SITE COST CONTROL MODEL FOR MEDIUM SIZED BUILDING PROJECT

BY

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A thesis submitted to the Postgraduate School Ahmadu Bello University, in partial fufillment of the requirements for the degree of Master of Science (CONSTRUCTION MANAGEMENT)

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December, 1989

DIGITIZED

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 meams of references.

Signed:----------

SHEHU BATURE GARBA

December, 1989

CERTIFICATION

This thesis entitled "Cost Control Model for Medium Sized Building Project" presented by Shehu Bature Garba meets the regulations governing the award of the degree of Master of Science of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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ACKNOWLEDGEMENT

My sincere gratitude must be echoed here to all those who helped in their various forms in the production of this work. I feel indebted particularly to the following:

1. Mr. Z.J. Sikora M.Sc., P.G.C. - Senior Lecturer, Department of Building and Supervisor, for the initial inspiration and kind assistance.
2. Mr. A.E. Larri B.Sc., M.Sc. - Lecturer, Department of Building, and Co-Supervisor his kind assistance.
3. Mr. Ukpon A. Kennedy - Lecturer, Department of Building and former classmate for his invaluable assistance.
4. Mr. Martindale - Chief Quantity Surveyor Songhai Limited, for providing research data.
5. Mr. Rando - Supervisor (Engineer) Songhai Limited for providing research data.
6. Mal. Abba Bello Ingawa - Friend, former classmate, for providing research material and useful advice.
7. Mal. N.A. El-Rufai - Friend, for assistance with research material.

8. Mal. Salihijo Ahmad - Friend, for useful suggestions.

9. Mal. Nuhu A. Umar - Classmate, friend for providing the secretarial needs of this work.

10. Mal. Abubakar Abdu - Classmate, for his invaluable assistance.

Lastly, but by no means the least, I would like to thank Ibrahim Williams for carefully typing this piece of work.

ABSTRACT

The practice of cost control as is obtained on the medium sized construction sites was compared and weighed against the cost control systems and procedures obtained in management and construction literatures. The differences were highlighted, the similarities upheld and possible areas of adjustments suggested. A subsequent site cost control model was proposed, which is designed to take care of the lapses envisaged by the theories, without necessarily making the procedures too cumbersome for apprehension by the site **staff and/or** too costly to be maintained by the management.

D E D I C A T I O N

To my mother Hauwa

my unknown wife called Hauwa

whose passionate thoughts occupy me through the hour

To all my brothers

who complimented the work of others

to see me float above bothers

To all those I call My-sister

whose prayers are that I become a minister

to have their kin listed in the honoured register

To those my friends

whose advice was that I make amends

to my life-style and principles to follow the trends

To the late sir Ahmadu Bello

who spear-headed the creation of Ahmadu Bello

the university whose teachings brought me up from below

To all lovers of peace

and justice

without prejudice

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1.0 CHAPTER ONE

1.1 General Introduction

The purpose of setting up most businesses is to make profit and increase worth thus opening a path for further advancements. Construction business is one of those businesses that are gone into largely for this simple reason. However, this speculation has not been exactly true with many a construction company. Some construction organisations come into being in order to make profit for the owners but end up creating liabilities at the end of the day, thus bringing about the demist of the enterprise prematurely through subsequence bankruptcy fueled by incompetent resource management personnel and techniques.

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Suffice it to say that the demise of such enterprises is to a very large extent the "hand work" of the organisations responsible for the administration of the businesses themselves. One of the areas in which an administrative and technical flaw may cause serious financial problems to any business is the "Cost Control" aspect of its operation.

In this work a site cost control model will be presented in the three main areas that it will be most effectively applied on the building construction site, namely, (1) Labour (2) Materials and (3) Equipment.

Of course, other areas which accept on-site-cost-control but to a very minimal extent will be made mention of and possible techniques applicable will also be highlighted.

1.2 Background

The construction business is one of the easiest to fall into with the required starting background, which could be in the form of investable capital, political patronage, influential connections and to some extent skill or general proficiency in construction. This is in contrast to other aspect of business in the economy which might require apart from the aforementioned more acumen in what ever one chooses. This relative ease of entry into the construction business encouraged many who would have otherwise been doing something else, to go into the industry. The attendent consequences of this is the execution of projects with almost total disregard for the rule governing same. While this could be said of some construction businesses others are due to absolute ignorance of the techniques that go with the successful running of such enterprises. In a nut-shell, the in-flux of people who are ill equipped technically and financially into the construction industry can be associated directly to the "non-performance" of the building industry in this country. One of the ways in which such an unhealthy situation could be remedied is by educating all and sundry in the construction industry on methods of realising set financial goals without necessary

going into such absordities like absconding with mobilisation fees, abandonning uncompleted projects, conniving with government officials to inflate contract figures etc. One of such methods may be by developing a cost constrol model which might be applicable to the medium sized building construction project regardless of educational background and/or financial status of the handlers.

1.3 Purpose Of The Work

This work is intended to give an insight into methods of controlling costs of construction as it affects the medium sized construction companies in Kaduna State. It is realised that what ever measures are taken as strategies for realising any particular goal may not be entirely applicable to all categories of construction, in other words, the process of any suggested solution to any particular problem in a construction company depends on among other things the size and hence the constructional capabilities of that enterprise. With this in mind this work intends to present their cost control model as is relevant only to the medium sized construction site.

1.4 Scope Of The Work

While there are many areas in which the cost control systems need to be improved upon, this work will be concerned with practical cost control on the site only (as against that of the project as a whole which might include pre-tender planning, budgetting, monitoring and controlling) with emphasis on resource (labour, material and plant) monitoring.

A careful study of the management of these resources on various sites with different management approaches and sizes will result in a fairly agreeable and useful cost control system for these resources to a larger section of the industry.

1.5 Limitations

This work due to limits of time and resources to back up the research is limited to four case studies. These selected cases all fall under the medium sized building construction projects. The particular attention given to the medium sized sites is due to the fact the "over 90% of building projects fall into this category".(2) The selection of these sites has also been limited to Kaduna because it has been found that generally for these medium sized projects the modes of operations on the sites are common throughout the industry in this country; any appreciable differences are found perhaps in the cost of materials at the different parts of the country but not in the modes of operation.

1.6 Nature And Order Of Presentation

This work has been divided into four chapter:-

Chapter I - General Introduction

This chapter introduces the work generally by giving its background, need, purpose, scope and limitations. This simply tries to show the purpose of the work and to whom such a development is relevant.

Chapter II - Cost Control Systems

This chapter highlights some theoretical cost control systems relevant to the aims of the work with a view to presenting cost control from a wider perspective in order to provide a basis for comparisons; adjustments and possible adoption into the practical systems obtainable at the sites.

Chapter III - Case Studies And Analysis

This could be said to be the core section of the work, as it deals with the collection of data, subsequent analysis of same and a final development of the model.

Chapter IV - Conclusion And Recommendations

This chapter deals strictly with the result attained from the suggested model with some advice on most effective ways of achieving uptimum advantages derivable from the model.

CHAPTER TWO

2.0.0 LITERATURE REVIEW

2.1.0 Cost Control System And Procedures

A review in 1973 of the use of the cost control procedures by Cooke , found that most medium sized contracting organisations (that is, building firms employing 60 - 299 staff and operatives) applied a monthly form of cost control, relying very largely on the comparison of monthly cost and value to asses the profit or loss situation in the course of construction operations.

Cooke (1979) further asserts:

"Few medium sized organisations operate weekly cost control system. Such systems reduce the dependence of the management on monthly cost-value comparisons for site control purposes, since operational costs are reviewed over shorter periods. Large organisations, which rely more often than smaller firms on weekly control systems, are also more remote from their sites and rely on financial statements produced from accounting data rather than on reports based on site cost information."

Financial control depends upon monthly cost value comparisons. These may be presented in tabular monetary form or be expressed graphically for comparison with the contract budget forecast. If, for control purposes, it is found necessary to introduce a weekly system, then this must be reconciled with the monthly account periodically.

2.2.0 Objectives Of Monthly Procedures

The exercise of financial control is a form of monitoring. It oversees financial performance without dwelling on the detail and, in its adverse reports, direct senior managers and directors to situation that appear to justify investigation. The cost data collection system at site may respond with useful and reliable information that explains the situation. Even if it does not, transactions would have been made. Given a classification of the cost data in terms of the factors of production - labour, materials, plant and overheads -- it should be possible to determine whether one of these is a particular source of loss, and so to direct the search for an explanation.

Beyond that point, the organisation and equipment of the firm will determine whether it will seek to obtain yet further detail from its site cost - control procedure, or instead to rely as most do, on various measures of physical control (which indicate productivity or utilization as a guide to cost).

The objectives of such procedures are:

1. to derive from the accounting procedures of the firm a monthly indication of contract status, and
2. to provide directors and senior managers with a guide to those activities of the firm that require their attention.

The limited detail and the necessity for further enquiry are reasons enough to emphasise the importance of speed in the presentation of such reports. The report on events that occured, on average, two to three weeks previously. By the time the report appears the cause of a situation is likely to be a month old. To extend this time very much reduces the control effectiveness of the procedure.

2.3.0 Accuracy Of Monthly Data

The liquidity of the company's funds depends upon the valuation of work done and the control of outgoings. It may be necessary to press hard for the one and delay the other. Its figures are then not of liabilities and entitlement but of receipts and payments. To base the monthly report on the latter, without reconciliation, would be misleading.

The quantity survey is required:

1. to reconcile the valuation to a common date;
2. to make adjustements for variations pending agreement;
3. to prepare an assessment of the increased cost element to date;
4. to assess items of day work;
5. to assess the value of remeasured work sections that may influence the value of work undertaken.

An internal adjustment to the valuation must be undertaken within a period of seven days of the valuation day.

Ledger accounts and records prepared by the accountant must be in such a form that reconciliation with other information source is possible. An assessment must be made of all goods received on the site up to the date of closing the ledger. Where invoices are outstanding for any goods delivered to site an assessment of the anticipated cost of the goods must be provisionally debited to the ledger. The ledger account should of course be checked carefully as an aid to reconciliation.

2.4.0 Cost-Value Comparisons - The Constractors Surveyor Responsibility

Cost-value comparisons are conveniently carried out monthly in the course of a contract, so as to coincide with the quantity surveyors' valuation in seeking an interim certificate.

Cooke (1979), clarifies thus:

"The contract surveyor is responsible for producing the valuation data and, since this is to be used for cost comparison, it must be a fair estimate to the value of the completed work and not a factual statement of the lowest expection (omitting variations etc.)"

