.86		Cleaning on Completion	89.48	
Setting Out	70.37		Setting Out	76.82	
First Aid Box	60.69		First Aid Box	62.07	
Progress Photograph	51.45		Progress Photograph	53.40	
Testing & Samples	50.38		Sign Board	41.70	
Sign Board	42.13		Testing & Samples	40.56	
Total Mean Preliminaries Sum	**2,819.57**		**Total Mean Preliminaries Sum**	**2,907.83**	
80% of Total Preliminaries Sum	**2,255.66**		**80% of Total Preliminaries Sum**	**2,326.26**	
Initial Sums (Cost per GFA)			***Final Sums (Cost per GFA)***		
Supervision & Administration	0.516	0.516	Supervision & Administration	0.525	0.525
Site Plant & Scaffolding	0.311	0.827	Site Plant & Scaffolding	0.341	0.866
Site Accommodation	0.234	1.060	Site Accommodation	0.252	1.117
Service site	0.139	1.199	Water for Works	0.184	1.301
Watching and Lighting	0.122	1.321	Service site	0.149	1.450
Cleaning on Completion	0.082		Watching and Lighting	0.127	1.578
Insurance & Guarantee	0.080		Insurance & Guarantee	0.099	
Setting Out	0.052		Cleaning on Completion	0.063	
Progress Photograph	0.032		Setting Out	0.058	
First Aid Box	0.030		Sign Board	0.035	
Sign Board	0.030		Progress Photograph	0.033	
Testing & Samples	0.008		First Aid Box	0.030	
Water for Works	0.000		Testing & Samples	0.019	
Total Mean Preliminaries Sum	**1.635**		**Total Mean Preliminaries Sum**	**1.914**	
80% of Total Preliminaries Sum	**1.308**		**80% of Total Preliminaries Sum**	**1.531**	

Source: Field Survey (2005)

When using the Pareto approach, four (4) preliminaries items contributed part of the 80% of the total cost of preliminaries for the four (4) data sets in table 4.8. These items include, Supervision and Administration, Site Plant and Scaffolding, Site Accommodation and Site Services. The items, which represent approximately 30% of the total preliminaries items, contribute as much as 62%, 62%, 73% and 66% of the

total cost of preliminaries using the raw initial sums, raw final sums, adjusted initial sums and adjusted final sums respectively.

Other preliminaries items also contributed to the 80% total cost of preliminaries which include the following: for both the raw data for initial and final sums are Water for Works and Insurance and Guarantee, those for the adjusted initial sums is Watching and Lighting while for the adjusted final sums are Water for Works and Watching and Lighting. Though these preliminaries items contribute more to the total preliminaries sums, in terms of monetary value, they however correlate with both the contract sums and total preliminaries sums at below 0.80. This may have influenced why they did not form part of the four (4) items which appeared in all the four types of data set.

The two approaches discussed above established different sets of cost significant preliminaries items. The first approach established these items based on each of the categories of preliminaries items by identifying those with the highest correlation coefficients while the second approach chose only those items that contributed up to 70% of the total cost of preliminaries sums. These results reveal that rather than concentrate on all the items of preliminaries in the building project, only a few (which are significant) should be given adequate attention. Where there is insufficient time for pricing during the pre and post tender stages and during the currency of the construction i.e. at contract administration stage. These items include: based on the first approach - Plant and Scaffolding, Site Supervision and Administration and Sign Board; and based on the second approach - Supervision and Administration, Site Plant and Scaffolding, Site Accommodation and Site Services.

After the identification of the various cost significant preliminaries items, the contributions of each of the cost significant items to the total preliminaries sums of the building projects studied were established. This was achieved using the multiple linear regression technique. Two separate analyses were performed for each of the two categories of cost significant preliminaries items, one having the constant term i.e. having to cut through the Y – axis when the x – variables are zeroed while the other had the constant term suppressed i.e. forcing it to pass through the origin. Table 4.9 and Table 4.11 show the results of these analyses.

Table 4.9 Contributions of 3 Significant Prelim Items to Preliminaries Sums

Item Description	Coefficient		Predictive Power		Significance	
	Value	Sig.	r	r^2	F	p - value
(Constant)	0.298	0.252	0.972	0.945	97.035	0.000
Site Plant & Scaffolding	-5.807	0.018				
Supervision & Administration	4.994	0.013				
Sign Board	30.790	0.007				
Site Plant & Scaffolding	-7.227	0.001	0.979	0.959	141.246	0.000
Supervision & Administration	5.985	0.002				
Sign Board	32.845	0.004				

Source: Field Survey (2005)

The results in Table 4.9 indicates that the three (3) cost significant preliminaries items (one each for the three categories of preliminaries identified in the study) mutually inclusively account for up to 96% of the variations contained in the Total Preliminaries Sum, having a r^2 of 0.945 for that with the constant term and 0.959 for that without the constant term. From the table it can be observed further that the high predictive power of these preliminaries items did not merely occur by chance, having F value of 97.035 and 141.246 for that with the unsuppressed and suppressed constant terms respectively.

A closer observation of the statistics contained in Table 4.9 reveals that when the constant term is suppressed, the predictive power of the three preliminaries items improved i.e. increases from 0.945 to 0.959, therefore the model whose constant term is suppressed is adopted. Hence, based on the data set collected for this study and as adjusted, the three cost significant preliminaries items determined using the first approach as described earlier contributes interactively to the total preliminaries sums thus:

- Plant and Scaffolding contributes a share of -7.227 units, which implies that the magnitude of the cost per GFA of Plant and Scaffolding is reduced by 7.227 times, hence for every unit change in the cost per GFA of Plant and Scaffolding the total preliminaries sum per GFA decreases by ₦7,227.00/m^2.

- The magnitude of the cost per GFA of Supervision and Administration increases 5.985 times towards its contribution to the total preliminaries sums. This means that for every unit change in the cost per GFA of Supervision and Administration, the total preliminaries sums increases by ₦5,985.00/m^2.

- The coefficient of contribution for Sign Board is 32.845, which means that within the parameter of data used for the study, the total preliminaries sums increases by ₦32,845.00/m^2 for every unit change in the cost Per GFA of Sign Board.

All the coefficient of the preliminaries items are statistically significant each having a *p* – value of less than 0.05. This implies that the contributions of each of the preliminaries items did not occur merely by chance and is significantly different from zero, the reason for this being explainable within the data set collected.

Upon establishing the contribution of each of the cost significant preliminaries items based on the three (3) categorisations i.e. CRP, TRP and LSP, we tested the validity of these contributions (coefficients) was tested by developing a regression model based on the formula below:

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where y is the predicted Total Preliminaries Sums

α is the constant term which has been suppressed to pass the origin

β is the coefficient of each of the significant preliminaries items

x represent each of the cost significant preliminaries items

$$y = -7.227x_1 + 5.985x_2 + 32.845x_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Taking the values of some of the Projects contained in the Appendix, and substituting them into equation (1), the following is obtained:

Project No 1 $y = - 7.227(0.05) + 5.985(0.23) + 32.845(0.01)$

$y = 1.347$

Project No 31 $y = -7.227(0.08) + 5.985(0.26) + 32.845(0.04)$

$y = 2.291$

Project No 40 $y = -7.227(0.04) + 5.985(0.04) + 32.845(0.01)$

$y = 0.279$

Project No 60 $y = -7.227(0.29) + 5.985(0.54) + 32.845(0.02)$

$y = 1.793$

Table 4.10 Prediction Based on the 3 Cost Significant Prelim Items Using Data from 9 selected Projects

Projects ID	$y_{predicted}$	$y_{observed}$	% difference
Project No 1	1.347	0.880	53
Project No 11	-0.170	0.820	-121
Project No 15	0.371	0.620	-40
Project No 31	2.291	2.000	15
Project No 33	1.462	0.650	125
Project No 39	0.231	0.220	5
Project No 40	0.279	0.350	-20
Project No 47	3.200	2.310	39
Project No 60	1.793	3.030	-41

Source: Field Survey (2005)

Table 4.10 reveals the predictive performance of the cost significant preliminaries items of some selected projects, which shows a very inconsistent pattern in the percentage differences between the observed values (final preliminaries sums) and the predicted values. The percentage differences between the observed and predicted values ranges between 121% to 125%. However, in some instances very small differences were noticeable, like in Project No 31 with a difference of 15%, No 39 a difference of 5% and No 40 with -20% differences. The computations were done without the standard error of the estimate, which is a measure of how much the value of a test statistic varies from sample to sample. It is the standard deviation of the sampling distribution for a statistic which for this estimate is 0.839. Hence, modifying equation (1) to accommodate the standard error with the following:

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n \pm e \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

where e is the standard error of the estimate

Table 4.11 Validation of Prediction Using the Standard Error of Estimate

Projects ID	$y_{predicted}$	Adj y_{p-}	Adj y_{p+}	$y_{observed}$	% diff	% diff -	% diff +
Project No 1	1.347	0.508	2.186	0.880	53	-42	148
Project No 11	-0.170	-1.009	0.669	0.820	-121	-223	-18
Project No 15	0.371	-0.468	1.210	0.620	-40	-175	95
Project No 31	2.291	1.452	3.130	2.000	15	-27	57
Project No 33	1.462	0.623	2.301	0.650	125	-4	254
Project No 39	0.231	-0.608	1.070	0.220	5	-376	386
Project No 40	0.279	-0.560	1.118	0.350	-20	-260	219
Project No 47	3.200	2.361	4.039	2.310	39	2	75
Project No 60	1.793	0.954	2.632	3.030	-41	-69	-13

Source: Field Survey (2005)

Introducing the standard error of the estimate as an adjustment factor for enhancing the predictive power of the model based on the three cost significant preliminaries item reveals a rather unusual pattern. When compared with the percentage differences of the unadjusted (adjustment here means introducing the standard error in the model) estimate, that of the adjusted presented more prediction whose differences were slight to moderate. For instance Project No 11 had a difference of -18%, Project No 33 -4%, Project No 47 2% and Project No 60 -13%, thereby increasing the number of prediction having differences within the plus or minus 20% from 2 to 4.

Hence, based on the results obtained in terms of validation of the behaviour of the 3 cost significant preliminaries items, the model without the constant term as contained in Table 4.9 was adopted and adjusted by using the standard error of the estimate to improve it predictability as shown in Table 4.10 for some randomly selected projects. However it can be observed that in some instances the prediction is irregular, further investigations indicate that these anomalies lie mostly with projects whose GFA – cost/m^2 of preliminaries sums relationship are irregular. This irregular pattern is observed where projects of low GFA correspondingly have disproportionately lower

cost/m^2 of preliminaries sums as opposed to the generally accepted building cost theory of the larger the size of a project, the lower its cost per unit area (Seeley 1996, Ashworth, 1986). This irregular behaviour can be seen in Projects No 1, No 15, 33, 47 as shown in the appendix.

Having considered the contributions of the three (3) cost significant preliminaries items established through the first approach, the contributions of those four (4) established using the second approach were further determined. The coefficients of contribution of each of these items are shown in Table 4.12.

Table 4.12 Contributions of 4 Significant Preliminaries Items to Preliminaries Sums

Item Description	Coefficient		Predictive Power		Significance	
	Value	Sig.	r	r^2	F	p - value
(Constant)	0.174	0.461				
Site Plant & Scaffolding	1.943	0.410				
Supervision & Administration	0.513	0.764	0.980	0.960	100.689	0.000
Site Accommodation	9.066	0.001				
Site Service	-7.750	0.038				
Site Plant & Scaffolding	1.620	0.477				
Supervision & Administration	0.711	0.670				
Site Accommodation	9.241	0.001	0.972	0.945	97.035	0.000
Site Service	-7.391	0.041				

Source: Field Survey (2005)

Table 4.12 reveals that when the constant term is suppressed, the predictive power of the model decreases from $r^2 = 0.960$ to $r^2 = 0.945$, hence the adoption of the model with the constant term for further analysis. Ideally, the constant term should be suppressed, but where they are used, as in this case, it suggests that when none of the four cost significant preliminaries items is undertaken, some amount of money is still spent for preliminaries. This should be expected since aside of these four significant preliminaries

items, there exist others, for instance Watching and Lighting, Water for Works, First Aid Box, Clearing on Completion etc.

Both models exhibits the characteristics of not having their high predictive power occurring by chance since they each have F – values of 100.689 and 97.035 for that with the constant term and that without the constant term respectively. This non-chanced occurrence is further corroborated by their p – values both having a value of 0.000, which are less than the 0.05 value for a 95% two tailed test of hypothesis. However, the coefficients of some of the cost significant preliminaries items are not statistically significant having their p – values greater than 0.05. These items are: the constant term (0.461), Site Plant and Scaffolding (0.410) and Supervision and Administration (0.764). Hence, we conclude that the coefficients of these items are not significantly different from zero and that their occurrence may have been by mere chance.

Therefore, the exclusion of the preliminaries items whose coefficient may have occurred by chance becomes obvious but since they were established as part of the cost significant preliminaries items, they were retained for further analysis. From Table 4.11, the contributions of the four (five, with the inclusion of the constant term) preliminaries items under consideration, to the Total Preliminaries Sums, based on the data set used for this study, are as follows:

From the above analysis, it is evident that two (2) preliminaries items significantly contribute to the total preliminaries sums, one positively and the other negatively, that is Site Accommodation and Services to Site respectively. To this list, the Site Plant and Scaffolding preliminaries item could be added, as contributing moderately and

positively to the Total Preliminaries Sums. Hence, it can be concluded that during contract administration, great care should be exercised in the expenditure of these items. Site Accommodation and Site Plant and Scaffolding items should be kept to the barest minimum especially Site Accommodation which aggressively increases the Total Preliminaries Sum for every unit increase in its cost per GFA. Conversely however, increases in the Services to Site preliminaries item should be encouraged (as long as the other items are held constant) since this item tends to progressively decrease the Total Preliminaries Sums.

Upon establishing the contribution of each of the cost significant preliminaries items based on the Pareto rule, and as was the case with the three (3) cost significant items established based on the first approach, the validity of these contributions (coefficients) was tested by developing a regression model based on the generalised formula stated in equation (1) above thus:

$$y = 0.174 + 1.943x_1 + 0.513x_2 + 9.066x_3 - 7.750x_4 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Where y is predicted Total Preliminaries Sum per GFA of a project

x_1 Cost per GFA of Site Plant and Scaffolding item

x_2 Cost per GFA of Site Supervision and Administration item

x_3 Cost per GFA of Site Accommodation

x_4 Cost per GFA of Services to Site

Taking the values of some of the Projects contained in the Appendix, and substituting them into equation (4) we get the following:

Project No 1 $y = 0.174 + 1.943(0.05) + 0.513(0.23) + 9.066(0.20) – 7.750(0.11)$

$y = 1.350$

Project No 31 $y = 0.174 + 1.943(0.08) + 0.513(0.26) + 9.066(0.15) – 7.750(0.03)$

$y = 1.590$

Project No 40 $y = 0.174 + 1.943(0.04) + 0.513(0.04) + 9.066(0.07) – 7.750(0.03)$

$y = 0.674$

Project No 60 $y = 0.174 + 1.943(0.29) + 0.513(0.54) + 9.066(0.65) – 7.750(0.50)$

$y = 3.032$

Table 4.13 Comparison of the results for Preliminaries based on cost significant items.

Projects ID	$y_{predicted}$	$y_{observed}$	% difference
Project No 1	1.350	0.880	53
Project No 11	-0.181	0.820	-122
Project No 15	-0.005	0.620	-101
Project No 31	1.590	2.000	-21
Project No 33	0.836	0.650	29
Project No 39	0.632	0.220	187
Project No 40	0.674	0.350	93
Project No 47	3.031	2.310	31
Project No 60	3.032	3.030	0

Source: Field Survey (2005)

The result of predictive capacity of the model (represented by equation 4) as shown in Table 4.13 reveals a rather inconsistent pattern between the observed and predicted values, as was the case with the model developed for values shown in Table 4.10. The percentage difference between the observed values (i.e. the final Preliminaries Sums) and the predicted values for the nine projects ranges between -122 to 187. Four out of the nine projects showed very radical differences between their observed and predicted

values namely Project No 11 (-122%), Project No 15 (-101%), Project No 39 (187%) and Project No 40 (93%). Three of them showed moderate differences amongst which are Project No 1 (53%), Project No 33 (29%) and Project No 47 (31%) while in one of the project the four cost significant preliminaries items, the predicted and observed values agreed accurately, i.e. Project No 60, with a 0% difference.

Given the wide differences between the observed and predicted values there is the need to adjust the model using the standard error as done in equation (3) hence, the model becomes:

$$y = 0.174 + 1.943x_1 + 0.513x_2 + 9.066x_3 - 7.750x_4 \pm 0.719 \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

where 0.719 is the standard error in the model. Adjusting the prediction ability of the model based on the error term, the following values are arrived at as contained in Table 4.14

Table 4.14 Validation of Prediction Using the Standard Error of Estimate of projects.

Projects ID	$y_{predicted}$	Adj y_{p-}	Adj y_{p+}	$y_{observed}$	% diff	% diff -	% diff +
Project No 1	1.350	0.631	2.069	0.880	53	-28	135
Project No 11	-0.181	-0.900	0.538	0.820	-122	-210	-34
Project No 15	-0.005	-0.724	0.714	0.620	-101	-217	15
Project No 31	1.590	0.871	2.309	2.000	-21	-56	15
Project No 33	0.836	0.117	1.555	0.650	29	-82	139
Project No 39	0.632	-0.087	1.351	0.220	187	-140	514
Project No 40	0.674	-0.045	1.393	0.350	93	-113	298
Project No 47	3.031	2.312	3.750	2.310	31	0	62
Project No 60	3.032	2.313	3.751	3.030	0	-24	24

Source: Field Survey (2005)

As was the validation case with the three (3) cost significant preliminaries items presented in Table 4.12, the adjustment of the model established for the four (4) cost significant items of preliminaries using the standard error of the estimate further improved the predictability of the model which in this case contained the constant term. Before the adjustment, only two projects had their difference within the plus or minus 20 - 25% i.e. Projects Nos. 31 and 60 while after adjustment the projects increased to four. These included Projects Nos. 15, 31, 47 and 24.

The irregularity of the prediction capacity of the model has been discussed earlier which is traceable to the anomalies that exist in the GFA – cost/m^2 of Preliminaries Sum relationship. Hence it is concluded that, within the limits of the data set used for this study, the predictability of the model based on the four cost significant preliminaries items established is not consistent despite the significant contribution of each of the items to the total preliminaries sums of building projects.

4.4 Influence of Changes amongst the categories of Preliminaries Items.

This section explores the influence of changes in the various categories of preliminaries items on both the Contract Sums and Total Preliminaries Sums. This was in furtherance of one of the study. To achieve this aspect of the work, regression analysis was performed on the data set, using as it were, the various CRP items as independent variables in the first instance, the TRP items in the second instance and LSP items in the third instance all against both the Contract Sums and Total Preliminaries Sums individually as dependent variables.

