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UNRRODUCTIVE COSTS IN BUILDING PROJECTS

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A thesis submitted to the post-graduate school, Ahmadu Bello University, Zaria in partial fulfilment of the requirements for the award of the degree of Master of Science in Construction Management.

DECLARATION

I hereby declare that this thesis has been written by me and that it is a record of my own research work. It has not been presented in any previous application for a higher degree.

All quotations are indicated and the sources of information are specifically acknowledged by means of references.

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APRIL, 1993

CERTIFICATION

We certify that we have read this thesis and in our opinion it conforms to acceptable standard of scholarly presentation and is fully adequate in scope and quality as a thesis for the degree of Master of Science in Construction Management.

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ABSTRACT

Building projects in Ahmadu Bello University are experiencing astronomical cost of construction resources especially materials, manpower, machines and overheads. Therefore clients commissioning building projects are cost-conscious and will not want to be saddled with avoidable and unnecessary expenses termed in this research as unproductive costs.

It is against this background that building costs were critically examined to isolate these unnecessary expenses that are of no effect on building projects from inception to completion and consequently propose ways of minimising them.

To achieve this main objective, a review of existing contractual system, cost patterns, cost control techniques as well as field investigation of relevant data was made to isolate costs that fit the definition of unproductive costs in building projects. Therefore data were collected and analyzed on selected building projects undertaken by the Ahmadu Bello University, Zaria.

It has been observed that loopholes in administrative procedures and inadequate management skills and tools are mainly responsible for unproductive costs in building projects leading to variation orders, fluctuation of materials and labour, delays, etc. The average unproductive cost was found to be as high as N1,971,417.29 representing 45 per cent of the total initial contract sum of N4,373,558.57.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 GENERAL BACKGROUND

Building projects in Ahmadu Bello University, Zaria are experiencing astronomical rising costs of building construction in-put such as materials, labour, plant and overheads caused by global inflation, high interest rates and the devaluation of Naira. Therefore, the clients be they industrialist concerned with profitability, government bodies concerned with accountability or joint stock companies concerned with both commissioning large building projects are increasingly cost-conscious, and will not want to be saddled with further unnecessary expenditure.

Building activities are turning into something more technologically sophisticated, complex and dynamic, but it is rather unfortunate that the contractual system operating in this country allows the gamut of illiterates, middle-men and non-professionals to operate. This situation has led to chaos, abuse of purpose, delayed project execution and shoddy performance at high cost of building.

Most building materials and components are on importation but yet the foreign reserve is currently very lean. The devaluation of Naira has made importation of these items very scarce and expensive. There is also the problem of delayed supply. The total implications of these in price fluctuation and variation of specified materials and components and slow progress, extension of time, claims and a preference for a second choice.

Mosaku (1982) stated that "the variations, in turn, may change the basis of the original contract from competitive to negotiate especially that the contractors in most cases seize this opportunity to hold the client to ransom to recover a loss situation".

The adaptation of foreign contract conditions, specification, standard code of practice and sometimes design by the consultants without relevant modifications to conform with the local condition, creates problems of misinterpretation of contract condition, reduce functional requirements and poor quality of structures due to low level of technology. For example, a structure that relies so much on artificial lighting and ventilation may not function very well because of the interrupted supply of electricity by the National Electric Power Authority. This situation shows serious lapses on the part of consultants with grave consequences.

Additionally, poor management skills and tools such as improper conceptual planning of building projects by clients, contract award made to incompetent contractors, poor planning and scheduling during project execution and late payment of interim valuations by clients have led to a cycle of project delays, abandonment, termination of contracts and re-award.

Furthermore, social ills such as bribery and corruption contribute substantially to the cost of building projects. Some clients, consultants and contractors connive in this unfortunate practice, which action according to Wahab (1983), resulted in "inflated estimates, shoddy job and consequently waste of funds".

From the foregoing, it is noted that unproductive costs do exist in building projects and unless they are minimised, the escalating cost of building projects will continue at an alarming rate.

Therefore, this research work has been titled as "unproductive costs in building projects", which can be defined as avoidable or unnecessary expenses incurred at both pre-contract and post-contract stages of building projects.

1.2 AIM AND OBJECTIVES

The main aim of this is to identify unproductive costs and their causes in building projects from inception to completion, and to plan their avoidance. This is done by:-

(1) Examining the overall cost patterns of building projects in terms of materials, labour, plant and overheads.

(2) Isolating from total building cost which one can be regarded as unproductive costs, that is those costs with negative effects in building projects.

(3) Proposing methods of minimising unproductive costs in building projects.

1.3 SCOPE AND LIMITATIONS

This is a pilot study carried out to look into the overall cost patterns of selected building projects from the drawing board to occupancy. It is carried out with a view to identifying avoidable expenses of building production resources.

This research work covers Ahmadu Bello University, Zaria building projects and the finding can therefore be applied to this University only.

1.4 METHODOLOGY FOR RESEARCH

In pursuance of the objectives set for this research, a review of existing contractual system, cost patterns, cost control techniques as well as field investigations of relevant data was made to isolate costs that fit the definition of unproductive costs in building projects.

In this regards, some previous building project records such as bills of quantities, specification, drawings and contract files containing correspondence, minutes of site meetings architect's instructions, variation orders, valuations and payments have been examined, analyzed and presented to provide an insight into the causes of unproductive costs and suggest ways to avoiding them.

In addition, conclusions and recommendations have been made based on the review of existing practice and findings from field investigations.

CHAPTER TWO

2.0 CONTRACTUAL SYSTEM

Contractual system usually encompasses two important objectives:-

(1) Definition of the agreement between the parties in respect of design, time and cost.

(2) Provision of a sound and definitive legal and administrative basis for the construction process.

The choice of the type of contract will normally be made by the employer in the light of advice that he receives from his professional advisers.[1]

2.1 TYPES OF CONTRACT

Seeley (1974) has pointed out the main types and the more sub-types which cover the vast majority of construction contracts are:-

2.1.1 Cost Plus Contracts

These contracts are sometimes described as cost reimbursement 'or' prime cost' contracts. In practice they can take any one of the three quite different forms:-

a) Cost plus percentage contracts are those in which the contractor is paid actual cost of the work plus an agreed percentage of the actual or allowable cost to cover overheads and profit. They are useful in an emergency, when there is insufficient time available

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[1] Ivor H. Seeley, *Quantity Surveying Practice*, Macmillan Publishers Ltd., London, p.54.

to prepare detailed schemes prior to commencement of the work, but it will be apparent that an unscrupulous contractor could increase his profit by delaying the completion of the works. No incentive exists for the contractor to complete the works as quickly as possible or to endeavour to reduce costs. They are quite commonly used in maintenance work.

b) Cost plus fixed fee contracts are those in which the contractor will be paid the actual cost incurred in carrying out the work plus a fixed lump sum, which has been previously agreed upon and does not fluctuate with the final cost of the work. No real incentive exists for the contractor to secure efficient working, although it is to his advantage to earn the fixed fee as quickly as possible and to release his resources for other work. This type of contract is superior to the cost plus pe, ge type of contract.

c) Cost plus fluctuating fee contracts are those in which the contractor is paid the actual cost of the work plus a fee, the amount of the fee being determined by reference to the allowable cost by some form of sliding scale. Thus the lower the actual cost of the works, the greater will be the value of the fee that the contractor receives. An incentive than exists for the contractor to carry out the work as quickly and as cheaply as possible, and it does constitute the best form of cost plus contract from the employer's viewpoint.

2.1.2 Target Cost Contracts

Target cost contracts have been introduced to encourage contractors to execute the work as cheaply and efficiently as possible. A basis fee is generally quoted as a percentage of an agreed target estimate often obtained from a priced bill of quantities. The target estimate may be adjusted for variations in quantity, design and fluctuation's in the cost of labour and materials. The actual fee paid to the contractor is obtained by increasing or reducing the basic fee by an agreed percentage of the saving or excess between the actual cost and the adjusted target estimate. In some cases a bonus or penalty based on the time of completion may also be applied. Target cost contracts can be useful when dealing with unusual or particularly difficult situations, but the real difficulty lies in the agreement of a realistic target.

2.1.3 Measure and Value Contracts

These contracts include those based on schedules of rates, approximate quantities and bill and quantities. Their great merit his in the predetermined nature of the mechanism for financial control provided by the pre-contract agreed rates. The risk of making a profit or loss rests with the contractor. Another adaptation of the orthodox bill of quantities contract is serial tendering whereby a series of contracts are let to a single contractor.

a) Serial contracting is based on a standing offer, made by a contractor in competition, to enter into a number of lump sum contracts in accordance with the terms and conditions set out in a master or national bill of quantities. This procedure is particularly well suited for a know programme of building work

over a period of time in a specific locality, and where there is a high degree of standardisation of construction. The advantages for this system include improved relationships with the contractor, more effective cost control, faster, and more economical planning and execution of jobs.

b) Schedule contracts may take one of two forms. The employer may supply a schedule of unit rate covering each item of work and ask the contractors, when tendering, to state a percentage above or below the given rates for which they would be prepared to execute the work. Alternatively, it is more usual, the contractors may be requested to insert prices against each item of work, and a comparison of the rates to entered will enable the most favourable offer to be ascertained.

Approximate activities are sometimes included to assist the contractors in pricing the schedules and the subsequent comparison of the tendered figures.

This type of contract is very suitable for maintenance and repair contracts, where it is impossible to give realistic and accurate quantities of work to be undertaken.

c) Bills of quantities contracts are still a very commonly used contractual arrangement for building projects, where the quantities of the bulk of the work can be ascertained with reasonable accuracy before the work is commenced. A bill of quantities gives as accurately as possible the quantities of work to be executed and the contractor enters a unit rate against each

items of work. The extended totals are added together to give the total cost of the job.

In the absence of a bill of quantities each contractor tendering will have to assess the amount of work involved and this will normally have to be undertaken in a very short time, in amongst other jobs. Under these circumstances a contractor, unless he is extremely short of work, is almost bound to price high in order to allow himself a sufficient margin of cover for any items which he may have missed. Furthermore, there is no real satisfactory method of assessing the cost of variations and the contractor may feel obliged to make allowance for this factor also, when building up his contract price. Bills of quantities thus assist in helping tender figures to a minimum.

2.1.4 Contracts Based on Drawings and Specification

These are often described as 'lump sum' contracts although they may be subject to adjustment in certain instances. They form a useful type of contract where the work is limited in extend and reasonably certain in its scope and are frequently used for works of alteration and conversion. They have on occasions been used where the works are uncertain in character and extend, and by entering into a lump sum contract the employer hoped to place the on the contractor for deciding the full extent of the works and the responsibility for covering any additional costs which could not be foreseen before the works were commenced. The employer would then pay a fixed sum for the works, regardless of their actual cost, and this constitutes an undesirable practice from the contractor's point of view.

2.1.5 Package Deal Contracts

These constitute a specialised form of contractual relationship in which responsibility for design as well as construction is entrusted to the contractor. The less developed the design, the less detailed the specification and hence the less precise must be the calculation of the price. Contingencies must be included to provide for the unknown.

Package deal contracts have been used for housing, often incorporating heavy industrialised systems; hospitals; defence installations and factories.

With housing schemes about six contractors may be invited by the employer to submit a complete development scheme for a large site. The contractors may use their own design teams or private architects to prepare schemes within the specified requirements of densities and costs, and the successful contractor will subsequently be required to collaborate with the employer's architect. This form of approach is particularly favoured where special factors exist such as the use of building systems.

2.2 TYPES OF CLIENT

The initiator of any construction activity in the building industry is know by varied names:- The client, the employer the building owner, the developer, the promoter and so forth.

Clients can be grouped into three broad categories namely:-

1) Client with non-consultant design team;
2) Client with consultant design team:
3) Client without any design team.

In the first case the client has his projects designed internally by staff within the organisation. In this case bills of quantities are usually not prepared. Governments agencies, institutions, etc., fall into this group.

The practice that obtains in this first case holds for the second case except that the design team undertakes to design for other organisation, projects not requiring the preparation of bills of quantities. This is the practice between the Ministry and Works and Housing and other Ministries. The Ministry of Works and Housing assuming the role of consultant.

The third class of employer which includes corporation, companies, individuals, etc., has no qualified persons within the organisation to carry out any design and as such the services of independent consultants are usually engaged.

Each type of client would normally have regulations dealing with the invitation of a building project, the award and execution of the contract.

2.3 CONTRACTUAL ARRANGEMENTS AT PRE-CONTRACT STAGE

There are four basic building activities at this stage which consist of appointment of consultants, project design, preparation of tender documents 5 and contract award.

2.3.1 The Consultants

In any given building work the consultants include the architect, as the co-ordinator, the quantity surveyor, the structure, electrical and mechanical engineers. Both the electrical and mechanical services engineers are normally engaged in the case or large building projects. The consultants form the design group and are responsible for the translation of the clients' wishes and concepts into graphical and visual appreciation. This translation is expected to be done in a manner that will comply with the socio-economic standing for the client and also guarantee the functional viability.

a) The architect

The architect is usually regarded as the leader of the building team. It is he who normally receives the commission to design and supervise the erection of the building. The amount of specialised knowledge required for the design of a modern, complex building is so great that the architect will almost uncertainly need assistance from specialists. For example, structural engineers may be required to design the structural frame, electrical and mechanical engineers to design the services and quantity surveyors to advise on cost aspect and prepare bills of quantities and other documentation[2].

[2] Ivor H. Seeley, *Quantity Surveying Practice*, Macmillan Publishers Ltd., London, p.26.

b) **The quantity surveyor**

The quantity surveyor is essentially a cost expert whose prime task is to ensure that the project is kept within the agreed budget.

The services that he offers cover such aspects as preliminary cost advice and cost planning, preparation of tender documents, advice on type of contract and method of obtaining tenders, negotiations with contractors, valuation of work in progress and settlement of the final account. He will at all times need to collaborate very closely with the architect[3].

c) **The engineers**

On large and complicated building projects, it is customary for the architect to recommend to the employer the appointment of consulting engineers, usually specialist in structural work and mechanical and electrical engineering services. The architect's knowledge and experience in these specialised areas will be insufficient to cover these functions effectively. Some integrated practices will contain these specialists within the practice and can then offer the services 'in-house'[4].
Alternatively, independent consulting engineers work with a number of architects and thus, acquire a wide experience, although co-ordination will be more difficult. An integrated practice avoids this problem but in but' engineers may lack

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[3] Ivor H. Seeley, *Quantity Surveying Practice*, Macmillan Publishers Ltd., London, p.28.

[4] Ibid., p.29.

authority. Generally, the consultants having been registered under government statute with their respective professional bodies, consulting organisations wishing to obtain will have to complete and submit an application from design by the prospective client, on the other hand an introductory letter is usually written by the consultants to the would be employer.

It is necessary for the consultants to institute follow-up action to find out where, when and which jobs are coming up and then to "lobby" from the intended client.

2.3.2 The Project Managers (Contractors)

*Usually the project managers include the main-contractor, sub-*contractors and suppliers.

a) Main-Contractor

The main-contractor or simply contractor is the person or firm who undertakes to complete a building project in accordance with the contracts documents on behalf of the employer. He is, accordingly, one of the most important parties to a building contract and have a full control of all operations on site, including the work to be carried out by nominated sub-contractors, with whom he has a direct contractual relationship by means of sub-contracts. All instruction and payments to nominated sub-contractors some through the main contractor.
The contractor is proceed regularly and diligently with the work and to complete it by a specified date. Failure to comply with *this requirement may render* the contractor liable for payment of

liquidated damages. The contractor is required to comply with all statutory requirements affecting the works and to give all notices that may be legally demanded. He is to ensure the building operations against fire and possible injury to persons or property. He has to attend to many matters of considerable complexity and has many obligations under the terms of the contract.

He receives all his instruction through the architect but has dealing with other parties to the contract, such as the quantity surveyor, when he measures and value completed work. The contractor maintains close contract with the clerk of works in his supervision of the work. The contractor employs personnel to take charge

The contractor employs personnel to take charge of work on the site and for large projects there can be a site agent, while on a small scheme a foreman will probably suffice. A foreman is a workforce and ensures that the work is performed satisfactorily and on time. The contractor often employs a quantity surveyor to safeguard his financial interests.

b) **Sub-contracts**

The specialist sub-contractors embrace crafts, structural work, building services and decorative and other finishes. It is generally possible to achieve a cheaper and higher standard of workmanship by employing specialist sub-contractors to undertake these classes of work.

The employer,through his agent the architect retains control of the sub-contractors' work as they are normally appointed or selected by the architect. The main-contractor is, however, responsible for all operations on the site and sub-contractors have to look to him for instructions and payment. There is no contractual relationship between the employer and the sub-contractor. For this reason alone it is imperative that a sub-contract is entered into between the main-contractor and the sub-contractor to safeguard the interests of the main-contractor. The principal provisions in sub-contract are as follows:-

i) To ensure that the main-contractor secures full and proper co-operation from the sub-contractor in carrying out the sub-contract;

ii) To ensure that the sub-contractor indemnifies the main-contractor against the same obligations as those for which the main-contractor is responsible to the employer under the terms of the main contract;

iii) To ensure that the sub-contractor has full use of all general site facilities, although he is liable for any misuse or damage caused by his employees;

iv) To ensure that the sub-contractor undertakes the necessary obligations as to time and progress[5].

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[5] Ivor H. Seeley, *Quantity Surveying Practice*, Macmillan Publishers Ltd., London, p.31.

c) Suppliers

Building suppliers supply building materials and components to contractors and sub-contractors. The architect may specify the use of certain materials to be obtained from nominated suppliers and the contractor is entitled to a cash discount of five per cent, provided he meets the contract requirements as to payment, but all other discount pass to the employer. The quantity surveyor often needs to examine suppliers! invoices when checking prices in the basic schedule or against claims for recoverable costs of fluctuations, daywork and related matters[6].

d) Registration of contractors

Any contractor wishing to undertake a government or public authority projects is usually registered with such an authority in the appropriate category.