The clients quantity surveyor is responsible for preparing the monthly payment certificate; in order to ensure that the contract is accurately valued, the contractors surveyors should check the inclusion in the valuation of the following items:

1. Increased costs
2. Assessment of the value and agreement of Valuation issued
3. Assessment of the value of day works
4. Remeasured work sections of the account

2.4.1 Increased Costs

Increased cost returns for labour and material on flunctuation contract must be submitted in sufficient time for inclusion in the account. Returns should be submitted monthly at least 7 days prior to the interim-certificate date in order that they can be checked and certified.

The increased cost of material delivered to site and of labour will be included in the contractor's cost ledger. Gross errors in the assessment of the increased costs bear directly on the apparent profit or margin recovery.

2.4.2 Assessment Of The Value And Agreement Of Variation Issues

The tactics associated with variations and claims are affected by many factors, not least the character and attitude of those concerned. Variations should be agreed as they are carried out and included in the next valuation due if the out-come is to represent the situation properly.

. Where this is not possible, it is desirable to include provisional assessment figures rather than omit such figures all together. If these represent the minimum expectation from protracted negotiations then the contractor may not be aware of a substantial hidden value of variations during the contract towards the end of the contract, or at the final - account stage.

However, cost incurred in carrying out variations will have been included in the labour and material costs and will be reflected in the accounts.

2.4.3 Assessment Of The Value Of Dayworks

Similar procedures should again be adopted. Daywork sheets must be prepared weekly and signed, and their value is included in the next certificate.

2.4.4 Remeasured Work Sections Of The Account

It is the contractor's responsibility to ensure that full documentation regarding remeasurement records are submitted to the client's surveyor.

As soon as possible after completion of a bill section say, substructures or drainage - a remeasure for the work should be submitted for checking and approval. This may then be included in the valuation.

2.5.0 Inaccuracy In Interim Valuations

Cooke[2] claims that experience has shown that contractors tend to under-value work in progress. Some of the areas he highlighted as "of concern" are:

1. Assessment of materials on site
2. Assessment of the value of measured work.

2.5.1 Assessment Of Materials On Site

The materials on site should be values for inclusion in the interim certificate. This will involve the careful checking of stockpiles of bricks, blocks, timber, frames and fittings.

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To assist the accurate assessment of materials on site, preprinted check sheets may be used. These should include basic material prices. The value of special items may be checked by reference to resent delivery note. On large housing site many thousands of pounds worth of goods may be stored in completed dwellings or garages. Appropriate time must be allowed for the correct assessment of the value of materials on site.

This appears to be one of the main sources of inaccuracy.

2.5.2 Assessment Of The Value Of Measured Work

The value of measured work may be assessed in various ways:

1. The value of bill items may be considered on an individual basis, item by item. On a large project this process tends to be laborious, and surveyor may revert to valuing the percentage of each page completed.
2. The percentage value of each trade may be assessed. A more operational form of bill might simplify such assessment.
3. Schedules analysing the trades or operations to be carried out may be prepared. Individual blocks of flats or houses may be valued in lifts of brick work, expressed as a percentage value of the trades section or measure for each house type. Simple tick sheets may be produced to simplify the valuation process. Undervaluation holds back monies until later stages of the contract and thereby distorts cost-value comparisons and controls based on them.

4. Contract preliminaries should be assessed carefully at each valuation stage. The value of each preliminary item may be received to see whether the total sum may be released or only a proportion. The basis upon which to determine the proportion may be based on contract duration or on the percentage value of measured work.

2.6.0 Quantity Surveyor's Monthly Reports

In order that internal adjustments may be made to the valuation it may be necessary to submit a surveyor's monthly valuation report or progress reports. This enables adjustments each month to be received and compared. In the firms reconciliation of the valuation it is necessary to ensure that something approaching the true value of work is compared with a realistic contract costs. Adjustments can be made for the following factors.

1. Under-or overvaluation of measured work sections;
2. Variations to the contract that have been carried out but not yet agreed for inclusion in the account;
3. Items of daywork undertaken but not agreed for inclusion in the account;
4. Assessment of remeasured bill section;
5. Assessment of increased costs for the main contractor's labour and material;
6. Adjustment of preliminaries for capital costs expanded but not yet recovered.

The surveyor's report also enables the claims situation to be reviewed along with any extension of time applied for and granted. A review of progress will indicate any delays to the contract - that is, weeks ahead of or behind the programme. The adjusted gross value indicated on the surveyor's report can be used for comparison with the actual cost situation, thereby permitting realistic comparisons and reviews of the contract's profitability in the course of the work.

2.7.0 Sources Of Monthly Cost Data

(The Accountant's Role)

"Accountancy staff are responsible for the record of transactions associated with the contract. Costs should be recorded in such a manner that reconciliation of liabilities and payments can take place at a given date each month. Figures that related to an agreed valuation date (say the fourth Friday in every month) are required." - Cooke (1979)

Payroll, transport and plant accounts will often be debited to the contract ledger account weekly.

Accounts for materials supplied to the contract, the payments of subcontractors and head office overheads will normally be debited monthly.

Sundry expenses for small purchases at site level that is, weekly expenses for office, the purchase of small tools - are charged as they arise, but may be paid directly or by monthly account paid one, two or more months after the receipt of the goods on site.

This is dependent upon the supplier's promptness in submitting accounts and liniency with regard to credit, the credit rating of the contractor and the pressure on his liquid assets at the time.

At the data of reconciling the cost ledger, some allowance will have to be made for goods received on the contract for which invoices have not yet been rendered. An account of goods received during the month must be reconciled with invoices received for payment. Invoices not included in an account should be priced up at the quoted rates and a provisional sum entered in the cost ledger.

Both direct and nominated subcontractors should be instructed to make payment requests 7 days prior to the valuation date.

This will enable the account to be checked and included in the valuation and debited to the contract ledger account.

The monies allocated in the valuation for a subcontract trade should be carefully checked against the subcontractor's invoice requesting payment. Over payment to subcontractors can give rise to discrepancies, especially where the amount included in the valuation for the subcontractors is difficult to analyse and abstract from the bills of quantities.

2.8.0 The Contract Ledger Account

Cost data should be entered into the accounts ledger under the headings appropriate for comparisons.

Cost centres or cost headings should:

1. be related to activities that are readily identified;
2. be adaptable for comparison with monthly valuation data;
3. reflect expenditure on contract preliminaries, and
4. be identified with areas of expenditure on subcontractors, and specific units of labour and plant whenever possible.

2.9.0 Cost Centres For Ledger Accounts

The number of cost headings is required to be sufficient to meet the demands of those seeking information from the cost system.

The cost headings should aid the surveyor's monthly valuation analysis. The choice of cost headings in the ledger account should facilitate the quantity surveyor's reconciliation statement. Cooke (1979) asserts:

> "The following cost headings have been used for a simple ledger-accounting system in a medium-sized contracting organisation.
>
> 1. Trade Activities - Labour:
>
> Direct wages to operatives by trade;
> Salaries - site management,
> payment to labour - only subcontractors
>
> 2. Materials:
>
> Direct materials debited to the contractor
>
> 3. Plant:
>
> Plant-hire charges - outside hire;
> internal plant charges.
>
> 4. Preliminaries:
>
> A selected number of different cost headings may be developed depending upon the information required by the company:
>
> (a) setting up site accommodation
> (b) telephone/heating

(c) site-management salaries/expenses
(d) scaffolding
(e) sundry site expenditure/consumable stores

5. Own Subcontractors:

Payment to subcontractors directly employed by the contractor.

6. Nominated subcontractors:

Payments debited

7. Nominated Suppliers:

Payments debited

8. Head-Office Overheads:

These may be charged separately to the contract or indicated in the ledger account.

9. Total Cost

The ledger account must also contain information relating to the date of the entry, account or invoice reference/firm and amount invoiced. The accounts department may utilise their own system of invoice numbering but a coherent system of coding for the whole firm may reduce any possible confusion. The table indicates a cost ledger card statement for the allocation of construction cost".

2.9.1.0 Procedure And Reconciliation At Monthly Intervals

At some date each month (such as the 28th day) the ledger account should be closed and totalled.

An assessment must then be made of outstanding invoices and entries to be included in the ledger, as follows:

1. The value of goods delivered to site for which invoices have not yet been received may be assessed by pricing delivery notes at quoted or current material rates.

Table 1

CONTRACT: ..... COST LEDGER SHEET: .....

JOB NO: ..... DATE: .....

Date	Ref. Details	Invoice Ref.	Amount	Labour Wages	Material	Plant	Preliminaries			Own S/C	N/S/C	N/S	H.O. Overheads
							Site Staff	Scaf-fold	Temp/ Sun				
		B/F											
							Total	Cost	To:-				£

CONTRACTOR'S LEDGER
SOURCE: COOKE etal.

2. The contractor's monetary commitment to subcontractos for work undertaken to date and included in the valuation must be assessed. Domestic subcontractors are frequently dilatory in their invoicing procedures and the contractor must be vigilant if he is to avoid inaccuracy. High profit margins shown during the contract may be reduced dramatically when final accounts from subcontractors are received.

Entries in the valuation for nominated subcontractors and suppliers must be cross-checked in the ledger account. The quantity surveyor's monthly statement may show the contractor's commitments to subcontractors with any difference between monies included to date in the valuation and invoiced amounts requested by the subcontractor.

The accountant and the chief surveyor will compare the reconciled cost and value figures monthly. A cost-value report indicating the situation on all contracts in progress might be similar to the examples in pg.18 and 20, which provide a statement of the monthly and cumulative cost-value situation for presentation to the director.

Figure on pg.18 indicates the contract cost-value position to date on all contracts in progress. Figure on pg.20 enables the cost and value to be compared on a monthly year-to-date and contract-to-date basis. The percentage profit or loss to date is indicated and also the current retention situation.

Table 2

MONTH	MONTHLY COMPARISON OF COST AND VALUE											DATE: SHEET NO: PREPARED BY:
		Month			Year To Date			Contract To Date				
Value Of Contract	Contract	Cost	Value	Profit/ Loss	Cost	Value	Profit/ Loss	Cost	Value	Profit/ Loss	Profit Loss %	Retention Held To Date	Notes/Action

CONTRACTOR'S COST VALUE COMPARISON
SOURCE: COOKE etal.

2.9.2.0 Monthly Cost Statement Of Commitments To Subcontractors

In order to assess the commitment to subcontractors, both own and nominated, a monthly cost statement may be prepared at the valuation date. The figures may later be used in developing the cost value comparison. The amount due to each subcontract is derived from an analysis of the monthly valuation and clearly the subcontractor's certificate must not exceed this amount. If domestic subcontractors under-value and thus fall behind with their payment requests, this is of benefit to the main contractor's cash-flow position but he must know the true liability involved.

Analysis of the subcontractor's quotation is necessary in order to assess the difference in margin between the main contractor's bill rates and the subcontractor's quotation. From this analysis the commitment to the subcontractor can be assessed. The statement enables the valuation adjustment to be estimated and the adjusted gross value to the month end to be shown.