The approach described above is expected to reverse the pattern in the relationship with the total preliminaries sums as they are affected by the individual items comprising the various categories of the preliminaries items. Hence to control for unusual trend, regression models were developed using all the preliminaries items as independent variables against the Total Preliminaries Sums and Contract Sums. The statistics of these models are tabulated in Table 4.15 which reveals sharp contrasting influence with Contract Sums and Total Preliminaries Sums.

Table 4.15 Influence of Changes in Preliminaries Items to Contract Sums and Total Preliminaries of projects.

Preliminaries Items	Contract Sum Vs Prelim Items				Total Prelim Sum Vs Prelim Items			
	with constant term		No constant term		with constant term		No constant term	
	Coeff	Sig.	Coeff	Sig.	Coeff	Sig.	Coeff	Sig.
(Constant)	10.455	0.138			0.968	0.048		
Site Accommodation	-167.758	0.113	-69.695	0.409	-9.550	0.142	-0.474	0.939
Water for Works	168.361	0.036	163.548	0.055	8.536	0.070	8.091	0.171
Site Plant & Scaffolding	78.873	0.408	179.479	0.059	-11.411	0.092	-2.099	0.731
Insurance & Guarantee	3.387	0.916	23.469	0.501	-2.577	0.234	-0.719	0.782
Supervision & Admin	-90.411	0.236	-167.767	0.030	13.680	0.023	6.520	0.196
Watching and Lighting	709.522	0.002	738.406	0.002	-15.017	0.109	-12.344	0.293
Service site	-90.196	0.457	-195.169	0.128	3.291	0.659	-6.425	0.470
First Aid Box	-1015.725	0.041	-808.879	0.096	20.392	0.420	39.538	0.248
Progress Photograph	-275.148	0.260	-11.275	0.953	-24.518	0.130	-0.095	0.995
Setting Out	481.931	0.111	126.074	0.488	45.472	0.033	12.535	0.368
Sign Board	819.670	0.116	1180.003	0.037	-99.951	0.014	-66.599	0.094
Cleaning on Completion	-369.071	0.004	-412.957	0.002	21.991	0.004	17.929	0.022
r	***0.998***		***0.999***		***0.999***		***0.998***	
r^2	***0.997***		***0.998***		***0.997***		***0.996***	
Std Error	***5.301***		***6.167***		***0.332***		***0.466***	

Source: Field Survey (2005)

For each of the categories considered in Table 4.15 i.e. Contract Sum Vs Prelim Items and Total Prelim Sum Vs Prelim items, the influence of change was modelled having the constant term in the model on the one hand suppressing it. Since it is very obvious that the coefficients arrived at for each of the predictor variables (i.e. the preliminaries items) for the two models are very dissimilar, a selection criterion for the appropriate model to adopt for further consideration becomes evident. r^2 is used as the basis for selecting the appropriate model since this statistics gives the predictive power of the model which translates to mean that the higher the r^2 value, the higher the predictive power of the model. Hence, for the Contract Sum Vs Prelim Items category the model without the constant term was chosen, having an r^2 value of 0.998 while for the Total Prelim Sum Vs Prelim Items category, the model with the constant term was selected having an r^2 of 0.997. Under the former, the influence of changes of four items on the Contract Sum are statistically significant, namely Supervision and Administration *(β = -167.767, p = 0.030)*; Watching and Lighting *(β = 738.406, p = 0.002)*; Sign Board *(β = 1180.003, p = 0.037)*; and Cleaning on Completion *(β = -412.957, p = 0.002)*. These coefficients indicate how changes in each of the Preliminaries items influence the Contract Sum. For instance, where there is a unit increase in the cost/m^2 of the Supervision and Administration preliminaries item, the Contract Sum decreases by N167,767.00/m^2 of GFA. However, there is a complete contrast with the Sign Board preliminaries item where a unit increase in its cost/m^2 brings about an increase of about N1,180,003.00/m^2 in the contract sum.

Considering the other category i.e. Total Preliminaries Sum Vs Prelim Items, four items were found whose influences on the Total Prelim Sums are statistically significant, namely: the constant term (*(β = 0.968, p = 0.048)*; setting out *(β = -45.472, p = 0.033)*;

Sign Board *(β = -99.951, p = 0.014)*; and Cleaning on Completion *(β = -21.991, p = 0.004)*. By the constant term, is meant that when nothing is spent on, or where there is no increase in the cost/m^2 of, any of the preliminaries items, some amount (i.e. N968.00/m^2) is still expended on other undefined items accountable for under Preliminaries. This may account for why provision should be made for preliminaries in building projects.

Also evident from Table 4.15 is the varying nature of influences exhibited in each of the categories by the Preliminaries Items on the contract sum as against total preliminaries sums. This is to be expected, the total preliminaries sums are part of the aggregated cost of the Contract Sum – the former forming part of the latter. Again the reason for this pattern is further corroborated by the correlation between the various preliminaries items on the one hand and the contract sum and total preliminaries sums on the other in which the preliminaries items correlate better with the latter than they do with the former (as shown in Table 4.5 and Figure 4.1.

Having determined the influence of change in each of the preliminaries items from a general view point, the specific influence of each of the three categories of preliminaries items was also established. This is presented in Table 4.16 which reveals that for both contract sums and total preliminaries sums, the time related preliminaries Items explains more of the variations (95% of Contract Sums and 97% of the Total Preliminaries Sums) than do either the Cost related and Lump Sum Preliminaries items. Hence we only give fuller details of the Time Related Preliminaries items for the purpose of this research work, which ever category is considered, either time related, cost related, no difference will be noticeable in the details.

When only the Time Related Preliminaries Items are considered, the following influences over the Contract/Preliminaries Sums are observed: the items with the greatest influence are First Aid Box – 224.057 for Contract Sums and Progress Photograph – 19.796 for Total Preliminaries Sums while that with the least is Services to Site – -0.780 for both contract sums and total preliminaries sums. In addition, the following changes between the control coefficients arrived at in Table 4.15 and that of the Time Related Preliminaries Items as shown in Table 4.16 include: For Contract Sums, Supervision and Administration (-167.767, 27.380); Watching & Lighting (738.406, 127.612); Service to Site (-195.169, -0.780); First Aid Box (-808.879, 224.057) and Progress Photograph (-11.275, 110.452).

Table 4.16 Influence of the Various Categories of Preliminaries Items of some projects.

Preliminaries Items	Contract Sum Vs Prelim Items		Total Prelim Vs Prelim Items	
	Coeff	**Sig.**	**Coeff**	**Sig.**
Cost Related Items				
(Constant)	-	-	0.412	0.217
Site Accommodation	50.069	0.476	10.707	0.000
Water for Works	29.209	0.792	-8.025	0.041
Site Plant & Scaffolding	33.854	0.000	2.045	0.000
Insurance & Guarantee	111.662	0.227	-1.004	0.772
r^2	*0.917*		*0.964*	
Std Error	*23.449*		*0.760*	
Time Related Items				
(Constant)	-	-	-0.192	0.386
Supervision & Admin	27.380	0.000	1.807	0.000
Watching and Lighting	127.612	0.143	1.963	0.566
Service site	-0.780	0.987	1.059	0.574
First Aid Box	224.057	0.404	10.395	0.327
Progress Photograph	110.452	0.607	19.796	0.031
r^2	*0.952*		*0.969*	
Std Error	*16.120*		*0.634*	
Lump Sum Items				
(Constant)	-	-	0.051	0.814
Setting Out	-94.826	0.656	0.550	0.928
Sign Board	704.981	0.005	35.515	0.000
Cleaning on Completion	220.509	0.085	11.878	0.010
r^2	*0.874*		*0.959*	
Std Error	*25.110*		*0.710*	

Source: Field Survey (2005)

While for the Total Preliminaries Sums, Supervision & Administration (6.520, 1.807); Watching & Lighting (-12.344, 1.963); Services to Site (-6.425, 1.056); First Aid Box (39.538, 10.395) and Progress Photograph (-0.095, 19.796).

4.5 Establishment of Variability of Preliminary Items.

Two approaches were adopted toward the establishment of variability amongst the various sums of preliminaries items, namely variability within preliminaries item over

projects and variability within tender preliminaries sums. The former compared the sums per GFA of each of the preliminaries items across all the projects used in the study while the latter compares the total preliminaries sum of the accepted tender with that of the other tenderers on a project basis. In addition, the total preliminaries sum of each tenderer was further compared with that of the average (statistically expected) total preliminaries sum. Results of the analyses performed for this purpose are shown in Tables 4.17 – 4.19. The standard deviation and coefficient of variation were used to establish variability.

4.5.1 Variability of Preliminaries Items amongst Projects

Table 4.17 Variability of Preliminaries items amongst projects

Items	N	Mean	Std. Dev	Population Std Dev	CV
Final Site Accommodation	24	0.252	0.251	0.256	102
Final Water for Works	24	0.184	0.166	0.170	92
Final Site Plant & Scaffolding	22	0.341	0.959	0.982	288
Final Testing & Samples	4	0.019	0.020	0.023	122
Final Insurance & Guarantee	19	0.099	0.075	0.077	78
Final Supervision & Administration	24	0.525	1.247	1.274	243
Final Watching and Lighting	24	0.127	0.108	0.110	87
Final Service site	23	0.149	0.182	0.186	125
Final First Aid Box	24	0.03	0.027	0.028	92
Final Progress Photograph	24	0.033	0.030	0.031	93
Final Setting Out	24	0.058	0.090	0.092	159
Final Sign Board	22	0.035	0.070	0.072	205
Final Cleaning on Completion	24	0.063	0.069	0.070	112

CV = coefficient of variation

The results of the analysis i.e. the establishment of coefficient of variation (CV) for each of the preliminaries items as shown in Table 4.17, reveals that all the preliminaries items of the projects studied exhibits very high variability ranging from 78% (for

Insurance and guarantee) to 288% (for Site plant and scaffolding). For those preliminaries items whose CV fall below 100% their standard deviations were less than their mean values with the computed percentages (CVs) indicating by how much. For instance, the 78% variability exhibited by Insurance and guarantee interprets to mean that the standard deviation of 'Insurance and guarantee' is 0.78 times its mean which indicates very wide variations amongst the unit cost of the item allowed for in the various bills of quantities used for the study.

The result of analysis contained in Table 4.17 shows the CV of all the projects studied irrespective of project type (whether public or private). Comparing the CV of the various preliminaries items along this dimension i.e. type of client, there are some noticeable differences as shown in Table 4.18.

Table 4.18 Variability of Preliminaries items amongst some completed Public and Private Projects

Preliminaries item (Per GFA)	Public Projects					Private Projects				
	n	Mean	SD	Pop SD	CV	n	Mean	SD	Pop SD	CV
Contract Sum	28	56.118	60.185	61.290	109	12	50.640	63.518	66.342	131
Total Preliminaries Sum	28	1.955	1.666	1.696	87	12	2.791	4.196	4.383	157
Site Accommodation	15	0.237	0.213	0.220	93	9	0.277	0.318	0.337	122
Water for Works	15	0.175	0.144	0.149	85	9	0.199	0.207	0.220	110
Site Plant & Scaffolding	15	0.114	0.094	0.098	86	7	0.827	1.672	1.806	218
Testing & Samples	2	0.018	0.025	0.035	200	2	0.020	0.025	0.035	181
Insurance & Guarantee	12	0.091	0.056	0.059	64	7	0.113	0.104	0.112	100
Supervision & Administration	15	0.287	0.182	0.188	66	9	0.922	2.032	2.155	234
Watching and Lighting	15	0.119	0.097	0.101	84	9	0.141	0.129	0.137	97
Service site	15	0.121	0.132	0.137	114	8	0.202	0.253	0.271	134
First Aid Box	15	0.030	0.028	0.029	99	9	0.030	0.025	0.027	88
Progress Photograph	15	0.038	0.033	0.034	92	9	0.025	0.024	0.025	99
Setting Out	15	0.054	0.068	0.071	131	9	0.064	0.124	0.131	206
Sign Board	15	0.025	0.025	0.026	105	7	0.054	0.123	0.133	244
Cleaning on Completion	15	0.072	0.069	0.071	99	9	0.049	0.071	0.075	153

SD - Standard deviation, Pop - Population, CV - Coefficient of variation

Private projects exhibited higher CV for all the preliminaries items compared to that of public projects except for the 'First Aid Box' (FAB) and 'Testing and Samples' (T&S) items where the reverse is the case i.e. the CV of the public projects (CV = 99% for FAB, CV = 200% for T&S) is higher than that of the public projects (CV = 88% for FAB, CV = 181 for T&S). For some of the CVs established, those of private projects are approximately twice that of the public projects and in yet an instance, as much as thrice, thus: Total preliminaries Sums (Public – 87% : Private – 157%), Site Plant and Scaffolding (86% : 218%), Supervision and Administration (66% : 234%), Sign board (105% : 244%), and Cleaning on completion (99% : 153%).

The reasons for these differences may not be too divorced from the factors associated with the characteristic nature of the projects considered for the study which is in line with Beeston's (1983) argument that even similar projects constructed either at different locations or for different clients, tend to exhibit great variability in their unit cost (e.g. cost per GFA). To appreciate further the difference inherent in the variability of the different project type, we graphed the CVs (for public projects, private projects and for both projects combined) as shown in Figure 4.3.

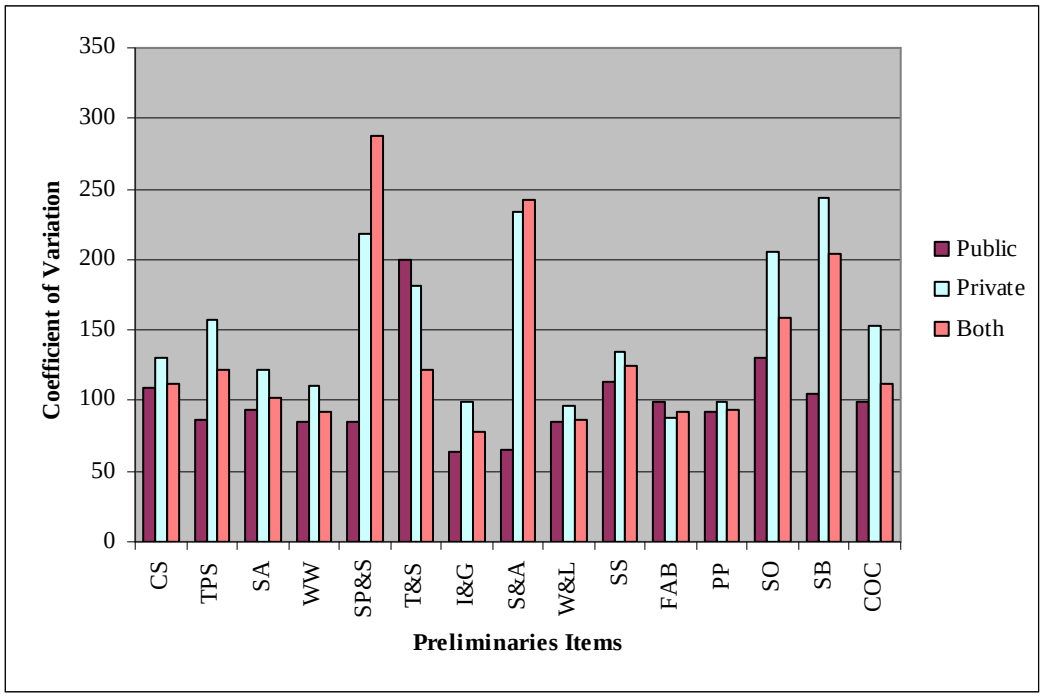


Figure 4.3 – CVs for some completed Public, Private and Both Projects for each Prelim Item

When the data set was adjusted for project type (in this instance public and private), the pattern of variability of each of the preliminaries items showed noticeable differences, as shown in Figure 4.3. For instance the private projects showed higher variability compared to public projects and when both are combined. It is suspected that the reason for this high variability may be entrenched in the procurement methods adopted for public and private projects, with the former strictly reliant on open tendering and the requirements of the Due process (a contract audit for public projects).

While in the private sector, it is a form of negotiation in which the various functional requirements of the projects are considered.

According to Beeston (1983) variability tends to reduce when factors which do have influence on the cost of projects are adjusted for or taken into account when establishing variability, which however, is the contrary here. The study revealed that when project

type was adjusted for the private projects exhibited higher variability than do the unadjusted data (i.e. combining both the public and private projects).

4.5.2 Variability of Total Preliminaries Sum over Projects

The concept of variability is deeply enshrined in the differences which occur in the various sums or unit rates provided for similar items when attended to under different circumstance, which may either be instigated by submissions from different tenderers, same work constructed under differing conditions, vagaries of pricing. This section of the research work examines 31 projects and establishes the variability in the preliminaries sums quoted by the various tenderers for each project as shown in Table 4.19 which gives their individual statistics.

Table 4.19 Variability Statistics for Preliminaries Sums Quoted for in 31 completed Building Projects

S/No	No of Tenderers per project	Preliminaries Sums (in ₦100,000)			Coefficient of Variation (%)
		Mean	Standard Deviation	Population Std Dev	
1	2	2.75	1.77	2.50	90.91
2	2	8.25	1.06	1.50	18.18
3	2	19.75	15.20	21.50	108.86
4	3	3.92	5.83	7.14	181.88
5	3	2.37	1.33	1.63	68.66
6	3	2.69	2.05	2.51	93.08
7	3	10.83	1.60	1.96	18.13
8	3	15.67	6.03	7.38	47.12
9	3	41.75	39.29	48.12	115.28
10	3	178.62	79.84	97.78	54.75
11	4	2.52	1.71	1.97	78.23
12	4	5.32	2.80	3.24	60.87
13	4	8.14	5.02	5.80	71.25
14	4	5.84	1.11	1.28	21.99
15	4	13.38	7.64	8.82	65.97
16	4	14.81	8.61	9.94	67.14
17	4	11.38	2.81	3.24	28.52
18	4	14.25	2.98	3.44	24.16
19	4	38.07	33.72	38.94	102.29
20	5	1.80	0.91	1.02	56.42
21	5	1.60	0.80	0.89	55.68
22	5	14.40	20.10	22.47	156.04
23	5	6.94	1.66	1.86	26.80
24	5	6.90	2.07	2.32	33.60
25	6	9.03	3.60	3.95	43.71
26	6	129.42	40.63	44.50	34.39
27	7	5.68	1.24	1.34	23.63
28	7	12.86	5.18	5.59	43.50
29	7	8.87	1.85	2.00	22.52
30	8	10.44	2.23	2.38	22.81
31	8	499.13	234.67	250.88	50.26

The projects are sorted according to the number of tenderers in each after the entry of data

Between the thirty-one projects studied, the CVs computed ranges from 18% to 181% with about 48% of the projects having their CVs between 0 – 50%, 35% of them with CV between 50 – 100%, 10% with CVs between 100 – 150% while only 6% of the

projects have their CVs ranging between 150 – 200%. From this revelation there seems to be a noticeable pattern in the CVs computed which tends to indicate that as the CV range increases the number of projects falling under such range reduces at a seemingly progressive ratio. The frequency of projects falling under each range was graphed as shown in Figure 4.4 below.