The process of and requirements for registration vary from employer to employer. Therefore for any contracting firm to be eligible for contract award with the various employing bodies, must be prepared to comply with both the procedures as well as satisfy the requirements stipulated by them.

[6] Ivor H. Seeley, *Quantity Surveying Practice*, Macmillan Publishers L., London, p.32.

Registration process includes, in certain cases, submission of a properly complete client-designed application forms accompanied by a prescribed non-refundable fee. In some cases the request for and the submission of application form together with the payment of appropriate registration fee are done after a notice of contract has been given by the prospective client.

The class into which a firm is registered is determined by the registration fee paid and how far the firm has been able to meet the stipulated requirements of employing authority.

The fact that the firm has been registered does not guarantee the firm a job the registering body. Classification as well as registration fee very from one client to another (see Tables 2.1 and 2.2).

TABLE 2.1

CLASSIFICATION SYSTEM OF BUILDING/CIVIL ENGINEERING AND MECHANICAL/ELECTRICAL ENGINEERING CONTRACTORS BY THE FEDERAL WORKS REGISTRATION BOARD

CATEGORY	BUILDING/CIVIL VALUE OF PROJECT (₦)	REGISTRATION FEE (₦)
A	Up to 50,000.00	40.00
D	Up to 250.000.00	100.00
C	Up to 1,000,000.00	500.00
D	Above 1.000.000.00	2,000.00
	MECHANICAL/ELECTRICAL	
A	Up to 50,000.00	20.00
D	Up to 250,000.00	40.00
C	Up to 1,000,000.00	100.00
D	Above 1,000,000.00	500.00

Source: Federal Works Registration Board (1980)

TABLE 2.2

CLASSIFICATION SYSTEM OF MAJOR BUILDING AND ELECTRICAL ENGINEERING CONTRACTS BY THE AHMADU BELLO UNIVERSITY, ZARIA

CATEGORY	MAJOR BUILDING CONTRACT VALUE OF PROJECT (₦)	REGISTRATION FEE (₦)
C1	10,001.00 - 24,000.00	100.00
C2	24,001.00 - 100,000.00	200.00
C3	100,001.00 - 999,999.00	500.00
C4	1,000,000.00 and above	1000.00
	ELECTRICAL CONTRACTS	
E1	1.00 - 2,000.00	40.00
E2	2,001.00 - 10,000.00	60.00
E3	10,001.00 - 24,000.00	100.00
E4	24,001.00 - 100,000.00	200.00
E5	100,001.00 - 999,999.00	500.00
E6	1,000,000.00 and above	1000.00

Source: Physical Planning Unit, Vice Chancellor's Office, A.B.U., Zaria (1990/91).

Registration is usually for a given period of time subject to renewal or withdrawal as the case may be depending on the extent of co-operation and understanding that existed between the parties during the previous period.

In some instance certain employers have adopted the upgrading system, that is, changing the category of the firms from one level to another after assessing their performances in the light of previous job executed.

Some information required to be given as contained in the registration forms include:-

i) Name and address of applicant

ii) Name of the company in full

iii) Office address

iv) previous registration (if any) and class registered with other clients

v) Jobs executed (with client or other client)

vi) Jobs at present being handled (for client or other clients)

vii) Available resources in terms of money, equipment and personnel

viii) Contract type for which application is being made (building, civil, mechanical, etc.) and category

ix) Name and address of bankers

Invitation notice is usually given in the local and national dailies of wide spread readership as it appeared in Daily Sketch of Wednesday, 31st October, 1990. See appendix 2/I.

2.3.3 Project Commission and Preparation of Documents

Once the client has commissioned a large building project, he usually appoints consultants who will prepare contract documents such as drawings, specification, bill of quantities, etc.

a) Design procedure

Project of any size and/or complexity will require inputs from various organisations and individuals for its realisation. Specifically, the activities of such individuals or organisations include either the design of the project or the construction of it.

i) *Preparing the brief*

The architectural design consultant being the first to be appointed now becomes the design co-ordinator and receives briefs from the client in form of function, requirements, fund available and the time the project is expected to take-off[1].

Preliminary discussion may indicate when certain information is expected and a programme drawn up. Supporting consultants at this stage be suggested by either party for approval and appointment[1].

In some cases, the supporting consultants are, in turn, briefed by the design co-ordinator concerning his own conceptual ideas of the client's requirements, the function for which the proposed project is intended for, etc. From this time onward both the design co-ordinator and the supporting consultants proceed with their work independent of one another until meeting may be called to resolve issues that are not clear or requiring further

[1] T. O. Mosaku, *A System Approach to Effective Project Management Control*. Unpublished PhD thesis, A.B.U., Zaria, 1982, p. 4.

consideration. More often than not the consultants and the client are located far apart. In which case consultation is not frequent and as such certain issues do not get resolved or if at all, at a considerable travelling cost which forms the basis of unproductive costs in building projects. The design process and the thoroughness of the design solution may be seriously hampered.

It is to be noted that detailed site and soil analysis are carried out at this stage[8].

ii) Sketch or preliminary design

After this initial interaction between the parties weighing and crystallizing ideas, the design co-ordinator will proceed to make sketch design to be presented to the client for further consideration and approval. The activities at this stage include detailed analysis of the brief and the preparation of an illustrative outline of the proposals. An indication of the project cost will be prepared to guide the client decision and approval[8].

iii) Final design

Final design stage will include the participation of the quantity surveyor to advise on the cost implications of the various design inputs from structural and services engineers[8].

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[8] T. O. Mosaku, *A System Approach to Effective Project Management Control*, Unpublished PhD thesis, A.B.U., Zaria, 1982, p.65.

There is more interaction between the design co-ordinator and the supporting consultants especially that the drawings are now to be prepared in full scale for final presentation. Full report with estimate of cost will now be presented to the client for approval[9].

iv) **Design details and production drawing**

This is expected to include production of detailed drawings with precise specifications as well as drawings showing the interrelatedness of structural, services and architectural designs. Detailed site plan, and bill of quantities and cost checks have been prepared ready for tender[9].

b) **Preparation of estimates**

The assessment of the cost at the pre-contract stage of building process involves preparation of an approximate estimate, the accuracy of which depends to a great extent on availability of reliable information for its calculations. These include detailed brief by the client of his intended requirements and access to the accurately recorded cost data of previously completed buildings of similar type.

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[9] T. O. Mosaku, *A System Approach to Effective Project Management Control*, Unpublished PhD thesis, A.B.U., Zaria, 1982. p.66.

Quite often, the brief from the clients to the architects are inadequate or scanty due to lack of initial homework on the proposed building project by the clients. The architects are made to submit several alterative designs of one project before an approval is made for detailed design of the scheme.

In most cases particularly in the case of governments and their agents, the professionals are rushed to produce their documents sometimes within an unreasonably short period of time. This often leads to inaccurate cost estimate of the proposed scheme as many essential items are omitted from the design.

Lack of accurately recorded cost data in this country makes the estimated project cost as prepared by the quantity surveyors unrealistic. More often than not such estimates are based on the theoretical manipulation of the consulting quantity surveyor and his experience on a similar project.

Preparation of realistic approximate cost estimate can be achieved when there is full co-operation and communication between architect, quantity surveyor can client from the inception of the scheme. However, it is unfortunate to observe that for a project located at Zaria, the consulting architect is based in Lagos while the quantity surveyor is at Kaduna as in the case of Kashim Ibrahim Library, A.B.U., Zaria. The desired close collaboration during the design stage becomes difficult or

impossible to achieve. The resultant effects are lack of co-ordination, unnecessary travelling expenses and consequently unrealistic estimate of the probable cost of proposed project.

Basically. the methods available for building up of cost of building are:-

i) Unit basis

ii) Cubic content basis

iii) Storey enclosure

iv) Floor area basis

v) Use of approximate quantities

The choice of method of estimating the probable cost of building project is influenced by the information, fact, form of the cost data available to quantity surveyor. Each method has its appropriate application and limitations.

2.3.4 Tendering Procedures

At this stage, it is necessary for reasons of cost for a firm to decide whether or not to tender and the following require consideration:-

1) The estimating success ratio. If a firm prepares twenty estimates and is successful in gaining only one job, estimating costs will be high.

2) The contractual conditions associated with the work for which it proposes to tender. For example, a firm might be involved with protracted negotiations for a design and build contract and finally withdraw from the negotiations, this is obviously a very costly process.

3) The probable competitors and how keenly they are likely to compete.

4) The climate and the future. If the amount of work coming on the market is declining, is might be advisable to strived for volume of work at low profit and maintained a good estimating success ratio.

5) The work in progress the company already has on its books.

6) It is essential to try to maintain goodwill with architects and clients. This may mean tendering for obtaining, and carrying out work which is not particularly attractive to the company.

a) **Tender documentation**

In practice the tender documents consist of drawings and bills of quantities. The composition of the two parts are as follows:-

i) **Bill of quantities:-** This consists of the Form of Tender, Articles of Agreement, Contract Conditions, Preliminaries, Trade Preambles and Measured Quantities.

ii) **Drawings:-** Consists of Architectural, Structural, Electrical, Mechanical and other Services Drawings and Specifications.

This classification implies that tenders for building works can be invited on either one part only or both of the parts. When drawings and specifications only are used, the contractor will have to prepare their own quantities themselves.

Due to differences in quantities tender figures based on this type of tender documentation shows very large differences and sometimes the clients had to re-tender the projects on the basis of bills of quantities in order to obtain reliable estimates.

The bills of quantities are normally prepared from the drawings before going to tender. But it is often observed that even at tender stage some of these architectural and engineering drawings are still at the preliminary stage.

This situation arises, for example, when the consultants are rushed to produce tender documents by the clients. The effect is that false impression is given of the estimated construction cost of projects. Hence, preparation of bills of quantities from inadequate drawings tend to reduce the reliability of any estimates or tenders based on such documents.

In addition, quality of information rather than quantity is one of the most important factors which greatly affects the accuracy of the pre-tender estimate as well as tenders from contractors. Hence, Smell (1973) stated that "we recognise that we can improve the accuracy of estimating and the valuation of variations by providing better information instead of more detailed information." The sketch design provide only scanty information on the project and any bills of quantities based on such drawing may lead to in accurate tenders from contractors and subsequently lack of control as well as fraudulent practices during the construction stage of works. It is necessary to prepare accurate bills of quantities based on complete sets of drawings

and specifications for tendering of building works which subsequently ensures effective control of the project.

b) Tendering methods

In all cases, the purpose of tendering procedure is the select a suitable contractor at a time appropriate to the circumstances and to obtain from him at the proper time an acceptable tender or offer upon which a contract can be let.

In most building contracts, the contractor is selected on the basis of competitive tendering. The usual ways to obtain competitive tenders are open or selective tendering. The use of these means may be unfavourable to the client who then adopts direct negotiation.

To summarize therefore the most commonly adopted are:

i) Open tendering

ii) Selective tendering

iii) Tender for negotiated contracts.

i) Open tendering

In this case, the client advertises in the national dailies or on his notice boards invitation to contractors to apply to the client or his architect for necessary documents and gives brief details of the contractors to apply for the documents may be stated in the advertisement to deter the unqualified contractors from applying for the documents. But indiscriminate grading and registration of contractors by the authorities with outright disregard to criteria of competence and financial capability often defeats such noble objectives.

A typical advertisement inviting contractors to tender for the construction of office block is produced as appendix 2/11.

Another important condition usually included in the advertisement is the requirement for each tenderer to pay a non-refundable deposit between ₦100.00 to ₦200.00 in accordance with contractor's registration. This provision is normally made to deter persons applying for documents out of mere curiosity. It is also a means of recovering part of the money spent to produce tender documents. However, registration and processing fees are reflected in the building cost when tenders are submitted by contractors.

Apparently the objectives or advantages of charging these fees as stated here are not commensurate to the high cost of buildings.

TABLE 2.3: PROCESSING FEES PAYABLE BY CONTRACTORS ON MINOR AND MAJOR BUILDING CONTRACTS AT AHMADU BELLO UNIVERSITY, ZARIA

CATEGORY	VALUE (₦)	PROCESSING FEE (₦)
Minor Works Contract A	100.00 - 1,000.00	100.00
Minor Works Contract B1	1,001.00 - 2,000.00	100.00
Minor Works Contract B2	2,001.00 - 10,000.00	100.00
Major Building Contract C1	10,001.00 - 24,000.00	200.00
Major Building Contract C2	24,001.00 - 100,000.00	400.00
Major Building Contract C3	100,001.00 - 999,999.00	1,000.00
Major Building Contract C4	1 Million and above	2,000.00

Source: Physical Planning Unit, Vice Chancellor's Office, A.B.U., Zaria, (1990/91).

ii) **Selective tendering**

Under the selective tendering method, limited number of contractors are selected and invited to submit tenders. The number of contractors on the list may comply with the recommendations of the code of procedure for single stage selective tendering as published by the National Joint Consultative Committee for building. The criteria to be employed in drawing up a list of tenderers will depend, to some degree, on the character of the project its size, as well as payment of non-refundable deposit.

In practice, governments and their agents usually maintain a standing list of contractors that could be called upon to tender for project anytime depending on the type of work and its magnitude.

TABLE 2.4: MAXIMUM NUMBER OF TENDERERS FOR DIFFERENT SIZED CONTRACTS

SIZE OF CONTRACT (₦)	MAXIMUM NO. OF TENDERERS
Up to 100,000.00	**5**
100,000.00 - 500,000.00	**6**
500,000.00 - 2,000,000.00	**8**
Over 2,000,000.00	5

Source: NJCC Code of Procedure for Single Stage Selective Tendering, 1977.

iii) Tenders for negotiate contract

The negotiate contract methods of tendering is used for building work of a very difficult mature and where the magnitude of the contract may not be known at first or where early completion is most important. Under a contract of this nature there is usually no time to wait for the preparation of drawings and bills of quantities.

Negotiated contracts could be arranged on a prime cost basis with one contractors. These are the cost-plus, cost-plus fixed fee, and target cost with fluctuating fee. Another method of selection is serial tendering which can result in very keen prices. Here the selected contractors are invited for example tender for building one school, on the basis that successful tenderer will be asked to build several other schools at the same rates. This type of tendering can be based upon accurate bills of quantities. It help the quantity surveyor to estimate accurately the cost of other jobs well in advance on the basis of the known rates. It is also possible by negotiating contracts to retain the services of firms which been found satisfactory in the past.

c) Pricing of tender documents

This is basically done in two ways:-

i) Net pricing

ii) Gross pricing

2) Net pricing

Under net pricing, only the net site cost is included when building up a basic unit rate for an item; the quantities are then extended at these rates and a final net site cost is obtained for the whole building.

The profit and general overhead elements are calculated as lump sums which are based upon the total of the site cost and general overheads and profit then give the tender figure.

One of the advantages of the net pricing method is that the calculations of overheads and profit can be done in one operation, thus giving a more accurate tender. When necessary separate sums can be calculated and included for overheads and profit.

ii) Gross Pricing

In this case, net site unit rates are calculated and a percentage is added to each unit rate to cover general overheads and profit. These gross rates are inserted against the items in the bill of quantities which are extended and totalled to give the tender figure. Its advantage from the contractor's point of view, is that when variations occur in the contracts, they are priced pro-rate to the rates inserted in the bill quantities.

2.3.5 Tenders and Tenders Board

Generally, the tender are not opened until the prescribed day and time, or as soon as possible thereafter, and the procedures varies considerably between different organisations. It is pertinent therefore to understand Tender Board and examination of tenders.

The examination of the priced bills of quantities supporting a tender is usually undertaken by the quantity surveyor who treat the document as confidential. No details of a tenderer's pricing are disclosed to any person, other than the architect or other appropriate consultants, without the express permission of the tenderer[10].

The quantity surveyor will report to the architect and the employer on completing his examination of the tenders. However, the quantity surveyor's report will comment on the general pricing levels, any unusual aspects, and possible future matters if concern identified in the priced documents submitted by the tenderers, and a recommendation as to acceptance or otherwise.

2.4 CONTRACTUAL ARRANGEMENTS AT POST-CONTRACT STAGE

As soon as practicable after the contract has been awarded, the architect will arrange a meeting of all concerned, probably at his own office or that of the contractor, so that they may be made known to each other and to decide the procedure to be adopted at subsequent meetings the meeting will be attended by the architect, who usually chairs it, the quantity surveyor and other consultants, representatives of the client and contractor and if possible principal nominated sub-contractors and suppliers.

At this meeting the architect will supply the contractor with all available information relating to the site and works.

[10] Ivor H. Seeley, *Quantity Surveying Practice*, Macmillan Publishers Ltd., London, 1984, p.89.

The contractor's initial programme will also be considered alone with such other matters as sub-contracts, method of communication and insurances.

2.4.1 Parties

The parties of the contract are the contractor and the employer. The architect, quantity surveyor, engineers and other consultants are not parties to the contract. Each has their own terms of employment with employer, usually on a standard form issued by the appropriate professional body, and at agreed fees. The architect is given extensive agency powers to issue variations altering or modifying the design, quality or quantity of the works as described in the contract drawings and bills, which are collectively termed as architect's instructions under the standard form.

Relationships that exist between the parties will affect methods of payment and the approach to the supervision and control of work on site. In normal cases the architect is commissioned by the client and he is empowered to make appointment of the other consultants. In this case he not only co-ordinates the activities of such consultants but pays them their dues. In other cases the appointment of other consultants is also carried out by the client in which case payment is by the client but problem of co-ordination is by the architect.

Other appointment arrangement that is usually adopted is that sub-contractors may be nominated or the main-contractor may be given the power of the appoint his own sub-contractors, and in most cases the appointment is made direct by the client with or without the advice of the consultants.

The problems of this various methods of appointment of the sub-contractors are at times amplified out of proportion in relation to efficient supervision and control on the sites.

2.4.2 Project Supervision and Control

The main objective of project supervision is to ensure that the employer's requirements as defined in the contract documents are correctly interpreted and that any problems are satisfactory resolved.

Building construction supervision and control is a joint responsibility of the architect on behalf of the client and main-contractor. However the various methods of appointment can make it quite difficult for both the architect and contractor to perform their roles.