2.9.3.0 Analysis Of Monthly Cost Data By Management

The cost-value situation of contracts is reviewed monthly, not only as a form of production control but in order that the directors may decide on marketing strategy and any financial measure needed to ensure that resources are adequate. Action arising from the analysis of contract profitability will be delegated to the appropriate contracts manager in most cases. Apparent losses or reductions in profit margins that may cause

the cash-flow position to worsen are the concern of the accountant.

Quite apart from confidence in its accuracy the cost value comparison must be available as soon after the month end as possible in order that any action based on the analysis will be in time to be effective; if the analysis is of only historical value, then, it reflects a control system without dynamism.

Research by Cooke in 1973 showed that most companies relying upon monthly cost-value comparison to provide profit data were able to produce the information within 7 - 10 days of the valuation date. Companies with weekly cost control procedures relied upon monthly cost data for control information and comparisons took longer - up to 21 to 28 days after the valuation date.

Contractor's surveyors have to be aware of the purpose of the information they are producing and the need for accuracy during its collection and presentation. Surveyors should ensure that they value as accurately as possible and refrain from holding monies back at the valuation stages. Accuracy of data and speed of the analysis are essential prerequisite of a monthly cost reporting system.

2.9.4.0 Action On The Basis Of Monthly Cost-Value Comparison

Where cost-value comparison shows adverse trends, or where a loss in the month is reported, investigation is necessary.

A director or contract manager would normally be delegated to the task of determining the source of the losses.

The investigation might consider the following aspects:

1. Accuracy of cost and value of data
2. Analysis of labour, plant and preliminary costs
3. Effectiveness of site management team

2.9.4.1 Accuracy Of Cost And Value Data

Accuracy of the data on which the cost-value, comparison are based must be established. The first action of most experienced managers faced with a reported loss is to check the accuracy of both the valuation and cost ledger data. In practice, Gross errors have been observed in these areas, especially i n the build-up of the adjusted valuation figures.

2.9.4.2 Analysis Of Labour, Plant And Preliminary Costs

The comparison of forecast values for cumulative labour and plant costs with actual values may suggest that attentions should concentrate on one or the other. Trends are more valuable indicators of the situation than individual stage values. Uder-estimation of the preliminary items may occur when tendering. This, rather than mismanagement or irrecoverable variations in real cost, may give rise to loss.

2.9.4.3 Effectiveness Of Site Management Team

The arbitrary removal of the manager of a contract that is recording a loss is not unusual. It allows losses thus far to be treated as history; the new man to have a fresh start and his seniors can be seen to have taken actions. However, it is unlikely to lead a significant improvement where bad estimating is the cause of the losses.

A proper course of investigation is to analyse the problem and determine the action necessary to improve the position, preferably in an atmosphere free of the threat of retribution. Under threat, the value of information may well suffer. The short time planning facilities available to the site manager influence the use of resources. A weekly review of progress and plans for following week permits direct action. Monthly cost-value comparison are reporting past performance and few courses of action will be able to affect the current profit or loss situation. Such courses of action can only hope to affect the future cost-value figures. Cost-value report can only become vehicles for production control decisions if the figures are adjusted to treat entitlements and commitments rather than monies paid and received. Smaller firms may resort to direct observation of managers, comparison of actual and plan progrress, and other such resources of information, which, if they all point to the worsening situation, provide a much immediate warning that action is needed.

3.0 CHAPTER THREE

3.0.0 CASE STUDIES AND ANALYSIS

3.1.0 Introduction

In order to have a sound basis for comparing the practice of cost control on site with the theory found in literatures, a number of medium sized contruction sites randomly selected has to be studied, the observations recorded and analyised and then results infered. This reasoning informed the selection of the sites to be studies. Four sites have been chosen for this study and each was selected for its uniqueness. The four sites have different locations within Kaduna and they were constructed by three different organisations. That is two sites belong to one main contractor and the other two one to each contractor. The selection is deliberate as would be explained soon. Site I and Site II were handled by one construction company by name SNAB Nigeria Limited. Site III was constructed by the construction department of a commercial concern involved in distribution and general trading. This company is called General Supply and Distribution Agency Limited. The fourth site (Site IV) is being constructed by Songhai Limited.

SNAB Nigeria Limited: This company is 100% indigeneous. It has four people as its directors, of these four, two are quantity surveyors while the other two are builders all with 2 years experience in the construction industry before coming together to form this company. So the selection of sites managed by them was in order to study the activities on the site of a firm owned by 100% technocrats.

General Supply and Distribution Agency; this firm as explained above is involved in distributive business and general trading. This company however, has a well developed construction department headed by a builder; and this department among others handles job in Kaduna, Abuja, Kano and Kontogora. This company is also 100% Nigerian but is owned by persons who have had no training whatsoever in the construction business. Therefore, cost control decisions mainly emanate from the construction department to the site. The aim here is to have as a sample a case in which the top decision making body is not versed in the science of construction management.

Songhai Limited 80% indegeneous and 20% foreign in ownership. And on the Managing Directors seat is an Italian and the second in command the Chief Quantity Surveyor, is an English man. The whole three supervisors (Engineers) in the head office are all expatriates and so is the general manager. So in effect it could be said that the management of the company is 80% foreigners. Thus, this foreign management background is what qualified this site IV handled by them to be studies. In other words, representatives samples of the categories of constructions sites found around have been considered based on different management orientation and also financial strengths.

3.2.0.0 Sources Of Collected Data

3.2.1.0 SITE 1: Dalema Bakeries Limited

3.2.1.1 Project Description

This project as indicated above is an industrial one. It belongs to Daleman Bakeries Limited and they are the largest bakeries in Kaduna State as at now. This project is a two-storey structure of reinforced framed structure with sandcrete hollow blocks in-fills at the panels. The finishes are a combination of high quality and medium quality materials, the roof trusses are steel and the roofing is the long span aluminium type while the ceiling is the suspended type. The contract sum was ₦400,000.00 and the contract a lump-sum with no provision for the fluctuation clause.

3.2.1.2 Labour Cost Control System

On this site labour cost control has been centred more on the number of operatives employed per any particular operation than on other considerations such as productivity and choice of timing of the operation. This site has a foreman (general trades foreman) a storekeeper and a head labourer, who are always on the daily wages list of the site. The foreman is in charge of all the daily labour engagements subject to approval by the site Engineer who visits the site once or twice per day depending on the needs of the site on any particular day. The site engineer instructs the foreman on the operations to be performed the following day. It is then left to the discretion of the foreman to use his experience and intuition to decide on the number of the operatives to be engaged for that operation using the size of the operation and time given for the operation as guidelines.

He then instructs the head labourer who is always on the site to inform the labourers to report the following day in the correct numbers. It should be realised that the labourers are on daily pay basis, therefore, whenever the operations for which they have been invited were completed, they were disengaged with the sound promise that they shall be called again to serve soon as the other labour intensive operations are due for execution. The collection of the labourers when the operations are due to be performed explains the daily presence of the head-labourer on site and his retention on the pay list for all working days. The foreman now, after engaging the labourers in the self adjudged numbers records them in the "daily labour register". The need to record hours worked by the individual operatives did not arise because they all had a flat starting time which was 8 O'clock in the morning and allowed a break time of one hour between the times of 1.00 p.m. - 2.00 p.m. on Mondays to Thursdays and on Fridays the break time is 1.30 p.m. - 2.30 p.m. to accommodate the Friday prayer period for the moslems. And they close by 5.00 p.m. dialy. The recording is made by a tick in the morning column against the operatives names and at the end of the day after the roll call another tick is made in the afternoon column against each name present. There is the rate column which records a uniform rate for everybody except the head labourer who has a 50k edge over the other labourers. This same method used for the labourers is also applied to the skilled labourers or trades men. Except of course, in this case it is the site engineer who is responsible for their engagement. But the foreman all the same records their presence.

At the end of the week the site engineer collects the figures from the foreman and compares it with the one he has in his own records and on getting satisfied with the figures gives the money to the storekeeper to pay the wages to the operatives. The foreman and the storekeeper are on semi permanent basis as their employment is only for as long as work on that site continues.

3.2.1.3 Material Cost Control System

Here two large stores adjacent one another were built, and on one side of the stores is the trades men shade where carpentry and iron work were to be performed. One of the stores was solely for cement and surveying instruments while the other store keeps the tools and appliances and the vibrating machine and also served as the dressing room for the labourers and the trades men. The allocation of purposes to the stores was a deliberate policy to make sure that the store housing the cement and the surveying equipment was opened only in the morningss to bring out the number of cement needed for the day and also the surveying instrument when needed. This is for a number of reasons according to the project engineer and they are to minimise cement wastage due to availability temptation, to make sure that not very many people come into contact with the surveying instruments which were quite portable and expensive and could thus be easily smuggled out of the site at the slightest opportunity, to make sure a good record of cement consumption on the site is kept on daily basis. And because of the special security given to this particular store it was also used for keeping sub-contractors tools and materials. These sub-contractors can only collect their tools and materials from the store only in the mornings when cement is to be taken out and they can only return them on special request to the site engineer through the foreman, that is if they want to leave the site before the end of the day. Other small but precious materials belonging to the main contractor are also kept in this store .

The method f keeping security on this store is by leaving the key to the store with the night watchman who assumes duty before the site is closed for the day and stays till the following morning when he (the watchman) and the storekeeper together with the foreman make a visual inspection of the store before the storekeeper takes charge of the store and the keys. He then effects issuance of materials according to the foreman's requests for the day. The foreman makes sure that cement is collected in excess of need rather than in short-fall. This is because it costs less to return the unused cement back to the store at the end of the day than to wait half way through the work to collect same from the store. The hold-the-key security system was decigned to easily hold someone responsible for any losses found in the store. Should any loses be found to have occured during the night, the watchman is held responsible and any loses during the working hours is being accounted for by the storekeeper. All materials kept by the storekeeper are collected by the site foreman not by any special requisition form but by a simple note hand written and signed by the foreman stating clearly the quantity and description of material needed. The excesses or left-overs if any were returned in similar manner. The storekeeper merely files these notes and checks his balance in the "material movement and use hooks". The foreman keeps the key to the other store permanently. This store it will be remembered houses the tools and appliances such as the headpans, shovels, diggers, rammers and hammers; and also serves as dressing room for the operatives.

The reason here is that the foreman and the operatives come to the site earlier than the storekeeper to allow them time to change before going to collect the materials from the store. Valuable time would have been lost if the tools were also locked up with the materials, in sorting out what tool should be handled by who.