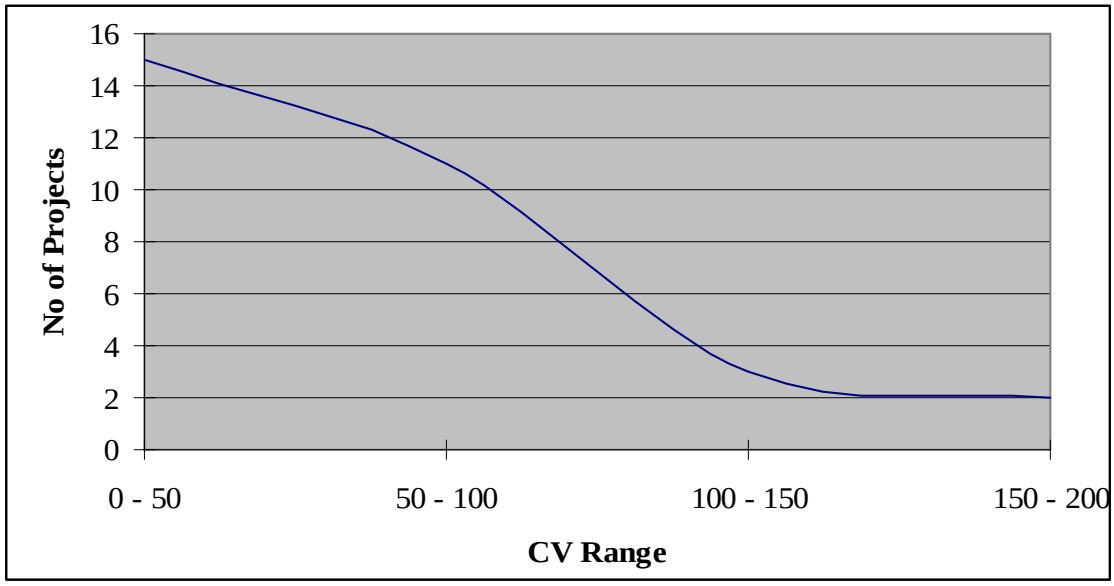


Figure 4.4 – Line Graph showing Pattern between Projects and CV ranges

The figure presents an inverted S – shape curve, we thus conclude, based on the data set used for this research work, that the distribution of projects based on the ranges of their CV does not follow a normal distribution even when the sample size is sufficiently large. This is very evident in that at the 50 – 100% range there is a sudden and steep fall in number of projects as the range progresses while between the 0 – 50% and 50 – 100% range the drop is rather slight and steady.

The statistics in Table 4.19 further reveal that there is wide variability amongst the tender figures allowed for preliminaries sums by each tenderer in the thirty-one projects studied with the least variability coefficient been 18% (which in itself is considered

high). However, since approximately up to half of the projects (i.e. 48%) have their CV within the 0 – 50% range, the average variability for building projects could be said to hover around this range, precisely 50%.

Another pattern seems obvious from Table 4.19 which is manifest in the relationship between the number of tenderers per project and the frequency of occurrence on the one hand and the mean CV on the other. These relationships are graphed in Figures 4.5 and 4.6 where the former shows a bimodal normal distribution.

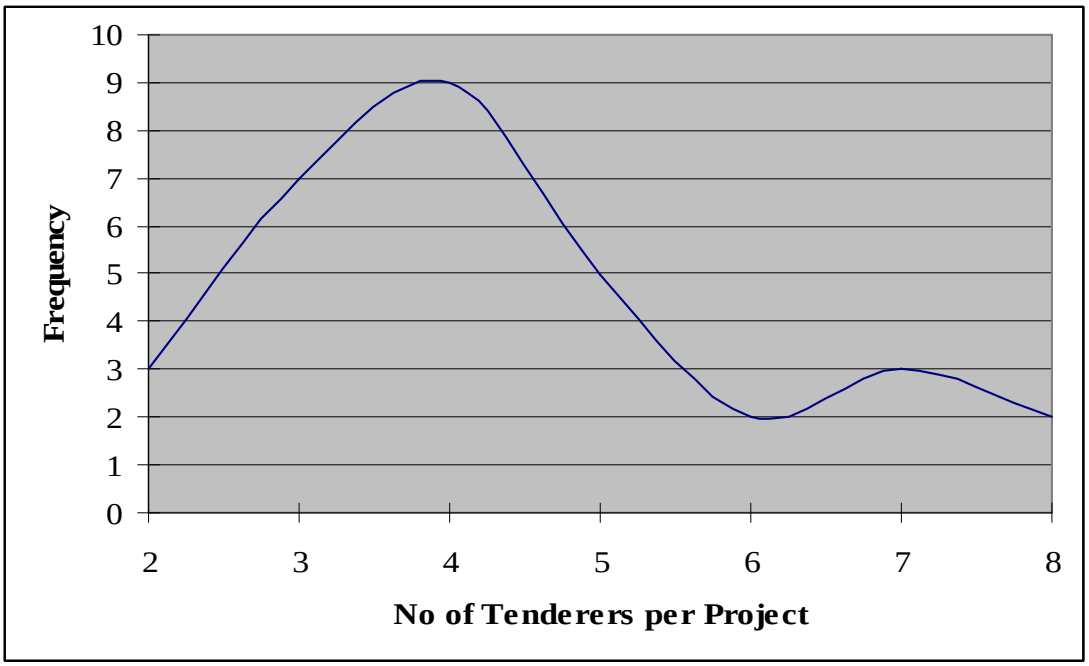


Figure 4.5 Line Graph showing Distribution Pattern of Tenderers per Project

By ignoring the smaller hunch, which represents a rather small number in the sample i.e. 2 and 3, the larger one exhibits near perfect normal distribution having a mean value of 4 number of tenderer per project which eventually is the calculated mean of the sample. However, this mean value is in contrast with the minimum allowable number of tenderers per project for open tendering particularly for public projects (NJCC Public 4).

4.5.3 Prediction of Variability of Preliminaries Sums for Building Projects

In this section, the results of the variability of Preliminaries established is employed to determining the most likely preliminaries sum to consider for award. The regression technique was employed and the result of the analysis is presented in Table 4.20 which gives the coefficients of each independent variable, their p – values and the model performance i.e. its predictive ability.

Table **4.20** Coefficients of Variables for Predicting Variability

Variables	**coeff**[a]	***sig***	**coeff**[b]	***sig***
Constant term	91.150	*0.003*	-	-
Number of tenderers per project	-9.227	*0.052*	1.822	*0.601*
Mean tender preliminaries sum	0.000	*0.967*	0.000	*0.116*
Size relative to prelim sum	6.287	*0.590*	32.119	*0.002*
Rr	0.392		0.807	
r^2	0.154		0.651	
Std Error	39.026		45.127	

Dependent Variable: Coefficient of Variation, [b] model without constant term

Using three variables - number of tenderers, expected preliminaries sums and size of project based on preliminaries sums, as functions of variability in preliminaries sums for tendering purposes, the prediction of variability based on the study dataset showed very low predictive power with an r^2 value of 0.154 and a standard error of estimate of 39.026. It is evident that these three variables may not be too apt for the prediction of variability, but very important is the nature of the data used for the analysis which shows very wide and extremely high coefficients of variation.

The coefficients of the various variables when resolved around the origin tend to improve the predictive power of the three independent variables having an r^2 value of

0.651. Of the two approaches, variables having their coefficients significantly different from zero are the constant term (p – value = 0.003) and number of tenderers (p – value = 0.052) under model with constant term, and size relative to preliminaries sums (p – value = 0.002) under model without constant term. The equations below represent the models for predicting variability in preliminaries sums before contract award:

$$V_w = 91.150 - 9.227(Num) + 6.287(Size) \quad \ldots\ldots(5a)$$

$$V_{wo} = 1.822(Num) + 32.119(Size) \quad \ldots\ldots(5b)$$

Where V_w is Variability of Prelim Sum amongst tenderers using constant term (in %)

V_{wo} Variability of Preliminaries sum without constant term (in %)

Num Number of tenderers

Size Size of project based on preliminaries sums (1 for sums less than N1m; 2 for sums between N1m – N3m, and 3 for sums above N3m

Table **4.21** Performance of Models for Predicting Variability of Preliminaries Sums

S/No[a]	Num	Size	CV	V_{m1}[b]	V_{m2}[c]	V_{m1} Dev[d]	V_{m2} Dev[d]
1	2	1	90.91	78.98	35.76	11.93	55.15
3	2	2	108.86	85.27	67.88	23.59	40.98
7	3	2	18.13	76.04	69.70	-57.91	-51.57
10	3	3	54.75	82.33	101.82	-27.58	-47.07
14	4	2	21.99	66.82	71.53	-44.83	-49.54
19	4	3	102.29	73.10	103.65	29.19	-1.35
22	5	2	156.04	57.59	73.35	98.45	82.69
24	5	1	33.60	51.30	41.23	-17.70	-7.63
25	6	1	43.71	42.08	43.05	1.64	0.66
26	6	3	34.39	54.65	107.29	-20.26	-72.90
27	7	1	23.63	32.85	44.87	-9.22	-21.24
28	7	2	43.50	39.14	76.99	4.36	-33.49
30	8	1	22.81	23.62	46.70	-0.81	-23.89
31	8	3	50.26	36.20	110.93	14.07	-60.67
				Total Deviation		**4.91**	**-189.88**

[a] numbering based on Table 4.19, [b] predicted CV using eqn 5a, [c] predicted CV using eqn 5b

[d] deviations of predicted variability from CVs as computed in Table 4.19 and shown under CV in this Table

Model 5a gave a total deviation of 4.91 over all the 14 projects used in the validation exercise while the model 5b gave a deviation of -189.88 which is too divergent from the 5a model and also in itself, widely diverse. Hence the model with the constant term (i.e. based on equation 5a) is hereby recommended for use in the prediction of variability of preliminaries sums during early phases of project implementation.

4.6 Development of Models for Predicting Preliminaries Sums.

Although some studies have been conducted on predicting preliminaries sums of construction projects Babalola and Jagboro (2001) but these studies did not state the stage at which the models targeted at, for example predicting preliminaries sums at the early design stages (for the purpose of establishing budgets), at the tendering stage (for the purpose of predicting the likely tender figure or selecting suitable contractor), or during the construction stage (for the purpose of predicting the likely sums at the end of each predetermined stage or at total completion of the project). This study attempts at developing models for predicting preliminaries sum at the point of contract award.

At contract award, certain issues would have been finalised with certainty amongst which are the project size, contract sum, awarded preliminaries sum, contract duration etc. Hence this study developed models based on the following project particulars which are readily available at contract award: client type (public or private), project size (GFA), awarded contract sum, awarded preliminaries sum. Two major different predictive models (each having various variations) were developed based on the following categorisation: combined (irrespective of ownership and magnitude) and ownership (either public or private projects).

4.6.1 Predicting Final Preliminaries Sums irrespective of Project Character

Table 4.20 shows the coefficients of the independent variables employed in the prediction of Final Preliminaries Sum for building project. Two models were developed – model based on the raw data and that based on the adjusted data (i.e. converting them to the cost per GFA). For each of the models developed, the constant term was included in one and suppressed in the other. Suppressing the constant term implies that the line is fitted through the origin which translates to mean that at contract award no amount is spent on preliminaries hence the Final Preliminaries Sum is Zero.

Table **4.22** Coefficients of Variables for Predicting Final Preliminaries Sums

Preliminaries Items	**Using Raw Values**		**Using GFA Values**	
	Coeff	**Sig.**	**Coeff**	**Sig.**
Model with Constant term included				
(Constant)	374.513	0.109	0.571	0.089
Type of Client	-109.012	0.570	-0.267	0.324
Project Gross Floor Area	-0.026	0.580	0.000	0.802
Initial contract Sum	0.000	0.910	-0.002	0.470
Initial Preliminaries Sum	0.986	0.000	1.047	0.000
r^2	*0.990*		*0.952*	
Std Error	*447.579*		*0.612*	
Model with Constant term excluded (i.e. passing through the origin)				
Type of Client	172.224	0.051	0.135	0.340
Project Gross Floor Area	-0.048	0.294	0.000	0.552
Initial contract Sum	0.000	0.813	0.000	0.980
Initial Preliminaries Sum	0.972	0.000	1.014	0.000
r^2	*0.992*		*0.970*	
Std Error	*458.053*		*0.629*	

Model with Constant Term

Comparing the two models (i.e. that using raw data and that using adjusted data), it is evident that the one constructed using the raw data has a higher r^2 value *(0.990)* than that constructed using the adjusted data *(0.952)* which goes to suggest that the former predicts better than the latter. However, (with constant term), only the coefficient of Initial Preliminaries Sum is statistically significant at 95% for both studies (raw data of adjusted data GFA), while those of type of client, project GFA, initial contract sum and initial preliminaries sum, are not.

The non-significance of the variables listed above implies that, based on the data set within which the regression analysis was conducted, the coefficients of each of these variables is not significantly different from zero and that their occurrence (i.e. the noticeable difference from zero) may have happened by chance. This may further imply that the importance of these variables in predicting final preliminaries sum may not be significant at the contract award stage. This therefore is an area where further researches can be conducted on.

Given the above outcome, therefore the equation (model) below for predicting final preliminaries sums for building projects are proposed:

$$F\,\mathrm{Pr}el = 374.513 - 109.012CliType - 0.026GFA + 0.986I\,\mathrm{Pr}el \quad \ldots\ldots\ldots\ldots \quad (6)$$

Where *FPrel* is Predicted Final Preliminaries Sum of an awarded building project

CliType The type of client

GFA Gross floor area of the project

IPrel Awarded Preliminaries sum of the project.

It should be noted however that contract sum is not included in the model above since its coefficient is 0.000 (whose actual value is 0.0002302) hence completely zeroing it if introduced in the model at three places of decimal.

Model without Constant Term

As was the case of the model with the constant term, the model constructed using the raw data have high predictive power than that constructed using adjusted data, with r^2 values of *0.992* and *0.970* respectively. Only the coefficient of the initial preliminaries sum is statistically significant and the coefficient of the initial contract sum zeros the variable. The model constructed using the raw data is therefore adopted and hence the model below is proposed for predicting Final Preliminaries Sum of a building project when it presupposes that as long as no work has commenced (just at contract award) the Final Preliminaries Sum is zero:

$$F\,\mathrm{Prel} = 172.224CliType - 0.048GFA + 0.972I\,\mathrm{Prel} \quad \ldots\ldots\ldots\ldots\ldots (7)$$

4.6.2 Predicting Final Preliminaries Sums based on Project Ownership

Under the section of establishing variability of project preliminaries, it was evident that there was significant difference between the variability in public and private projects. Hence it becomes necessary for further analysis to develop models for predicting final preliminaries sum specifically based on client type. The coefficients of the independent variables – GFA, Initial Contract Sum and Initial Preliminaries Sum are shown in Table 4.23.

Table **4.23** Coefficients for Predicting Final Preliminaries Sums for Public & Private Buildings

Preliminaries Items	Using raw data				Using adjusted data			
	Coeff	**Sig.**	**Coeff**	**Sig.**	**Coeff**	**Sig.**	**Coeff**	**Sig.**
Public Buildings								
(Constant)	87.206	0.644	-	-	-0.011	0.977	-	-
Project Gross Floor Area	-0.014	0.912	0.023	0.814	0.000	0.846	0.000	0.763
Initial contract Sum	-0.005	0.123	-0.006	0.101	-0.007	0.098	-0.007	0.086
Initial Preliminaries Sum	1.292	0.000	1.321	0.000	1.353	0.000	1.350	0.000
r^2	*0.865*		*0.944*		*0.849*		*0.938*	
Std Error	*487.602*		*479.926*		*0.687*		*0.673*	
Private Buildings								
(Constant)	145.506	0.144	-	-	0.064	0.300	-	-
Project Gross Floor Area	-0.093	0.067	-0.100	0.066	0.000	0.130	0.000	0.239
Initial contract Sum	0.005	0.169	0.006	0.073	0.004	0.181	0.005	0.044
Initial Preliminaries Sum	0.931	0.000	0.919	0.000	0.939	0.000	0.924	0.000
r^2	*1.000*		*1.000*		*1.000*		*1.000*	
Std Error	*181.838*		*197.509*		*0.096*		*0.098*	

In either of the two approaches adopted i.e. including or excluding the constant term, the models with the raw data exhibited higher predictive power, having their r^2 higher than those constructed using the adjusted data. Again, only the coefficients of the Initial Preliminaries Sum of all the models have their occurrences been statistically significant at 99%, all having p – values of *0.000*. Based on the values shown in Table 4.21, we develop the following models for predicting the Final Preliminaries Sums:

$$FP_{Pu} = 87.206 - 0.014GFA - 0.005ICSum + 1.292IPSum \quad \text{..... (8)}$$

$$FP_{PuO} = 0.023GFA - 0.006ICSum + 1.321IPSum \quad \text{..... (9)}$$

$$FP_{\Pr} = 145.506 - 0.093GFA + 0.005ICSum + 0.931IPSum \quad \text{..... (10)}$$

Where FP_{Pu} is Predicted Final Preliminaries Sum of an awarded public building project

FP_{PuO} Predicted Final Preliminaries Sum but without the constant term

FP_{Pr} Predicted Final Preliminaries Sum of an awarded private building project

From Table 4.21 we observe that equation (8) explains as much as 87% of the variations inhibited in the various variables used at predicting the final preliminaries sum, while in equations (9), (10), the independent variables accounts for the following variations respectively: 94%, and 100% .

4.6.3 Summary of Findings and Discussions.

Due to the wide variations and deviation in the data set used for this study, there was the need for data adjustment. This was done by converting the data from their raw state i.e. their monetary value (in naira) to unit sums in terms of their respective gross floor areas. The adjustment further reduces data to a common base for both comparative and analytical purpose.

4.6.4 Relationships between Preliminaries Sums

First, the study established relationships between the initial and final sums of preliminaries items and that for all the sums studied there exist strong positive relationships which are all statistically significant at 99% level of confidence except for 'water for works' which shows a rather weak relationship between their initial and final sums.

However, the existence of a positive relationship between initial and final preliminaries sums also indicates the existence of differences between these sums (as long as their correlation coefficients are less than 1.00). But whether these differences are significant was established by conducting tests of significance, with the results revealing that only three (3) items had differences that were statistically significant at 95% level of confidence. These items include Total preliminaries sums, water for works and services to site.

Having established and tested the differences existing between initial and final sums, the study determined the relationships amongst the various preliminaries items using the final sums since they represent the true cost of the project. All the preliminaries items had a weak negative relationship with their GFA with only some of them being statistically significant as follows: for cost related items – site accommodation and water for works, for time related items – watching and lighting, first aid and progress photograph, while there was none for the lump sum items.