For example, the services consultants usually find it difficult to supervise and control the installation of their designs by sub-contractors who are directly appointed by the client. This situation has rendered it almost impossible to define the line of accountability on most building sites. As a result control of progress and workmanship can be quite difficult to monitor.

From time to time and as the works progress, variations due to changes and extra works may be introduced arising from one of the known cases such as omission, addition, substitution and/or alteration. These may be as a result of changes in client's requirements, differences in site conditions, changes due to co-ordination problems, mistakes and non-availability of original specification. Such variations do constitute delays, disputes and claims.

2.4.3 Interim Payments

The usual way to make payment for works done by the contractor is through valuation by the quantity surveyor and the issuing of interim payment certificate by the architect. In this case the job executed to date is measured and valued including the value of all materials intended for the job but are yet to be incorporated into the building. A certain percentage of the amount is retained until the expiration of defects liability period to serve as insurance against defective work.

2.4.4 Practical Completion and Handing Over

a) Practical Completion

Practical completion is the stage at which a building is ready for occupation by the client without inconvenience. It is inconvenient and frustrating for a client who has moved into a new building to find sections of an otherwise complete building in need of making good, or with a couple of hight fittings missing[11].

It is essential, therefore, that the architect insists on absolute completion before the contractor leaves the site and before the client moves in. This means that the building is practically complete.

[11] Ronald Green, *The Architect's Guide to Running a Job*, Architectural Press, London, 1982, p.132.

b) Handing over

Upon practical completion of a project, a meeting is generally held between the employer, consultant and contractor to:-

i) Explain the use of any special equipment to the employer e.g central air conditioning system, etc., at the same time handing over all technical data.

ii) Any special maintenance information will be given by the contractor to the employer.

iii) The owner will now take over the project[12].

[12] John T. Butler, *Elements of Administration for Building Students*, Hutchinson & Co. Publishing Ltd., London, 1979, p.228.

CHAPTER THREE

3.0 NATURE OF BUILDING COSTS

It is essential to understand the nature of building costs and how they are incurred at pre-contract and post-contract stages.

3.1 TOTAL BUILDING COST

Generally the total cost of a building is the total amount of money required to obtain and use for all that have been specified. It includes expenditures for the development, engineering, testing, spare parts, and overhead.

This cost is influenced by the design in-puts and the specification on the one hand and/or the client requirements on the other. However the final decisions of the architect are usually based upon a reasonable knowledge of maximum economy and value in the selection and use of construction materials and methods. Total building cost is usually higher than the net cost of the building fabric in that it may include:-

a) Cost of land

b) Legal etc. Cost of acquiring and preparing the site

c) Demolition or other physical preparation

d) Consultancy fees

e) Furnishings, fitting, machinery, etc.

f) Costs in connection with disposal (sale, letting, etc.)

g) Cost of financing the project, (this principally represents interests, etc., on the monies expended before any return is obtained either by way of income or of use).

h) Cost of management, running and maintenance where the building is to be retained by the client for use or partially let to a tenant but the owner has made himself responsible for some or all of these costs[1].

These can be broadly divided into pre-contract and post-contract expenses.

3.2 PRE-CONTRACT EXPENSES

The pre-contract expenses are those costs that are incurred from the design stage to the contract award stage. They include:

3.2.1 Consultancy Fees

The consultancy fees or professional charges are agreed fees payable to the consultants by the client for rendering their services. In this regard the Government of the Federal Republic of Nigeria has approved consultancy fees payable by the public sector which came into effect on 18 June, 1975.

Usually, the remuneration to the consultant is determined on a sliding scale fee depending on the nature and estimated cost of the project and the degree of difficulty.

Tables for the computation of fees for services required in the fields of engineering, architecture and quantity surveying are as follow:-

[1] Douglas J. Ferry and Peter S. Brandon, *Cost Planning of Building*, 4th edition, Granada Publishing Ltd., London, 1980, p.8

a) Scale of fees for civil engineering works

Civil and structural engineering works have been classified into two categories.

These are:-

Category A Structures of reinforced concrete, prestressed concrete, steel and other metals. Such structures include buildings, power houses, water towers and tanks, swimming pools, stadia and bridges.

Category B Other civil engineering works such as road works, excluding bridges, runways, wharves, drainage works, earth dams, canals, irrigation and pipe lines.

The consultancy fees payable for each category are as indicated in Table 3.1 and 3.2 below.

TABLE 3.1

Structural work in buildings and other structures where a consultant/ architect is appointed by the employer.

Cost of Project ₦	Class of Work	Proposed fee as a Percentage of Cost of Project
Up to 250,000	Class A	2.50
	Class B	2.25
Next 250,001 -1,000,00	Class A	2.25
	Class B	2.00
Next 1,000,001-2,000,000	Class A	2.00
	Class B	1.75
Next 2,000,001-5,000,000	Class A	1.75
	Class B	1.50
Next 5,000,001-10,000,000	Class A	1.50
	Class B	1.25
Next 10,000,001-20,000,000	Class A	1.25
	Class B	1.00
Balance over 20,000,000	Class A	1.00
	Class B	0.75

TABLE 3.2:

Where the civil or structural engineer (as distinct from an architect) conceives and plans the project in its entirely, the following rates will apply.

Cost of Project N	Class of Work	Proposed fee as a Percentage of Cost of Project
Up to 250,000	Class A	4.25
	Class B	4.00
Next 250,001- 1,000,000	Class A	4.00
	Class B	3.75
Next 1,000,001-2,000,000	Class A	3.25
	Class B	3.00
Next 2,000,001-5,000,000	Class A	3.00
	Class B	2.75
Next 5,000,001-10,000,000	Class A	2.50
	Class B	2.25
Next 10,000,001-20,000,000	Class A	2.00
	Class B	1.75
Balance over 20,000,000	Class A	1.75
	Class B	1.50

The fee payable may be proportioned to cover the various stages of project implementation as follows:-

i) Preliminary design, sketch design or design 20%

ii) Final design or working drawing and tender documents 60%

iii) Full supervision of construction works 20%

Fees for assistance in supervision of construction works are to be negotiated.

b) Scale of fees for mechanical/electrical works in building

The scale of fees payable for mechanical and electrical services are shown in table 3.3 below:-

Cost of Project N	Fees Payable as Percentage of Cost of Project
Up to 250,000	1.00
Next 250,001 -1,000,000	0.85
Next 1,000,00 -2,000,000	0.75
Next 2,000,001 - 5,000,000	0.65
Next 5,000,001 - 10,000,000	0.55
Next 10,000,001 - 20,000,000	0.45
Balance over 20,000,000	0.35

In addition to the amount payable from table 3.3 and charge of two per cent of the cost the electrical and mechanical equipment installed is payable.

The Federal Ministry of Works and Housing clarified the above statement that one per cent only of the estimated cost of mechanical equipment and/or one per cent of the estimated cost of electrical equipment is added as the case may be. The cost of equipment is taken to be 60 per cent of the cost of mechanical or electrical installations as the case may be.

c) Scale of fees architectural work

The scale of fees payable for architectural works is shown in table 3.4 below:-

Cost of Project ₦	1st Stage %	2nd Stage %	3rd Stage %	Total %
Up to 250,000	1.25	2.00	1.25	4.50
Next 250,001 - 1,000,000	1.00	2.00	1.25	4.25
Next 1,000,001 - 2,000,000	1.00	2.00	1.00	4.00
Next 2,000,001 - 5,000,000	1.00	1.50	1.00	3.50
Next 5,000,001 - 10,000,000	0.50	1.50	1.00	3.00
Next 10,000,001 - 20,000,000	0.50	1.50	0.50	2.50
Balance over 20,000,000	0.50	1.00	0.50	2.00

Repetitive work for any project up to 20 million in value will be charged at the rate of 50% of the values shown in table 3.4. However, where the value of the a project involving repetitive work exceeds 20 million, negotiations based on a sliding scale is usually carried out to determine the fees payable. Partial and rehabilitation work on an existing building will be treated as a new project and the rates in table 3.4 shall apply.

d) Scale of fees for quantity surveying

For the purpose of assessing fees, quantity surveying work has been classified into three categories as follows:-

Category A Banks, chapels, mosques, offices, court-houses, dwelling houses, police stations, petrol service stations, public houses and inns, synagogues, laboratories, town halls, university buildings, abattoirs, canteens, residential hotels, restaurants and departmental stores.

Category B Buildings of a simpler character than those in category 'A' they include blocks of flats and maisonettes, factories, garages, swimming baths, swimming pools and warehouses.

Category C All civil engineering works.

The scale of fee approved for the three categories are shown in Table 3.5 below.

TABLE 3.5

Cost of Works ₦	Class of Works	Pre-contract %	Post-contract %	Total %
Up to 250,000	Class A	1.25	0.75	2.00
	Class B	1.00	0.65	1.65
	Civil Eng.	0.03	0.70	1.00
Next 250,001 - 1,000,000	Class A	1.15	0.50	1.65
	Class B	0.85	0.45	1.30
	Civil Eng.	0.25	0.60	0.85
Next 1,000,001 - 2,000,000	Class A	1.00	0.35	1.35
	Class B	0.85	0.30	1.15
	Civil Eng.	0.20	0.50	0.70
Next 2,000,001 - 5,000,000	Class A	1.85	0.30	1.15
	Class B	0.75	0.25	1.00
	Civil Eng.	0.20	0.40	0.60
Next 5,000,001 - 10,000,000	Class A	0.75	0.25	1.00
	Class B	0.65	0.20	0.85
	Civil Eng.	0.15	0.35	0.50
Next 10,000,001 - 20,000,000	Class A	0.65	0.15	0.80
	Class B	0.55	0.15	0.70
	Civil Eng.	0.10	0.30	0.40
Balance over 20,000,000	Class A	0.60	0.10	0.70
	Class B	0.50	0.10	0.60
	Civil Eng.	0.10	0.25	0.35

For repetitive work, full fees are chargeable on the first of each building or structure, a reduction to 25% of the fees charged on pre-contract cost is usually applied to addition unit. This reduction however shall not apply to post-contract charges.

3.2.2 Reimbursable Expenses

In addition to the charges payable under the scales of charges, reimbursement to consultants is made where applicable, in respect of transport, accommodation, computer rental and other specialised services. The total amount of refund to all consultants in respect of any one project will not exceed one per cent of the estimated cost of the project. Table 3.6 shows how reimbursable expenses are computed.

TABLE 3.6 REIMBURSABLE EXPENSES

ITEM	DESCRIPTION	UNIT RATE (₦)	ESTIMATED COST (₦) PRE-CONTRACT		POST-CONTRACT	
			Arc.	Eng. (C&S) Q.S.	Arc.	Eng. (M&E) Q.S.
1.	Printing and duplicating of drawings and document	At cost				
2.	Visits to site					
a)	Air fares					
b)	Telegrams					
c)	Office cars P.km					
d)	Taxi	At cost				
e)	Accommodation	At cost				
f)	Time charge					
	Principals: p.d.					
	Principals p.h.					
	Assistant: p.d.					
	Assistant: p.h.					
g)	Sundries p.h.	At cost				
3.	Local transportation p.km					
4.	Driver (site office) p.a.					
5.	Secretary (site office) p.a.					
6.	(Other)					
7.	(Other)					
8.	(Other)					
9.	Bank charges on other consultants fees and expenses					
	SUB-TOTALS ϕ					
	TOTALS					

p.a. = per annum
p.d. = day (7 hrs)
p.h. = per hour
p.km = per kilometre
Arc. = Architect, Eng. = Engineer, S = Structural, C = Civil,
M = Mechanical, E = Electrical, Q.S. = Quantity Surveyor.

ϕ = Proportional distribution of reimbursable expenses is: Arc. 50%, Eng. (C&S) 20%, Q.S. 20%, M & E 10%.

3.2.3 Application, Registration and Renewal Fees

Generally clients charge the contractors wishing to undertake building works certain amount of money for application form, registration and renewal of registration.

a) Application fees

Usually, application forms are designed by various organisation for registration of contractors who intend to carry out works with them. The application form charges differ from one organisation to another. A sum between five naira to N100.00 is charged to contractors by the clients to off set the cost of production of these forms.

b) Registration fees

Registration fees are charged to the contractors by the clients and ranges from N20.00 to N2,000.00 depending upon the nature of contract, category of registration and the organisation. The client charged these fees as a source of generating revenue and to limit the number of contracting firms scouting for jobs in their organisations. Registration is for a certain period of time, normally between two to three years subject to renewal or withdrawal.

c) Renewal of registration fees

In most cases contractors are charged a registration fee by the clients to contractor when the previous one has expired. The amount charged differs from one organisation to the other and it is either the same or 50 per cent of registration fees. Some client use to upgrade the contractors' previous category and in this case the renewal fees are charge as full registration fees for the appropriate category.

3.2.4 Tendering Expenses

Tendering expenses cover the costs of preparing, pricing, processing of tender documents and advertisement. These expenses are enormous when it is considered that any number between four to eight firms could be after the same job and that only one will be lucky, it is clear that much money is wasted by the other. For example, on average a contractor will only be successful with approximately three out of every ten tenders submitted. The money lost on the seven unsuccessful ones will have to be made up to future tenders or written off as a loss.

Processing fees or non-refundable deposits are charged by the clients to the contractors which ranges from N100.00 to N2000.00. These charges depend upon the type and value of contract. The clients charged the fees to deter contracting companies from applying for tender documents for curiosity and to recover some of the tendering expenses incurred. However, the fees charged by clients are reflected in the building cost when tenders are submitted by contractors.

3.3 POST-CONTRACT EXPENSES

Post-contract expenses could be regarded as construction costs which consist of the following:-

a) Material costs

b) Labour costs

c) Plant costs

d) Overhead costs

3.3.1 Material costs

All material costs are directly proportional to the quantities of relevant work defined in the contract will normally be incurred when the materials are delivered to site. In many cases the contractor will order materials and components in advance and may also accept responsibility for expeditious delivery at the specified rate to site[2].

The cost of the materials is normally paid either on cash or credit basis. In practice the monthly credit accounts of materials delivered in January are paid for at the end of February. Such settlement may entitle the contractor to a agreed "cash discount", two and half per cent being the most common figure although five per cent may sometimes be allowed.

If a contractor relays payment beyond the "cash" settlement date, sometimes for a further one or two months, he may as well lose his cash discount for the same of a few weeks credit. This is an expensive way of borrowing money compared to bank overdraft, but it has the advantages of being ready and convenient of not requiring collateral. Within reason building material merchants are not averse to acting as financiers to the industry in this way.

In most cases the contractor would have been paid by the client for the materials, components and works done before settling with his merchants.

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[2] P.A. Thompson, *Organisation and Economics of Construction*, McGraw-Hill Book Co. Ltd., London, 1981, p.55

3.3.2 Labour Costs

The site labour costs comprise the wages and/or salaries of personnel who are directly responsible for productivity at the site such as site engineer, architect, quantity surveyor, technician, artisan, clerk, labourer, security man, etc. Labour costs are of particular concern to the contractor because they have to be paid weekly or as agreed in ready cash as they are incurred and cannot be postponed or put on a credit basis, as can most of his other commitments.

3.3.3 Plant Costs

Most large contractors find it convenient to set up a subsidiary plant company, which will charge equipment out to sites on hire basis, while plant hired from outside will be similarly dealt with and paid for by credit account. Lorry transport is usually arranged in a like manner.

3.3.4 Overhead Costs

These are establishment charges incurred in running the company as a whole and which cannot be attributed to any particular contract and are categorised into site and office overheads.

a) Site overhead

These are general charges associated with running of the contract as a whole and include:-

i) Technical and administrative staff, offices, workshops, stores, welfare facilities and provision of water and electricity. On large and remote contracts, the cost of housing and feeding all staff and labour may also be incurred.

ii) General plant required to support the gangs operating in the fields e.g., bulldozers, compressors and pumps which may be required intermittently by individual gangs, service facilities such as petrol tanks and additional lorries, together with buses, landrovers, and cars.

iii) Contingencies - perhaps ten per cent of material cost - to cover wastage and damage are frequently added at this point. All such charges are best treated as separate cost centres independent of activity costs. They will be a mixture of fixed (e.g., setting up the site facilities) and time-related charges (e.g., staff salaries and plant[3]).

b) Head office overhead

A contractor must recoup part of the day-to-day cost of running his company from each contract he obtains. These head office overheads will cover that cost of staff, directors, estimators, and planning and design engineers and the central establishment (offices, stores, plant, yard, workshops, etc.). They are commonly added as a set percentage of total site costs perhaps two or four per cent[4].

[3] P.A. Thompson, *Organisation and Economics of Construction*, McGraw-Hill Book Co. Ltd., London, 1981, p.55

[4] P.A. Thompson, *Organisation and Economics of Construction*, McGraw-Hill Book Co. Ltd., London, 1981, p.56

CHAPTER FOUR

4.0 BUILDING COST CONTROL

Omer (1981) has indicated that the term "cost control" has been in use for so long now that its meaning is often taken for granted, even though term itself is not particularly descriptive or meaningful. A understanding of this term is obviously dependent on practical experience, and can vary considerably from person to person. To avoid any misunderstanding, it will be helpful to produce here as comprehensive definition of cost control as possible.

4.1 DEFINITION

Taking "cost" first, it is understood as meaning cost to the building owner, not the contractor. It also means total cost, including all general allowances such as overheads and profit. On the other hand "control" is applicable to the entire period from initial budget to final payment and entailing the co-operation of all disciplines in arriving at an optimum budget, and in subsequently designing and installing within this budget-unless of course the employer happens to alter his brief meanwhile. In this process it is the costs which are controlled, not the individuals, the controlling process being a joint effort (albeit with a single overall co-ordinator).

Putting the phrase together, "cost control" is an umbrella term governing all contributory stages such as cost analysis, cost planning, cost comparison, cost checking, cost reconciliation at the tender stage, and cost monitoring at the post-contract stage. Thus cost control refers to the various ways which are employed for the purpose of keeping costs within predetermined limit throughout the design and construction periods.