Material delivery to this site has been on mixed procurement methods. First and foremost, all materials on site with exception of cement were procured on the cash-and-carry method. That is the materials were either bought directly from the dealers or from vendors. But in either case a deposit has to be made in the form of part payment and with a definite arrangement to pay the balance at the end of the delivery. Materials procured through this system include sand, stones, blocks, timber, iron rods, doors and windows, paint and the roofing materials. The cement which was got from a distributor was procured on a bi-monthly pay basis. Other materials not mentioned like electrical installation materials and plumbing materials were the responsibilities of the sub-contractors. Storage of material on this site has been simple because there were two services gates leading into the site if material delivery through one gate has been stuffy the other gate is used for all subsequent deliveries until such a time that reasonable space has been found through the consumption of the materials.

Material wastage control was being exercised at almost all stages of the construction. In concreting a crude batching system was employed.

In this system they use the head pans to measure the aggregates and the cement, and water is being added as the mixing proceeds until such a time when it could be reasonably judged to be of acceptable workability. Concrete is conveyed by head pans and wheel barrows to the point of placing. The choice of head pan or wheel barrow depends on whether the concrete was to be placed below or above the working level. The wheel barrow is used when placing concrete below the working level while the head pan is used when pouring the concrete above the working surface.

3.2.1.4 Plant Use Cost Control System

This site is situated along Kachia road in Kaduna South. It is just adjacent the largest round about on this road which passes through the industrial area of the town. By this situation it was open to the general public that a site hoarding all round the site was necessary soon after the clearing. This site is also surrounded by three commercial banks: from across the round about was the Union Bank Kaduna South branch and to the left and right of the site were the First Bank and the Bank of the North respectively. The site has been, a long time ago, a training ground for soldiers, so that when work was to start on this site the clearing involved the removal of some rusty hardware apparently hitherto used for military exercise, and a number of big trees. This necessitated the involvement of bulldozer and bring it to site a low-loader has to be hired as well to convey the bulldozer to the site because it could not drive on the tarred and busy road because of its chain-wheel. The cost of hiring the low-loader was higher than the cost of hiring the bulldozer per hour, and the work on the site could hardly last more than one hour with the bulldozer.

KASHIM IBRAHIM LIBRARY
AHMADU BELLO UNIVERSITY
ZARIA, NIGERIA.

So an alternative approach to the problem was considered and it was found that a combination of a grader and a pay-loader would achieve the desired result at a cost much lower than if a bulldozer had been brought to the site. And secondly, no conveyor be needed because both of them use pneumatic wheels. Apart from these machinery used at the start of the work the only plants used subsequently were the concrete mixer and the vibrating machine. The cost aspects that are of interest in these machines are the running and maintenance costs. Both plants use gasoline as fuel. The gasoline supply is maintained by keeping a reservoir of the fuel on the site replesnishable after 4 to 5 days. Lubrication cost is also significant as the concrete mixer has to be cleaned and lubricated daily. Maintenance service is performed on them after two weeks or more depending on the extent to which they have been used within the period. Repairs were seldom performed as major breakdowns have not been recorded.

3.2.2.0 SITE II: 2 Blocks of 4-Bedroom Storey Houses

3.2.2.1 Project Description

This project is a residential one. It consists of two blocks of two storey houses each with 4-bedrooms. The project belongs to a company, Kat-Holdings Limited, Kaduna. It is reinforced concrete framed structure with sancrete hollow block as the in-fills in the panels. The finishes are of high quality materials all. The roof trusses are made of timber and the roofing material is the long span aluminium type and the ceiling is made of celotex. The contract sum was initially at ₦272,000.00 and reviewed during the course of the construction works to ₦380,000.00. The contract was the lump-sum type with the flunctuation clause invoked were applicable.

3.2.2.2 Labour Cost Control System

Labour cost control on this site has a slightly different approach, as here the labourers though on the same daily pay basis are on a more permanent basis compared to those on the first site. They have a limited number of labourers always in the region of 8 to 13 daily, and are always in the pay list. This is because of the nature of the site. The site is 60m x 60m square and two identical but detached storey buildings each covering an area of 10m x 11m on the ground. The construction works for these two blocks were started together but with a time lag of one week between them. This was a deliberate action by the site engineer to exploit the labour "stop-go" periods on each of the blocks to advantage. When one of the blocks does not have a

labour intensive operation to be performed, the other block might just be in the reverse situation or near that. In situations where-by the two blocks do not need intensive labour works the labourers are assigned to prepare the site against the next operations or are forced on sub-contractors as a condition. There were two carpenters also on permanent daily pay basis. Here a "weekly time sheet" is used to record labour costs and also to pay the wages. This weekly time sheet is as simple as the "daily labour register" used on the first site but a little more elaborate in content. Apart from the "name column" there is the "trade column" which indicates the nature of the labour employed, and the days from Monday to Sunday all have solumns to be ticked at the end of each working day. There are also columns for Rate, Bonus, Subtractions, Expenses and Remarks, which are all filled as applicable against each operative. The names being always on the list did not need daily recording as in the "daily labour register" records are effected by simply calling the roll in the mornings and making a tick in the appropriate days column against the individual and at the end of the day when the roll is called again the tick is then converted to an X by yet another line to cross the first tick. At the end of the week the total number of days worked by the operatives are entered into the column marked "total" and this total number of days worked by the operative is multiplied by the rate and recorded in the "Total Amount" column against his name. The sum total for all the operatives in the Total Amount column gives the total wage payable

that week. It should be realised that the foreman and the storekeeper do not appear on this sheet as they are paid monthly on a more permanent basis. Here there is slight difference in the terms of employment of the foreman and that of the storekeeper. The foreman still keeps his appointment with the firm even after work on this particular site has been completed, because of the prospects of having some other sites in the nearest future, while the storekeeper has his appointment terminated even before handing over the project to the clients.

3.2.2.3 Material Cost Control System

A small store measuring 4 x 3.5m was constructed on termination, this site and adjacent to it is the site office. Due to his/ there is no storekeeper, the store is being managed by the foreman. The foreman here notifies the project engineer of long term and immediate needs of the site in terms of material. The engineer then decides on which of the long term demands should be met, and the immediate needs were delivered om small quantities likely to last not more than one week of operation. The foreman stores these materials in the store and withdraws them according to daily needs. The implications or advantages of this system could be seen in the fact that the cost of employing a storekeeper has been obviated. The formalities associated with the receiving of materials where a substantive storekeeper is employed has also been obviated. The foreman makes sure that materials going down in stock are reported to the engineer before the

day of need.

Material procurement here is by supply system. All materials to this site are brought on monthly pay basis. The engineer makes arrangement with the suppliers to collect the material at the end of an agreed time ranging from three to six weeks. Materials that fall under this condition are: cement, sand, stone, electrical materials, plumbing materials, timber and the finishing materials. Doors and windows (aluminium) and the roofing material are not got by this system as the manufacturers always insist on 40% - 50% down payments at placing of order and the balance before delivery. Arrangements are also entered into with the suppliers of sand and stone to keep the site always with material that is when the sand supplier in his judgement finds that the level of sand stock on the site has gone down he just orders his trucks to deliver same to the site and the foreman together with the gateman confirm the delivery. The foreman then issues a hand written note with date to the supplier explaining the nature of the material and the quantity. The supplier then gives a copy of this note to the engineer the same day or a day after.

Waste control here is effected in many forms depending on the operations. Cement is brought out in sufficient quantity for the day, here too it is brought out slightly in excess of need. Batching is also by head-pans. Pouring concrete also by head-pans and wheel barrows. The sand and the stones are laid in heads in a straight line by the trucks and lying side by side with each other. That is, the line

of heaps of the sand lies near the line of heaps of the stones. When the trucks bring in further supplies of these materials to the site they try to place them in the spots left by the used heaps. This minimises the wastage due to left-overs as there will be a stagnant left-over on each spot that was left by a used heaps. Timber is only brought to the site a day before use to minimise the cost of handling and obviate the chances of weather action on them. Used timbers are selected and kept under weights for future use. The ones that have been used over and over again, that is those that have out stretched their usefulness are packed in a heap and carted away. It has been noticed that the foreman sometimes negotiates with some scrap dealers to take the heap at an agreed sum payable to the foreman. But these are off the record dealings between the foreman and the dealers and what ever is realised from this deal is solely to the benefit of the foreman and nothing to the company.

3.2.2.4 Plant-use Cost Control System

This site is just on the bank of a small river called River Karama and the road going along side the river is named after the river, hence River Karama road contains this plot of land. By the situation of the site it is marshy and water logged. This makes the use of among other plants the pumping machine a necessity. This site did not need heavy clearing processes as because of the fertility of the land it has for a long time been used as a farm land. Thus major plants used on this site were only the concrete mixer, the

concrete vibrator and the pumping machine which was used extensively and daily throughout substructure construction period. The cost of running and operating these machines are all similar except in the type of fuel used. While the mixer and the vibrator used gasoline the pumping machine used petrol and hardly ever needed any servicing of the engine parts apart from the lubricant that was religiously applied to it. So in effect plant costs on this site is similar to that of siteI with the exception of the plant hire cost which was not applicable in this case.

3.2.3.0 SITE III: 4-Storey Block of Offices

3.2.3.1 Project Description

This is meant to be a block of offices. It is an L-shaped block of four storeyed reinfored concrete framed structure. It was being constructed by direct-labour from the construction department of the owner company's organisation. It was estimated by a consultant quantity surveyor to cost ₦1,540,000.00 and then quoted by two contractors at ₦1,650,000.00 and ₦940,000.00 before the company decided to embark on direct-labour execution. This project is yet to be completed though started some three years ago.

3.2.3.2 Labour Cost Control System

This project which is an L-shaped block of offices comprising the ground floor and three other suspended floors covers an area of $512m^2$ on the ground of a 30m x 30m plot ($900m^2$). It is a reinforced concrete frame structure with sandcrete hollow block in-fills on the outer walls only, as it is the open space office type left for partitioning by the prospective tenants. Before the constructional work on the new building was commenced, an already occupied residential building was first demolished. All the infrastructures in the building were first removed and even the substructure was dug out in some of the areas that coincided with the foundations of the new structure to be erected.

Cost control on this site started right from the time of the demolishing. The site agent here refused to employ direct labour for the demolishing exercise. He decided to

subcontract it out to the same labourers who were supposed to work on the new project as daily paid labourers, through their leader who happens to be an agent of the gang as well as a supplier of concreting materials namely sand, stones, cement and sometimes blocks. The subcontract was entered into with only the leader for a lump sum and a time limit was given for the operation. He in turn engaged this gang to do the demolishing at another agreed sum. After the demolishing which was completed earlier than the agreed time another contract was entered into with this "subcontractor" for tipping and dumping away the debris. All this was completed in two working days. After the completion of this "subcontract" the site was organised, the site offices, the stores, the trades men's shade and the workers convenience were all constructed and the site, hoarding too was erected on the only one side of the plot facing the road. The site agent have all these out as subcontracts. After this, the site foreman took charge of the site from the subcontractors and the site clerk/storekeeper assumed duty. Engagement of labourers started on this site. Responsibilities were assigned the foreman and the site clerk/storekeeper. The foreman is directly in charge of recruiting the labourers on a daily basis for the required operation on the day in question. He then passed this list to the site clerk for recording. The foreman is thus only responsible for engaging the labour but not for their remuneration. And if the foreman decided to terminate somebody's engagement before the the end of the day he quickly notifies the site clerk who makes the necessary adjustments in his records. The foreman

Table 3 GENERAL SUPPLY & DISTRIBUTION AGENCY LIMITED

AGENT: ..... SITE: .....