The next relationship established were those between the contract sums and the various preliminaries items. For the cost related items these relationships are positive and strong, with all of them are statistically significant, for the time related items all are positive with the strongest being supervision and administration, while for the lump sum items the relationships are positive and very strong for setting out and sign board, and strong for cleaning up on completion. Relationships between total preliminaries sums the various preliminaries items are similar to that which exist between them and contract sums only that they correlate better with the total preliminaries sums than with the contract sums.

4.6.5 Cost Significant items and Influence of changes in Preliminaries Items

The influence of changes in the three categories of preliminaries items on the total preliminaries sum are as follows: for the cost related items, when there is a unit increase in site accommodation the total preliminaries sum tends to increase by N10,707/m^2, an increase in water for works reduces the total preliminaries sums by N8,025/m^2, site plant and scaffolding gives an increase of N2,045/m^2. Changes in the time related items brings about the following influences to the total preliminaries sum – supervision and administration +N1,807/m^2, watching and lighting +N1,963/m^2, site services +N1,059/m^2, first aid +N10,395/m^2, and progress photographs +N19,796/m^2. Finally, changes in the lump sum preliminaries items influence the total preliminaries sum thus: setting out +N550/m^2, sign board +N35,515/m^2 and cleaning on completion +N11,878/m^2.

4.6.6 Variability of Preliminaries

On projects studied, there exist very high variability in all the preliminaries items ranging between 78% for insurance and guarantee to 288% for site plant and scaffolding. Cost related items have variability as high as 135%, time related items 128% while the lump sum items have variability as high as 159%. This shows that the lump sum preliminaries items exhibit the greatest variability inherent in preliminaries items in building projects followed by the cost related items, with the time related items exhibiting the lowest variability (which in itself is very high at 128%). Classifying the projects according to ownership revealed that private projects exhibits higher variability for all the preliminaries items than public projects only with the exception of testing and samples, and first aid box. The reason for this may be traceable to the differing procurement routes adopted for public and private owned projects.

Within similar projects, there exist lower variability, ranging between 18% to 181% as compared to that in projects of dissimilar characteristics, and as the no of projects increases the range of variability tends to reduce which indicates that there is an inversely proportional relationship between number of projects and the range of variability within which a group of projects will fall. There also exist a relationship between the number of tenderers per project and the magnitude of variability which is evident in the distribution pattern, in this case a normal distribution.

In an attempt to develop model for predicting variability of preliminaries sums for building projects, three variables were considered as independent or predictor variables, namely: number of tenderers, mean tender preliminaries sum and the relative size of the project. Two models were developed using the regression analysis technique – one with the constant term and the other without the constant term, with the former being more apt for adoption. Below is the proposed model:

$$V = 91.150 - 9.227(Num) + 6.287(Size)$$

Where V is the predicted variability expressed in percentage, Num is the number of tenderers for the project, and Size is the relative size of the project based on the total preliminaries sum (1 for sums less than N1m, 2 for sums between N1m – N2m, and 3 for sums greater than N3m).

4.6.7 Predicting Final Preliminaries Sums

Two main models were developed for predicting final preliminaries sums for building projects using the regression analysis technique. The first model is a general model which predicts final sums irrespective of the nature of the project (irrespective of ownership i.e. whether public or private) and the second are models for specific

adoption for either public or private building projects. Each of these two models contains two variants, one with the constant term and the other without the constant term. Those with the constant term interpret to mean that at contract award some amount of money would have been committed on items that are related to project preliminaries, which may seem to portray the current practice in the Nigerian construction industry.

For the general model, four variables which are readily available at contract award, were used as predictor variables to predict final preliminaries sum of an awarded contract, namely: type of client (CliType), project size (GFA), awarded contract sum (ICSum) and preliminaries sum at contract award (IPrel). Below are the models developed for the prediction of final preliminaries sums irrespective of the ownership of the project:

With constant term: FPrel = 374.513 – 109.012CliType – 0.02GFA + 0.986IPrel

Without constant term: FPrel = 172.224CliType – 0.048GFA + 0.972IPrel

The above models do not feature the awarded contract sum (ICSum) this is because the coefficient of this variable (0.00023) when rounded to three decimal places is zero.

For the models, three independent variables were employed to model the prediction of final preliminaries sum for building projects. These variables include project size (GFA), awarded contract sum (ICSum), and preliminaries sum at award (IPSum). The models developed are shown below:

For public projects

With constant term: FPrel = 87.206 – 0.014GFA – 0.005ICSum + 1.292IPSum

Without constant term: FPrel = 0.023GFA – 0.006ICSum + 1.321IPSum

For Private projects

With constant term: FPrel = 145.506 – 0.093GFA + 0.005ICSum + 0.931IPSum

Without constant term: FPrel = 0.100GFA + 0.006ICSum + 0.919IPSum

4.8 Administration of Preliminaries In The Construction Industry in Nigeria

4.8.1 Provision of Preliminaries in Building Projects

It is accepted that preliminaries should be provided for all types of building contracts and that such a provision should be made for in the bills of quantities, as contained in literature. However, while this practice is widely agreed with, a proportion of the respondents do not fully agree with it as shown in Table 4.24.

Table **4.24** Respondents' Statistics for Provision of Preliminaries in Building Projects

Research Variables	n	Response (in %)		Total	Aggregate Response
		Yes	No		
1. Provision of Preliminaries Necessary	44	93	7	100	Yes
2. Sectioning Preliminaries in BOQ	44	93	7	100	Yes
		Minor	**Medium**	**Major**	
3. New construction works[a]	2	5	-	-	Minor
4. Rehabilitation/Refurbishing[a]	3	7	-	-	Minor
		Yes	**No**	**Total**	**Agg**
5. Factoring Preliminaries into rates[b]	4	7	2	9[c]	Yes

[a] repondents who answered 'No' to item 1 and [b] those who answered 'No' to item 2

[c] A respondent who'd earlier answered 'Yes' to item 2 also responded to this variable

4.8.2 Necessity of Preliminaries for all Type of Projects

Respondents were asked whether the provision of preliminaries is necessary for all projects to which 93% opined in the affirmative while 7% said no, giving an aggregate

response of 'Yes'. Out of the 7% that do not agree that preliminaries are necessary for all projects, in responding to specific project types that require preliminaries, 5% (2 of all the 44 respondents) of them indicated it was necessary for new construction works while all of them i.e. 7% indicated rehabilitation/refurbishing. This response is rather unexpected, being contrary to the usual practice as suggested in literature. Probing the responses further, it was revealed that for each of the categories, based on occupation and years of experience, at least a respondent said 'No' except in the client organisation and those within the 11 – 15 years and over 20 years. The result of this analysis is shown in Table 4.25.

Table **4.25** Cross-tabulation for Provision of Preliminaries in Projects

Categories	**Yes**	**No**	**Total**	**Chi - square test**	
				value	**T**
Respondent's occupation					
contractor	16	1	17		
consultant	23	2	25	0.225	0.894
client organisation	2		2		
Total	**41**	**3**	**44**		
Work experience					
0 – 5 years	11	1	12		
6 - 10 years	8	1	9		
11 - 15 years	7		7	0.965	0.915
16 - 20 years	13	1	14		
above 20 years	2		2		
Total	**41**	**3**	**44**		

The responses in the Table are frequencies and not expressions in percentages

Furthermore, from table 4.23 we find out that on the issue of provision of preliminaries for all types of project, there is no significant difference in the responses gathered based on either the respondents' occupations or years of working experiences as revealed by the chi-squared test statistics having p-values of 0.894 and 0.915 respectively.

Separate Section for Preliminaries in BOQ

Respondents were also asked that, where preliminaries was required in a project, should a separate section be provided in the BOQ to cater for such on inclusion, to which 93% responded in the affirmative while 7% said 'No', as contained in Table 4.1. All of those who did not agree that preliminaries should constitute a separate part of the BOQ indicated that it should form part of the rates used in pricing the BOQ. However, a respondent under this category (i.e. those not in agreement with having a separate section of preliminaries in the BOQ) believes that preliminaries should not be factored into the bill rates. Since this response pattern is very similar to that which sought opinions on provision of preliminaries in all projects, it is expected that there is no significant difference in the respondents on their opinion of providing a separate section for preliminaries in BOQs, based on respondents' occupations and years of working experiences.

4.8.3 Pricing Preliminaries Items

There have been various arguments on the pricing of preliminaries in building projects which cuts across, amongst others, the methods adopted (common and appropriate), factors influencing the pricing methods and their accuracy Ramus (1997). Tables 4.3 – 4.5 show the results of the analysis conducted on data which relates to pricing preliminaries for building projects in the construction industry.

Table **4.26** Method of pricing preliminaries and Ranges of Percentage Cover

Variables	Common		Most Appropriate	
	N	**%**	**n**	**%**
Methods				
Inserting a fixed percentage	9	20	2	5
Pricing individual items	13	30	34	77
combination of the two	22	50	8	18
Total	***44***	***100***	***44***	***100***

Ranges	**Frequency**	**Percentage**
0 - 5%	15	38
6 – 10%	19	49
11 – 15%	4	10
16 – 20%	1	3
Total	***39***	***100***

Common and Most Appropriate Pricing Methods for Preliminaries

Table 4.26 shows the response distribution on both the common and perceived appropriate methods of pricing preliminaries and the allowable ranges of percentages. The combination of the two main methods i.e. inserting a fixed percentage and pricing individual items is the most common in practice, indicated by 50% of the respondents while pricing of individual items is the most appropriate methods (77%). The difference in the 'common practice' and the perceived most appropriate method of pricing preliminaries points to the fact that there may be some problems associated with the pricing of individual items since as much as 20% indicated using fixed percentage as common practice. The lack of patronage of the individual pricing in practice is in line with literature Kehinde & Aiyetan (2001).

Further, a look at the distribution pattern of the responses on methods of pricing based on respondents' occupation as shown in Table 4.27 clearly shows an even distribution amongst those in the contracting firms and those in consultancy.

Table **4.27** Cross-tabulation for Occupation and Methods of Pricing Preliminaries

Respondent's occupation	**Method of pricing preliminaries**						**Total**	
	Percentage		**Pricing**		**combination**			
	a	**B**	**A**	**b**	**a**	**B**	**A**	**b**
Contractor	4	1	5	13	8	3	17	17
	24	6	29	76	47	18	100	100
Consultant	4	1	7	20	14	4	25	25
	16	4	28	80	56	16	100	100
client organisation	1		1	1		1	2	2
	50		50	50		50	100	100
Total	***9***	***2***	***13***	***34***	***22***	***8***	***44***	***44***
	20	***5***	***30***	***77***	***50***	***18***	***100***	***100***

a - responses for common methods, b - responses for most appropriate methods

Top figures are frequency of response while bottom figures are percentages

It is evident from Table 4.27 that for commonly used methods there is gradual increase in both of these categories: Contracting firms 24%, 29% and 47% while for those in Consultancy 16%, 28%, and 56%, for fixed percentage, individual pricing and combination of both respectively. Similar pattern is noticeable in both categories for most appropriate pricing methods where a rise and fall pattern exists, thus: contracting firms 6%, 76%, and 18% while for those in consultancy 4%, 80%, and 16% for fixed percentages, individual pricing and combination of both. This further suggests that those in the contracting firms and those in consultancy reason alike in both the commonly used, and most appropriate methods of pricing of preliminaries items. Patterns for those

in client organisations are not easily noticeable mainly due to their relatively very small size in the sample i.e. representing only 5%.

As much as half the respondents (49%) are of the opinion that the range of percentage applicable for pricing preliminaries item when the fixed price method is adopted is between 6 – 10% while 38% believe the range to be within the 0 – 5%. Some respondents agreed to higher percentages, for instance 10% accepted the 11 – 15% range with 3% accepting the 16 – 20% category. Majority of the respondents i.e. 87% accepting the 0 – 10% range of percentage, is in total agreement with percentages obtained by Kehinde and Aiyetan (2001). However, experience has shown that as the size of a project increases the percentage allowable for preliminaries decreases.

Factors influencing the Pricing of Preliminaries Items

Several factors have been identified in literature as affecting the pricing of preliminaries items of building projects. Some of these factors are related to the various methods i.e. using the fixed percentage, individual pricing of items and the combination of both methods. Respondents were asked their opinions on these areas. The results are shown in Tables 4.28 and 4.29.

Table **4.28** Factors influencing Percentages used in Pricing Preliminaries

Factors	Highly	Moderate	Low	Mean	Ranking
	3	2	1		
Size/complexity of project	29	6	2	2.73	1
Location of project	15	14	7	2.22	2
Duration of project	14	16	6	2.22	2
Contract sum	13	18	6	2.19	4
Type of client	10	13	13	1.92	5

The figures shown under each category are the frequency of respondents

Percentages used in pricing preliminaries

Seventy eight percentage (78% i.e. 29 out of 37) of the respondents believe that the size and complexity of a project highly influence the percentage used in pricing preliminaries items, 42% and 39% are of the opinion that the location of a project highly and moderately influence the percentage respectively. The duration of a project is believed by many (40%) of the respondents to have a moderate influence while 39% think that its influence is high. Contract sum similarly exhibited similar pattern observed in duration of projects, with 35% of the respondents believing it to have a high influence on the percentage used and 49% indicating that it only has a moderate influence. For type of client, 36% believe that its influence is moderate while another 36% indicate that it only has a low influence.

Literature established that the use of fixed percentages as a method of pricing preliminaries items in building projects is highly dependent on the complexity, location and type of client Jagboro and Ogunsemi (2001) which is in line with the findings. However, the revelation that contract sum has moderate influence may not be a surprise since the content of preliminaries will depend more on the support services required on

the job rather than the sum. This may explain the ranking of the factors as contained in Table 4.25 indicating size/complexity of project coming first, followed by both location and duration of project.

Factors affecting pricing of preliminaries items

In general, there are some factors that affect the pricing of preliminaries irrespective of the method adopted. Some of these factors have been identified in literature Lowe (1998) but only those considered as most common were used in the questionnaire. The result of the perceived influence of these factors is shown in Table 4.29.

Table **4.29** Factors affecting the Pricing of Preliminaries Items

Factors	Highly	Moderately	Low	No Influence	Mean	Ranking
	4	**3**	**2**	**1**		
Experience of estimator	38	3	0	0	3.93	1
Insufficient information	23	7	6	0	3.47	2
Inadequate time of bidding	11	17	4	4	2.97	4
Complexity of project	23	7	4	2	3.42	3
Competitiveness of project	9	11	12	4	2.69	5

The figures shown under each category are the frequency of respondents

Ninety-three percent of the respondents (n = 38) believe that experience highly influence the accuracy of pricing preliminaries highly. Also of high influence on pricing accuracy are insufficient information (64%, n = 23) and project complexity (64%), while a large proportion of the respondents (47%) believe that inadequate time for bidding moderately affects pricing accuracy, 31% of them think this factor has a high influence. The influence of competitiveness of project on pricing accuracy tends to have

an even spread amongst the respondents thus: 25% say its influence is high, 31% say it is moderate, 33% say it is low while 11% of them say it has no influence.

There are no previous studies to ascertain the consistency of these findings. Table 4.6 further shows the ranking (based on the calculated means) of each of these factors with experience of estimator coming 1st, 2nd is insufficient information and 3rd complexity of project.

4.8.4 Variations in Preliminaries Sums

There exist variations in the cost of preliminaries items both within same projects (i.e. comparing sums giving by different bidders for a given project) and over different projects of similar character (i.e. comparing the sum, especially unit costs/sums of individual preliminaries item, of one project with another) as was established in chapter 4. Literatures have attributed the reason for the causes of variations to some factors which respondents were asked to indicate the extent of their contribution. The result is shown in Table 4.30.

Table **4.30** Contribution of Factors affecting Variations in the Cost of Preliminaries Items

Factors	Very High	High	Low	None	Mean	Ranking
	4	3	2	1		
Size/complexity of contract	22	9	4	1	3.44	2
Duration of the contract	23	13	3	0	3.51	1
Contract sum	2	18	12	4	2.50	8
Location of the project	10	12	11	3	2.81	4
Client factors	7	16	12	1	2.81	4
Consultants' action/inaction	9	18	8	1	2.97	3
Weather	3	20	12	1	2.69	6
Economy	5	15	14	2	2.64	7

The figures shown under each category are the frequency of respondents. 39 respondents responded to the second factor while 36 responded to the remaining.

From Table 4.30, majority of the respondents believe that size/complexity of project (61%, n = 22, N = 36) and duration of contract (59%, n = 23, N = 39) contribute very highly to variations in preliminaries sums. About half the respondents are of the opinion that the following factors have a high influence on variations: contract sum (50%, n = 18), client related factors (44%, n = 16), consultants' action/inaction (50%, n = 18), weather (56%, n = 20) and economy (42%, n = 15). For contract sum, location of project, client related factors, and weather, a third of the respondents feel that these factors only have a low influence on variations.

Based on the computed mean response for each of the factors, only duration of contract is describable as having a very high influence on variation in preliminaries cost with a mean value of 3.51 hence making it rank 1st. Size/complexity of project and consultants' actions/inactions rank 2nd and 3rdwith mean values of 3.44 and 2.97 respectively. It is obvious from the Table that all the other factors, with the exception of duration of contract, have mean values between 2.50 and 3.44, hence making them describable as having high influence on variations in preliminaries costs.

4.8.5 Valuing Preliminaries during the Construction Stage

Respondents were asked to indicate their opinion on areas that border on valuing preliminaries during the construction phase of projects which included often used methods, the most appropriate method, difficulties experienced in valuing preliminaries amongst others. Tables 4.8 – 4.10 show the results of the analysis conducted on these areas.

Table **4.31** Responses on methods of valuation of Preliminaries.

Methods of Valuing Prel	Often Used		Most Approriate	
	n	**%**	**n**	**%**
use of percentage	17	39	1	2
valuation of individual items	9	20	36	82
combination of the two above	18	41	7	16
Total	***44***	***100***	***44***	***100***

Appropriateness of methods			**Difficulty in valuation of Preliminaries**		
Categories	**n**	**%**	**Categories**	**n**	**%**
very appropriate	10	23	yes	16	37
Appropriate	28	65	No	27	63
not appropriate	5	12	***Total***	***43***	***100***
Total	***43***	***100***			

On the methods of valuing preliminaries 39% of the respondents are of the opinion that use of percentage is the method often used in practice while 20% chose valuation of individual items as shown in Table 4.31. The combination of the two methods is believed to be often used by 41% of the respondents. However, these findings are not in consonant with that of the most appropriate method where 82% of the respondents indicate that valuation of individual items is the most appropriate method as compared with the 20% of them who say it is often used. This revelation may be pointing to the fact that there exist some reasons for this dissonance between the commonly used method of valuing preliminaries and the most appropriate method.

On a general note however, majority of the respondents i.e. 65%, feel that the methods used in valuing preliminaries items during the construction of projects are appropriate with approximately a quarter of them (23%) believing the methods to be very appropriate. Though, despite the comfortable appropriateness of these methods, there still exist some problems (difficulties) associated with the valuation of preliminaries in which 37% of the respondents affirmed to. The low percentage responses to the existence of difficulty may be traceable to the perceived appropriateness of these methods. Result of the frequency of occurrence of the difficulties associated with valuing preliminaries items is shown in Table 4.32.