Generally, the are three essentials for an effective cost control system:-

1. Frame of reference
2. Frame of checking
3. Frame of taking remedial action[1].

4.1.1 Frame of reference

Setting up a frame of reference for a cost control system entails going through two stages:-

i) Establishing a realistic first es
ii) Planning how this estimate will be spent among the element of the building.

The estimate is usually within the amount allowed by the client, since the principle behind cost control is mainly to keep expenditure within the amount allowed by the client. When the client has accepted the estimate, it becomes the cost limit, this is cost beyond which the project may not be pursued. The cost limit is then apportioned between the various elements of the building, producing a balanced design and good value for money. The proposed cost for each element is known as the cost target for that element.

4.1.2 Means of Checking

In order to do an effective cost check, it is vital to observe current cost levels, compare them with a standard plan or norm and institute necessary action in case of departures to keep cost within acceptable bounds.

[1] I.T. Omer, Post Contract Cost Control in the Nigerian Building Industry, Unpublished M.Sc Thesis, A.B.U., Zaria, 1981, p.2

4.1.3 Remedial Action

Remedial action is normally taken before any damage is done, and within the time allowed for the project. Occasionally, however, suitable remedial action is impossible; in such cases, additional funds will be obtained from the client in order to complete the project.

4.2 COST CONTROL TECHNIQUES

Omer (1981) has described the two fundamentals of cost control techniques are cost analysis and cost planning. Closely associated with these is budgetary control.

4.2.1 Cost Analysis

Cost analysis is the systematic breakdown of cost data, often on the basis of elements, to assist in estimating the cost and in the cost planning of future projects.

Cost analysis are often supplemented with specification notes, data concerning site and market conditions, and various quantity factors, such as wall to floor ratios.

Cost analysis aims at examining the cost of buildings already planned or built, and for which priced bills of quantities and tenders are available.

a) Essential constituents

The essential constituents of a cost analysis are cost, elements and yardstick.

i) Cost

The building costs analyzed in elemental cost analysis can be either the cost to the contractor or the cost to the client. As the basic purpose and uses of elemental cost analysis are all for the benefit to the design professionals and the client rather than the contractors, it is the client's costs that are analyzed.

The actual cost which a client has paid for a completed building can be obtained from the final account prepared on completion. The costs on a priced bill of quantities submitted as a tender by a contractor will usually contain a number of provisional or prime cost sums which may not be exactly the same as the final cost of the items they represent. However, it is usually the tender prices that are analyzed. This is because the tender prices are available much earlier than the final account figures.

ii) Element

Element cost analysis seeks to relate costs to these functions of buildings which are common to all buildings. A trade by trade analysis is not useful here mainly because many element include work executed by several trades, and any one trade may

include a number of elements. For example, a block-layer may work on external walls, partitions and external works (three elements). Due to this, the purpose of elemental cost analysis cannot be achieved by using a priced bill of quantities in its original form; a separate analysis has to be produced by gathering together the costs of each element from the various trades in which sections of it appeared.

iii) Yardstick

The follows from the general purpose of elemental cost analysis that it usually have a method of expressing costs which will allow sensible comparisons between buildings of different sizes and uses. It is futile to try to compare the cost of buildings directly without first expressing them in a way which takes account of the differences in size or capacity.

For schools, the 'cost per pupil' or 'cost per desk could be a suitable yardstick to use when comparing the costs of schools of different sizes. This is because the costs of any type of school are usefully considered in relation to the number of pupil-places provided. Similarly, for hospitals, the 'cost per bed' could be used. Generally, for buildings the cost per square meter of gross floor area is used. This would allow meaningful comparisons to be made between buildings whose areas are different, and would have the same value for buildings of similar

design, quality, date of tender, and as on, but of different sizes. Moreover, clients and designers are more likely to think of buildings in terms of floor area. In addition, it is found that costs per square metre of floor area can be easily computed. Summarising, a yardstick is used so that costs of buildings of different sizes can be compared without explicitly considering the sizes of the building.

4.2.2 Cost Planning

A cost plan is simply a statement of how the design team proposes to distribute the available money among the constituent elements of the building.

There is no universal method of cost planning will be suitable in application to all buildings. This is because buildings have widely different characteristics, they perform a diversity if functions and serve the needs of a variety of building clients. Moreover, their erection is subject to a number of different administrative and planning techniques to meet the needs of these diverse situations.

The type of cost plan adopted will mainly depend on the information available. This information can be about function only, or about both function and the building morphology or, finally function, morphology and structure.

The method of using cost plans broken down into elements has proved to be very suitable for school projects but is not necessarily the ideal system for use with industrial buildings.

4.2.3 Budgetary Control

One of the most widely used devices for effecting managerial control is the budget. Indeed, it has sometimes been assumed that budgeting is only device for accomplishing control. This, however, is stretching things a bit too far, as it has been seen that there are many other tools for effective cost control. The concept of budgeting is essentially the formulation of plans for a given period in the future in specific numerical terms. As such, budgets are statements of anticipated results.

From the numerical statement of plans and the breaking of these into components consistent with the overall cost limit of a project, budgets furnish a means of correlated planning and a means whereby authority may be broadly delegated without loss of control.

As soon as a design team finishes preparing the cost plan and the allocation of cost targets to the various elements, this will be summarised and used as the budget. The cost limit, representing the maximum amount of money to be spent to the project, will be kept at the required level by means of controlling the design and construction works. Budgetary control may as well be, after all, cost control.

4.2.4 Computer Applications

The use of computers is not generally widespread in the building industry in Nigeria. With the level of technology and economic activity in the country, it can easily be seen that the time is ripe for introducing the computer into the industry.

The advantage are immense. As far as cost planning is concerned, there is a lot of room for the computer. The design process usually starts with a brief, which in essence consists of a list of spaces needed by the client and a statement of the performance he requires from each space. Most cost plans and analysis are based on elements, whereas the architect and client are concerned with the enclosed spaces. To be really effective, the cost control mechanism is usually based on space use and performance and this can probably only be achieved with the use of computers and mathematical models, whereby a computer representation of the reality can be manipulated by testing assumptions on the model which reads in a manner closely resembling the real situation. A Computer representation of the building is needed which will respond to the flow of design decisions in such a way that the actual cost implications are reflected.

Due to computer's capacities to store and analyse vast amount of data, they can be used extensively in cost control. As size, range and complexity of building jobs increase, it becomes more difficult to deal effectively with the cost aspects by manual processes, and there will be a real need to harness the immense calculating and storing capacity of computers in this work. The sooner the Nigerian construction companies engage in the use of computers in the building industry, the better.

4.3 PRE-CONTRACT COST CONTROL

Seeley (1973) has explained that cost control at the pre-contract stage has three main objectives:-

1) To ensure that the actual cost of the building does not exceed the owner's budget.
2) To give the owner good value for his money.
3) To achieve a proper balance of expenditure over the various building components.

The design process can be seen as a series of sub-processes in stages, often overlapping, which lead up to the final set of working drawing and specifications from which the contractors can estimate their costs in order to submit tenders.

The various stages and the actions to be taken to achieve effective cost control in each of them as formulated by the Royal Institute of British Architects (1973), will now briefly discussed.

4.3.1 Inception and Feasibility Study

When prospective building owner has made up his mind to erect a building, he goes to an architect with an outline of what he wants, based on his investigations. Whatever form it might take, the result is some description, perhaps a written programme, which will indicate the type of building to be erected, its location, possibly its overall size and not areas of spaces which have to be provided within the building. If any drawings are to be prepared, they will only show block plans, probably at a small scale, with perhaps some indication of how the interior might be planned in very broad outline.

The precise area of the plot, where it is situated, the type of soil, means of access, any neighbouring buildings or other geographical features, what the building will be used for the approximate number of people it will accommodate, and what type of returns are expected. Design team is usually required to produce a first estimate at this stage. Such estimates are very approximate and could not be relied upon. The client usually wants to know as accurately as possible what the building is going to cost him. The interpolation method is generally used to prepare first estimate. The costs of other buildings of similar design are studied, bearing in mind the space and standards provided by these building. To reduce the number of other buildings considered to a minimum, the information available about the proposed building will be used to choose the most appropriate cost studies.

The interpolation takes place in three stages:

i) Choosing the most suitable cost analysis

ii) Isolating as many as possible of the major differences between the building analyzed and the proposed building.

iii) Making allowances for these differences.

4.3.2 Outline Proposals

At the beginning of this stage, design criteria are usually available. The cost analysis chosen at the feasibility study stage is generally used.

Also available at this stage are the general brief, town planning policies, and the feasibility report-including the first estimate as approved by the client.

This increase in the amount of information makes possible to isolate several differences between the building priority analyzed and the new project which could not be detected at the feasibility study stage.

There is still not enough data, however, for a reliable cost target to be prepared for each element. Instead, an outline cost plan is prepared.

To prepare an outline cost plan, cost targets are prepared for each maior group of elements. Allowance will be made for unforeseen design difficulties which may only come to light later. To prepare cost targets for these groups of elements, the differences are isolated and allowed for .

4.3.3 Scheme Design

As in all other stages, it is best to start preparing a cost plan as early as possible during this stage. The cost targets prepared earlier on can be checked after the scheme design stage drawings have been prepared. Thus, the information available when the cost plan started are:

a) The complete brief.

b) The outline design, including drawings.

c) The outline cost plan.

d) All the information available at the beginning of the outline proposals.

By the time of cost is finalised at the end of the scheme design stage, the scheme stage drawing will also be available.

4.3.4 Detail Design

At this stage, the brief is completed and the design team develop at full design of the project, including planning arrangement, appearance. construction method, outline specification and cost. All necessary approvals are obtained- for example, planning approval from local planning authorities and the formulation of cost plan.

All members of the design team normally participate in the formulation of the cost plan because in the design of a building project, the skills of each design team member may be responsible for incurring expenditure. This liaison between members of the design team helps to ensure that the standards set achievable within the cost limits.

The usefulness of the cost plan depends to a large extent on the cost targets being realistic. Cost targets will therefore only be altered as a last resort after every alternative design solution for a troublesome element has been rejected as unsuitable. If the cost target for an element has to be raised, other cost targets will be adjusted throughout but the cost will not be exceeded.

The basic cycle of operations during the detail stage is;

a) Design

b) Approximate quantities estimate

c) Comparison with cost target

d) Decision and action

The cycle of operation is repeated until all the elements have been designed and cost-checked. When all the allowances are checked, a final cost check is performed to make sure that nothing has been overlooked.

4.3.5 Bills of Quantities

The bills of quantities set out in a systematic manner the quantities and full descriptions of all the items of labour, materials and plant required to erect and complete a building or other work.

The preliminaries section of the bill gives the particulars of the type of contract to be used and also details of the general matters which may affect the price of the works.

The main purpose for constructing a bill quantities is to provide a uniform basis for pricing on competitive tenders. Other uses include valuing variations, interim payments, final accounts, and analysis and programming work. The bill is also very useful for purposes of cost control, the principal use at the pre-contract stage being the use to which it can be put as a source of cost data for performing cost analysis. The only problem is to abstract the different portions making up each element from various parts of the bill.

4.4 POST-CONTRACT COST CONTROL

Controlling costs at this stage is even more important than at the pre-contract stage. by now, the client knows precisely how much he is going to pay for the project, and the contractor knows how much he is going to receive by the time he completes the building according to

contractual terms. Thus, this amount of money (contract sum) will be strictly adhered to, and this can only be done through cost control. The various ways whereby effective cost control can be carried out are as follows:

4.4.1 Management Input

Management input can be generally described as the judicious allocation and efficient usage of resources to achieve a desired goal.
For building the industry, the resources required are money, materials, labour, plant and time. For an effective cost control system, these resources will be carefully utilised so as to achieve the desired profits.

Overall management of a contract lies with the contractor. It is the contractor who is bound by contract to meet certain construction time requirements, and he is the one who gains from expeditious and economic field operations. In cases where a project manager is employed, the contractor will not abrogate t abrogate his primary responsibility of project management.

The management of field construction is usually based on project basis, that is, each project has its own manager, quantity surveyor and other consultants as necessary. Project management cuts across functional lines of the parent organisation and the central office acts in a service role to the field projects. major decisions made by management at this stage are:-

a) Construction methods to be used

b) Time schedule of operations

c) Plant to be used.

(a) Construction methods

There are various ways of performing majority of site operations which make the choice of construction method a very important aspect of project management. It is usually more economical to consider the costs of the various methods available and choose the most economical one. This of course does not mean that each set of possibilities has to be analyzed for the best method to be chosen. Rather, where saving can be considered when a particular method is employed, a full analysis is implied. On the other hand, some firms might have a customary way of doing particular things, some operations are determined by the type of plant owned by the firm and of course the experience of the staff.

Whatever happens, the major construction techniques to be employed will be pin-pointed even before the work begins. Strictly, this will be done at the estimating stage, as it will help a lot in arriving at a fairly accurate figure.

b) Time schedule

The preparation of a general time schedule is an important aspect of management and will be given serious consideration. Unfortunately most contractors only worry about how much money is coming to them by concentrating on the physical aspects of the project. This is a mistaken, since most overhead costs are directly related to time.

If the project is a small one, it not require too much consideration time-wise but for large projects, it is necessary to sit down and organise the project handling in such a way that it is completed in as short a time as possible, without doing sloppy work.

Before a general time schedule and be worked out, the project will be carefully studied and understood: all the peculiarities and special requirements, if any, will be fully understood. Quite apart from monitoring time and therefore costs- a schedule will also be very useful for pricing purposes. With a calendar of operations at hand, the time available for each of the major parts can be established as well as the kind of weather to be anticipated. This provides useful information to the estimator concerning the plant and labour productivity, rainy weather operations, necessity or multiple shifts and overtime.

c) Plant requirements

Mechanisation is another form of industrialisation, and has often been advocated as the simple answer to the problem of increasing productivity. Sufficient considerations are essential before hiring or purchasing mechanical plant and equipment because of enormous capital *outlay associated with their procurement.*

Therefore the use of plant and equipment has become a standard portion of construction execution. In some cases plant and equipment are absolutely necessary (for example, tower cranes in a high-use buildings) and in some cases they are essentially to reduce the cost of labour.

The proportion of the output of the industry for what mechanical methods are applicable is smaller than often appears at first sight. Only small hand-powered tools - for drilling, spraying and sawing are utilised in new buildings. For example, it is difficult to mechanise laying blocks. However, the greater the element of structure which

consists of large units and/or poured in-situ concrete, the greater the opportunity for using mechanical methods. The advantages of using mechanical methods are not limited to gains from the direct substitution of mechanical for hand operations, but include the possibilities of gains from the integration of the operation.

In fact the best results cannot be obtained by substitution of mechanical plant for hand operations; the job will be looked at afresh to see the possibilities of the whole construction process when mechanical aids are substituted for hand methods. The effective cost of plant in the building tends to be higher than in manufacturing. This is due to a number of reasons.

Firstly, the plant is usually taken to the job rather than the job to the plant. Often the amount of work for which a unit of plant is used on a site is quite small. So that the cost of transportation and handling of the plant form a large overhead on the cost of using it.

Secondly, while the volume of work carried out on a site may be small, the plant may need to be on the site along calender period in order to complete the work, since sometimes there are long intervals between each of the uses of the machine. To some extent, greater utilisation of the machine can be effected by moving it to another site where it is needed and then transporting it back, but this may not be worthwhile all the time.

Thirdly, job variability both between and within jobs tends to results in low plant utilisation.

Finally, the use of contractor's plant on rough surface in the open air subjects it to wear and tear far greater than is normally experienced by plant in use in factories.

4.4.2 Project Planning and Scheduling

Planning is the devising of a workable scheme of operations which is designed to accomplish an established objective when put into action. Construction planning is concerned primarily with establishing the sequential order in which various operations will be carried out on the job site. Planning is the most time consuming and difficult phase, as well as being the most important, of the job management system. It requires an intimate knowledge of construction methods combined with an ability to visualised discreet work elements and to establish their mutual inter-dependencies.

A plan does not take the time factor into effect. It is only when an outline plan has been formulated that the time is introduced and merged into it. This process is project scheduling. A project schedule, them, is simply a project time-table of construction operations.

Construction is a very complicated process. Even the simplest of houses might require hundreds of operations for its completion. Numerous trades are employed: carpenters, block-layers, painters, ironmongers and glaziers to name but just a few. Coupled to that, there are diverse professionals ranging from architects, quantity surveyors, electrical, mechanical and structural engineers, to sub-contractors and material suppliers. All these tradesmen and professional have to be co-ordinated in order to obtain a very smooth

operation and complete the building on time and without divergence from the expected standard.

All these have combined to make the development of a good planning method absolutely desirable. Such a method will allow the project manager to manipulate this large number of project activities and complex sequential relationships in a simple and understandable fashion.

In construction planning there are three essential steps, often performed simultaneously:-

i) Determination of the job steps of activities that will be performed in order to construct the project.

ii) Ascertainment of the sequential relationships among these activities.

iii) Presenting this planning information in the form of a network diagram.

For a job schedule, on the other hand , seven steps are necessary for devising a workable job schedule:-

i) Estimating the time required to carry out each network activity.

ii) Using these time to compute the time period required for overall project completion.

iii) Establishment time intervals within which each activity will start and finish to satisfy the completion date requirement.

iv) Identifying the critical activities i.e. those activities whose expedient execution is crucial to timely project completion.

v) If the project completion date is not consonant with contract or other requirements, project duration will be shortened at least possible cost.

vi) Utilise surplus (float) time that most activities possess to adjust the start and finish times of selected activities to minimise resource conflicts and smooth out demands on manpower and equipment.

vii) Drawing up a working project schedule that shows anticipated calender dates for the start and finish of each network activity.

Generally, the bar chart and critical path method (C.P.M.) techniques are used for planning and scheduling purposes.

a) Bar chart

The bar chart is conventionally a series of horizonal bars representing activity durations for a particular project. The bar chart is not too useful when compared to C.P.M., but it has a lot of merit. For example, before a contractor finishes drawing up a good bar chart, he normally becomes very intimately conversant with the whole project, which will enhance his understanding of the project and thus find out ways of overcoming all the likely problems well in advance.

b) Critical path method (C.P.M.)