AUTHORISED: ..... WEEKLY TIME SHEET WEEK ENDING: .....

Name	Trade	Mon	Tue	Wed	Thur	Fri	Sat	Sun	Total	Rate	Basic	Bonus	T.AM	Subs.	Expenses	Remarks

sometimes makes it clear to the labourers that some of them would work for only "half-day" and this is also recorded accordingly. The form used for this recording is the same weekly time sheet as that used on Site II. The only difference here is the method of completing the form. Here a dash under the days column indicates first half of the day and another dash across indicates the other half of the day. The labourers here like those of Site I are on daily pay basis employable only when there is immediate used for them. However, due to the large size of the project there was always work for the labourers although, in varying scales. When the labourers were not engaged in excavating trenches they were pouring concrete, when they were not pouring concrete, they were helping the carpenters, when not with the carpenters, they were with the iron benders and by the nature of the project i.e. having repetitive floors the labour engagement became a vicious circle. Only the masonry work on this site was handled directly; the carpentary, iron bending works and the electrical were all subcontractted.

One striking similarity to site II policy was that all the subcontractors here used the site labour but on their own pay records. This helps the main contractors to retain the labourers who would otherwise have been away looking for jobs elsewhere, and when labour intensive operations comeby the main contractors will waste effort trying to bring the labourers together. The masons (block layers) were on the same basis of employment as the labourers but with one retained daily regardless of whether or not there was masonry

work. This block layer was regarded although unofficially as the Head-Mason. There was also a Head labourer but he was remunerated accordingly. This site agent explained this by saying that while the leadership of the mason was only symbolical, that of the Head-Labourer was helping in being the spokesman of the labourers and serves as communication medium between the site management and the labourers. He was in turn given some powers in suggesting a list of the labourers to be employed in any particular day. This makes the labourers obedient to him and eases the task given him. But it must be realised that in spite of the powers given the Head labourer, he still works with them in any operations they are assigned. This has the effect on the labourers of accepting any of his stands as being borne out of personal involvement. Payment on this site were made weekly and/at weekends. The site agent collects the list of those engaged on works on Monday to Friday and a projected cost for Saturday was added and by Saturday afternoon, he makes the exact amount available to the site clerk/storekeeper who makes the payments at the end of the working day. The foreman and the site clerk/storekeeper are on monthly pay basis. While concrete work for all the columns and the sandcrete hollow block in-fills were executed directly, all the concrete work for the suspended floors were subcontracted to a mobile concreting gang who use their own machinery. They have work force of about 300 labourers both men and women who work relentlessly from 8.00 a.m. to 6.00 p.m. They have the advantage of completing the work that would have taken

the direct labour 6 to 7 days only two days. They however, have their own disadvantages which will be discussed under subsequent topics.

3.2.3.3 Material Cost Control System

This site it will be remembered was once developed and then demolished. The debris was carted away after sorting out some of the useful components. The materials so chosen were then used as part of the materials for constructing the site offices, the store, the workers shade and workers convenience. These materials include the roofing sheets which were used for part of the cladding to the temporary offices the ceiling board which were used for lining the inner parts of the cladding and the roof to serve as insulators, the roof truss members were also used for erecting the framing for the structures. The main store is detached from the offices and situated such that the doors and windows of the offices are directly facing the store. This enables the site engineer to oversee whatever was going into or out of the store. The two offices facing the store accomodate the site engineer and the other accomodate the site clerk/storekeeper. The site engineer's office also serves as accomodation for site meetings. The site $clerk's office also accomodate the foreman who uses it when there is need for desk work. This office also keeps the operatives' personal effects. There were two gates at each end of the building line of the plot. One of them was closed by the site engineer and left only the other for all movements to and from the

site. Next to the gate is the watchman's shade. The watchman keeps this gate always closed except when deliveries are to be received. And the site engineer's office is also facing this gate from the far end, this enables the site engineer to acknowledge movement of material in and out of the site.

Material procurement on this site is effected through various means. The owners of the project being a commercial concern and dealing on the distributive business were supplying cement and iron rods at factory prices. The sources of the cement were the Benue Cement Company and the Ashaka Cement Company, while iron rods were got from Lagos. This had a very good impact on lowering the cost of production. The cement supply from the factories did not cease, while the iron rods supplies lasted only briefly, and subsequent iron needs of the site were met by purchasing cash down from other dealers. Sand, cement and stones, were supplied by vendors who collect their payments two weeks after delivery. Because of the tight nature of the site material supply in the form of sand and stones, were made only when the last supply has substantially gone down, thus giving enough room for fresh supply. Timber was used extensively here because of the suspended floors and the vertical columns and horizontal beams carrying them. Timber was got from the market on payment of cash or at best payment after two weeks. Blocks were also got on cash and carry basis. The space left for the blocks could carry up to 1,800 at a time. At one time, the whole of the space for blocks used to be filled with the stock. Later it was

found to be uneconomical, inconveniencing and wasteful. It was uneconomical because of the fact that a stock of 1,800 blocks takes two weeks or more to exhaust, so if half of this money has been used to pay for either sand or stones the idle time of this money could have been reduced, inconvenience of blocking so many working paths could have been minimised and the waste associated with handling also halved. So later it was decided to half the quantity of blocks supply to the site.

Waste control was applied to concrete production and and placing and also on carpentary. The batching being by the use of head pans, had a person assigned to the task of filling the loose cement into the head pans for the labourer to convey to the mixer. This was in order to achieve a uniformity in the measure and in the relative strength of the different batches, which could not have been achieved if every labourer was allowed to feed his own head pans by himself. Another labourer who has been assigned the task of measuring and pouring the correct volume of water for the particular mixes was in charge of counting the numbers of sand and stones head pans discharge into the drum for the batch. It has been realised that the absence of such a person might lead to producing different batches with different stone, sand and cement ratios. This will lead to different mixes with different strengths and in most cases this will involve high cost of production.. Timber was used twice for columns and beams and then once or twice again for the floor slab before being heaped up as scrap.

3.2.3.4 Plant-use Cost Control System

Equipment here too are similar to those of the other sites. The concrete mixer and the vibrator are the major plants used on this site.

3.2.4.0 SITE IV: National Board for IEchnical Education Head Office

3.2.4.1 Project Description

This site is housing the National Board for Iechnical Education Head Office project. It is made of four floors with the basement as parking space, and the other floors accomodate the offices. Made of reinforced concrete framed structure with hollow sandcrete blocks in-fill at the panels the project was for ₦1,900,000.00 initially but with variations and flunctuations the figure now stands at more than two million naira. It should be noted that a lump sum contract was entered into with the flunctuation clause invoked. This site is on one of the very busy roads in Kaduna township. It is just next to the new branch of the National Bank of Nigeria being constructed and just across the road are the Kaduna State Library Board and High Court of Justice Kaduna State.

3.2.4.2 Labour Cost Control System

Labour generally on this site is on yearly contract basis. Each labourer on the site has on one complete working year with the contractors from the date of his employment. At the end of this contract period, the contractors have the option of retaining services of the labourer or refusing to renew the contract. Reasons for non renewal of the contract from the contracts include lack of jobs on which to engage the labour, decline in productivity on the part of the labourer, decline in level of discipline in the labourer. Reasons for renewal of contract are of course obvious i.e.

when the reverse of all the aforementioned situation prevail. When asked why they do not, like in or organisations, engage the labourers on daily pay basis, the Chief Quantity Surveyor said that the union (labour) is strong enough to protect the workers against such a policy. And added that if other firms get away with it, may be its because of the small size of labour employed by those organisations and the fact that the labourers keep changing sites and therefore, have little or no time to know about the union activities and to even patronise them. Another reason advanced by the C.Q.S. is that due to lack of employment in the construction industry and the country in general labourers are always too eager to get employed irrespect of the terms of the employment. Thus labourers on this site are paid monthly. The site clerk keeps a "Daily Time Sheet" which he compiles and totals at the end of the month and takes the papers to the head office. There the accountant prepares the payment vouchers, collect the cash from the bank and gives the supervisor to effect the payments. The supervisor performs the same function at the end of the month on so many other sites. The designation supervisor refers to the project engineer who has so many sites under his charge. There are no methods of checking the accuracy or otherwise of the site clerk's roll call of the labourers and hence, the total site labour due at the end of the month. Absenteesm or lateness to report to the site is being punished by non payment and non engagement respectively. The difference between the two is that, the occurence of the former twice in a month leads to a reconsideration of the labourers contract

while the latter attracts three or more depending on the situation that warranted the default. A labourers contract can be terminated without any conditions if found wanting in areas of discipline without the unions interference. The labourers here are classified into department or according to operations but all of them are under the general foreman. The general foreman coordinates the activities of the Head of carpenters, and the head of block layers, the labourers assigned to these departments remain with them till the end of the project. However, there is little room for transfer between the departments depending on the workload in their hands. The trade foreman in turn issues directives to and supervise the trade men under him and also directly supervise the labourers in his department. Work on this site starts from 7.00 a.m. to 4.00 p.m. with a break time of 12.00 noon to 1.00 p.m. Here there is no checking at the end of the day because the labourers are under close supervision from both the trades men and the trade foreman. The general foreman controls the site and report directly to the supervisor who visits the site regularly depending on the work nature of the site. The site clerk also performes the duties of the store keeper.

3.2.4.3 Material Cost Control System

Material store on this site was constructed on a very temporary basis. This was due to some factors which advised against having a store that will last the construction period. First there was this space limit on the site which would necessitate the space being occupied by the store

to be used by the later sections of the project. Secondly, the nature of the plot, which is mashy does not go well with the idea of keeping cement for too long. Thirdly, the the materials used for constructing the store would be used on another site to erect same. So the store and offices were transfered to the ground floor of the building which is a four storey block, and the appropriate pertitioning erected with the necessary security system put in place.

The main store contains the cement and the manual tools, while the office keeps the special instruments and special fittings like flush doors, and some plumping sanitary wares. Other special fittings like iron mongery and taps are kept at the head office and deliver to the site only when they are ready to be fixed. These materials are only stored in the site office if they have to stay till the following day. Other materials like sand and stones are kept in single individual heaps with the help of a loader on the site. This gives enough operation room and also reduces storage waste. Blocks are also piled in manageable quantities and if possible very close to the area of operation.

Material request to the site's store are made by the trade foreman to the general foreman who in turn passes the request to the store, the storekeeper releases the materials to the general foreman who signs for them and gives the trade foreman for use.