Table **4.32** Frequency of Occurrence of Difficulties in Valuing Prelim

Difficulties	**Always**	**Sometimes**	**Often**	**Rarely**	**Mean**	**Ranking**
	4	**3**	**2**	**1**		
Under valuation	20	30	20	30	2.40	3
Insufficient valuation	38	31	25	6	3.00	1
Insufficient time	6	25	38	31	2.06	4
Over valuation	42	25	0	33	2.75	2

The figures shown under each category are the percentages of respondents that indicated the existence of difficulties in valuing preliminaries.

In Table 4.32, there is a seemingly even spread of respondents amongst the frequency of occurrence of undervaluation in practice where 20% indicated that it occurs always, 30% sometimes, 20% often and 30% saying rarely. Having a mean value of 2.40, on the average undervaluation can be described as often occurring in practice. A larger proportion of the respondents (38%) believe insufficient valuation always occurs while 31% and 25% of them say it occurs sometimes and often respectively. On the average, this occurs sometimes having a mean value of 3.00.

Insufficient time occurs often, on the average having a mean value of 2.06 with 25% of the respondents indicating that it sometimes occur, 38% saying it often occur while 31% indicated that it rarely occurs. A high percentage of the respondents (42%) believe that over valuation always occur in practice with a quarter of them believing it to occur only sometimes. Having a mean value of 2.75, over valuation can be said to occur sometime on an aggregated basis i.e. on the average. Based on their mean values in terms of frequency of occurrence, insufficient valuation ranks 1st followed by over valuation then under valuation and lastly insufficient time.

4.8.6 Preliminaries as a subject of Claim for Extension of Time

The problem of valuing preliminaries in the event of an extension of time has been a persisting one amongst practitioners. To this end therefore respondents were asked if preliminaries should be subject of claim in the event of an extension of the contract duration.

Ninety-eight percent of the respondents are of the opinion that preliminaries should be a subject of claim in the event of an extension in the contract duration of a project. The response is congruent with the general conditions guiding contract administration which stipulate that in the event of an extension time, the activities causing the extension shall be ascertained and the time related preliminaries items appropriately adjusted. The gross total of the addition is then added to the contract sums which shall be so adjusted JCT98, (1998).

Further to the opinion of respondents on preliminaries as claimable items in the event of an extension of time, respondents were asked to indicate the method they think is most appropriate in valuing such preliminaries items. The result is shown in Table 4.33.

Table **4.33** Methods for Valuing Claimable Preliminaries items

Methods	Very appropriate	Appropriate	Not appropriate	Mean	Ranking
	3	2	1		
Use of pro-rata	41	44	15	2.26	2
Application of fixed percentage	3	33	63	1.40	4
Use of negotiation award	17	52	31	1.86	3
Detail pricing of the items	83	17	0	2.83	1

The figures shown under each category are the percentages of respondents

Detail pricing of the preliminaries items involved in the event of an extension of time is considered the most appropriate with 83% and a mean value of 2.83 hence ranking first amongst the four other methods. On the average, use of pro-rata ranked second with 41% and 44% of the respondents believing it to be very appropriate and appropriate respectively, and having a mean value of 2.26 is adjudged appropriate. Third amongst the methods is use of negotiation award with 52% of the respondents indicating that it is appropriate and 31% saying it is not appropriate thus earning the appropriate status with a mean value of 1.86.

This finding corroborate that of appropriate method for valuing preliminaries which reveal that irrespective of the nature of preliminaries (whether normal or as a result of an extension) the detail pricing of individual items is the most appropriate method. Although it is not certain if this method is commonly used in practice, it is suspected that the commonly used method in pricing preliminaries in general i.e. the use of fixed percentage and detail pricing of individual items, as was shown in Table 5.5, may also be the common practice for pricing extended preliminaries items.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the general summary of the research work in three sections namely conclusions, recommendations and area for further studies. The conclusions section briefly discusses the research problem and the need, then it highlights the main aim of the research giving insights into the objectives sought. It further describes the main findings of the whole study and discusses the factors in terms of inferences drawn from the findings. Thereafter, the appropriate recommendations were made as desirable towards providing solutions to some of the factors which tend to pose as hindrances to the provision and administration of preliminaries items in building projects. These suggestions are discussed under recommendation in this chapter. Finally, areas for further studies are highlighted, born out of the implications of some findings not treated in this research, in view of their inherent significance in the administration of preliminaries in the construction industry.

5.1 Conclusions

The successful execution of most types of construction works lies in the provision of preliminaries on to the main work which are required either at some particular points in time or throughout the construction period. There is a general agreement that these items are difficult to price, and that the pricing are usually done arbitrarily and even when they are priced there exist wide spread variability in the prices.

The following are the conclusions reached from this study.

i) There exist strong positive relationships between the initial and final sums of preliminaries items. However, only three of these items exhibited differences that are statistically significant namely total preliminaries sums, water for works and services to site.

ii) The correlation between sums of the items of preliminaries and total preliminaries is higher than that between sums of items of preliminaries and contract sums. Also there exist relatively weak negative relationships between the sums of all the preliminaries items and the GFA of projects indicating that as the area of projects increases there is a proportionate decrease in the cost/GFA of the preliminaries item.

iii) Four cost significant preliminaries items were identified in the study namely plant and scaffolding, site supervision and administration, and sign board and their contributions to total preliminaries sum were also established. Their contributions (i.e. the coefficients arrived at) were used to develop models which were further used to determine the influences of these preliminaries items. In addition, the influences of changes in each item of the various preliminaries categories on the total preliminaries sum were determined. The findings provided a basis for which changes that occur to preliminaries items can be ascertained, monitored and controlled giving the likely cost implications in relation to increases or decreases in projects GFA.

iv) The study found that there exist very high variability amongst the various preliminaries items and preliminaries sum, and that public projects exhibited lower variability than private projects.

v) The use of both fixed percentages and detailed pricing of individual items is most common amongst practitioners in practice while the latter is however the most appropriate. where percentages are used in pricing preliminaries items, the most accepted and popular percentages adopted are not greater than 10%.

vi) In the pricing of preliminaries in general, experience of estimator has the highest influence followed by insufficient information then complexity of project. Among the factors that affect variations in the cost of preliminaries, duration of the contract makes the highest contribution closely followed by size/complexity of project then consultants' actions/inactions.

5.2 Recommendations

Based on this study, the following recommendations were made.

i) In the course of the construction of building projects, adequate care and diligence must be exercised in the management of plant and scaffolding, site supervision and administration.

ii) Efforts should be made by practitioners to value individual items of preliminaries.

iii) The variability of preliminaries can be predicted and managed using the models established.

iv) Contractors and consultants must establish the following facts before pricing preliminaries, size and complexity of project. It is however recommended that researches in these areas be undertaken so as to critically study the effects of these factors on the preliminaries costs of building projects.

5.3 Areas for Further Studies

This study attempted at capturing the opinion of virtually all the consultants in the Nigerian construction industry i.e. the architects, builders, engineers, and the quantity surveyors including the contractor. But the work did not hypothesis on the biases that exist amongst these categories of professionals. Hence, this opens a window for further research to investigate the behaviours of consultants on a profession by profession basis to the provision and administration of preliminaries.

To understand variability in building projects better, and develop robust models for predicting preliminaries, project-specific data on factors bordering on the management of preliminaries are required. Hence, further research should be conducted to determine the factors that cause variability in preliminaries so that more accurate models for predicting both variability and preliminaries sums can be established.

Further studies are recommended to be carried out in the future on the effect of inflation on preliminaries.

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APPENDIX

Table Preliminaries Sums Extracted from BOQ for Projects 1 - 40

PROJ_ID	CNTRSUMI	CNTRSUMF	TOTPRELI	TOTPRELF	SITEACCI	SITEACCF	WATERI	WATERF	SITEPLTI	SITEPLTF
1	58787.10	58787.11	1517.16	1689.16	300.00	379.89	320.00	337.83	80.00	91.20
2	11461.60	11461.60	540.00	540.00	111.99	111.99	108.00	108.00	46.80	46.80
3	44957.50	58666.60	2000.00	2000.00	394.84	394.84	338.83	338.83	130.00	130.00
4	44957.50	62078.30	2000.00	2000.00	394.84	394.84	338.83	338.83	130.00	130.00
5	19517.00	20000.00	500.00	834.13	100.00	113.50	50.00	96.00	80.00	114.45
6	3700.00	3236.20	350.20	350.20	85.50	85.50	65.00	65.00	-	-
7	20301.30	24730.30	964.55	1015.00	215.00	220.00	137.40	190.00	164.25	160.00
8	286601.00	250217.00	23874.50	23307.70	-	-	-	-	-	-
9	74714.50	69674.70	3758.00	3758.00	-	-	-	-	-	-
10	35670.40	41552.33	750.00	750.00	75.90	75.90	105.00	105.00	115.00	115.00
11	88524.30	86464.50	1700.00	2200.00	100.00	105.00	120.00	150.00	45.00	440.00
12	31109.00	35189.20	460.00	460.00	-	-	52.00	-	65.00	85.00
13	48623.50	51982.30	460.00	460.00	-	-	-	-	85.00	85.00
14	55590.70	55590.70	690.00	690.00	-	-	-	-	75.00	75.00
15	52056.10	56225.50	1250.00	1250.00	-	-	135.00	135.00	230.00	230.00
16	200875.00	221400.00	13442.00	13442.00	800.00	850.00	520.00	530.00	4037.50	4137.50
17	20103.80	20103.80	1435.46	2795.92	100.00	100.00	120.00	120.00	300.00	300.00
18	13533.40	13533.40	441.00	847.00	45.00	45.00	85.00	85.00	45.00	45.00
19	35143.60	35143.60	850.56	850.56	-	-	-	-	-	-
20	18316.60	18874.35	660.00	660.00	-	-	-	-	-	-
21	30459.90	30459.91	750.00	1435.00	60.00	60.00	125.00	125.00	75.00	75.00
22	14994.90	14994.90	460.00	460.00	-	-	70.00	70.00	30.00	30.00
23	28948.60	26425.30	840.00	840.00	-	-	-	-	-	-
24	39196.80	39196.80	1250.00	1250.00	180.00	180.00	125.00	125.00	85.00	85.00
25	19129.90	19129.90	620.00	620.00	-	-	-	-	-	-
26	12750.00	12285.00	450.00	450.00	-	-	-	-	-	-
27	51293.20	45061.60	4132.00	3499.78	750.00	750.00	300.00	250.00	800.00	750.00
28	20103.80	19249.94	1400.46	1330.46	332.00	232.00	103.46	102.00	180.00	175.00
29	16456.30	17056.56	650.00	650.00	-	-	-	-	-	-
30	14365.30	14056.56	500.00	500.00	-	-	-	-	-	-
31	27624.00	27624.00	1000.00	1875.00	145.00	145.00	120.00	120.00	75.00	75.00
32	24560.00	24560.00	900.00	900.00	-	-	-	-	-	-
33	48540.00	48540.00	1850.00	1850.00	235.00	235.00	200.00	200.00	140.00	140.00
34	23854.80	29680.00	1250.00	1452.00	-	-	-	-	-	-
35	112504.00	110850.00	8560.00	8560.00	1200.00	1200.00	750.00	750.00	1500.00	1500.00
36	19566.80	19566.80	1000.00	1000.00	-	-	-	-	-	-
37	26720.00	26418.00	1450.00	2780.00	250.00	250.00	120.00	120.00	150.00	150.00
38	15688.50	15688.50	300.00	300.00	-	-	-	-	-	-
39	186389.00	183830.00	2560.00	2230.00	600.00	600.00	300.00	300.00	285.00	-
40	111565.00	109005.00	2320.00	2210.00	490.00	470.00	240.00	230.00	250.00	250.00

Table Preliminaries Sums Extracted from BOQ for Projects 1 - 40 (Cont'd)

PROJ_ID	TESTI	TESTF	INSURANI	INSURANF	SUPERVI	SUPERVF	WATCHI	WATCHF	SERVICI	SERVICF
1	-	-	51.25	-	400.00	437.92	40.00	53.20	190.00	209.00
2	-	-		-	135.69	135.69	19.44	19.44	57.24	57.24
3	-	-	250.00	250.00	398.73	398.73	100.00	100.00	162.60	162.60
4	-	-	250.00	250.00	398.73	398.73	100.00	100.00	162.60	162.60
5	-	-	24.00	-	40.00	184.65	50.00	78.53	90.00	187.00
6	-	-	-	-	125.00	125.00	45.00	45.00	-	-
7	-	-	-	-	110.00	120.00	95.50	100.00	112.90	140.00
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	-	-	64.50	64.50	125.00	125.00	74.60	74.60	80.00	80.00
11	25.00	100.00	125.00	170.00	250.00	300.00	200.00	220.00	350.00	370.00
12	-	-	12.50	20.00	125.50	150.00	100.00	95.00	-	-
13	-	-	20.00	20.00	150.00	150.00	95.00	95.00	-	-
14	-	-	105.00	105.00	195.00	195.00	145.00	145.00	-	-
15	-	-	180.00	180.00	280.00	280.00	140.00	140.00	130.00	130.00
16	-	-	250.00	200.00	5650.00	5660.00	300.00	350.00	660.00	680.00
17	-	-	100.00	100.00	450.00	450.00	140.00	140.00	50.00	50.00
18	-	-	-	-	145.00	145.00	35.00	35.00	15.00	15.00
19	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-
21	-	-	-	-	260.00	260.00	50.00	50.00	25.00	25.00
22	-	-	-	-	120.00	120.00	50.00	50.00	25.00	25.00
23	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	300.00	300.00	110.00	110.00	250.00	250.00
25	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
27	300.00	.00	300.00	300.00	600.00	600.00	300.00	300.00	200.00	190.00
28	25.00	25.00	60.00	50.00	150.00	150.00	90.00	192.00	120.00	100.00
29	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-
31	-	-	85.00	85.00	240.00	240.00	90.00	90.00	24.00	24.00
32	-	-	-	-	-	-	-	-	-	-
33	100.00	100.00	85.00	85.00	400.00	400.00	145.00	145.00	80.00	80.00
34	-	-	-	-	-	-	-	-	-	-
35	-	-	850.00	850.00	2200.00	2200.00	620.00	620.00	890.00	890.00
36	-	-	-	-	-	-	-	-	-	-
37	-	-	50.00	50.00	280.00	280.00	110.00	110.00	100.00	100.00
38	-	-	-	-	-	-	-	-	-	-
39	45.00	-	400.00	400.00	200.00	200.00	200.00	200.00	210.00	210.00
40	20.00	-	350.00	350.00	260.00	240.00	230.00	230.00	180.00	180.00

Table Preliminaries Sums Extracted from BOQ for Projects 1 - 40 (Cont'd)

PROJ_ID	FISTAIDI	FISTAIDF	PRGRESI	PRGRESF	SETGOUTI	SETOUTF	SIGNBRDI	SIGNBRDF	CLEANGI	CLEANGF
1	30.00	38.00	15.00	19.00	50.00	76.00	10.91	12.92	30.00	34.20
2	7.20	7.20	9.36	9.36	22.68	22.68	3.60	3.60	18.00	18.00
3	30.00	30.00	30.00	30.00	75.00	75.00	50.00	50.00	40.00	40.00
4	30.00	30.00	30.00	30.00	75.00	75.00	50.00	50.00	40.00	40.00
5	10.00	20.00	2.00	5.00	6.00	-	8.00	-	40.00	35.00
6	7.50	7.50	5.20	5.20	12.00	12.00	-	-	5.00	5.00
7	35.00	35.00	15.00	15.00	35.00	25.00	-	-	45.00	10.00
8	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-
10	20.00	20.00	25.00	25.00	30.00	30.00	10.00	10.00	25.00	25.00
11	60.00	80.00	65.00	65.00	60.00	70.00	30.00	30.00	270.00	100.00
12	25.00	20.00	35.00	30.00	.00	.00	10.00	15.00	35.00	45.00
13	20.00	20.00	30.00	30.00	.00	.00	15.00	15.00	45.00	45.00
14	.00	.00	85.00	85.00	.00	.00	.00	.00	85.00	85.00
15	55.00	55.00	40.00	40.00	.00	.00	20.00	20.00	40.00	40.00
16	55.00	60.00	70.00	75.00	300.00	350.00	250.00	300.00	550.00	189.50
17	25.26	25.26	30.20	30.20	20.00	20.00	25.00	25.00	75.00	75.00
18	5.00	5.00	6.00	6.00	15.00	15.00	10.00	10.00	35.00	35.00
19	-	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-	-
21	15.00	15.00	20.00	20.00	30.00	30.00	25.00	25.00	65.00	65.00
22	15.00	15.00	10.00	10.00	.00	-	-	-	140.00	140.00
23	-	-	-	-	-	-	-	-	-	-
24	25.00	25.00	35.00	35.00	30.00	30.00	45.00	45.00	65.00	65.00
25	-	-	-	-	-	-	-	-	-	-
26	-	-	-	-	-	-	-	-	-	-
27	50.00	52.00	100.00	120.00	45.00	50.00	150.00	12.78	237.00	125.00
28	90.00	84.46	60.00	60.00	40.00	40.00	70.00	60.00	80.00	60.00
29	-	-	-	-	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-	-	-
31	15.00	15.00	18.00	18.00	28.00	28.00	35.00	35.00	125.00	125.00
32	-	-	-	-	-	-	-	-	-	-
33	75.00	75.00	85.00	85.00	75.00	75.00	80.00	80.00	150.00	150.00
34	-	-	-	-	-	-	-	-	-	-
35	50.00	50.00	45.00	45.00	65.00	65.00	40.00	40.00	350.00	350.00
36	-	-	-	-	-	-	-	-	-	-
37	45.00	45.00	60.00	60.00	120.00	120.00	45.00	45.00	120.00	120.00
38	-	-	-	-	-	-	-	-	-	-
39	60.00	60.00	100.00	100.00	60.00	60.00	60.00	60.00	40.00	40.00
40	65.00	65.00	100.00	80.00	70.00	70.00	35.00	35.00	30.00	10.00