The building industry is unique in its numerous problems. As the saying goes, it is easy go into the building industry, but it is even easier to get out.

Realistic planning is thus very important. Uncertainties will be reduced to the barest minimum - barring "acts of God", viz; earthquakes, floods, and strong winds; and some "acts of man", like wars. C.P.M. is beautifully suited to these problems, since most of them involve time and money.

In applying C.P.M. to construction planning, it is necessary to first of all have an accurate estimate of both time and cost for each operation comprising the project. This can be easily done by using the traditional bills of quantities prepared by quanti urveyors or other cost experts.

It permits systematic reviewing of current situations as they arise, so that allowance can be made for the effect of uncertainties in the original planning, as well as future re-valuations of uncertainties and remedial measures can be initiated for those operations that require correction or acceleration.

The use of C.P.M. enables the most economical planning of all operation to meet desirable completion dates. It replaces the judgement based on *experience (trial and error) formerly used to select operation times*, crew sizes, equipment and so on. With C.P.M. the best completion date for the project is determined.

4.4.3 Cost Checking

One of the most important functions of managers of building teams is cost checking. Measures for this is normally introduced as soon as the execution of the project commences on site.

Pointers to possible problems include output falling behind planned level- which implies that more money is spent for a particular volume of work than should have been the case. Another pointer is difficulty on site delaying the performance of a particular operation.

The carefully prepared schedule - be it a bar chart or C.P.M. is regularly checked and compared with what has actually taken place on site. As soon as divergence is noticed, corrective measure will be taken to neutralise it as soon as possible. A good system of cost checking, however effective, will be rendered useless if corrective action is not take immediately. Thus as soon as a problem is identified, it will be dealt with promptly.

CHAPTER FIVE

5.0 DATA AND ANALYSIS

The overall cost pattern of some building projects at Ahmadu Bello University, Zaria were investigated to isolate those expenses which can be regarded as unproductive costs.

The project records which were carefully examined and analysed include bills of quantities, specifications, drawings, correspondences, minutes of site meetings, architect's instructions, variation orders, valuations and payments. Questions were asked of personnel attached to or conversant with the selected projects for further clarification on areas of friction.

5.1 KASHIM IBRAHIM LIBRARY BUILDING

5.1.1 Project Particulars

Contract No.: AB/61

Contract Sum: N1,653,450.52

Contract Period: 82 weeks

5.1.2 Type and Purpose of Structure

The library is a three-storey building including basement of reinforced concrete structure. The building is to serve as the main library for both staff and students of the University. The capacity of the library is for 500,000 volumes and 2,000 readers.

5.1.3 Project Team

The following consultants were selected as the project team:

a) Architectural - Egbor and Associates

b) Structural - Ove Arup and Associates

c) Electrical - Chris Fajemirokun Associates

d) Mechanical - Soboyejo Associates

e) Quantity Surveyor - Qu-Ess Partnership

f) Soil Investigation - Civil Engineering Department, A.B.U.

5.1.4 Contract Award

Competitive tendering was employed and A.G. Ferrero and Co. Limited happened to be the successful tenderer at the sum of ₦1, 653,450.52 with a contract period of 19 months as from 21st February, 1972.

5.1.5 Organisation and Administration

The first formal meeting of the parties to the project policy formulation took place on the 20th November, 1970. Among other things discussed was the scope of the project in relation to the limited financial resources. Three basic issues were to be resolved viz:

1) Proceed as planned but use some of the areas to be provided in this building for other purposes within an agreed period of time.

2) Spread payment for the project over three years.

3) Split the job into three classes, that is:

a) that part that can be financed directly by the University including builder's works, fittings, plumbing, drainage, preliminaries and contingencies.

b) that part for which technical aid or deferred payment may be sought including electrical services, air-conditioning, lift, telephone, fire alarm and burglar alarm.

c) that part which may be postponed for execution including shelving, library laboratory and external works.

The first proposal, that is to go ahead as planned but use part of the building for other purposes, was disqualified on the ground that

i) Once part of the library was permitted for other uses, it would be very difficult to eject the temporary users.

ii) This suggestion invariably would involve partitioning to suit the needs of such users.

iii) Security of the library would be very difficult to accomplish.

Other suggestions were also rejected for various obvious reasons ranging from time delay in finding and reaching agreement with the would-be technical aid, to the functional deficiencies in the proposed library for non-inclusion of necessary facilities.

A further proposal was made which sought a complete re-design of the scheme to reduce the present level of amenities. The disadvantages of these were:

i) double payment of professional fees to all consultants.

ii) time lost for taking the brief once again, for re-designing and preparing contract documents.

iii) delay in commencement of construction in the face of rising costs.

iv) failure to meet the pressing need for a new library of a required standard.

The final decision therefore, was that the scheme should go ahead in the hope that any future problem might be accommodated without difficulties.

A second meeting over this project was convened to approve the final design drawings and preliminary estimates excluding professional fees. A reduction in overall cost was suggested without any interference with the physical size of the building.

Various suggestions were advanced by the consultants. The consultant architect proposed savings on floor finishes. The air-conditioning consultant suggested a single stage installation of all air-conditioning ducts but a phased provision of cooled air. That is, only essential areas need be served with cooled air at any one time and the rest with ordinary filtered air. Hence there is no cut in duct works and suspended ceiling. The structural engineer substituted the basement platform with annex to reduce his own cost whilst the electrical and mechanical consultants had no objection to the idea of omitting separate generator for the library and cheaper but not smaller lift substituted. The estimate was re-computed by the quantity surveyor to reflect these adjustments.

5.1.6 Meetings and Reports

The following observations were made from initial and subsequent meetings

Mandilas Ltd. air-conditioning sub-contractor and Kalarabis acted in dual capacity hence separate fees. The Bursar felt that the idea of a consultant determining the allocation of funds was irregular since such allocation determines the level of their earnings.
Sub-contractor's appointment was questionable especially as this was done before the acceptance of the quotations.

Government sanction came out soon after the acceptance of estimate (Adebo Award) and the cost shot up by about 10% as a result of 5% increase in labour cost.

The University was no longer given a chance to go through the design in relation to the breakdown of costs submitted by the quantity surveyor in his cost plan.

As at the time of preliminary estimate, no detailed drawings on services were received. Provisional sum was therefore allowed for these.

Unwillingness on the part of the consultant architect to amend the drawing as suggested by the client in view of past experience as regards maintenance and construction problems was placed on records.

The quantity surveyor advised that tender should be submitted on a fixed price basis. This means that there is no fluctuation but allowance for any future increase is contractor's responsibility. It was hoped that this would eliminate a lot of trouble during the construction period as well as when preparing the final account.

The contractor was warned to use Adebo rates as this was going to affect the project cost.
Negotiation for a resident architect was to increase the cost by five million Naira more than planned.

Contractor was appointed on February 3, 1972; acceptance was confirmed on 14th February, 1972 and construction work commenced on 21st February, 1972. By 24th March 1972, there were still no complete sets of drawings necessary to confirm certain materials orders. This gave rise to claim right from the onset. The appointment of electrical sub-contractor was still to be made and therefore his work could not be included with the planning of floor and foundation works. Contractors requested confirmation if the set of drawings with them were the latest and whether or not to proceed with the work.

As at April 4, 1972 a request for time claim has been made and there was still no meeting between parties as such most of the initial problems could not be resolved.

Actual construction progress could not commence also as a result of the necessity to re-site and demolish an old store occupying the building site.

Furthermore, information needed for structural engineer regarding bending schedules was still not received and the resident architect has had to travel to Lagos in respect of same. This has kept the contractor waiting. During the excavation work the contractor had damaged underground cables of the P&T and he as asked to request P&T to submit estimate which will be agreed before diversion.

At the formal site meeting held on 28th April, 1972, it was observed that the diversion of telephone line by P&T might affect line of engineering services. Before this meeting, records showed that there had been communication between the various parties concerning clarification and confirmation of specification and instructions and particularly on items that were not available.

On 1st May, 1972 attention of the client representative was drawn to the poor drainage system around the site which may subsequently disrupt work progress during the rainy season that was fast approaching. It was therefore necessary to protect the site by preparing and constructing drainage network.

By 4th May, 1972 instruction was issued to suspend further work due to a necessary modification to foundation and floor around the staircase area to accommodate the installation of lift at a later date.

Reply to a letter by the Chief Estate Engineer regarding additional lift written on 22nd October, 1971 was made by the architect on 5th May, 1972 contradicting an earlier suggestion to install lifts later during the construction. The reasons for this contradiction were:

a) Lift should have to be selected right away so that the over-run pit size could be determined.

b) Installation of lift after the library has been in operation would be a complicated exercise that might disrupt the smooth functioning of the library.

c) A lift shaft would have to be constructed in the stair well using the main entrance hall as access to the working area, and movement to the upper floor would be through this working area.

d) A roof level aluminium shade roofing over the first three bays would have to be lifted to allow a platform for raising of the lift machinery and for construction of the plant room. The shade roofing would then have to be reinstated over the front two bays.

e) Above conditions would increase cost of lift considerably. It was therefore a question of now or never.

In one of the meetings the contractor's representative expressed concern over difficulty to obtain high tensile square steel as recommended for the foundation and columns. He suggested the engineer might alter this specification. The contractor's representative in the meeting requested for the determination of depth of lift shaft and the position of dowels in precast concrete sun-breakers. The engineer's response to these remarks was that final decisions would be made in respect of all points raised and would be communicated to the contractor soonest.

As a result of non-availability of the specified high tensile twisted square steel bars, the contractor advised the use of mild steel rods but the engineer was to confirm. This suggestion was agreed upon at the next site meeting but the bending schedules will be issued right away.

At another meeting reference was made to the cost of suspended ceiling as there was misunderstanding as to whether or not ceiling will be provided throughout the building so that additional refrigeration could be added without interference with the functioning of the library. This confusion was as a result of the fact that cost of suspended ceiling was not originally included in the contract sum. The prime cost included for this item was found to be short by a considerable amount. It was therefore the opinion of the Chief Estate Engineer that quotation for this item be made by open tender.

Soon after this meeting the consulting architect issued instruction to omit the prime cost sum for felt roofing in accordance with items *a, b, c, d* of their quotations.

The librarian having had further discussion with consulting service engineer felt no more need for a second lift especially when the storey height is only three. In the same breadth the quantity surveyor was quoting for the supply and fixing of lift and emphasizing that if installation was delayed until building was completed, the cost might rise by 30 to 50 per cent.

At another meeting, the accepted variation in respect of the use of mild steel bars instead of twisted high tensile square steel bars was revised to meet the original specification after about a month that the decision had been taken. Also at this meeting, certain levels were supposed to be taken and handed over to the engineer before designing the shoe for the lift shaft. There was doubt expressed at this meeting also about the correctness of quantities against certain items and whether or not unit price included fixing costs.

Before the following meeting the newly designed shoe for the lift has already been cast but was not tied to the column as expected. As a result the engineer had to propose alternative way of securing the shoe for structural stability in a sketchy way hoping to submit proper drawings later.

Engineer in-charge observed that the iron bars in stock were not of the specified standard. He therefore requested that appropriate tests on these items be carried out to ascertain quality before using.

Five months after the contract had been awarded to the main contractor, a new electrical engineering consultant was appointed, following the death of the original consultant, to produce a revised electrical scheme in two months. The mechanical consultant by this time was still promising to produce details of ground floor drainage. At this meeting the quantity surveyor was not present therefore discussion on cost of reinforcement to type 'C' columns was deferred. Certain cases of doubt regarding the use of alternative pipes in preference to cast iron for sub-floor drainage and drilling of holes in fibreglass sunshades were

referred to mechanical consultant, and suppliers respectively. This doubt or enquiry suggested a gap in the information system. Enquiry for the number of fixing points is a manifestation of inadequate detailing.

At a meeting held in August it was pointed out that no allowance was made for supporting light fittings. Service engineer's representative remarked that drawings were still being prepared but may be possible to suspend fittings from trunking. Nothing was, however, conclusive about this statement.

Later in the same month, instruction was issued to omit fibreglass sunshades to North or South elevation and also from contract details of alternative to be provided later.

A series of architect's instructions were issued from October of same year to alter original design in order to accommodate either new concept or the installation of services details which were not submitted earlier. Some of these were at extra cost.

By November meeting, shortage of materials was being reported leading to prohibitive prices. Against this trend, the contractor complained bitterly and remarked that he may not wish to continue just in the name of progress except he would be reimbursed. Due to shortage too, certain materials have had to be ordered from overseas requiring a waiting time of about seven weeks.

The appointment of electrical sub-contractor provided another interesting observation in that certain group of people among the parties to the contract were of the opinion that a particular sub-contractor ought to have been invited to tender. They registered their open protest and also advised the particular sub-contractor to protest.

Notable difficulties and disruptions in the installation of certain units such as air-conditioners and lift were placed on record suggesting that care had to be taken from the onset. Instead decisions were being taken on the spur of the moment. This situation not only led to confused supervision but also to a break up of already completed aspects of the work so as to accommodate new decisions. For example, there was no coordination between the electrical consultant drawings and that of the air-conditioning drawings resulting in electrical unit location being on the same spot as the air-conditioner duct location which were already installed.

Additionally, it was discovered that the air-conditioning units each weighed six and a half tons to be lifted and placed on the third floor of the structure. The main contractor had no crane that could hoist such weights and besides the available cranes were such that when located anywhere along the outside perimeter of the building, it would be impossible for them to reach the plant room.

Yet another problem faced was the unsuitability of the air-conditioning plant for the plant room necessitating the contractor to carry out further works on the plant room through the issue of variation order.

The air-conditioning contract was awarded to Messrs Mandilas Limited, Lagos long after the building works had begun. The plan conceived that the central cooling units would be located at the centre of the third floor and then led through ducts to the other utilities. The air-conditioning equipment was placed on order from abroad and arrived late enough to meet most of the building works already completed.

On February 18, 1977 the electrical sub-contractor Messrs Mandilas in charge of installation of air-conditioning plant, without prior information to the Librarian, main contractor and electrical installation sub-contractor switched on the air-conditioning plant. The vibration and noise that followed created panic within and around the library building. The ceiling in Arts and Social Science readers area collapsed. The unpleasant occurrence led to a subsequent effort to first of all detect or find out the cause, those who it can be attributed to and a solution.

On February 23, 1977, on the order of the resident architect and in the presence of the electrical sub-contractor and the structural engineer, the air-conditioning blower was switched on for short periods. The following observations were made:

a) The ceiling began to sag in some areas especially the Arts and Social Science reading area.
b) Strong vibrations were felt in the structure around the blower.
c) The electrical switch gear panel on wall was shaking violently.

After recording these observations, the resident architect convened a special site meeting of consultants, contractor, sub-contractors and client on April 20, 1977. At that meeting, the architect briefed members on the air-condition test incident and enumerated the damages done and later conducted them around the library where the damage could be assessed. Mandilas after their preliminary inspection insisted that the plant had no fault and could still be used. The electrical engineer from the Estate Department suggested that the fault of the intense vibration of the air-conditioning unit might be attributed to the non-steady voltage provided by the National Electric Power Authority (NEPA). He said he had observed that the power generated and distributed by NEPA was in the range of 340-360 volts.

The engineer from Mandilas Ltd. informed the members that if the voltage provided is not between 380 and 400 volts, the air-conditioning equipment would not work, and recommended that NEPA be approached to provide a three-phase supply to the library to give the plant enough power to function smoothly.

5.1.7 Unproductive Costs

Avoidable expenses incurred on this project are as follows:

a)	Variations			₦
	i)	Architect's instructions		222,267.80
b)	Fluctuations		₦	
	i)	Material: 4712 bags of cement @ ₦1.60	7,539.20	
	ii)	Labour	₦	
		Builder's work including variations	889,606.73	
		Deduct builder's work before Udoji award as valuation No. 21 of June 27, 1974	743,294.00	
			146,312.73	
		Allow 32% of ₦146,312.73 for Udoji award	46,820.07	54,359.27

c) Delays

i)	Loss and expense claim	₦
	Manager and Head Office	350.00
	Expatriate Supervisor	1,000.00
	Nigerian Foreman	500.00
	Site Clerk	100.00
	Store Keeper	100.00
	Night Watchman	100.00
	Scaffolding	100.00
		2,250.00

Original completion date: September 3, 1973
Actual completion date: July 21, 1976
Extension of time granted = 35 months.
Claim: ₦2,250.00 x 35 [illegible].00

d) Others
The cost for the supply and installation of air-conditioning unit which has never functioned is also regarded as abortive cost 520,556.49

Total ₦875,933.56

Eight hundred and seventy-five thousand, nine hundred and [illegible]ty-three Naira, fifty six kobo only.

It can be seen that 53 per cent of unproductive cost was incurred when compared with the initial contract sum of the project. Total unproductive cost comprised 25 per cent variations, six per cent fluctuations, nine per cent delays and 60 per cent supply and installation of air-conditioning unit.

A large sum of unproductive cost in this project is due to wrong specification of air-conditioning unit by the design consultants. This situation might have emanated from inadequate information by the designer at pre-contract stage to the possibility of the designer adopting a foreign design without necessary modifications to conform with the local conditions.

5.2 NEW UNIVERSITY BOOKSHOP

5.2.1 Project Particulars

Contract No.: AB/134

Contract Sum: ₦1,088,287.40

Contract Period: 44 weeks

5.1.2 Type and Purpose of Structure

The new Bookshop is a single square block structure with a total floor area of 3,100m^2. It incorporates a basement, a ground floor and a small central second floor. The functional division of the building is as follows:

a) Public Zone 2,600m^2

The public zone is mainly the sales area, display shelves for the books and stationery, and finally an exhibition area for the display of recent important publications and acquisitions.

b) Service Zone 500m^2

This zone includes all the offices, the toilets, store and delivery rooms as well as other commercial areas.