There is flexibility in the procurement system of this site. The practice is that for the supplier of sand, stones and laterite contractors have a fleet of five 10-ton tipper

lorries. They own a stretch of river bed along river Kaduna where they dig their sand through the dry season and heaped it on the river bank for collection by their lorries as and when needed. The sand is transported directly from the river bank to the needing site. Usually, this sand finishes before the end of the raining season and the vendors are then employed for the supply throughout the remaining of the period. Sometimes, when the rains fall alot, the road to the river bank was not quite motorable, they therefore , have to buy the sand from the vendors in spite of having theirs. Annual rents are payable to the government for the lease of the river stretch. The cost of this annual rent and the cost of digging from the river bed and then collecting it at the river bank added with the cost of transporting the sand to the site is still cheaper than ₦10.00 per cubic metre which is the cost from the vendors, according to the chief quantity surveyor.

Laterite is got from digging sources but collected by the company's own vehicles.

Stones are obtained from the quarries and transported by self to the site. It is bought at ₦26.00 per cubic metre and the system of buying is by paying at the head office of the quarry and presenting a receipt to the quarry site to collect the exact quantity paid for. It should be realised here that it is on cash and carry basis. By this it is still much cheaper than by buying from the vendors. For the advantages to be appreciated , the quantity bought or paid for should be substantial.

Blocks used to be made at the yard of the head office becuase it was cheaper. But now according to the chief quantity surveyor, it is cheaper to buy the blocks than to make them. When asked why it is so now, he said he thinks the blocks makers do not use the standard mix for making the blocks because he noticed that on so many trials, that production cost of one block was always higher than the market price of the blocks which was 90k. And besides, he said, if he wanted to produce 200 blocks and he bought the materials for the 200 blocks and produce them by the time he cures and transport them they might be 185 to 190 the balance gone as waste.

Now, all materials that are to be bought from sources other than the usual, i.e. from the vendors as against the production sources are arranged from the site by the supervisor and the bills sent to the head office for settlement. Later when the market situation beame such that materials needed have to be paid for before delivery, the supplier brings the bill from the site to the head office where he is issued a cheque to clear only after delivery. Materials subject to such site arrangement are only sand, stones laterite, cement, blocks and timber. Situation that warrant such site arrangement are either (1) materials on site is almost finishing and having to wait for the head office bureaucracy might delay operations and thus have a negative effect on the general site schedule. (2) when materials are not obtainable from the usual sources due to reasons of none availability of inability to reach the source. Other materials not listed above are considered as special materials

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and therefore, purchaseable only by the head office. Some of such materials include the doors and windows, the roofing and ceiling materials, the paints and joinery materials etc.

Materials wastage control takes different forms depending on the nature of the material. First as mentioned earlier, materials in loose granular form such as sand, laterite and stones are kept in single individual heaps and during mixing the concreting materials are measured by the use of gauge boxes for all batches. Used timbers are retained for use on some other operations or some other sites. Those that must have out-stretched their use are still retained for burning bitumen for various purposes in the site.

3.2.4.4 Plant-use Cost Control System Employed

Mechanisation of this site is comparably higher than that found on all the site studied. The main resons for this are (1) the relatively better financial background of the main contractor of this site compared to that of the main contractors of other sites, (2) the level of sophistication of the design of this particular project which is also higher than that of all of the other projects. The size happens to be another reason but for the fact that Site III is on comparable grounds as far as the size is concerned. Plants used on this site include (1) excavator (2) buldozers (3) loaders (4) graders (5) dampers (6) tipper lorries (7) concrete mixer (8) crane (9) water pumps. All these plants and vehicles belong to the equipment pool of the company. This company has a mechanical department

under which is the workshop, which has qualified people for servicing the machines. This department also has a training school for producing their own needs in plumbing and maintenance services. This pool of equipment is under the mechanical engineer who releases the machinery to the various other sites according to the needs. This department is also responsible for transporting to the site and erecting the crane where a high rise building is to be constructed. The mechanical department is also responsible for supplying the operators of these machines including the concrete mixers and the vibrators and in fact, all mechanical implements on the site.

When these machines were not working on the site, they were lying idle in the yard or were under repairs. On very rear occasions were they hired out to do other jobs not directly belonging to the company. No special accounting records were kept to know how much work what equipment has done on what site. The running and maintenance cost of these plants have been greatly reduced by the activities of this mechanical department however. The fuel needs of these plants have been taken care of by the fuelling station situated in the yard at the headquarters. The vehicles are fuelled daily according to assigned task on the instructions of the mechanical engineer. Fuel for the building plants that are always on the site are also got from this source and delivered to the site by any of the lorries at the written request of the foreman and on the approval of the mechanical engineer. The lorries and other mobile equipment all have specifically assigned drivers to each.

3.3.0 Analysis of Collected Data

3.3.1 Labour

Labour cost seems to be recognised on all the sites as one area that needs constant attention hence the fact that on all the sites studied one form of recording labour costs or another are used. It is also of interest to note that not just that records are kept but the involvement of labour on all the sites was being regulated by various not necessary varying means. And not only is the labour involvement regulated but also attempts made directly or indirectly at bringing down labour costs on site to the barest minimum. Many ways were seen to have been used to achieve this aim. Taking few but significant examples from the sites such as (1) subcontracting some works which will have normally been done directly, (2) employing the site operatives on daily pay and semi-permanent basis, (3) forcing the labourers on the subcontractors, (4) assigning the labourers to particular trade permanently, the significant of these designs to cost control could be appreciated.

Some works on one of the sites which could have been executed directly by the contractors such as sites offices, stores, works shade and workers convenience were seen to have been issued out as subcontracts by the site agent. On answering the question the site agent said the time and money to be spent when constructing these directly by far would have exceeded the contract-sum at which he gave them out due to the following reasons:

1. The carpenters engage to erect the stores and offices knowing fully well that because they are on daily basis, the amount of financial gains they make on the site depends on how long they spend working on the site, they therefore, would naturally attempt making any operation they are handling to last as long as they can make it. Now the calculated delay will not only increase the labour cost but will also delay the construction commencement day and this could be easily translated into cost terms.

2. The cost of the labour will increase with the delay proportionally to that of the skilled labour.

3. The advantage got from the early completion of these preliminaries provides a float to the contract period.

4. It enables an assessment of the amount of money ex - pended on the preliminaries directly at a glance thus relieving them of the cost of keeping records and supervision.

Employing site labour on daily pay and semi permanent basis is another effective way of controlling labour costs. It is a common knowledge that site construction activities are not always a continuous labour intensive affair. It is usual to find that a site which works with a labour force of over 100 persons for many days to be found not needing more than fifteen persons the next day. Now, on a site employing labour on a permanent basis, what then happens to the remai-

ning 85. Certainly the retention of this labour size for a day longer than necessary will have serious cost implications on the project. The activities of labour unions have been found to dictate against the practice of daily pay on one of the sites. Nonetheless, the practice is justifiable if the continuous survival of the company would depend on prudent management of the projects resources. It is only natural that he/who works gets paid and that no one is forced to pay for work not done. Largely, the practice of employing labour on construction site is by the daily-pay basis. This system ensures value for money by motivating the labourer to put in their best at the time of their employment to be "in the good books" against future dates. This system also has the advantage of selecting the best "site materials" any day. Also benefits enjoyed as of right by permanently employed workers are saved these sites.

Besides, these advantages there are however, the attendent disadvantges. These disadvantages include (1) lack of workers development (2) the risk of having to be using unknown persons each time a new selection is made, persons whose characters are untested/and whose conduct cannot be predicted (3) the indirect cost of orienting the new comers to site conducts.

On sites that semi permanent employment is being practised, the employed labourers that are supposed to be idle due to a fall in labour demand on the main contractors side are forced on the sub-contractors. These sub-contractors use this otherwise idle labourers for the ordinary parts

of their works. It is quite unfair to the sub contractors but for the fact that it was made a condition for the award of the sub-contracts.

The sub contractors have to disengage their own labourers and replace them with the main contractor's labourers but on the sub-contractors pay-list and at the main sub-contractor's rates. This is a good cost control practice as it saves the main contractors the burden of paying for idle times and at the same time "seasoned" labourers are retained on the site. Thus the disadvantages of daily pay system have been curtailed.

On one of the sites it was found that the labour force which was on yearly contract basis was departmentalised. The possible departments are : the block laying, the carpentary, the plumbing, the iron bending and concreting. The departmentalisation of the labour force augurs well for workers development. The labourer who has been assigned to the carpentary department for a prolonged period ends up training to be a carpenter and same for the blocklaying and the other departments. This has the advantage of producing own needs of skilled labour at no extra costs. The producing of own skilled labour in turn has the advantage of maintaining operatives on the site who work like a family with the effect of that brotherhood help to produce the best out of each assigned job.

The feed-back system employed on the sites with regard to labour costs is what seems to be inadequate. Labour cost reports to the head office seem to have the single objective of just "acknowledging" the head office of the wages

total for the week or for the month as the case may be, instead of serving as reference data for the future. This is evident from the fact that situations effecting productivity and the labour costs do not seem to be adequately recorded.

3.3.2 Material

It is realised that all the sites studied favoured the idea of keeping stores on the sites. And all of them placed great emphasis on the store security system. Also the provision of more than one store for different types of materials is a common idea. The assigning of a site personnel to manage the store is also common all the sites. The assigning of different storage facilities or systems to different materials has been understood to be borne out of experience of site routines. Very little difference can be detected in this regard with all the sites. Cement which seems to be the only bulky but "precious" material on the sites has been given special storage attention. The storing of cement in large and high protected stores could be understood as due to its relatively high cost compared to the other concreting materials and also due to its perishable nature. The use of site offices as store facilities for some certain materials seems also a common practice. This clearly offers the continuous overlooking of these materials by the site management staff themselves, and also put into use the investment involved in constructing the office for most of the times that the office might other been "unused".

The stores are found to be kept not by the storekeeper on some of the sites, but the site general foreman himself. This is understood to be a wise cost saving initiative by saving the project the costs associated with employing a storekeeper or site clerk, if the engagement of such personnel is found to be necessary. Not only this, it also saves the site the material movement processes involved if a storekeeper is there in between the materials and the operatives. However, where the presence of a storekeeper is highly desirable such a practice could be counter productive. Such a situation occurs where the site is fairly large and work has come above the ground level it becomes uneasy for the foreman to direct and supervise the operatives and still take care of deliveries of materials to the site and also the issuing of same to the operatives. And this practice places a lot of trust on the integrity of the site foreman, which sometimes could be misplaced. And where the integrity of the foreman could be testified same could not be claimed for ability to cope with the diversified functions. Different systems of stock piling materials on the sites are understood to be due to different ideas of how to minimised 'piling-waste'. All the systems are found to be good, the only difference being in the degree of sophistication of the systems employed.