Table Preliminaries Sums Extracted from BOQ for Projects 41 - 60

PROJ_ID	CNTRSUMI	CNTRSUMF	TOTPRELI	TOTPRELF	SITEACCI	SITEACCF	WATERI	WATERF	SITEPLTI	SITEPLTF
41	130496.00	129296.00	1200.00	1225.00	340.00	350.00	115.00	120.00	110.00	150.00
42	278328.00	278328.00	4782.50	4782.50	-	-	-	-	-	-
43	94673.60	91784.00	6120.00	5900.00	680.00	680.00	720.00	720.00	800.00	800.00
44	80696.00	84082.00	5218.00	5316.00	-	-	-	-	-	-
45	74564.00	74564.00	3780.00	7460.00	600.00	600.00	500.00	500.00	400.00	400.00
46	50000.00	52879.00	1970.00	3840.00	400.00	400.00	200.00	200.00	100.00	100.00
47	52250.00	51800.00	1560.00	1495.00	350.00	300.00	150.00	150.00	59.00	75.00
49	38580.00	38580.00	750.00	750.00	-	-	-	-	-	-
50	35687.00	38720.00	1000.00	1100.00	-	-	-	-	-	-
51	26890.00	25600.00	900.00	900.00	-	-	-	-	-	-
52	5500.00	5500.00	250.00	250.00	-	-	-	-	-	-
53	5500.00	5500.00	200.00	200.00	-	-	-	-	-	-
54	5500.00	5500.00	200.00	200.00	-	-	-	-	-	-
55	10780.00	10780.00	450.00	450.00	-	-	-	-	-	-
56	178025.00	165163.00	12413.00	10285.00	1655.00	1500.00	1350.00	1200.00	1550.00	1400.00
57	29124.00	41928.00	3154.00	3945.00	450.00	500.00	100.00	180.00	490.00	635.00
58	182485.00	190997.00	13241.00	14175.00	2400.00	2500.00	1300.00	1400.00	2100.00	2250.00
59	22156.00	21249.00	1432.00	1432.00	300.00	300.00	40.00	40.00	120.00	120.00
60	55000.00	62000.00	2500.00	3755.00	600.00	809.00	250.00	670.00	250.00	357.00

Table Preliminaries Sums Extracted from BOQ for Projects 41 - 60 (Cont'd)

PROJ_ID	TESTI	TESTF	INSURANI	INSURANF	SUPERVI	SUPERVF	WATCHI	WATCHF	SERVICI	SERVICF
41	10.00	15.00	200.00	200.00	145.00	150.00	80.00	80.00	70.00	70.00
42	-	-	-	-	-	-	-	-	-	-
43	20.00	15.00	200.00	150.00	1700.00	1700.00	750.00	750.00	500.00	500.00
44	-	-	-	-	-	-	-	-	-	-
45	-	-	150.00	150.00	900.00	900.00	450.00	450.00	350.00	350.00
46	-	-	85.00	85.00	500.00	500.00	250.00	250.00	150.00	150.00
47	-	-	70.00	60.00	450.00	300.00	200.00	200.00	100.00	150.00
49	-	-	-	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-	-	-	-
51	-	-	-	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-	-	-
53	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-
55	-	-	-	-	-	-	-	-	-	-
56	50.00	45.00	1800.00	1455.00	2600.00	2000.00	900.00	850.00	1100.00	950.00
57	10.00	15.00	158.00	250.00	600.00	850.00	300.00	350.00	500.00	550.00
58	50.00	50.00	850.00	1000.00	2800.00	2850.00	900.00	950.00	1720.00	1750.00
59	-	-	84.00	84.00	540.00	540.00	120.00	120.00	30.00	30.00
60	-	-	110.00	150.00	220.00	670.00	250.00	305.00	550.00	620.00

Table Preliminaries Sums Extracted from BOQ for Projects 41 - 60 (Cont'd)

PROJ_ID	FISTAIDI	FISTAIDF	PRGRESI	PRGRESF	SETGOUTI	SETOUTF	SIGNBRDI	SIGNBRDF	CLEANGI	CLEANGF
41	30.00	30.00	20.00	20.00	35.00	30.00	15.00	10.00	30.00	-
42	-	-	-	-	-	-	-	-	-	-
43	200.00	200.00	100.00	100.00	150.00	120.00	60.00	45.00	240.00	120.00
44	-	-	-	-	-	-	-	-	-	-
45	120.00	120.00	65.00	65.00	100.00	100.00	45.00	45.00	100.00	100.00
46	50.00	50.00	45.00	45.00	65.00	65.00	25.00	25.00	100.00	100.00
47	45.00	50.00	40.00	45.00	50.00	65.00	15.00	25.00	31.00	75.00
49	-	-	-	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-	-	-	-
51	-	-	-	-	-	-	-	-	-	-
52	-	-	-	-	-	-	-	-	-	-
53	-	-	-	-	-	-	-	-	-	-
54	-	-	-	-	-	-	-	-	-	-
55	-	-	-	-	-	-	-	-	-	-
56	260.00	200.00	150.00	120.00	300.00	250.00	80.00	65.00	618.00	250.00
57	200.00	200.00	100.00	120.00	100.00	100.00	40.00	45.00	106.00	150.00
58	300.00	400.00	200.00	250.00	370.00	450.00	55.00	75.00	196.00	250.00
59	-	-	18.00	18.00	120.00	120.00	-	-	60.00	60.00
60	60.00	30.00	40.00	60.00	50.00	50.00	20.00	20.00	100.00	134.00

Table Adjusted Project Preliminaries Sums Showing Sums in Cost per GFA

Proj Id	GFA	Initial Contract Sum	Final Contract Sum	Initial Prelim Sum	Final Prelim Sum
1	1,928	30.49	30.49	0.79	0.88
2	396	28.94	28.94	1.36	1.36
3	1,398	32.16	41.96	1.43	1.43
4	1,398	32.16	44.41	1.43	1.43
6	187	19.79	17.31	1.87	1.87
7	482	42.12	51.31	2.00	2.11
8	3,630	78.95	68.93	6.58	6.42
9	667	112.02	104.46	5.63	5.63
10	557	64.04	74.60	1.35	1.35
11	2,684	32.98	32.21	0.63	0.82
12	1,680	18.52	20.95	0.27	0.27
13	1,680	28.94	30.94	0.27	0.27
14	1,680	33.09	33.09	0.41	0.41
15	2,006	25.95	28.03	0.62	0.62
16	900	223.19	246.00	14.94	14.94
18	1,900	7.12	7.12	0.23	0.45
19	2,874	12.23	12.23	0.30	0.30
23	720	40.21	36.70	1.17	1.17
29	354	46.49	48.18	1.84	1.84
30	336	42.75	41.84	1.49	1.49
31	936	29.51	29.51	1.07	2.00
32	843	29.13	29.13	1.07	1.07
33	2,842	17.08	17.08	0.65	0.65
34	782	30.50	37.95	1.60	1.86
35	2,880	39.06	38.49	2.97	2.97
36	720	27.18	27.18	1.39	1.39
37	432	61.85	61.15	3.36	6.44
39	10,368	17.98	17.73	0.25	0.22
40	6,280	17.77	17.36	0.37	0.35
41	8,256	15.81	15.66	0.15	0.15
42	840	331.34	331.34	5.69	5.69
46	967	51.71	54.68	2.04	3.97
47	648	80.63	79.94	2.41	2.31
49	397	97.18	97.18	1.89	1.89
50	374	95.42	103.53	2.67	2.94
51	484	55.56	52.89	1.86	1.86
52	649	8.47	8.47	0.39	0.39
53	100	55.00	55.00	2.00	2.00
54	100	55.00	55.00	2.00	2.00
60	1,240	44.35	50.00	2.02	3.03

Some projects were eliminated from the Table due to the non-availability of their GFA from Project Files

ble Correlations of Preliminaries Sums Components for both Initial and Final

	IConSum	FConSum	IPrelSum	FPrelSum	ISiteAcc	FSiteAcc	IWateWrk	FWateWrk	IPlanSca	FPlanSca	ITestSam	FTestSam	IInsuGua	FInsuGua	ISupe
nSum	1.000	0.994	0.807	0.789	0.729	0.715	0.720	0.697	0.719	0.801	-0.068	0.098	0.676	0.666	0.71
	.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.824	0.802	0.000	0.000	0.00
onSum	0.994	1.000	0.785	0.772	0.722	0.714	0.706	0.693	0.751	0.832	-0.100	0.097	0.638	0.631	0.74
	0.000	.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.746	0.804	0.000	0.000	0.00
elSum	0.807	0.785	1.000	0.985	0.889	0.878	0.894	0.874	0.916	0.906	0.125	-0.047	0.763	0.766	0.92
	0.000	0.000	.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.683	0.904	0.000	0.000	0.00
relSum	0.789	0.772	0.985	1.000	0.873	0.873	0.862	0.865	0.891	0.889	0.081	-0.019	0.666	0.678	0.90
	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000	0.000	0.000	0.793	0.962	0.000	0.000	0.00
teAcc	0.729	0.722	0.889	0.873	1.000	0.994	0.933	0.940	0.674	0.669	0.165	-0.102	0.808	0.858	0.67
	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000	0.000	0.590	0.793	0.000	0.000	0.00
teAcc	0.715	0.714	0.878	0.873	0.994	1.000	0.913	0.942	0.673	0.673	0.119	-0.098	0.759	0.822	0.66
	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000	0.713	0.801	0.000	0.000	0.00
teWrk	0.720	0.706	0.894	0.862	0.933	0.913	1.000	0.969	0.656	0.637	0.067	-0.002	0.866	0.883	0.69
	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000	0.828	0.995	0.000	0.000	0.00
ateWrk	0.697	0.693	0.874	0.865	0.940	0.942	0.969	1.000	0.643	0.635	0.030	0.011	0.797	0.830	0.67
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000	0.923	0.979	0.000	0.000	0.00
anSca	0.719	0.751	0.916	0.891	0.674	0.673	0.656	0.643	1.000	0.995	0.222	-0.157	0.512	0.497	0.98
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000	0.466	0.688	0.002	0.007	0.00
lanSca	0.801	0.832	0.906	0.889	0.669	0.673	0.637	0.635	0.995	1.000	0.174	-0.057	0.487	0.481	0.97
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	0.590	0.885	0.004	0.011	0.00
stSam	-0.068	-0.100	0.125	0.081	0.165	0.119	0.067	0.030	0.222	0.174	1.000	-0.199	0.085	-0.009	0.05
	0.824	0.746	0.683	0.793	0.590	0.713	0.828	0.923	0.466	0.590	.	0.608	0.782	0.979	0.87
stSam	0.098	0.097	-0.047	-0.019	-0.102	-0.098	-0.002	0.011	-0.157	-0.057	-0.199	1.000	0.007	0.019	-0.0
	0.802	0.804	0.904	0.962	0.793	0.801	0.995	0.979	0.688	0.885	0.608	.	0.986	0.961	0.91
suGua	0.676	0.638	0.763	0.666	0.808	0.759	0.866	0.797	0.512	0.487	0.085	0.007	1.000	0.982	0.52
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.782	0.986	.	0.000	0.00
nsuGua	0.666	0.631	0.766	0.678	0.858	0.822	0.883	0.830	0.497	0.481	-0.009	0.019	0.982	1.000	0.50
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.011	0.979	0.961	0.000	.	0.00
peAdm	0.714	0.742	0.924	0.903	0.671	0.664	0.696	0.670	0.981	0.975	0.050	-0.040	0.528	0.501	1.00
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.871	0.919	0.001	0.007	.
peAdm	0.692	0.728	0.906	0.900	0.654	0.659	0.657	0.656	0.983	0.984	0.042	-0.064	0.461	0.443	0.99
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.892	0.870	0.006	0.018	0.00

figures are Pearson correlation values while bottom figures are correlation 2 - tailed test of significance at 0.05 and 0.01

Table Correlations of Preliminaries Sums Components for both Initial and Final (Cont'd)

	FSupeAdm	IWatcLig	FWatcLig	IServSit	FServSit	IFirsAid	FFirsAid	IProgPho	FProgPho	ISettOut	FSettOut	ISignBoa	FSignBoa	ICleaCom	FCleaCo
FConSum	0.692	0.668	0.667	0.694	0.674	0.548	0.541	0.685	0.632	0.722	0.700	0.522	0.567	0.630	0.475
	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.002	0.001	0.000	0.003
FConSum	0.728	0.644	0.649	0.699	0.685	0.538	0.541	0.668	0.628	0.736	0.725	0.550	0.622	0.615	0.467
	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.004
FPrelSum	0.906	0.850	0.861	0.895	0.874	0.721	0.705	0.710	0.695	0.910	0.888	0.655	0.662	0.838	0.769
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

PrelSum	0.900	0.841	0.858	0.891	0.881	0.718	0.722	0.685	0.694	0.898	0.892	0.616	0.655	0.773	0.773
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
tSiteAcc	0.654	0.887	0.898	0.943	0.928	0.806	0.816	0.784	0.798	0.849	0.831	0.405	0.343	0.606	0.713
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.054	0.000	0.000
'SiteAcc	0.659	0.867	0.883	0.951	0.943	0.788	0.809	0.763	0.796	0.838	0.834	0.381	0.344	0.587	0.736
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.054	0.000	0.000
WateWrk	0.657	0.922	0.912	0.903	0.870	0.804	0.773	0.723	0.688	0.836	0.781	0.375	0.342	0.691	0.696
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.029	0.055	0.000	0.000
WateWrk	0.656	0.905	0.910	0.940	0.923	0.803	0.780	0.703	0.703	0.821	0.781	0.337	0.330	0.637	0.703
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.051	0.065	0.000	0.000
PlanSca	0.983	0.603	0.628	0.706	0.700	0.464	0.474	0.508	0.516	0.797	0.813	0.795	0.845	0.791	0.644
	0.000	0.000	0.000	0.000	0.000	0.005	0.004	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000
PlanSca	0.984	0.593	0.623	0.717	0.716	0.467	0.489	0.527	0.542	0.796	0.820	0.788	0.852	0.784	0.643
	0.000	0.000	0.000	0.000	0.000	0.005	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
TestSam	0.042	0.067	0.050	-0.038	-0.049	-0.082	-0.071	0.246	0.291	-0.017	-0.049	0.877	-0.237	0.219	0.183
	0.892	0.829	0.870	0.901	0.875	0.790	0.818	0.418	0.335	0.956	0.880	0.000	0.457	0.473	0.550
TestSam	-0.064	-0.092	-0.110	0.057	0.059	-0.081	-0.015	0.055	-0.006	0.086	0.122	-0.233	0.466	0.179	0.226
	0.870	0.813	0.777	0.884	0.880	0.837	0.969	0.887	0.987	0.826	0.755	0.547	0.206	0.646	0.558
InsuGua	0.461	0.794	0.765	0.755	0.700	0.664	0.564	0.652	0.548	0.664	0.561	0.266	0.186	0.698	0.638
	0.006	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.135	0.315	0.000	0.000
InsuGua	0.443	0.803	0.780	0.821	0.776	0.672	0.607	0.673	0.589	0.660	0.592	0.180	0.143	0.637	0.674
	0.018	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.001	0.368	0.477	0.000	0.000
upeAdm	0.992	0.645	0.661	0.705	0.693	0.496	0.492	0.493	0.483	0.829	0.828	0.759	0.844	0.819	0.662
	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000
SupeAdm	1.000	0.617	0.643	0.704	0.703	0.478	0.486	0.473	0.484	0.808	0.821	0.758	0.854	0.782	0.657
	.	0.000	0.000	0.000	0.000	0.003	0.003	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000

op figures are Pearson correlation values while bottom figures are correlation 2 - tailed test of significance at 0.05 and 0.01

ions of Preliminaries Sums Components for both Initial and Final (Cont'd)

m FConSum	IPrelSum	FPrelSum	ISiteAcc	FSiteAcc	IWateWrk	FWateWrk	IPlanSca	FPlanSca	ITestSam	FTestSam	IInsuGua	F
0.644	0.850	0.841	0.887	0.867	0.922	0.905	0.603	0.593	0.067	-0.092	0.794	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.829	0.813	0.000	
0.649	0.861	0.858	0.898	0.883	0.912	0.910	0.628	0.623	0.050	-0.110	0.765	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.870	0.777	0.000	
0.699	0.895	0.891	0.943	0.951	0.903	0.940	0.706	0.717	-0.038	0.057	0.755	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.901	0.884	0.000	
0.685	0.874	0.881	0.928	0.943	0.870	0.923	0.700	0.716	-0.049	0.059	0.700	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.875	0.880	0.000	
0.538	0.721	0.718	0.806	0.788	0.804	0.803	0.464	0.467	-0.082	-0.081	0.664	
0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005	0.790	0.837	0.000	
0.541	0.705	0.722	0.816	0.809	0.773	0.780	0.474	0.489	-0.071	-0.015	0.564	
0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.003	0.818	0.969	0.001	
0.668	0.710	0.685	0.784	0.763	0.723	0.703	0.508	0.527	0.246	0.055	0.652	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.418	0.887	0.000	
0.628	0.695	0.694	0.798	0.796	0.688	0.703	0.516	0.542	0.291	-0.006	0.548	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.335	0.987	0.001	
0.736	0.910	0.898	0.849	0.838	0.836	0.821	0.797	0.796	-0.017	0.086	0.664	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.956	0.826	0.000	
0.725	0.888	0.892	0.831	0.834	0.781	0.781	0.813	0.820	-0.049	0.122	0.561	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.880	0.755	0.001	
0.550	0.655	0.616	0.405	0.381	0.375	0.337	0.795	0.788	0.877	-0.233	0.266	
0.001	0.000	0.000	0.017	0.029	0.029	0.051	0.000	0.000	0.000	0.547	0.135	
0.622	0.662	0.655	0.343	0.344	0.342	0.330	0.845	0.852	-0.237	0.466	0.186	
0.000	0.000	0.000	0.054	0.054	0.055	0.065	0.000	0.000	0.457	0.206	0.315	
0.615	0.838	0.773	0.606	0.587	0.691	0.637	0.791	0.784	0.219	0.179	0.698	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.473	0.646	0.000	
0.467	0.769	0.773	0.713	0.736	0.696	0.703	0.644	0.643	0.183	0.226	0.638	
0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.550	0.558	0.000	

orrelation values while bottom figures are correlation 2 - tailed test of significance at 0.05 and 0.01

tions of Preliminaries Sums Components for both Initial and Final (Cont'd)

eAdm	IWatcLig	FWatcLig	IServSit	FServSit	IFirsAid	FFirsAid	IProgPho	FProgPho	ISettOut	FSettOut	ISignBoa	FSignBoa	ICleaCom
17	1.000	0.994	0.884	0.859	0.871	0.830	0.796	0.764	0.771	0.699	0.320	0.248	0.687
00	.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.065	0.171	0.000
43	0.994	1.000	0.905	0.886	0.888	0.855	0.808	0.790	0.785	0.724	0.345	0.284	0.681
00	0.000	.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.115	0.000
04	0.884	0.905	1.000	0.995	0.822	0.838	0.745	0.774	0.836	0.829	0.349	0.379	0.644
00	0.000	0.000	.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.043	0.033	0.000
03	0.859	0.886	0.995	1.000	0.803	0.834	0.722	0.769	0.817	0.825	0.334	0.381	0.604
00	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000	0.000	0.000	0.053	0.032	0.000
78	0.871	0.888	0.822	0.803	1.000	0.965	0.847	0.834	0.795	0.730	0.260	0.229	0.511
03	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000	0.000	0.137	0.207	0.001
86	0.830	0.855	0.838	0.834	0.965	1.000	0.844	0.873	0.795	0.777	0.236	0.232	0.417
03	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000	0.180	0.201	0.011
73	0.796	0.808	0.745	0.722	0.847	0.844	1.000	0.972	0.735	0.698	0.415	0.290	0.527
03	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000	0.015	0.107	0.001
84	0.764	0.790	0.774	0.769	0.834	0.873	0.972	1.000	0.725	0.723	0.402	0.277	0.451
02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000	0.018	0.124	0.005
08	0.771	0.785	0.836	0.817	0.795	0.795	0.735	0.725	1.000	0.981	0.596	0.657	0.704
00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000	0.000
21	0.699	0.724	0.829	0.825	0.730	0.777	0.698	0.723	0.981	1.000	0.580	0.679	0.643
00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000
58	0.320	0.345	0.349	0.334	0.260	0.236	0.415	0.402	0.596	0.580	1.000	0.857	0.676
00	0.065	0.046	0.043	0.053	0.137	0.180	0.015	0.018	0.000	0.000	.	0.000	0.000
54	0.248	0.284	0.379	0.381	0.229	0.232	0.290	0.277	0.657	0.679	0.857	1.000	0.624
00	0.171	0.115	0.033	0.032	0.207	0.201	0.107	0.124	0.000	0.000	0.000	.	0.000
82	0.687	0.681	0.644	0.604	0.511	0.417	0.527	0.451	0.704	0.643	0.676	0.624	1.000
00	0.000	0.000	0.000	0.000	0.001	0.011	0.001	0.005	0.000	0.000	0.000	0.000	.
57	0.751	0.759	0.762	0.748	0.567	0.539	0.561	0.567	0.612	0.608	0.392	0.389	0.779
00	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.022	0.028	0.000

orrelation values while bottom figures are correlation 2 - tailed test of significance at 0.05 and 0.01

egression Prelim Vs 3 Cost Significant Preliminaries Items with Constant Term

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.972	.945	.935	.8394

a Predictors: (Constant), Final Sign Board per GFA, Final Site Plant & Scaffolding per GFA, Final Supervision & Administration per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	205.102	3	68.367	97.035	.000
	Residual	11.978	17	.705		
	Total	217.079	20			

a Predictors: (Constant), Final Sign Board per GFA, Final Site Plant & Scaffolding per GFA, Final Supervision & Administration per GFA

b Dependent Variable: Final Total Preliminaries Sum per GFA

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.298	.251		1.186	.252
Final Site Plant & Scaffolding per GFA	-5.807	2.207	-1.732	-2.631	.018
Final Supervision & Administration per GFA	4.994	1.803	2.017	2.770	.013
Final Sign Board per GFA	30.790	10.100	.671	3.048	.007

a Dependent Variable: Final Total Preliminaries Sum per GFA

Regression Prelim Vs 3 Cost Significant Preliminaries Items without Constant Term