5.2.3 Project Team

The project team comprised the following:

a)	Architectural	-	Egbor and Associates
b)	Structural	-	Obi Obembe and Associates
c)	Mechanical & Electrical	-	Henri-Mos and Partners
d)	Quantity Surveyor	-	Qu-Ess Partnership
e)	Soil Investigation	-	Civil Engineering Department, A.B.U.

5.2.4 Contract Award

The method of tendering used in this project was the selective tendering procedure. After considering the tender sums submitted by the contracting firms selected, Messrs D'Alberto and Giampoli Ltd. was awarded the contract at the sum of ₦1,088,287.40 for a period of eleven months from June 6, 1977.

5.2.3 Unproductive Costs

Unnecessary expenses incurred in this contract are as follows:

a)	Variations	₦	
1)	Architect's instructions		
i)	Diversion of underground cables	16,491.23	
ii)	Roof insulation	9,078.00	
iii)	Concrete display troughs	4,500.00	
iv)	Car port, rendered band	7,930.44	
v)	Rendered plinth partitions	11,723.10	
vi)	Display window and slab, high level louvres	1,772.40	
vii)	Clerestory	3,676.52	
viii)	Cable floor ducts	2,011.00	
ix)	Internal and external finishes	21,139.20	
x)	Balustrading	12,031.03	
xi)	Telephone	14,488.86	
xii)	Burglar proofing	1,860.00	
xiii)	Security light base	204.00	
xiv)	Burglar proofing (Ofokansi)	25,834.75	
xv)	Air-condition and fan hooks	3,950.00	
xvi)	Partitions, etc.	10,261.60	
	Sub-total, additions		+146,952.13
2)	Adjustment of prime cost sums		
i)	Ironmongery	1,500.00	
ii)	Metal doors and windows (G.M.P)	18,307.90	
iii)	Windows (Naco)	15,373.90	
iv)	Demountable partitions (Barada Ltd)	17,329.49	
v)	Sanitary fittings (D'Alberto)	- 887.40	
vi)	Electrical installation	42,802.59	
vii)	Suspended ceilings (Eng. Suppliers)	7,750.00	
viii)	Suspended ceilings (Barada Ltd)	-13,815.90	
	Sub-total, omissions		- 57,612.78
3)	Adjustment of provisional sums		
i)	Additional foundation	10,000.00	
ii)	Additional fittings	10,000.00	
iii)	Staircase and floor balustrading (A.I.Z16)	10,000.00	
iv)	Additional plumbing installation	3,000.00	
v)	Additional external works and fencing	5,000.00	
vi)	Contingencies	50,000.00	
	Sub-total, omissions		- 88,000.00
4)	Other adjustments		
i)	Extra concrete work	23,552.00	
ii)	Tree felling	500.00	
iii)	Roofing (re-measurement)	7,660.00	
iv)	External works	20,349.50	
	Sub-total, additions		+ 52,061.50
	Total additions (1-4)		+ 53,400.85

	Total additions (1-4) (b/d)	+ 53,400.85

b) Delays

Claims for stoppage of work submitted by the main contractor Messrs D'Alberto and Giampoli of ₦170,386.88 but negotiated by the client and consultants to the sum of ₦93.303.08. The detail is as follows:

i)	Site protection	2,684.00
ii)	Notice of pay employees	2,619.91
iii)	Office overheads	9,718.00
iv)	Maintenance of retention	5,441.40
v)	Day works	3,503.25
vi)	Additional preliminaries	47,277.00
vii)	Increased cost of wages	22,059.52
	Total additions	+ 93,303.08

c) Others

Bank interest charges

The works on the project were stopped for about a year due to shortage of funds by the client. Therefore, the client had to borrow the sum of ₦300,000.00 at the interest rate of 8% from the First Bank Samaru, Zaria in order to complete the project.

Interest = 8% of ₦300,000.00 = ₦24,000.00

Total additions	+ 24,000.00
Grand Total	₦170,703.93

One hundred and seventy thousand, seven hundred and three naira, ninety-three kobo only.

From the foregoing, it is noted that the prime cost sums were overloaded to the tune of ₦57,612.78 and provisional sums were under-loaded by ₦58,952.13 which was ironically balanced by other adjustments of ₦52,061.50. It is interesting to note that the net addition to variations of the sum of ₦53,400.85 was very close to the contingency sum of ₦50,000.00 provided in the initial contract sum. this shows the trial and error method of estimating building projects by the consultants.

The unproductive costs account for 16 per cent compared with the initial contract sum. However, 31 per cent, 55 per cent and 14 per cent of total unproductive costs were contributed as a result of variations, delays and bank interest charges respectively. This is mainly because the client stopped works at site due to cash flow problems.

5.3 NEW STUDENT CENTRE

5.3.1 Project Particulars

Contract No.: AB/259/80-85

Contract Sum: ₦1,631,820.65

Contract Period: 50 weeks

5.3.2 Type and Purpose of Structure

The structure is framed reinforced concrete. The main purpose of the structure is to serve as a recreation centre for the entire University students.

5.3.3 Project Team

The following consultants were nominated as the project team:

a) Architectural - Design Office
Department of Architecture
A.B.U., Zaria

b) Structural - Department of Building
A.B.U., Zaria

c) Quantity Surveyor - Adesoye and Partners, Kaduna

d) Mechanical & Electrical - Henri-Mos and Partners, Kaduna

f) Soil Investigation - Civil Engineering Department, A.B.U., Zaria

5.3.4 Contract Award

Selective tendering was used and eight contractors were invited and submitted their quotations as shown below:

No.	Contractor	Quotation ₦	Completion Time (weeks)
1.	A.G. Ferrero & Co. Ltd	1,845,766.85	65
2.	Abunks Nig. Ltd	1,649,877.10	60
3.	B. Stabilini & Co. Ltd	1,831,263.10	55
4.	Belag Construction Nig. Ltd	1,801,423.35	58
5.	Alh. Murtala Zangon Aya	1,280,712.66	36
6.	Zazzau General Trading Co.	1,631,820.65	50
7.	Alh. Yusuf Samaru	1,585,702.52	40
8.	E.M. Michelleti & Sons, Nig. Ltd	1,811,096.65	70

The consultant quantity surveyor, after they had scrutinised all the quotations, recommended that the contract should be awarded to Abunks Nigeria Limited at the price of ₦1,649,877.10 because of its past reputations.

The tenders board met on April 19, 1982 and awarded the contract to Zazzau General Trading Co. at the cost of ₦1,631,820.65 against the recommendation of the consultant quantity surveyor.

Zazzau General Trading Co. signed the contract on November 1, 1982 and sub-contracted the whole project to Devenco Nigeria Ltd. on November 7, 1982 by using the Oath of Attorney.

5.3.5 Unproductive Cost

The unproductive cost incurred on this project are summarised below:

			N	N
a)	Variations			
	i)	Soil test due to change of original site	12,167.28	
	ii)	Structural consultancy fee for re-designing the sub-structure	30,025.58	
	iii)	Remeasured sub-structure	500,000.00	
	iv)	Payment to independent quantity surveyor for (iii) above	8,502.93	550,695.79
b)	Fluctuations			
	i)	Material: (Cert. 1 - 11)		188,792.58
c)	Delays			
	i)	Waiting for revised structural working drawing	38,336.66	
	ii)	Removing steel and warped formwork for late appointment of electrical sub-contractor	18,607.15	56,943.81
d)	Others			
	i)	Abortive works due to relocation of project at new site	36,111.00	
	ii)	Overpayment to the contractor as a result of negotiation of remeasured sub-structure	92,236.62	128,347.62
		Total		N924,779.80

Nine hundred and twenty-four thousand, seven hundred and seventy-nine Naira, eighty kobo only.

The breakdown of total unproductive cost incurred on this project were due to 60 per cent variations, 20 per cent fluctuations, six per cent delays and 14 per cent abortive work and over-payment to the contractor.

The total unproductive costs when compared with the initial contract sum is about 57 per cent and the stage of works executed was about 70 per cent when the study was conducted and the project had been determined and abandoned.

This project is rather unique because the major causes of unproductive costs are due to change of site, relocation of building to about 25.30 metres and coupled with lack of proper project planning, co-ordination and control by the project team.

5.4 SUMMARY OF UNPRODUCTIVE COSTS

The total unproductive cost of ₦1,971,417.29 representing 45 per cent of the total initial contract sum of ₦4,373,558.57 has been discovered in the course of conducting this research work as shown below.

TABLE 5.1: SUMMARY OF UNPRODUCTIVE COSTS

PROJECT	UNPRODUCTIVE COSTS (₦)						
	VARIATIONS	FLUCTUATIONS	DELAYS	OTHERS	TOTAL	INITIAL CONTRACT SUM	RATIO OF TOTAL TO INITIAL CONTRACT SUM
Kashim Ibrahim Library Building	222,267.80	54,359.27	78,750.00	520,556.49	875,933.56	1,652,453.52	53%
	25%	6%	9%	60%	100%		
New University Bookshop	53,400.85	Nil	93,303.08	24,000.00	170,703.93	1,088,287.40	16%
	31%	Nil	55%	14%	100%		
New Student Centre	555,695.79	188,792.58	56,943.81	128,347.62	924,779.80	1,631,820.65	57%
	60%	20%	6%	14%	100%		
TOTAL	826,364.44	243,151.85	228,996.89	672,904.11	1,971,417.29	4,373,558.57	45%
	42%	12%	12%	34%	100%		

The breakdown of the total unproductive cost was found to be ₦828,364.44 for variations, ₦243,151.85 for fluctuations, ₦228,998.89 for delays and ₦672,904.11 for others which accounted for 42 per cent, 12 per cent, 12 per cent and 34 per cent of total unproductive cost respectively.

CHAPTER SIX

6.0 SOURCES OF UNPRODUCTIVE COSTS

There are numerous sources of unproductive costs in building projects both at pre-contract and post-contract stages. Successful projects contain in-built unproductive costs. The main sources of unproductive costs are broadly classified into two:

1) Loopholes in administrative procedures.

2) Inadequate management skills and tools.

6.1 UNPRODUCTIVE COSTS AT PRE-CONTRACT STAGE

There are loopholes leading to unproductive costs at pre-contract stage such as:

i) Application, registration and renewal fees

ii) Appointment of consultants

iii) Preparation of contract documents

iv) Tender processing and non-refundable fees

v) Contract award

vi) Public relation sums

6.1.1 Application, Registration and Renewal Fees

The application, registration and renewal fees charged by the clients to contractors with good intention but due to poor implementation invariably constitute unproductive costs in building projects and, win or lose, the contractors include these expenses whenever they submit their tender figures to the clients. Hence the main purpose of charging these fees by the clients is rather defeated.

6.1.2 Appointment of Consultants

The criteria for the appointment of consultants by the client in most cases are not clear especially the extent and nature of their duties, relationships with the client representatives and sometimes contractor, sub-contractors and nominated suppliers.

However, the co-ordination of a project may be difficult since the consultants are often located at different parts of the country which makes consultation rather difficult if not impossible.

The method of remuneration of the consultants generally does not encourage them for cost saving because they are usually paid on certain percentage of estimated contract sum. Thus, a source of unproductive cost here is a possibility of over-design by the consultants which may lead to high professional fees.

6.1.3 Preparation of Contract Documents

The use of foreign codes of practice, specification, contract conditions and sometimes design in preparing contract documents by the consultants without necessary modifications to conform with the local conditions and needs, more often than not creates problems such as poor function of structures due to low level of technology, scarcity and delayed supply of materials and components because they are on importation. Wrong interpretation of contract conditions can change the type of contract from competitive to negotiated contract which result in variations, fluctuations and delays at construction stage as observed in almost all the three projects investigated and analysed.

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It has been noticed in Kashim Ibrahim Library Building where the central air-conditioning unit was wrongly specified by the design consultants which cost the client N520,556.49 for the supply and installation of the unit that has never functioned. Therefore this huge sum of money is regarded as unproductive cost.

Furthermore, the client ended up with incomplete contract documents like drawings and bill of quantities prepared haphazardly by the consultants from inadequate information supplied by the client. This unfortunate situation may result in unproductive costs in the form of variations, fluctuations, delays, etc. at post-contract stage.

6.1.4 Tender Processing and Non-refundable Fees

Tenders are usually submitted by the contractors to the client after payment of tender processing fee for collecting tender documents and non-refundable fee. Ironically, these fees are reflected in the tender sum submitted by the contractors which account for about five per cent of project cost.

Some contractors hardly employ the services of estimators in preparing estimates but prefer cooking up all sorts of figures to arrive at tender sum with resultant effect of unproductive tendering by either too high or too low tender figure.

The expenses incurred in unproductive tendering by the contractor is usually transferred to another tender in order to minimise unproductive costs. However, the success ratio of the firm may be reduced in the subsequent tender.

6.1.5 Contract Award

The political and selfish considerations that characterised the decisions of most tenders boards in selecting the 'right' contractor normally lead to outright disregard of the consultant's recommendations.

The case of the New Student Centre is a good example of this situation where the consultants recommended that the contract should be awarded to Abunks Nigeria Ltd. because of its past reputations after they had scrutinised all the quotations at the cost of ₦1,649,877.10. The tenders board awarded the contract to Zazzau General Trading Co. at the price of ₦1,631,820.65 as against the recommendation of the consultants.

A week after Zazzau General Trading Co. signed the contract it sub-contracted the whole project to Devenco Nigeria Ltd. by using the Oath of Attorney. The contract was later terminated by the employer because of excessive delay and non-performance of the contractor.

The resultant effect of such considerations is that the client awards contract to contractor with unrealistic tender and little or no resources to carry out the works satisfactorily. Hence, the incompetent contractors usually hold the clients to ransom by giving flimsy excuses for not proceeding with the works and by finding a way into the employer's pocket through claims leading to unproductive costs.

6.1.6 Public Relations Sums

This is mainly concerned with the social ills either in cash or in kind under various terminologies such as kickbacks, gratifications etc. It is practised in both public and private sectors. It is also very difficult to prove, because those involved take necessary measures not to be discovered. If building contracts fail as a result of social ills, those involved usually give covering reasons for its failure. Many times the reasons given correspond with the events and very difficult to disagree with the evidences presented.

In most meetings of tenders boards, the top members come with specific firms at the back of their minds and what each tries to do is to see that his choice is accepted. In many cases the contracts are left to the firms with the most influence, and therefore the most competitive firms suffer loss.

Some firms which are not ready to bribe clients and consultants may have their tenders rejected or if accepted they may suffer delays in payments for the works executed and certified by the consultants. In this situation the contractors have to pursue payments from one office to another and without bribe, delay tactics are mostly used to waste their time which result in an extension of time. Consequently the contractors who borrow money from the bank with high interest rate to execute the projects have no alternative than to succumb to all sorts of social ills by showing appreciation to the clients and consultants. In this regard, the expenses incurred by the contractors are transferred to subsequent jobs for which tender will have to be inflated in order to recover them.

Indeed social ills are greatly diseases that immensely contributed to unproductive costs in building projects because these costs are not expended at all into the projects. Though the law of the Nigerian Government about bribery and corruption clearly states that "do not give and do not collect".

6.2 UNPRODUCTIVE COSTS AT POST-CONTRACT STAGE

This is a production stage where the sources of unproductive costs are directly from the four production resources (the 4M's) to which a further two may be added without which the picture is incomplete. The prime four are:

1. Materials
2. Methods
3. Machines
4. Manpower

to which will be added

5. Management
6. Money.

6.2.1 Materials

Generally the influence of materials and components on progress of work which depends on whether or not they can easily be procured. Delay in procurement leads to loss of production time. Non-availability leads to variation orders resulting in revision of drawings and hence prolonged duration of contract period, increased cost and re-planning of contract programme. Scarcity creates high market value resulting in escalation of material prices and claims as observed in all the projects studied.

For instance, the contractor who handled the construction of Kashim Ibrahim Library Building reported about shortage of materials leading to prohibitive prices. Against this trend the contractor complained bitterly and remarked that he may not wish to continue just in the name of progress except he would be reimbursed. Furthermore, the air-conditioning unit was placed on order early from abroad and arrived late enough to meet most of the building work already completed.

In the case of New University Bookshop, the contractor complained about the shortage of cement. The consultants advised the ceiling, partition, doors and windows sub-contractors to expedite action on their deliveries. Later on Messrs G.M.P. informed the building team that all materials were now available in the country, but no delivery dates can be mentioned due to the discrepancy between the design drawing and the site dimension of doors, high level windows and displays. A similar situation was observed in the New Student Centre where the contractor complained about the long delay caused by the non-award of electrical works that has resulted in replacement of formwork which had warped. At this juncture, the quantity surveyor pointed out that delays could be very expensive especially with the unpredictable inflation in prices of building materials.

In most cases inadequate control of materials and components contributes to unnecessary wastage, multiple handling, breakages and pilfering by the site staff; the over-invoicing of materials and components delivered to site by the receiving officer in connivance with the suppliers. The resultant effect of these actions on the project is unproductive expenses.

6.2.2 Methods

Construction methods usually influence rate of production and quality of work. Therefore slow production means delayed returns on investment and poor quality of work which results in unsatisfactory performance. The structural consultants observed two glaring faults at the construction of New University Bookshop by the contractor such as countless honeycombs and edges of the beam that were not straight as they should be due to the improper vibration of the concrete and later due to bad shuttering. The structural consultants also confirmed that the initial collapse of the roof beam was attributed to bad construction method by the contractor.

Therefore the structural consultant gave a specific instruction to the contractor that before any concrete work is cast, they have to inspect formwork, the placement of iron bars and the vibration of the concrete.

In most cases poor or absence of definition of methods for execution of the work, the sequence of operations and the selection of the processes to be used for specific operations, plant selection and movement patterns for men and materials usually lead to defective work resulting in unproductive costs in building projects.

6.2.3 Machines

Generally mechanical plant and equipment in the building industry have been introduced to increase output whilst the labour force is reduced. Thus any production planning procedure must take into consideration all available data on plant specification, capacity, availability and

reliability. It will usually interrelate plant and manpower in its production flow to ensure an optimum balance between these two resources, analysing the nature of each process to determine which is the controlling factor in each case.