Material procurement systems differed on almost all the sites, the differences other than being by design were found to be dictated by the prevailing market situation and the ability of the management to strike a suitable arrangement with suppliers. The ability to strike a good arrange-

ment for the supply of materials to the sites did not depend on the financial states of the buying companies but in the intrinsic abilities of the managers at achieving a favourable negotiation. Whatever method for procurement of materials is employed that is whether the cash-and-carry or against monthly account, it is realised that obtaining the materials from the sources of production is cheaper than getting them from other sources. A lot of savings in cost have been realised in the cases where the materials were got from the sources of production, no matter the methods of payment used. One other thing found common with all the sites is that no payments were allowed to be made on the sites. Even when materials have to be ordered for from the sites, the payments are invariably made at the head office or by the head office staff. This has a number of advantages:

1. Material purchase records are kept unmixed up
2. Eliminates the possibilities of duplication of orders and / or payments,
3. Minimises the chances of pilfering by the concerned site staff.
4. Rids the site of raw-cash and reduces the attendent dangers.

While some materials are allowed to be ordered for from the site, others classified as special materials are strictly for the head office to order and store. Reasons for this could not be divorced from the values of these materials and the ease with which they could be pilfered with or damaged.

Material re-use where applicable, as in the case of timber, is found to be common on all the sites but the ultimate point, that is what to do with the "scrap" is what leaves some sites confused as to what to do next. Some sites simply "cart-away" these materials and even pay for the removal from the site of these materials. One site simply leaves these to the site foreman to decide what to do with them. It is on this site that the foreman has been found to search for buyers and collects the payment for himself. On yet another site a special arrangement has been found to be made for these "unusable" materials. This firm believes that these materials could be of use in some other sites and for some other uses like site hoarding, and where some are not good enough to be erected for any other structures, they are kept to serve as fuel for melting bitumen and other similar functions.

One site experimented on the manufacture of blocks themselves. This according to them has been found to be very effective in saving material cost because of the low cost of production as compared to the unit cost of blocks obtainable from outside sources. However, as the cost of building materials escalated, especially cement, it was found to be cheaper buying from other manufacturers than making the blocks with in-house facilities. And thus the practice of making the blocks was stopped in favour of buying them.

5.5.5 Plant

All the sites have two plants in common and those are the concrete mixers and the concrete vibrating machines. Other plants found on the sites apart from these two are dictated by the nature of the site and/or the type and size of the project as well as the financial strength of the contractors handling the project. On the common ground the 10/7 mixer type is seen to be favoured by the three smaller sites while the 14/10 type was in use in the fourth site. Reasons likely to be why the other sites have the 10/7 type common could be their financial strength which might not make the owning of the 14/10 type economical for them and perhaps the proficiency needed in handling as against the 10/7 which could be handled by any operative with minimum observatory training. Research conducted in 1981 on the maintenance and running costs of building plants " [5] at the department of building showed that the 10/7 and the 14/10 mixer types were rated BEST while the 5/3½ and the 7/5 mixer types were rated BETTER and GOOD respectively in terms of running and maintenance cost. Now, all these sites have been found to assign the responsibilities of operating these plants to particular operatives. This has been a well informed decision because it is highly beneficial to have one person operating one plant always because of the following advantages:

1. the assignment of one person as the regular operator of a machinery affords him the opportunity of mastering the art of the operation thus increasing his produc-

tivity due to familiarity of operating mechanics

2. allow early detection of faults by the operator who must have been conversant with the good working condition of the machinery, therefore, likely to notice any abnormalities before they escalated thus causing higher repair costs,
3. the operator also with time learns to repair minor but recurring malfunctions;
4. saves the machinery the hazards of incessant breakdowns due to unskilled handling associated with changing operators.

Other plants necessary for use on the sites but which are not owned are hired. This brings to question which plants should be hired and which should be owned. Like it has been shown the larger plants were hired by one of the sites and one of the sites has all the plants it needed for its constructional purposes while the other two have had no cause to hire any plants in spite of the fact that one of these two sites has a fairly large project. It might be stating the obvious to say that the smaller firms could not afford the big plants but even if they were in such a financial situation that they can afford these machines they would not because of the obvious tying down of capital in those "heavy" machines. And there are many factors which should be considered in deciding whether to hire or to buy large plants and some are:

1. Economics
2. Quantity and condition of company fleet of plant
3. Type of work the company goes for and is given
4. Time-cycle of work - this will have a bearing on the situation when considering hire or purchase
5. Availability of skilled machine operators
6. Location of contract - distance from plant depot facilities

All these points would have gone against the idea of the smaller firms buying heavy plants.

The biggest firm which has almost all the plants it needs has a way of handling them with sole aim of minimising maintenance and running costs. One bold step taken by this firm is the establishment of a mechanical department within the firm to handle all mechanical appliances belonging to it. Another function of this department is to train the operators of the more sophisticated machinery and also the plumbers of the company. This department decided that fuelling of these equipment would be at the yard where they have filling points from reservoirs stored in the yard. This policy has the advantages of:

1. Monitoring the fuel consumption rates by the various plants.
2. Minimises pilfering by unscrupulous drivers and operators.
3. Buffers the department from the effects of fuel scarcity when there is fuel scarcity in town.

4. Saves the accounts department the problem of having to be giving out cash daily for fuelling the plants.

It has been however, regretfully learnt that many of the plants belonging to one of this company are lying broken down due to lack of spare parts, which is one of the direct effects of the present state of the country's economy on the firm.

3.3.4 Overheads

All these sites studied seem to have a non - chalant attitude towards overhead costs. Although striking similarities are found with the three smaller sites, the fourth and the larger one only varies from the others in the elaborate nature of its management set up but not in the over-head cost control as it originates from the site.

Wainwright and Wood[6] stated that items which should be considered in the general overhead and establishment charges are:

1. Directors fees
2. National health insurance
3. Private superannuation scheme contributions (employees contribution for non-productive staff only)
4. Wages (Materials and wages clerks, and non-working foremen)
5 Office rent, rates, insurances etc.
6. Builders yard rent etc.
7. Electricity and heating costs for the office

8. Motor-car expenses (including depreciation, repairs, tax, insurance, fuel and oil provided for head office staff)
9. Printing and stationery
10. Advertising
11. Postage and telephones
12. Furniture and fixtures (renewals and depreciation)
13. Bank charges, including interests on overdraft.
14. Accountants fees

Of these items only the last ten could be said to have had a significant impact on benefitted from the cost control systems being employed on the sites. These impacts were not as a result of a deliberate overhead cost control policy, but as a rebound from those directed at labour, material and plant. Taking the items one-by-one this assertion could be confirmed:

Wages:- control has been applied here by the policies adopted on some of the sites by not employing the materials and wages clerks and the foremen on permanent basis.

Office rent:- the construction of offices on the site with cheap and temporary materials and the use of the offices on site for the dual purposes of storage and office accomodation is a cost control policy.

Builders yard rent:- the three smaller site did not have any builders yard apart from the site. The functions to be performed by the builders yard have been taken over by the

sites in the various capacities, with the resultant effect of saving the cost of the renting or owning such a yard.

Electricity and heating:- these costs are at very minimal positions. Electricity needs to the three smaller sites were provided by the use of small generating plants brought to the site by sub-contractors who are likely to need power for their operations. The cost of this power supply is an integral part of the sub-contract figures. The largest site however, has Nepa power supply on the site during the construction periods.

Motor-car expenses:- these are not taken care of significantly by the site cost control systems involved.

Printing and Stationery:- because of the non-chalant attitudes of the sites towards records keeping and feed back procedures, the printing and stationery needs of the sites have been kept at the barest minimum with the resultant effect of saving the costs involved.

Advertising:- apart from the large sign board displayed at the sites, the quality of the products of the sites and the sanitary situations of the sites are serious contribution aspects of advertising which are effected better on the sites than at the head offices.

Postage and telephones:- all the sites studied have little or no use for this facilities. All correspondences were being conducted at the head offices.

Furniture and Fixture:- furniture as they effect the site are only those in the site clerks office. These same furniture cheap and crude as they are, were also being used for the site meetings. And where the seats were not sufficient, it has been found a common practice that blocks and timber planks were used to provide the seats. This too is a very useful form of cost control.

Bank Charges including interest on overdraft:- the method of procurement of materials here plays a very effective part in reducing or increasing bank charges. When materials are procured through the monthly account system that is not by the cash-and-carry method the need for overdraft is seldom necessary as all materials needed could be got on credit. And normally, under this arrangement materials are paid for after receiving Interim payments. Wages payment is one aspect which might occasionally necessitate bank overdrafts, but this is by no means the responsibility of the site staff. However, where a very cordial working relationship and understanding exists between the site management and the operatives, pay-days could be differed to such a date that Interim payments must have been collected; but this should not be too long for the workers endurance.

Accountants fees:- this has not been under direct control from the site.

3.3.5 Cost-Value Reconciliation

Cost-value reconciliation as a control instrument is found to be absent on the first three sites. From observations, records checking and discussions held with the site staff, it was evidently clear that the value of work performed at intervals between valuation dates were not compared with the actual cost expended on them for the purpose of effecting controls or corrective action on subsequent operations, but that the value of work done was only checked from the priced bill of quantities only to determine the value of the item for inclusion in the valuation-data.

The fourth site however, owing to the elaborate nature of its head office organisation conducts fairly good cost value comparisons through their quantity surveyors, based on the apparently scanty feed-back information system in use. Thus the cost-value reconciliation tactics have to be improved on all the sites.

Table 4

JOB: ..... FOREMAN'S TIME CARD DATE: .....

REPORT NO: .....

Employer		Work Item						Hours	Rate	Amount
Trade	Name	Formwork	Reinforcement	Concrete					₦	₦
Carpenter	Audu Tasha	8						8	1.25	10.00
"	Ayo Dele	8						8	1.25	10.00
"	Obi Okoro	7						7	1.25	8.75
Labourer	James E.			8				8	0.75	6.00
"	Jibo Gombe			8				8	0.75	6.00

3.4.0 The Proposed Model

The suggested method of control is a day to day reporting system that would provide a measure of performance to compare with the estimate.

One of the basic reports is the "Foreman's Time Card" shown on page 74 . On this card the foreman enters daily, the trade, a brief description of each job worked during the day, and list the men who worked on each job. At the end of the day he enters the total hours worked by each man in the hour column. A separate card of distinctive colour can be used for overtime work. This makes it possible to highlight areas where overtime cost was incurred.

The time card enables the foreman to report his labour allocation in a standard uncomplicated format, while an office clerk fills in cost totals.

The site engineer verifies the foreman's manpower allocation by periodic check.