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.979	.959	.952	.8488

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Final Sign Board per GFA, Final Site Plant & Scaffolding per GFA, Final Supervision & Administration per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	305.303	3	101.768	141.246	.000
	Residual	12.969	18	.721		
	Total	318.272	21			

a Predictors: Final Sign Board per GFA, Final Site Plant & Scaffolding per GFA, Final Supervision & Administration per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum per GFA
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	Final Site Plant & Scaffolding per GFA	-7.227	1.875	-1.890	-3.854	.001
	Final Supervision & Administration per GFA	5.985	1.616	2.171	3.704	.002
	Final Sign Board per GFA	32.845	10.063	.664	3.264	.004

a Dependent Variable: Final Total Preliminaries Sum per GFA
b Linear Regression through the Origin

Regression Prelim Vs 4 Cost Significant Preliminaries Items with Constant Term

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.980	.960	.950	.7191

a Predictors: (Constant), Final Service site per GFA, Final Site Plant & Scaffolding per GFA, Final Site Accommodation per GFA, Final Supervision & Administration per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	208.295	4	52.074	100.689	.000
	Residual	8.792	17	.517		
	Total	217.087	21			

a Predictors: (Constant), Final Service site per GFA, Final Site Plant & Scaffolding per GFA, Final Site Accommodation per GFA, Final Supervision & Administration per GFA

b Dependent Variable: Final Total Preliminaries Sum per GFA

Coefficients

Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	.174	.230		.755	.461
Final Site Plant & Scaffolding per GFA	1.943	2.299	.580	.846	.410
Final Supervision & Administration per GFA	.513	1.684	.207	.305	.764
Final Site Accommodation per GFA	9.066	2.308	.720	3.927	.001
Final Service site per GFA	-7.750	3.438	-.444	-2.254	.038

a Dependent Variable: Final Total Preliminaries Sum per GFA

Regression Prelim Vs 4 Cost Significant Preliminaries Items without Constant Term

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.986	.972	.966	.7105

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Final Service site per GFA, Final Site Plant & Scaffolding per GFA, Final Site Accommodation per GFA, Final Supervision & Administration per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	313.620	4	78.405	155.315	.000
	Residual	9.087	18	.505		
	Total	322.706	22			

a Predictors: Final Service site per GFA, Final Site Plant & Scaffolding per GFA, Final Site Accommodation per GFA, Final Supervision & Administration per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum per GFA
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
	Final Site Plant & Scaffolding per GFA	1.620	2.231	.422	.726	.477
	Final Supervision & Administration per GFA	.711	1.644	.256	.433	.670
	Final Site Accommodation per GFA	9.241	2.269	.854	4.073	.001
	Final Service site per GFA	-7.391	3.364	-.458	-2.197	.041

a Dependent Variable: Final Total Preliminaries Sum per GFA
b Linear Regression through the Origin

Regression Contract Sum Vs all Preliminaries Items with Constant Term

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.998	.997	.990	5.3008

a Predictors: (Constant), Final Cleaning on Completion per GFA, Final Insurance & Guarantee per GFA, Final Site Plant & Scaffolding per GFA, Final First Aid Box per GFA, Final Water for Works per GFA, Final Watching and Lighting per GFA, Final Progress Photograph per GFA, Final Service site per GFA, Final Site Accommodation per GFA, Final Setting Out per GFA, Final Sign Board per GFA, Final Supervision & Administration per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	46177.873	12	3848.156	136.950	.000
	Residual	140.495	5	28.099		
	Total	46318.367	17			

a Predictors: (Constant), Final Cleaning on Completion per GFA, Final Insurance & Guarantee per GFA, Final Site Plant & Scaffolding per GFA, Final First Aid Box per GFA, Final Water for Works per GFA, Final Watching and Lighting per GFA, Final Progress Photograph per GFA, Final Service site per GFA, Final Site Accommodation per GFA, Final Setting Out per GFA, Final Sign Board per GFA, Final Supervision & Administration per GFA

b Dependent Variable: Final Contract Sum per GFA

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	10.455	5.919		1.766	.138
	Final Site Accommodation per GFA	-167.758	87.436	-.879	-1.919	.113
	Final Water for Works per GFA	168.361	59.196	.560	2.844	.036
	Final Site Plant & Scaffolding per GFA	78.873	87.456	1.599	.902	.408
	Final Insurance & Guarantee per GFA	3.387	30.406	.005	.111	.916
	Final Supervision & Administration per GFA	-90.411	67.220	-2.483	-1.345	.236
	Final Watching and Lighting per GFA	709.522	122.986	1.498	5.769	.002
	Final Service site per GFA	-90.196	111.982	-.343	-.805	.457
	Final First Aid Box per GFA	-1015.725	370.845	-.533	-2.739	.041
	Final Progress Photograph per GFA	-275.148	216.424	-.173	-1.271	.260
	Final Setting Out per GFA	481.931	249.196	.955	1.934	.111
	Final Sign Board per GFA	819.670	431.944	1.206	1.898	.116
	Final Cleaning on Completion per GFA	-369.071	71.271	-.529	-5.178	.004

a Dependent Variable: Final Contract Sum per GFA

Regression Preliminaries Sum Vs all Preliminaries Items with Constant Term

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.999	.997	.991	.3322

a Predictors: (Constant), Final Cleaning on Completion per GFA, Final Insurance & Guarantee per GFA, Final Site Plant & Scaffolding per GFA, Final First Aid Box per GFA, Final Water for Works per GFA, Final Watching and Lighting per GFA, Final Progress Photograph per GFA, Final Service site per GFA, Final Site Accommodation per GFA, Final Setting Out per GFA, Final Sign Board per GFA, Final Supervision & Administration per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	210.191	12	17.516	158.760	.000
	Residual	.552	5	.110		
	Total	210.743	17			

a Predictors: (Constant), Final Cleaning on Completion per GFA, Final Insurance & Guarantee per GFA, Final Site Plant & Scaffolding per GFA, Final First Aid Box per GFA, Final Water for Works per GFA, Final Watching and Lighting per GFA, Final Progress Photograph per GFA, Final Service site per GFA, Final Site Accommodation per GFA, Final Setting Out per GFA, Final Sign Board per GFA, Final Supervision & Administration per GFA

b Dependent Variable: Final Total Preliminaries Sum per GFA

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.968	.371		2.609	.048
	Final Site Accommodation per GFA	-9.550	5.479	-.742	-1.743	.142
	Final Water for Works per GFA	8.536	3.709	.421	2.301	.070
	Final Site Plant & Scaffolding per GFA	-11.411	5.480	-3.430	-2.082	.092
	Final Insurance & Guarantee per GFA	-2.577	1.905	-.055	-1.353	.234
	Final Supervision & Administration per GFA	13.680	4.212	5.571	3.248	.023
	Final Watching and Lighting per GFA	-15.017	7.706	-.470	-1.949	.109
	Final Service site per GFA	3.291	7.017	.185	.469	.659
	Final First Aid Box per GFA	20.392	23.238	.159	.878	.420
	Final Progress Photograph per GFA	-24.518	13.561	-.229	-1.808	.130
	Final Setting Out per GFA	45.472	15.615	1.336	2.912	.033
	Final Sign Board per GFA	-99.951	27.066	-2.180	-3.693	.014
	Final Cleaning on Completion per GFA	21.991	4.466	.467	4.924	.004

a Dependent Variable: Final Total Preliminaries Sum per GFA

Regression Contract Sum Vs all Preliminaries Items without Constant Term

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.999	.998	.993	6.1667

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Final Cleaning on Completion per GFA, Final Site Plant & Scaffolding per GFA, Final Insurance & Guarantee per GFA, Final First Aid Box per GFA, Final Water for Works per GFA, Final Progress Photograph per GFA, Final Watching and Lighting per GFA, Final Service site per GFA, Final Setting Out per GFA, Final Site Accommodation per GFA, Final Sign Board per GFA, Final Supervision & Administration per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	92711.116	12	7725.926	203.162	.000
	Residual	228.171	6	38.028		
	Total	92939.287	18			

a Predictors: Final Cleaning on Completion per GFA, Final Site Plant & Scaffolding per GFA, Final Insurance & Guarantee per GFA, Final First Aid Box per GFA, Final Water for Works per GFA, Final Progress Photograph per GFA, Final Watching and Lighting per GFA, Final Service site per GFA, Final Setting Out per GFA, Final Site Accommodation per GFA, Final Sign Board per GFA, Final Supervision & Administration per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Contract Sum per GFA
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	Final Site Accommodation per GFA	-69.695	78.585	-.356	-.887	.409
	Final Water for Works per GFA	163.548	68.793	.553	2.377	.055
	Final Site Plant & Scaffolding per GFA	179.479	77.210	2.746	2.325	.059
	Final Insurance & Guarantee per GFA	23.469	32.808	.041	.715	.501
	Final Supervision & Administration per GFA	-167.767	59.328	-3.553	-2.828	.030
	Final Watching and Lighting per GFA	738.406	141.805	1.799	5.207	.002
	Final Service site per GFA	-195.169	110.416	-.678	-1.768	.128
	Final First Aid Box per GFA	-808.879	409.350	-.460	-1.976	.096
	Final Progress Photograph per GFA	-11.275	182.182	-.008	-.062	.953
	Final Setting Out per GFA	126.074	170.637	.209	.739	.488
	Final Sign Board per GFA	1180.003	442.934	1.396	2.664	.037
	Final Cleaning on Completion per GFA	-412.957	77.712	-.609	-5.314	.002

a Dependent Variable: Final Contract Sum per GFA
b Linear Regression through the Origin

Regression Preliminaries Sum Vs all Preliminaries Items without Constant Term

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.998	.996	.988	.4660

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Final Cleaning on Completion per GFA, Final Site Plant & Scaffolding per GFA, Final Insurance & Guarantee per GFA, Final First Aid Box per GFA, Final Water for Works per GFA, Final Progress Photograph per GFA, Final Watching and Lighting per GFA, Final Service site per GFA, Final Setting Out per GFA, Final Site Accommodation per GFA, Final Sign Board per GFA, Final Supervision & Administration per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	314.143	12	26.179	120.569	.000
	Residual	1.303	6	.217		
	Total	315.446	18			

a Predictors: Final Cleaning on Completion per GFA, Final Site Plant & Scaffolding per GFA, Final Insurance & Guarantee per GFA, Final First Aid Box per GFA, Final Water for Works per GFA, Final Progress Photograph per GFA, Final Watching and Lighting per GFA, Final Service site per GFA, Final Setting Out per GFA, Final Site Accommodation per GFA, Final Sign Board per GFA, Final Supervision & Administration per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum per GFA
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	Final Site Accommodation per GFA	-.474	5.938	-.042	-.080	.939
	Final Water for Works per GFA	8.091	5.198	.470	1.557	.171
	Final Site Plant & Scaffolding per GFA	-2.099	5.834	-.551	-.360	.731
	Final Insurance & Guarantee per GFA	-.719	2.479	-.022	-.290	.782
	Final Supervision & Administration per GFA	6.520	4.483	2.370	1.454	.196
	Final Watching and Lighting per GFA	-12.344	10.715	-.516	-1.152	.293
	Final Service site per GFA	-6.425	8.343	-.383	-.770	.470
	Final First Aid Box per GFA	39.538	30.931	.386	1.278	.248
	Final Progress Photograph per GFA	-9.499E-02	13.766	-.001	-.007	.995
	Final Setting Out per GFA	12.535	12.894	.357	.972	.368
	Final Sign Board per GFA	-66.599	33.469	-1.352	-1.990	.094
	Final Cleaning on Completion per GFA	17.929	5.872	.454	3.053	.022

a Dependent Variable: Final Total Preliminaries Sum per GFA
b Linear Regression through the Origin

Regression of Contract Sums Vs Cost Related Preliminaries Items

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.958	.917	.894	23.4493

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Final Insurance & Guarantee per GFA, Final Site Plant & Scaffolding per GFA, Final Site Accommodation per GFA, Final Water for Works per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	85241.117	4	21310.279	38.755	.000
	Residual	7698.170	14	549.869		
	Total	92939.287	18			

a Predictors: Final Insurance & Guarantee per GFA, Final Site Plant & Scaffolding per GFA, Final Site Accommodation per GFA, Final Water for Works per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Contract Sum per GFA
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
	Final Site Accommodation per GFA	50.069	68.423	.256	.732	.476
	Final Water for Works per GFA	29.209	108.798	.099	.268	.792
	Final Site Plant & Scaffolding per GFA	33.854	7.183	.518	4.713	.000
	Final Insurance & Guarantee per GFA	111.662	88.305	.196	1.264	.227

a Dependent Variable: Final Contract Sum per GFA
b Linear Regression through the Origin

Regression of Contract Sums Vs Time Related Preliminaries Items

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.976	.952	.939	16.1200

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Final Progress Photograph per GFA, Final Supervision & Administration per GFA, Final Service site per GFA, Final First Aid Box per GFA, Final Watching and Lighting per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	93026.921	5	18605.384	71.599	.000
	Residual	4677.388	18	259.855		
	Total	97704.309	23			

a Predictors: Final Progress Photograph per GFA, Final Supervision & Administration per GFA, Final Service site per GFA, Final First Aid Box per GFA, Final Watching and Lighting per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Contract Sum per GFA
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	Final Supervision & Administration per GFA	27.380	4.544	.567	6.026	.000
	Final Watching and Lighting per GFA	127.612	83.244	.316	1.533	.143
	Final Service site per GFA	-.780	46.837	-.003	-.017	.987
	Final First Aid Box per GFA	224.057	262.098	.136	.855	.404
	Final Progress Photograph per GFA	110.452	210.994	.076	.523	.607

a Dependent Variable: Final Contract Sum per GFA
b Linear Regression through the Origin

Regression of Contract Sums Vs Lump Sum Preliminaries Items

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.935	.874	.854	25.1103

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Final Cleaning on Completion per GFA, Final Sign Board per GFA, Final Setting Out per GFA

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	83091.820	3	27697.273	43.927	.000
Residual	11980.011	19	630.527		
Total	95071.831	22			

a Predictors: Final Cleaning on Completion per GFA, Final Sign Board per GFA, Final Setting Out per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Contract Sum per GFA
d Linear Regression through the Origin

Coefficients

Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
Final Setting Out per GFA	-94.826	209.447	-.157	-.453	.656
Final Sign Board per GFA	704.981	221.024	.825	3.190	.005
Final Cleaning on Completion per GFA	220.509	121.557	.324	1.814	.085

a Dependent Variable: Final Contract Sum per GFA
b Linear Regression through the Origin

Regression of Contract Sums Vs Average Sums of Preliminaries Categories

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.953	.908	.895	20.7085

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: LUMPSUM, COSTRELA, TIMERELA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	88998.107	3	29666.036	69.177	.000
	Residual	9005.695	21	428.843		
	Total	98003.802	24			

a Predictors: LUMPSUM, COSTRELA, TIMERELA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Contract Sum per GFA
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	COSTRELA	54.717	60.682	.329	.902	.377
	TIMERELA	63.755	70.620	.340	.903	.377
	LUMPSUM	226.091	117.921	.306	1.917	.069

a Dependent Variable: Final Contract Sum per GFA
b Linear Regression through the Origin