In Kashim Ibrahim Library Building, it was discovered that the air-conditioning unit each weighing six and a half tons had to be lifted and placed on the centre of the third of the structure where the plant room is located. The main contractor had no crane that could hoist such weight and besides the available cranes were such that when located anywhere along the external perimeter of the building, it would be impossible for them to reach the plant room. The problem of irregular maintenance, scarcity of spare parts and components, poor plant matching and inadequate production planning definitely cause under-utilisation, idle time and breakdown of machines at site. Thus, resulting in unnecessary expenditure.

6.2.4 Manpower

Building projects are still very much labour intensive in Nigeria. However, shortage of qualified personnel like architects, engineers, surveyors, estimators, foremen, equipment operators and other skilled workers hamper the ability to do a large volume of work to acceptable standard of workmanship.

It was discovered in Kashim Ibrahim Library Building that there was incomplete contract document. As at the time of preliminary estimate, no detailed drawing on services were received, as such provisional sum was allowed for. There were still no complete set of drawings after

about six weeks of commencement of construction works to confirm certain materials order. This gave rise to claims right from the onset.

Furthermore, information needed from the structural consultants by the contractor regarding bending schedule was still not received and the resident architect had to travel to Lagos in respect of same. This kept the contractor waiting. Five months after the contract award the mechanical consultants were still promising to produce details of ground floor drainage. The cost of suspended ceiling was not originally included in the contract sum.

In the case of the New University Bookshop project, the structural consultants informed the main contractor their dissatisfaction with the quality of works because reinforcement bars having no cover in several areas and had been covered up with plaster. This implied that the required bond anchorage between the steel and the concrete was not obtained. There were also several honeycombs in many places.

Responding, the main contractor refuted these charges and blamed the structural consultants of perpetual absence to inspect works whenever the casting of concrete was made.

The main contractor pointed out the discrepancy between the quantity of steel as stated in the bill of quantities as 200 toms and the structural drawings as 220 toms. The quantity surveyor was asked by the resident architect to sort this out.

The existence of ghost workers in some organisations also constitute unproductive costs. It is usually done with the connivance of pay officers due to insufficient control.

Staff redundancy and incompetency; lack of staff incentive, motivation, training and welfare by the employer; inadequate labour resources coupled with indifferent supervision usually result in apathy, poor productivity and slow development of skills with an outcome of useless expenses in building projects.

6.2.5 Management

The administrative lapses and poor management skills and tools lead to poor level of performance in terms of money, time and quality of building as a product.

Notable difficulties and disruptions in the installation of certain units such as air-conditioners and lift were placed on record at Kashim Ibrahim Library Building suggesting that care had to be taken from the onset. Instead decisions were being taken on the spur of the moment. This situation not only lead to confused supervision but also to a break up of already completed aspects of the work so as to accommodate new decisions. For example, there was no co-ordination between electrical drawings and that of air-conditioning drawings resulting in electrical unit location being on the same spot as the air-conditions ducts location which were already installed.

It was noted at New University Bookshop where the structural consultants showed some lukewarm attitudes over the supervision of structural works. For example, the structural engineer, despite invitation, did not turn up to inspect the fabrication of the roof trusses in progress and the casting of the high columns. Therefore the architectural consultants expressed their dissatisfaction over the poor supervision of the structural work and reminded the structural consultants of the need for close and effective supervision especially as the work had reached a critical stage.

The Bookshop Management Board was not satisfied with the progress of the works and directed that a member of the Bookshop Management Staff should be present at subsequent site meetings and keep the Board informed through reports. This shows that there was a missing link between the end-users and the building team before this decision was taken.

In the case of the New Student Centre, the client changed the project site twice from its original position. This decision cost the client N500,000.00 for sub-structure. On seeing the magnitude of this variation, the client decided to make cost reduction in superstructure which was already at an advanced stage of construction. The client also insisted that no further alteration in designs of structural elements be made or ordered until cost implication is clearly determined and a positive decision was made as to the acceptance or otherwise. The client further instructed the design consultants that it does not wish to be loaded with any embarrassing situation of increased costs due to re-designs.

The main contractor sub-contracted the entire project to sub-contractors after signing the contract by using the Oath of Attorney. Later on the sub-contractor also abandoned the project because the expatriate management staff including the Project Manager left the country without notice to indigenous partners. This situation indicates the consequences of clients awarding contracts to incompetent contractors who do not have resources to execute the job satisfactorily.

The client had no option than to terminate the contract because of excessive delay and non-performance of the contractor.

The separation of design from construction lends more support to the unsatisfactory situation. The design of a building determines the sequence of site operations as well as the method which can be adopted in carrying out the operations. This in turn will affect the distribution of resources to be employed.

Inadequate pre-contract and post-contract planning by the project team normally nullifies much of the time-consuming efforts in the application of modern management techniques and improved methods of programming and controlling building operations. This situation has led to excessive and expensive variation orders, fluctuations and delays resulting in unproductive costs.

6.2.6 Money

Generally cash flow problems from the project team retard the satisfactory execution of building projects. It causes variations, fluctuations, delays and discord.

The delay in honouring interim payment by the employer to the contractors and suppliers frequently results in contractual claims like escalation of materials and labour, loss and expense and bank interest charges on monies borrowed from banks to finance the project by the project team. The overall outcome of this action is inconsequential spending on the building projects.

Even after valuation and certification for payment in respect of job done, the claimant was found to face difficulties with the accounting system of the client. Undue influences sometimes lead to the claimant violating laid-down social order. Such violation will of necessity be well compensated by the client one way or the other before the contract runs out.

In the case of New University Bookshop where the main contractor gave a three-day ultimatum from September 20, 1979 for settlement in respect of interim certificate No. 10 and 11 amounting to N78,294.91 for the months of July and August, 1978 or they would close up the site. The site was closed up on October 20, 1979 due to the client's failure to meet his financial obligation. The University was suffering from financial problems due to the austerity measures introduced at the national level to help save the country from financial embarrassment.

The works on site were suspended for about a year due to shortage of funds with the client. Therefore the client had to borrow the sum of ₦300,000.00 at the interest rate of eight per cent from the First Bank in order to complete the project. This action cost the employer ₦24,000.00 as interest paid to the bank.

At the move to re-open the site, the main contractor confirmed receipt of payment in respect of interim payment certificate No. 10 and promised to re-start tokenly and to fully co-operate only after all outstanding payments in their favour had been made.

The architect informed all concerned to document their claims for delay, re-mobilisation and inflation. The electrical sub-contractor informed the project members of their unwillingness to resume on site until they had received payment for their claim dated October 2, 1978. The architect informed them that their claim had been approved for payment and directed them to pass all future claims to be certified by the electrical consultants before being passed to the architect for approval.

The New Student Centre is unique because the site was re-located twice from its original position by the client after the award of the contract. Soil investigation was conducted at the new site and the result showed very poor soil bearing pressure. Therefore the foundation was re-designed to conform with the new site conditions. This means that the project had started with variation and delay from the onset.

There were accusations between the client and structural consultants because of the huge amount of money needed for the sub-structure and also claims made by the contractor and structural consultants due to delay and re-design respectively.

At this juncture, the client had to employ the services of an independent quantity surveyor to quantify and assess the amount of money needed to execute the foundation based on the new site drawings. The client approved the sum of N717,646.00 for payment to the contractor based upon independent quantity surveyor's estimate as against the consultant quantity surveyor's estimate of N834,892.00.

The contractor had already collected the sum of N617,236.62 in respect of the variation of sub-structure only but later on the Vice-Chancellor invited the contractor and negotiated the varied foundation work to the tune of N500,000.00. As the contractor had agreed to refund the difference of N177,326.62, the said amount had to be recovered in five instalments at N25,000.00 x 4 plus N17,236.00.

The client proposed a cost reduction in superstructure to the architectural and structural consultants on seeing the magnitude of sub-structure variation. This was done to save cost at construction stage of the project. Saving would have been possible if tackled at conceptualisation stage of the project. The project was terminated by the client due to excesses and non-performance of the contractor.

The three building projects studied reveal that total unproductive cost of ₦1,971,417.29 representing 45 per cent of the total initial contract sum of ₦4,373,558.57 was incurred.

The breakdown of total unproductive cost shows ₦826,364.44 for variations, ₦243,151.85 for fluctuations, ₦228,996.89 for delays and ₦672,904.11 for others, which accounted for 42 per cent, 12 per cent, 12 per cent and 34 per cent of total unproductive costs respectively.

CHAPTER SEVEN

7.0 UNPRODUCTIVE COSTS CONTROL

Control of unproductive costs is basically aimed at minimising or eliminating avoidable expenses in building projects with a view to giving the employer good value for money at pre-contract and post-contract stages. This control can be achieved by using sound administrative procedures and applying modern management skills and tools.

7.1 PRE-CONTRACT CONTROL

The unproductive costs control at pre-contract stage involves the control of the following:

i) Application, registration and renewal fees

ii) Appointment of consultants

iii) Preparation of contract documents

iv) Tender processing and non-refundable fees

v) Contract award

vi) Public relation sums.

7.1.1 Application, Registration and Renewal Fees

The registration of contractors, seemingly rational, has its own loopholes which renders the process unsatisfactory. It is required of the intending contractors to supply certain information which cannot be verified. Therefore false claims are often made. Compilation of a list of firms does not guarantee that those on the list are the best for the project being envisaged.

The contractors on the list of the client also constitute pressure group capable of taking advantage of their power or opportunity. It is more so in that they have to pay a prescribed sum which ranges from ₦5.00 to ₦1,000.00 for a place on the list.

To plug the loopholes and avoid emergency contractors who go in to 'loot' the industry in general and the client organisation in particular, the following control of registration is suggested.

1. Abolish application, registration and renewal fees due to poor implementation.
2. Avoid long period of relationship to minimise social abuses by connivance of project team.
3. Register contractors on the basis of project at hand in order to reduce pressure group.

7.1.2 Appointment of Consultants

There is no unified approach to the appointment of consultants. Hitherto the appointment of consultants is on the basis of who you know and not what you can offer. In some cases some depend more on luck than ability. In other cases probability of getting commission is on the basis of purchasing power in cash or in 'kind'.

Traditionally the architect is expected to be contacted first before the others and he is supposed to co-ordinate the activities of the others. Today there is the general feeling that the client as the owner of the project also reserves the exclusive right to appoint other consultants with or without the eventual expected co-ordinator's knowledge.

On the other hand, the other consultants prefer to get their commission direct from the client to avoid losing part of their fees in what is usually termed 'handling charges'. They also prefer direct commission to avoid breach of trust caused by delayed payment of their dues which will first go into the account of the co-ordinator.

The haphazard approach has a lot of inherent disadvantages ranging from social abuse to unsatisfactory performance, cost and function. The following approach may ease the continuous pressure on the client which is now the case.

1. Advertise project envisaged for competitive design;
2. Advertise for cost estimate preparation;
3. Allow short space of time between submission and appointment of consultants.

The usual information will be required as the brief for the designers after which each will be expected to submit their proposals for consideration.

In the case of cost consultants the situation will be different. Interview on the basis of submitted design proposals and other conditions would be conducted to score their performance.

7.1.3 Preparation of Contract Documents

Generally the preparation of contract documents consist of drawings and bills of quantities.

a) Drawings

Most clients can state their needs in clear and precise terms but the majority hardly can differentiate their needs from wants. There is therefore the need for proper counselling between the designer and the client to ensure that what is needed is what is provided. The unproductive costs control at the design period includes the determination of:

1. User's needs and delineation of user's needs from wants.
2. User's psychophysical, ergonomic and socio-psychological needs.
3. Construction production needs in relation to site conditions and state of technological development.
4. Construction cost reduction parameters without necessarily sacrificing standard through judicious use of design knowledge and experience.

This means that user analysis is a very important aspect of design procedure. The stages of analysis at this level are as follows:

1. Basic information

   At this stage, the user input consists of

   i) Purpose/function

   ii) Size of requirement/capacity

   iii) Resources required and available

   iv) Time required/delivery date

   v) Project policy/special requirement

   vi) Location

   vii) Economic life

2. Project acceptance and allocation of project time

The designer makes his first input by:

i) Examining own resources

ii) Preparing programme

iii) Accepting project

3. Design information

The designer also provides his second input regarding site data and user analysis:

Site data

i) Site details

ii) Relevant regulation and codes

iii) Climatic condition

User analysis

i) Physiological needs

ii) Psychological needs

iii) Social and cultural values.

Finally, alternative schemes based on site data and basic information will be considered along with the user choice of materials and special items based on analysis by the designer. Further work on the design from this stage will be based on priority rating of the client.

b) Bills of quantities

The primary purpose of the bills of quantities is to provide a uniform basis of obtaining the likely cost of the project being contemplated. It also forms the basis of valuing any additional work done in consequence to the contract.

Stages of preparation include the ascertainment of the quantities of work to be carried out by an appointed building firm and the writing of full specifications and requirements. To ascertain the quantity of work the following procedure is normally employed:

1. Taking-off the materials or labour including all allowances
2. Abstracting to obtain net quantities of materials or value of work.
3. Billing in the prescribed standard method of measurement (SMM) units.

Attached to the Bills are:

i) Description of works
ii) Instruction to persons tendering
iii) Tender form
iv) Articles of agreement
v) Conditions of contract
vi) Preliminaries
vii) Trade preambles.

The accuracy in preparation of bills of quantities mainly depends upon the detailed and complete drawings by the design team. What is required, therefore, are contract documents that use simple language and are compatible with the experience of the end user. Designs need to incorporate local practices and materials; and drawings, specification, and bills of quantities also ought to be clear, self-explanatory, and related to methods and procedures as well as to performance.

7.1.4 Tender Processing and Non-refundable Fees

Usually in building contracts one important condition included in the advertisement is the requirement for each tenderer to pay tender processing and/or non-refundable fees according to the project which ranges from ₦100.00 to ₦200.00. This provision is normally made to recover part of the money spent to produce tender documents and deter persons applying for the documents out of mere curiosity.

This amount charged by the client is normally included in the tenders submitted by the contractors. In case of abortive tendering, contractors often transfer these expenses to subsequent tenders as a means of recovery. This practice may reduce their chances of winning the next tenders. Therefore these fees must be abolished to reduce contractors general overheads thus controlling unproductive costs in building projects.

7.1.5 Contract Award

Contract awards by the tenders board must be based on sound principles and realistic approach. This entails certain guidelines which are dependent upon the structural definition as well as the policy of the organisation, technical ability and the available resources for the project execution.

The structural definition and policy of the organisation form the static framework in deciding what to do, who to do what and how best it can be done. Without an effective control of these aspects through the application of technical skill backed up with other resources estimate of what is to be done for how much and by what method cannot be realistic.

However, control of unproductive costs during contract award period can be achieved by rational approach to the following:

1. The appointment of consultants and acceptance of design that guarantees value for money.
2. The registration of contractors.
3. The determination of building project cost and subsequent selection of contractor and sub-contractors.
4. The avoidance of in-built social, economic and political problems as related to project success or failure.
5. The prevention of disputes arising from breach of trust requiring arbitration.

7.1.6 Public Relation Sums

The fraudulent practices such as social ills due to political, economic and bureaucratic problems impair political developments, economic efficiency and bureaucratic effectiveness.

To control unproductive costs as a result of corruption therefore, governments may consider the following possible measures:

1. High-level commissions to conduct inquiries on a government-wide basis.
2. "Ombudsman" to examine citizen complaints about government corruption.
3. Courses, seminars, and action research projects to heighten officials' awareness and provide them with tools for combating corruption.
4. Efforts to simplify administrative procedures and to strengthen financial management recording and reporting requirements.[1]

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[1] D.J. Gould and J.A. Amaro-Reyes, *The Effects of Corruption on Administrative Performance - Illustrations from Developing Countries*, The World Bank, Washington D.C., 1987, p.35

7.2 POST-CONTRACT CONTROL

This is a building construction stage and unproductive costs control can basically be achieved by promotion of:

1. Team spirit among all parties involved.
2. Co-ordinated supervision techniques
3. Efficient information recording and transmission techniques to monitor progress and avoid delays.
4. Efficient decision-making technique or prompt action as and when necessary.

Therefore, it is pertinent to control unproductive costs with respect to production resources such as materials, methods, machines, manpower and management which can all be reduced to a common denominator, namely money.

7.2.1 Materials

Unless the materials and components are available at the work face in the right quantity and quality and at the right time the production process cannot meet its schedule and to ensure that they are available must be a primary function of any production planning procedure.

The incorporation of locally sourced building materials and components by the designers may reduce delay in execution of project due to non-availability and saves hard currency.

Furthermore, materials wastage, breakages and vandalism can be controlled by:

1. Minimising multiple handling.
2. Adequate store keeping arrangement.
3. Minimising walking distances.
4. Avoiding loss by the elements.

5. Adequate security arrangements to combat theft and vandalism.
6. Minimising congestion.
7. Continuity of employment[2].

Since production largely depends upon the specifications (dimensions, tolerances and quality), the accuracy of the inventories of required materials, their availability and procedures of progressing their procurement are highly necessary in order to control unproductive costs in building projects.

7.2.2 Methods

The overall method of building construction is determined by the product design whilst the definition of method for the execution of the work, the sequencing of operations and the selection of the processes to be used for specific operations, plant selection and movement patterns for men and materials are functions of production management. The allocation of responsibility and the setting up of production centres form part of planning procedure.

Therefore, control can only be exercised by establishing an agreed method statement and by the evaluation of the methods by judging their efficiency and depend upon the following factors:

1. The location and nature of the particular site and its immediate environment.
2. The amount of site space to establish storage and work place areas and deploy plant.

[2] R.A. Burgess and G. White, *Building Production and Project Management*, The Construction Press Ltd., London, 1979, p.55

3. The company's expertise in that type of construction.
4. The availability of resources.
5. Company objectives such as the least possible construction time or maximising on the use of certain resources which will be available for limited period only.
6. The complexity of the site, that is, access, shape, slope, storage areas available, type of soil or unusual geographical or environmental factors.
7. The opportunity available for technique development[3].

7.2.3 Machines

Plant and equipment mechanisation is reducing manpower on building sites as it can handle more easily the greater loads required by modern management at a time when labour costs are rising without any assurance of the output levels likely to be expected. Thus, any production planning procedure must take into consideration all available data on plant specification, capacity, availability and reliability. It will usually interrelate plant and manpower in its production flow to ensure an optimum balance between these two resources, analysing the nature of each process to determine which is the controlling factor in each case. Unproductive cost control will be maintained by keeping a close watch on delays, breakdowns and levels of plant utilisation, together with an analysis of effectiveness of plant maintenance policies.

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[3] R.A. Burgess and G. White, *Building Production and Project Management*, The Construction Press Ltd., London, 1979, p.53

7.2.4 Manpower

Every product requires a different mixture of skills and the effectiveness of any manpower resource is conditioned by the size of the force and the quality of skills available for recruitment. The levels of its productivity and utilisation are dependent upon such factors as the working conditions, the planning operations and the demarcation of responsibilities, the working methods, and the degree of motivation provided by the financial and other incentives. The changing technologies of building construction have led to a re-distribution of demand for individual skills and consequently problems of recruitment which are not helped by the minimal degree of repetition in the nature of the work so that newly won experience can easily be built upon[4].

Thus production planning procedures must be based upon the availability of labour resources rather than upon the opportunity to train, or re-train personnel in specific skill, and it must adjust its output schedules accordingly. Production control is concerned with the monitoring of output, in particular the analysis of data relating to compliance with the planned schedule of work, the rationalisation of tasks, and the effectiveness of incentives. It is a common complaint of management in building construction that feedback of information on labour performance is unreliable, and therefore of doubtful value, when used as a control parameter. In comparison to other industries, this is probably true but nevertheless the best available of such information must be used if any semblance of labour production control

[4] R.A. Burgess and G. White, *Building Production and Project Management*, The Construction Press Ltd., London, 1979, p.31

is to be initiated with a view to controlling unproductive costs in building projects.

7.2.5 Management

At this juncture, unproductive costs control can be achieved by the effectiveness of the systems of communication and control are dependent upon the skills and experience of management and its ability to adapt to changing situations, to recognise signals of danger or opportunity, and to provide leadership and direction. Control of unproductive costs is maintained by the evaluation of results, which reflects the effectiveness of the procedures which management has installed. In building construction the nature of the work often demands flexibility in decision-making and there must be willingness to accept that communication and control may need to be re-designed if they are to be effective for a variety of contracts.

7.2.6 Money

All production requires financial resources to underwrite its activities, though the amount of involvement in building industry tends to be very much less than in other industries where high investment in plant is often necessary. This limited amount of monetary resources makes it equally, if not more, important to maintain a rigorous financial control over such aspects as cash flow, liquidity and the allocation of resources to individual fields of firm's activities by using modern management skills and tools at all stages of the project.

The delays caused by cash flow problems in building projects resulting in unproductive costs due to project suspension, abandonment, termination and re-award can be controlled by applying the following measures:

1. Project account may be opened in a convenient bank after working out the details of the project programme and duration of the project.
2. How much may be required for the project within certain regular periods can be determined or estimated.
3. A list of all the parties that may make claims and their representatives may be submitted.
4. The format for making claims and recognised mark of the certifiers be decided and designed.

Valuation will be made in the normal way or as specified in the contract conditions for interim payments.

On the presentation of recognised papers by the representative of any of the parties, money may be withdrawn in normal way. Normally payment will be made less retention and the documents to be presented to the bank must have taken care of retention so that net due is shown.

CHAPTER EIGHT

8.0 CONCLUSIONS AND RECOMMENDATIONS

In the preceding chapters, a critical examination of building costs has been carried out to identify unproductive costs in building projects and recommend ways of minimising them.

8.1 CONCLUSIONS

During the course of this research work, it has been discovered that unproductive costs in building projects are mostly associated with administrative lapses in procedures and inadequate management skills and tools at both pre-contract and post-contract stages. They include:

1. The application, registration and renewal fees charged by the employers to the contractors though logical but due to poor implementation constitute unproductive costs in building project because win or lose, the contractors include these expenses whenever they submit their tenders to the clients. Therefore, the main purpose of charging these fees is rather defeated.

2. The application of foreign codes of practice, specification, contract conditions and sometimes design in preparing contract documents by the consultants without necessary modifications to conform with the local conditions and needs, usually creates problems due to low level of technology. These problems include poor quality of structure, scarcity and/or non-availability of specified items, wrong interpretation of contract conditions and incomplete contract documents leading to unproductive costs.

This is observed in Kashim Ibrahim Library Building where the central air-conditioning unit specified by the design consultants at a cost to the client of ₦520,556.49 for supply and installation of the unit that has never functioned because of poor installation and low voltage supply by the National Electric Power Authority. This situation has led to insufficient ventilation of the building.

3. The tender processing and/or non-refundable fees charged to contractors for collecting tender documents by the client constitute unproductive costs particularly in case of abortive tendering. Ironically, these fees are reflected in the tender figures submitted to the client by the contractors which account for about five per cent of project cost.

4. The political and selfish considerations that characterised the decisions of most tenders boards in selecting the 'right' contractors normally lead to outright disregard for the consultant's recommendations. The case of the New Student Centre is a good example where the client awarded the contract to Zazzau General Trading Company as against the consultant's recommendation of Abunks Nigeria Limited. A week after the contractor signed the contract, the project was sub-contracted to Devenco Nigeria Limited by using the Oath of Attorney which was later terminated by the client due to excessive delay and non-performance by the contractor.

5. The social ills such as bribery and corruption either in cash or in kind are being practised in both private and public sectors. This is very difficult to establish because those involved take necessary measures not to be discovered. Indeed social abuses are great diseases that immensely contribute to unproductive costs in building projects. These costs are not at all expended into the projects but concealed under public relation sums.

6. The delay in procurement, scarcity and non-availability of materials and components usually retard the progress of building works resulting in unproductive costs. Delay in procurement leads to loss of production time. Non-availability leads to variation orders resulting in revision of drawings and hence prolonged duration of contract period, increased cost and re-planning of contract programme. Scarcity creates high market values resulting in escalation of material prices and claims as observed in Kashim Ibrahim Library Building where the contractor reported shortage of materials leading to prohibitive prices. Against this trend, the contractors complained bitterly and remarked that they may not wish to continue just in the name of progress except they would be reimbursed. The air-conditioning unit was placed early on order from abroad but arrived very late after most of the building works were already completed.

7. The construction methods usually influenced the rate of production and quality of work. Therefore, slow production means delayed returns on investment and poor quality which results in unsatisfactory performance. Faults were noted in the New

University Bookshop by the structural consultants such as countless honeycombs and the edges of the beam were not straight due to improper vibration of the concrete and the latter due to bad shuttering. The structural consultants confirmed the initial collapse of the roof beam which was attributed to bad construction method by the contractor.

8. *The insufficient considerations before hiring or buying* mechanical plant and equipment, poor plant matching and inadequate production planning cause under-utilisation of machines at sites. This results in unnecessary expenditure. It was discovered in Kashim Ibrahim Library Building that the air-conditioning units each weighed six and a half tons which had to be lifted and placed on the centre of the third floor of the structure where the plant room is located. The main contractor had no crane that could hoist such weights and besides the available cranes were such that when located anywhere along the external perimeter of the building, it would be impossible for them to reach the plant room.

9. The problems of shortage of qualified personnel, staff redundancy and incompetency, lack of staff incentive, motivation, training and welfare by the employer usually result in poor productivity, low standard of workmanship and slow development of skills with the outcome of useless expenses in building projects. It was discovered in Kashim Ibrahim Library Building that at the time of preliminary estimate, no detailed drawing on services were received; as such provisional sums were allowed for. There were

still no complete set of drawings after about six weeks of commencement of construction works to confirm certain materials order. This gave rise to claim right from the onset due to incomplete contract documents.

10. The administrative lapses and poor management skills and tools mostly lead to poor level of performance in terms of money, time and quality of building. This situation has led to excessive and expensive variation orders, fluctuations and delays resulting in unproductive costs. In the case of the New Student Centre, the client changed the position of the site after the contract was awarded. This action cost the client the sum of N500,000.00 as variation for sub-structure. The main contractor sub-contracted the entire project to a sub-contractor a week after signing the contract. Later on, the sub-contractor also abandoned the project because the expatriate management staff including the project manager left the country without notice to the indigenous partners. The client terminated the contract because of excessive delay and non-performance by the contractor.

11. The cash flow problem from the building team mostly retard the satisfactory execution of building projects. The delay in honouring interim payments by the employer to the contractors and suppliers frequently results in contractual claims like escalation of materials and labour, loss and expense and interest charges on monies borrowed from banks to finance the project by the project team. The overall outcome of this action is inconsequential spending on the building projects. The three

building projects studied reveal that total unproductive cost of N1,971,417.29 representing 45 per cent of the total initial contract sum of N4,373,558.57 was incurred. The breakdown of total unproductive costs shows that N826,364.44 for variations, N243,151.88 for fluctuations, N228,996.89 for delays and N672,904.11 for others, which accounted for 42 per cent, 12 per cent, 12 per cent and 34 per cent of total unproductive cost respectively.

8.2 RECOMMENDATIONS

In view of the above findings, the following recommendations became necessary with the hope that when applied judiciously, they will drastically minimise unproductive costs in building projects:

1. The application, registration and renewal fees charged by the clients to contractors should be abolished because of poor implementation and the contractors usually include these fees in their tender sum. In case of abortive tendering, the processing and/or non-refundable fees are often transferred by contractors to subsequent tenders as a means of recovery. This practice may reduce their chances of winning the next tenders. Therefore, these fees should also be abolished to minimise contractors general overheads.

2. The appointment of consultants should be based on merit and their duties and relationships with other members of the project team should be clearly stated. The consultants should extract adequate and detailed information from the client regarding their

requirements at the briefing stage to prepare detailed and accurate contract documents constructed with simple language. Design should incorporate local practices and materials. Drawings, specifications and bills of quantities should also be clear, self-explanatory and should be related to methods, procedures and performance before tenders are invited. This will drastically reduce project variations, fluctuations and delays at construction stage.

3. The award of building contracts by the tenders boards should be based on sound principles and realistic approach in deciding what to do, who to do what and how best it can be done. This entails certain guidelines which are dependent upon the structural definitions as well as the policy of the organisation, technical ability and the available resources for the project execution. Social ills due to political, economic and bureaucratic problems which impair political development, economic efficiency and bureaucratic effectiveness should be controlled by government through ethical re-orientation of the general public and efforts to simplify administrative procedures and to strengthen financial management recording and reporting requirements.

4. Before purchasing, hiring or leasing mechanical plant and equipment, contractors should take serious considerations of such aspects as: cost per hour of operation, duration of the project or the future availability of projects which will require the use of such machine to ensure effective plant utilisation. The levels of productivity and utilisation of manpower should be based on

good working conditions, proper planning operations, efficient work methods, demarcation of responsibilities, relevant training and adequate motivation provided by financial and other incentives in order to control unproductive costs since building projects are labour intensive.

5. The project management should have systems of communication and control based on skills and experience. The management should be flexible to adapt to changing situations, to recognise signal of danger or opportunity and to provide leadership and direction. The management should also evaluate results for comparison with set out standards and apply remedial actions to deviations as a means of controlling unproductive costs. Furthermore, rigorous financial control over project cash flow, liquidity and allocation of resources to building activities at both pre-contract and post-contract stages should be employed by the management using simple skills and tools. Project account should be opened in a convenient bank after working out details of the project programme to prevent cash flow problems resulting in variations, fluctuations and delays leading to unproductive costs.

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APPENDICES

Appendix 2/I

THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

(OFFICE OF THE REGISTRAR)

REGISTRATION/RENEWAL OF REGISTRATION OF CONTRACTORS AND CONSULTANTS

1. PROCEDURE FOR REGISTRATION OF CONTRACTORS AND CONSULTANTS

The Federal University of Technology, Akure wishes to register, and renew the registration of Contractors and Consultants for the 1991 Fiscal Year, that is, 1st January to 31st December, 1991. Suitably qualified and experienced companies, firms and individuals interesting in working for the University may apply for forms from the Registrar, Federal University of Technology, P.M.B. 704, Akure.

2. CLASSIFICATION OF CONTRACTORS

i) Category A

Minor Contractors and Supplies (up to ₦25,000.00): Uniform and Tailoring, Interior Decoration, Printing, Local Building Materials, Stationery, Drugs, Food Stuff, Manufactured Goods (other than food stuff), Furniture.

ii) Category B

Building, Civil Engineering, Electrical, Furniture, Plumbing, Mechanical. This category is sub-divided into:

B1 - Maximum contract value up to ₦ 25,000.00
B2 - Maximum contract value up to ₦ 100,000.00
B3 - Maximum contract value up to ₦ 500,000.00
B4 - Maximum contract value up to ₦1,000,000.00
B5 - Maximum contract value up to ₦2,000,000.00
B6 - Maximum contract value over ₦2,000,000.00

iii) Category C

Interested qualified and experienced Consultants in:

1. Architecture
2. Civil/Structural Engineering
3. Electrical Engineering
4. Mechanical Engineering, and
5. Quantity Surveying.

(Consultants who are currently registered with the University need not re-apply).

3. REGISTRATION FORMS

All applicants are requested to complete registration forms as follows:

Category A (Minor Contractors/Suppliers) Form RC1

Category B (Major Contractors) Form RC2

Category C (Consultants) Form RC3

4. APPLICATION FEES

Application forms can be obtained from the Office of the Registrar, Federal University of Technology, Akure on payment of the appropriate fee to the University Bursar in Bank draft/ certified cheque, cheque/cash made payable to the Federal University of Technology, Akure as follows:

Category A (Minor Contractors/Suppliers) - ₦20.00

Category B (Major Contractors) - ₦30.00

All applicants, with the exception of consultants, are required to pay application fees.

5. REGISTRATION FEES

Successful applicants shall pay registration fees as follows:

Category A1 - ₦ 100.00
Category B1 - ₦ 100.00
Category B2 - ₦ 200.00
Category B3 - ₦ 400.00
Category B4 - ₦ 600.00
Category B5 - ₦ 750.00
Category B6 - ₦1000.00
Category C - No registration fees.

6. RENEWAL FEES

The above does not affect contractors who are currently registered with the University. Such contractors are, however, advised to renew their registration by paying the stipulated 50% of the original fee. Contractors currently registered with the University but who seek a re-grading are requested to pay the full registration fees stated above.

7. QUALIFICATION FOR REGISTRATION

a) All applications must be accompanied by:

i) Photocopy of Certificate of registration in the appropriate categories of the Federal or State Ministry of Works.

ii) Tax Clearance Certificate for the last three (3) years.

b) In particular, applicants for registration/renewal in categories B2 to B6 must supply the following additional information:

1) Category B2 - Maximum Contract Value up to ₦00,000.00

Contractors should show evidence of:

i) Successful completion of at least one (1) job valued up to ₦100,000.00. Such proof should come from client.

ii) In the case of regrading, evidence of successful performance as a FUTA Contractor in Category B1.

iii) Photocopies of credentials of at least one(1) skilled supervisory employee in the relevant trade.

iv) Registration with either Federal or State Ministry of Works.

v) Photocopy of Business Registration.

vi) In case of Partnership, if one of the partners is a professional in the relevant area of registration, items (1) and (2) may not be required.

2) **Category B3 - Maximum Contract Value up to N 500,000.00**

1) Same as in B2.

2) Certificate of Incorporation and proof of successful performance of jobs valued up to ₦500,000.00 or proof of successful performance of job(s) with FUTA valued up to ₦500,000.00 where certificate of Incorporation is not available.

3) Evidence from the Bank of credit worthiness of contractor.

3) **Category B4 - Maximum Contract Value up to ₦1 million**

1. Same as B3 plus
2. List of professional employees
3. Inventory of plant and machinery

4) **Category B5 - Maximum Contract Value up to ₦2 million**

1. Same as B4 plus
2. State Consultants worked with.

5) Category B6 - Maximum Contract Value up to and above N2 million

1. Same as B5 plus

2. Applicants must have handled a contract worth no less than N2.5 million

6) FILLED AND COMPLETED FORMS SHOULD BE SENT TO:

The Registrar
Federal University of Technology
P.M.B. 704
Akure, Ondo State.

To reach him not later than 31st December, 1990.

No new applications will be entertained after 31st December, 1990.

Signed:

BABATUNDE A. ADEBAYO
Registrar

Appendix 2/II

AHMADU BELLO UNIVERSITY, ZARIA

Tender notice to ABU registered contractors and contractors registered with either Federal or State governments in the equivalent categories.

INVITATION TO TENDER FOR THE CONSTRUCTION OF AERLS OFFICE BLOCKS BUILDING PROJECT AB/AERLS/77

1. Tenders are hereby invited from Building and Civil Engineering Contractors registered under Category C3 and above and having at least 4 (four) years experience with Ahmadu Bello University Capital Project and/or similar experience elsewhere in Nigeria for the construction of AERLS Office Blocks Building - Project AB/AERLS/77.

2. Contractors not previously registered with Ahmadu Bello University but registered with other Federal and/or State government under the equivalent categories may tender upon payment of the appropriate Registration and Processing fees as shown below:

CATEGORY	REGISTRATION FEE	PROCESSING FEE
C3	₦250	₦ 500
C4	₦500	₦1000

3. Tender Documents may be obtained on application by post or by personal call on the Director of Works, Estate Department, Ahmadu Bello University, Zaria upon payment of the appropriate non-refundable processing fee and/or registration fee as the case may be.

4. All applications must be accompanied by original copy/copies of the receipt(s) of the Registration/processing fee(s).

5. All Tender Documents must be submitted in sealed envelopes marked "CONFIDENTIAL TENDER FOR PROJECT NO. AB/AERLS/77", addressed to the Registrar, Ahmadu Bello University, Zaria and should reach him not later than 31st January, 1978.

6. The University Tenders Board is not bound to accept the lowest or any tender.

SIGNED:

T.K.O. OKPAPI
Secretary
University Tenders Board.