Regression of Total Preliminaries Sums Vs Cost Related Preliminaries Items

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.982	.964	.953	.7599

a Predictors: (Constant), Final Insurance & Guarantee per GFA, Final Site Plant & Scaffolding per GFA, Final Site Accommodation per GFA, Final Water for Works per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	203.236	4	50.809	87.985	.000
	Residual	7.507	13	.577		
	Total	210.743	17			

a Predictors: (Constant), Final Insurance & Guarantee per GFA, Final Site Plant & Scaffolding per GFA, Final Site Accommodation per GFA, Final Water for Works per GFA

b Dependent Variable: Final Total Preliminaries Sum per GFA

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.412	.318		1.299	.217
	Final Site Accommodation per GFA	10.707	2.218	.832	4.827	.000
	Final Water for Works per GFA	-8.025	3.532	-.395	-2.272	.041
	Final Site Plant & Scaffolding per GFA	2.045	.240	.615	8.526	.000
	Final Insurance & Guarantee per GFA	-1.004	3.393	-.022	-.296	.772

a Dependent Variable: Final Total Preliminaries Sum per GFA

Regression of Total Preliminaries Sums Vs Time Related Preliminaries Items

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.984	.969	.960	.6338

a Predictors: (Constant), Final Progress Photograph per GFA, Final Supervision & Administration per GFA, Final Watching and Lighting per GFA, Final First Aid Box per GFA, Final Service site per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	213.993	5	42.799	106.538	.000
	Residual	6.829	17	.402		
	Total	220.822	22			

a Predictors: (Constant), Final Progress Photograph per GFA, Final Supervision & Administration per GFA, Final Watching and Lighting per GFA, Final First Aid Box per GFA, Final Service site per GFA

b Dependent Variable: Final Total Preliminaries Sum per GFA

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-.192	.216		-.890	.386
	Final Supervision & Administration per GFA	1.807	.183	.727	9.851	.000
	Final Watching and Lighting per GFA	1.963	3.353	.067	.586	.566
	Final Service site per GFA	1.059	1.845	.061	.574	.574
	Final First Aid Box per GFA	10.395	10.308	.089	1.008	.327
	Final Progress Photograph per GFA	19.796	8.397	.192	2.358	.031

a Dependent Variable: Final Total Preliminaries Sum per GFA

Regression of Total Preliminaries Sums Vs Lump Sum Preliminaries Items

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.979	.959	.952	.7099

a Predictors: (Constant), Final Cleaning on Completion per GFA, Final Sign Board per GFA, Final Setting Out per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	211.750	3	70.583	140.041	.000
	Residual	9.072	18	.504		
	Total	220.822	21			

a Predictors: (Constant), Final Cleaning on Completion per GFA, Final Sign Board per GFA, Final Setting Out per GFA

b Dependent Variable: Final Total Preliminaries Sum per GFA

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	5.141E-02	.216		.238	.814
	Final Setting Out per GFA	.550	6.018	.016	.091	.928
	Final Sign Board per GFA	35.515	6.278	.771	5.657	.000
	Final Cleaning on Completion per GFA	11.878	4.106	.260	2.893	.010

a Dependent Variable: Final Total Preliminaries Sum per GFA

Regression for Predicting Total Preliminaries Sums (using raw values)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.995	.990	.988	447.5794

a Predictors: (Constant), Initial Total Preliminaries Sum, Project Gross Floor Area, Type of Client, Initial contract Sum

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	669124401.034	4	167281100.258	835.039	.000
	Residual	7011457.741	35	200327.364		
	Total	676135858.775	39			

a Predictors: (Constant), Initial Total Preliminaries Sum, Project Gross Floor Area, Type of Client, Initial contract Sum

b Dependent Variable: Final Total Preliminaries Sum

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	374.513	227.733		1.645	.109
	Type of Client	-109.012	190.166	-.012	-.573	.570
	Project Gross Floor Area	-2.577E-02	.046	-.013	-.559	.580
	Initial contract Sum	-2.302E-04	.002	-.004	-.113	.910
	Initial Total Preliminaries Sum	.986	.030	1.005	33.026	.000

a Dependent Variable: Final Total Preliminaries Sum

Regression for Predicting Total Preliminaries Sums (using GFA values)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.976	.952	.947	.6120

a Predictors: (Constant), Initial Total Preliminaries Sum per GFA, Type of Client, Project Gross Floor Area, Initial contract Sum per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	261.364	4	65.341	174.443	.000
	Residual	13.110	35	.375		
	Total	274.474	39			

a Predictors: (Constant), Initial Total Preliminaries Sum per GFA, Type of Client, Project Gross Floor Area, Initial contract Sum per GFA

b Dependent Variable: Final Total Preliminaries Sum per GFA

Coefficients

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	.571	.326		1.751	.089
Type of Client	-.267	.267	-.047	-1.001	.324
Project Gross Floor Area	-1.409E-05	.000	-.011	-.253	.802
Initial contract Sum per GFA	-1.910E-03	.003	-.042	-.731	.470
Initial Total Preliminaries Sum per GFA	1.047	.063	1.013	16.574	.000

a Dependent Variable: Final Total Preliminaries Sum per GFA

Regression for Predicting Total Preliminaries Sums (using raw values thro origin)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.996	.992	.991	458.0526

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Initial Total Preliminaries Sum, Project Gross Floor Area, Type of Client, Initial contract Sum

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	913380567.554	4	228345141.888	1088.331	.000
	Residual	7553237.845	36	209812.162		
	Total	920933805.399	40			

a Predictors: Initial Total Preliminaries Sum, Project Gross Floor Area, Type of Client, Initial contract Sum
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	Type of Client	172.224	85.118	.049	2.023	.051
	Project-Gross Floor Area	-4.805E-02	.045	-.027	-1.065	.294
	Initial contract Sum	4.832E-04	.002	.009	.238	.813
	Initial Total Preliminaries Sum	.972	.029	.971	33.216	.000

a Dependent Variable: Final Total Preliminaries Sum
b Linear Regression through the Origin

Regression for Predicting Total Preliminaries Sums (using GFA values thro origin)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.985	.970	.966	.6293

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Type of Client, Initial contract Sum per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	454.765	4	113.691	287.045	.000
	Residual	14.259	36	.396		
	Total	469.023	40			

a Predictors: Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Type of Client, Initial contract Sum per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum per GFA
d Linear Regression through the Origin

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	Type of Client	.135	.140	.054	.968	.340
	Project Gross Floor Area	-3.362E-05	.000	-.027	-.600	.552
	Initial contract Sum per GFA	-6.347E-05	.002	-.001	-.026	.980
	Initial Total Preliminaries Sum per GFA	1.014	.062	.958	16.362	.000

a Dependent Variable: Final Total Preliminaries Sum per GFA
b Linear Regression through the Origin

Predicting Total Preliminaries Sums for Public Buildings (using raw values)

Model Summary

Model	Type of Client = Public (Selected)	R	R Square	Adjusted R Square	Std. Error of the Estimate
1		.930	.865	.848	487.6022

a Predictors: (Constant), Initial Total Preliminaries Sum, Project Gross Floor Area, Initial contract Sum

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	36628842.084	3	12209614.028	51.354	.000
	Residual	5706141.423	24	237755.893		
	Total	42334983.507	27			

a Predictors: (Constant), Initial Total Preliminaries Sum, Project Gross Floor Area, Initial contract Sum
b Dependent Variable: Final Total Preliminaries Sum
c Selecting only cases for which Type of Client = Public

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	87.206	186.333		.468	.644
	Project Gross Floor Area	-1.412E-02	.126	-.008	-.112	.912
	Initial contract Sum	-5.300E-03	.003	-.210	-1.599	.123
	Initial Total Preliminaries Sum	1.292	.155	1.096	8.340	.000

a Dependent Variable: Final Total Preliminaries Sum
b Selecting only cases for which Type of Client = Public

Predicting Total Preliminaries Sums for Public Buildings (using raw values thro origin)

Model Summary

Model	Type of Client = Public (Selected)	R	R Square	Adjusted R Square	Std. Error of the Estimate
1		.971	.944	.937	479.9257

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Initial Total Preliminaries Sum, Project Gross Floor Area, Initial contract Sum

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	96238850.215	3	32079616.738	139.278	.000
	Residual	5758217.854	25	230328.714		
	Total	101997068.069	28			

a Predictors: Initial Total Preliminaries Sum, Project Gross Floor Area, Initial contract Sum
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum
d Linear Regression through the Origin
e Selecting only cases for which Type of Client = Public

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	Project Gross Floor Area	2.295E-02	.096	.015	.238	.814
	Initial contract Sum	-5.505E-03	.003	-.186	-1.702	.101
	Initial Total Preliminaries Sum	1.321	.139	1.126	9.495	.000

a Dependent Variable: Final Total Preliminaries Sum
b Linear Regression through the Origin
c Selecting only cases for which Type of Client = Public

Predicting Total Preliminaries Sums for Private Buildings (using adjusted values)

Model Summary

Model	Type of Client = Private (Selected)	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1.000	1.000	.999	9.632E-02	

a Predictors: (Constant), Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Initial contract Sum per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	193.602	3	64.534	6956.508	.000
	Residual	7.421E-02	8	9.277E-03		
	Total	193.677	11			

a Predictors: (Constant), Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Initial contract Sum per GFA
b Dependent Variable: Final Total Preliminaries Sum per GFA
c Selecting only cases for which Type of Client = Private

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	6.414E-02	.058		1.109	.300
	Project-Gross Floor Area	-1.556E-05	.000	-.012	-1.690	.130
	Initial contract Sum per GFA	3.763E-03	.003	.052	1.466	.181
	Initial Total Preliminaries Sum per GFA	.939	.035	.945	26.740	.000

a Dependent Variable: Final Total Preliminaries Sum per GFA
b Selecting only cases for which Type of Client = Private

Predicting Total Preliminaries Sums for Private Buildings (using adjusted values thro origin)

Model Summary

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
1	Type of Client = Private (Selected)	1.000	1.000	1.000	9.753E-02

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Initial contract Sum per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	287.049	3	95.683	10058.531	.000
	Residual	8.561E-02	9	9.513E-03		
	Total	287.135	12			

a Predictors: Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Initial contract Sum per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum per GFA
d Linear Regression through the Origin
e Selecting only cases for which Type of Client = Private

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	Project Gross Floor Area	-9.188E-06	.000	-.009	-1.261	.239
	Initial contract Sum per GFA	5.221E-03	.002	.079	2.339	.044
	Initial Total Preliminaries Sum per GFA	.924	.033	.925	28.273	.000

a Dependent Variable: Final Total Preliminaries Sum per GFA
b Linear Regression through the Origin
c Selecting only cases for which Type of Client = Private

Predicting Total Preliminaries Sums for Public Buildings (using adjusted values)

Model Summary

Model	Type of Client = Public (Selected)	R	R Square	Adjusted R Square	Std. Error of the Estimate
1		.921	.849	.830	.6866

a Predictors: (Constant), Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Initial contract Sum per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.611	3	21.204	44.984	.000
	Residual	11.313	24	.471		
	Total	74.924	27			

a Predictors: (Constant), Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Initial contract Sum per GFA
b Dependent Variable: Final Total Preliminaries Sum per GFA
c Selecting only cases for which Type of Client = Public

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-1.053E-02	.363		-.029	.977
	Project Gross Floor Area	3.965E-05	.000	.018	.196	.846
	Initial contract Sum per GFA	-6.616E-03	.004	-.240	-1.724	.098
	Initial Total Preliminaries Sum per GFA	1.353	.183	1.116	7.403	.000

a Dependent Variable: Final Total Preliminaries Sum per GFA
b Selecting only cases for which Type of Client = Public

Predicting Total Preliminaries Sums for Public Buildings (using adjusted values thro origin)

Model Summary

Model	Type of Client = Public (Selected)	R	R Square	Adjusted R Square	Std. Error of the Estimate
1		.968	.938	.930	.6727

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Initial contract Sum per GFA

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	170.575	3	56.858	125.649	.000
	Residual	11.313	25	.453		
	Total	181.888	28			

a Predictors: Initial Total Preliminaries Sum per GFA, Project Gross Floor Area, Initial contract Sum per GFA
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum per GFA
d Linear Regression through the Origin
e Selecting only cases for which Type of Client = Public

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	Project Gross Floor Area	3.485E-05	.000	.017	.305	.763
	Initial contract Sum per GFA	-6.594E-03	.004	-.209	-1.789	.086
	Initial Total Preliminaries Sum per GFA	1.350	.141	1.145	9.596	.000

a Dependent Variable: Final Total Preliminaries Sum per GFA
b Linear Regression through the Origin
c Selecting only cases for which Type of Client = Public

Predicting Total Preliminaries Sums for Private Buildings (using raw values)

Model Summary

Model	Type of Client = Private (Selected)	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1.000	1.000	.999	181.8376	

a Predictors: (Constant), Initial Total Preliminaries Sum, Project Gross Floor Area, Initial contract Sum

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	537546625.625	3	179182208.542	5419.102	.000
	Residual	264519.404	8	33064.926		
	Total	537811145.029	11			

a Predictors: (Constant), Initial Total Preliminaries Sum, Project Gross Floor Area, Initial contract Sum
b Dependent Variable: Final Total Preliminaries Sum
c Selecting only cases for which Type of Client = Private

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	145.506	89.925		1.618	.144
	Project Gross Floor Area	-9.323E-02	.044	-.044	-2.118	.067
	Initial contract Sum	4.574E-03	.003	.057	1.513	.169
	Initial Total Preliminaries Sum	.931	.032	.952	29.316	.000

a Dependent Variable: Final Total Preliminaries Sum
b Selecting only cases for which Type of Client = Private

Predicting Total Preliminaries Sums for Private Buildings (using raw values thro origin)

Model Summary

Model	Type of Client = Private (Selected)	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	1.000	1.000	.999		197.5094

a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
b Predictors: Initial Total Preliminaries Sum, Project Gross Floor Area, Initial contract Sum

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	818585647.662	3	272861882.554	6994.672	.000
	Residual	351089.668	9	39009.963		
	Total	818936737.330	12			

a Predictors: Initial Total Preliminaries Sum, Project Gross Floor Area, Initial contract Sum
b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
c Dependent Variable: Final Total Preliminaries Sum
d Linear Regression through the Origin
e Selecting only cases for which Type of Client = Private

Coefficients

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	Project Gross Floor Area	-9.967E-02	.048	-.055	-2.093	.066
	Initial contract Sum	6.250E-03	.003	.101	2.026	.073
	Initial Total Preliminaries Sum	.919	.034	.934	27.374	.000

a Dependent Variable: Final Total Preliminaries Sum
b Linear Regression through the Origin
c Selecting only cases for which Type of Client = Private

NAME OF PROJECT	*INITIAL CONTRACT SUM* (N) ,000.00	*FINAL CONTRACT SUM* (N) ,000.00	*INITIAL TOTAL PRELIMS* (N) ,000.00	*FINAL TOTAL PRELIMS* (N) ,000.00	**COST RELATED PREL**				
					Site Acomodation	Water for works	site plant & scaffolding	Insurance & guarantee	Reasc for Chang
									consult s

Notes **Site services**; temporary roads, temporary fencing/hoarding, telephone, electricity, etc
Supervision and administration: site supervision/foremen, meetings, stationaries/records, etc
Site accomodation: site office, site storages, laboratories, etc

APPENDIX 1

PREAMBLE

As part of a research studies in the MSc. Construction Management programme, it is desired to collate information on the provision and management of preliminaries in building construction contracts. The aim is to assess the variability of the items of preliminaries in building contracts. Respondents are required to please assist in completing the questionnaire appropriately.

SECTION A (Tick against the appropriate response)

1. Profession of Respondent

- ☐ Architect
- ☐ Quantity Surveyor
- ☐ Engineer
- ☐ Builder
- ☐ Others specify

2. Nature of Occupation

- ☐ Contractor
- ☐ Consultant
- ☐

Client organisation (in-house consultant)

3. Years of Experience

- ☐ 0 – 5 years
- ☐ 6 – 10 years
- ☐ 11 – 15 years
- ☐ 16 – 20 years
- ☐ Over 20 years

4. Highest qualification of Respondent

- ☐ HND
- ☐ BSc/B. Eng
- ☐ MSc/M.Eng
- ☐ PhD
- ☐ Others specify

SECTION B

1. Types of projects handled

   ☐ Building projects only

   ☐ Civil Engineering only.

   ☐ Building and Civil Engineering

2. Is provision for preliminaries necessary for all types of contracts?

   ☐ Yes

   ☐ No

3. If No to Q2, indicate which of the following types of projects should not have a section for preliminaries?

   a) New Construction Projects

      ☐ Minor

      ☐ Medium

      ☐ Major

   b) Rehabilitation/Refurbishing

      ☐

Minor

☐ Medium

☐ Major

4. Where preliminaries are required, should be a separate section of the contract Bill of Quantities?

   ☐ Yes

   ☐ No

   If No in Q4, should it be factored into the build up for various rates in Bill of Quantities?

   ☐ Yes

   ☐ No

5. What are the common methods of pricing preliminaries in building contracts?

   ☐ Inserting a fix percentage

   ☐ Pricing the individual items

   ☐ Combination of the two.

7. Where a fixed percentage is used, how do the following influence the percentage used? **Highly** **Moderately** **Low**

   ☐ Size/complexity of the project

   ☐ Location of project

   ☐ Duration of project

   ☐ Con tract sum

   ☐

Type of client.

8. If your firm uses the fixed percentage method, on the average, what is the range of percentage often used to cover for preliminaries?

- ☐ 0 – 5%
- ☐ 6 – 10%
- ☐ 11 – 15%
- ☐ 16 – 20%
- ☐ 21 – 30%
- ☐ 31 – 40%
- ☐ Over 40%

9. Which of these methods do you consider most appropriate for pricing preliminaries.

- ☐ Inserting a fix percentage
- ☐ Pricing the individual items
- ☐ Combination of the two.

10. Rate the adequacy of these methods in pricing preliminaries.

Very adequate Adequate Not adequate.

- ☐ Inserting a fix percentage
- ☐ Pricing the individual items
- ☐ Combination of the two.

11. How do you rate the influence of detailed pricing of all items of preliminaries on its adequacy?

- ☐ High
- ☐ Moderate
- ☐ Low
- ☐ No influence.

12. How do the following factors influence the accuracy of pricing of preliminaries?

	Highly	**Moderately**	**Low**	**No influence**
☐ Experience of the estimator				
☐ Insufficient information				
☐ Inadequate time of bidding				
☐ Complexity of project				
☐ Competitiveness of the project.				

13. Rate the following factors as they contribute to variations (changes) in the cost of preliminaries.

	Very high	**High**	**Low**	**None.**
☐ Size/complexity of the contract				
☐ Duration of the contract				
☐				

Contract sum

☐ Location of the project

☐ Client factors

☐ Consultants' action/inaction

☐ Weather

☐ Economy

☐ Others specify.

14. Indicate which of these of preliminaries experience wide variations in project execution.

SECTION C

15. What is your experience of the appropriateness of the method adopted in the valuation of preliminaries?

- ☐ Very appropriate
- ☐ Appropriate
- ☐ Not appropriate.

16. Which of these methods of valuing preliminaries do you consider most appropriate?

- ☐ Use of fixed percentage
- ☐ Valuation of…
- ☐ Combination of the two

17. Which of these methods is often used in valuing preliminaries in building construction projects?

- ☐ Use of percentage
- ☐ Valuation of individual items
- ☐ Combination of the two above.

18. Do you experience difficulty in the valuation of preliminaries?

- ☐ Yes
- ☐ No

19. If YES in Q14, rank the following scenario in the order they are encountered, starting from 1 for the most frequent.

- ☐ Under valuation
- ☐ Insufficient information
- ☐ Insufficient time
- ☐ Over valuation.

20. Should preliminaries be subject of claims in the event of an extension of contract duration?

- ☐ Yes
- ☐ No

21. If YES in Q 20, rate the following methods of valuation as you consider them appropriate.

	Very appropriate	**Appropriate**	**Not appropriate**
☐ Use of pro-rata			
☐ Application of fixed percentage			
☐ Use of a negotiated award			
☐ Detail pricing of the items involved.			