The man hours reported by the foreman should be confirmed by the site engineer or the supervisor who normally makes two field trips per day, one at the beginning of work and again toward the end of the day. By recording on the "Daily Time Check Sheet" shown on page 76 the names of the men working in both instances, and comparing it with the attendance record, he can verify the foreman's time card for accuracy and also pinpoint late starters and early quitters.

The foreman's time card is the basis for the payroll, which is prepared by the accountants by applying each individuals wage rate to his man hours. It should be noted

Table 5

JOB: ..... DAILY TIME CHECK SHEET DATE: .....

TIME CHECKER: .....

Name	Time In	Time Out	Hours	A.M.	P.M.	Name	Time In	Time Out	Hours	A.M.	P.M.
Audu Tasha	✓	✓	8								
Ayo Dele			8								
Obi Okoro	8.00		7								
James E.			8								
Jibo Gombe			8								

here that the labour cost is measured in man hours rather than days to provide extra precision in labour compensation.

Besides the foreman time card, the foreman also should submit a "Daily Progress Sheet" shown on page 78. Here, he enters the quantities of work performed according to work items in "code numbers".

The foreman's time card and progress sheet are basic to successful man hour control. In filling these reports, the foreman gets a good idea of man hours per unit of work done. The foreman's time cards and progress sheets provide the essential information for:

1. the "Man-hour Distribution Summary",
2. the "Unit Cost Report",

Information obtained from the Foreman's Time Card and Daily Progress Sheet is entered on the Man-hour Distribution Summary shown on page 80.

Man-hour Distribution Summary is used to obtain, on one sheet, the cumulative man-hour cost separately for each work item, such as concrete, blockwork and so on. The total of each work item on each serially numbered time card should be posted daily to the Man-hour Distribution Summary referenced by the time card's number. The Man-hour Distribution Summary is biweekly and the total costs are assigned to the work item accounts. As an alternative, a subsidiary ledger with one sheet for each work item may be used.

The Man-hour Distribution Summary does not show quantities of work done and therefore cannot be used to determine unit costs. This is done through the "Man-hour Unit

Table 6

JOB: ..... DAILY PROGRESS SHEET DATE: .....

	Quantity Of Work Performed By Work Item Code					
	DLB 021	DLB 022	DLB 023			Remarks
Formwork (M^2)	85.2					
Reinforcement (Tons)		1.42				
Concrete (M^3)			7.6			

Cost Report" shown on page 82.

It reports for each work item the estimated, current and to-date quantity of work, cost and unit cost that make possible a comparison between estimate and progress, thus providing the platform for the much needed cost-value reconciliation. The report also gives the contractor his to-date profit or loss on each work item and a projection of profit/loss at completion, thus giving the correct signal for early corrective action, which is the seal for any cost control procedure.

Scheme of the Model:

Foreman's Time Card — this records:

1. the trade
2. the description of the job worked during the day
3. the list of the men who worked on each job
4. the total hours worked by each men per day

Daily Time Check Sheet — this records:

1. names of men working at the beginning and also at the end of the day, for comparison with the attendance recorded

Table 7

JOB: .....
WORK ITEM: CAST-IN-SITU CONCRETE

MANHOUR DISTRIBUTION SUMMARY

FROM: 2nd - 7 - 84
TO: 13th - 7 - 84

Monday		Tuesday		Wednesday		Thursday		Friday		Monday		Tuesday		Wednesday		Thursday		Friday		Total
FIC	₦ AM	FIC	₦ AM	FIC	₦ AM	FIC	₦ AM	FIC	₦ AM	FIC	₦ AM	FIC	₦ AM	FIC	₦ AM	FIC	₦ AM	FIC	₦ AM	
001	250	002	300	003	275	004	299	005	320	006	365	007	240	008	210	009	260	010	210	

FIC - Foreman's Time Card
AM - Amount

in the foreman's time card. And

2. it verifies the foreman's time card for accuracy. And also
3. pinpoint late starts and early quitters for necessary disciplinary actions.

Daily Progress Sheet

this sheet:

1. records quantities of work performed according to work item in "coded numbers".
2. provides a good idea of man-hours per unit of work done.

Man-hour Distribution Summary

this sheet:

1. records data from the Foreman's Time Card and the Daily Progress Sheet.
2. is used to obtain the Cumulative Man-hour Cost separately for each work item.
3. is biweekly and the total costs are assigned to the work item accounts.

Table 8

JOB: ..... MANHOUR UNIT COST REPORT DATE OF REPORT: .....
PREPARED BY:.....

Work item Code	Quantity				Cost			Unit Cost			Profit Or Loss		
	Units	Estimated	To Date	Forcast At Completion	Estimated	To Date	Forcast At Completion	Estimated	To Date	Forcast At Completion	Break Even	To Date	Projected
1	2	3	4	5	6	7	8	9	10	11	12	13	14
DLB 021	M^2	353	83	354	8550	1786	7011	2422	21.52	19.80	-	224	1539
DLB 022	Tons	6.35	1.58	7.85	4165	1046	5141	656	662	655	-	(10)	(976)
DLB 023	M^3	191	46	201	5776	1534	6922	30.24	33.35	34.44	-	(143)	(1146)

PROPOSED COST CONTROL MODEL FOR MEDIUM SIZED CONSTRUCTION SITES:

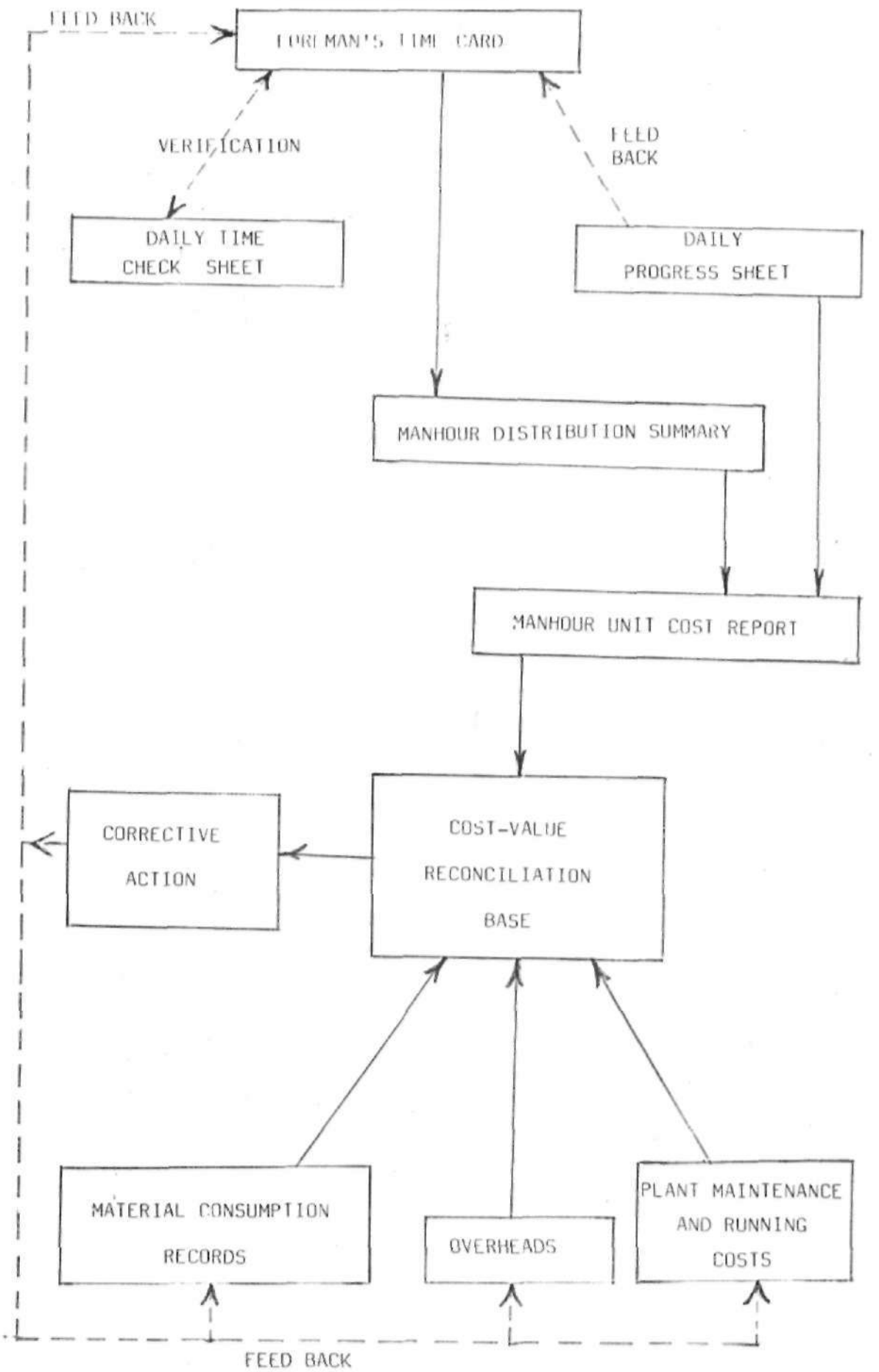


Figure 1

Man-hour Unit Cost Report

this report for each work item:

1. estimated,
2. current, and
3. to-date quantities of work, the cost and the unit-cost.

3.4.1 Notes on the Proposed Model

Material purchase:- Before any purchase is initiated, materials to be purchased by the headquarters office and those to be purchased by the site office must be separated.

Headquarters purchasing allows close corporate control and takes advantage of the saving possible through its buyer specification, consolidations of various job requirements for informed pricing, and access to better sources. On-site purchasing is however, necessary on remote projects or at times when waiting for headquarters office purchasing will impede project progress.

Whether it is headquarters or field office purchase, the requisition should be initiated by the foreman and passed through the site engineer or the supervisor, who compares it with the Bill of Materials and specifications, and then send it to the purchasing department for review.

The requisition must clearly state what is required to ensure purchase of the proper product and eliminate any possibility of confusion on the part of potential suppliers. It is preferable for purchasing

personnel to invite bids from vendors. They know where to locate suppliers and obtain a number of bids to get the best possible deal.

Material Usage:- A Warehouse Requisition slip, as on page 77b should be filled out by the supervisor or an individual authorised by him, before he receives material from the warehouse to be used on the job site. The store-keeper issuing the material knows where his material is being sent and can update his inventory. If a material is not required on the project and is returned to the warehouse, a similar warehouse requisition slip is used for a reverse entry.

The materials required from the warehouse are then checked against the original requisition by the on - site materials clerk. It is the cost engineer's responsibility to see that all material costs are properly allocated. He therefore must work closely with the field accountant, storekeepers, purchasing agents, foremen, and field engineers.

Materials drawn from storage to be charged to a job must be extended to Naira. Material is often bought and placed in inventory at different times and hence at different prices. Which price should be used for conversion to Naira. Several methods are in use. With the first-in first out method, the material is priced out at the rate paid for the earliest consignment in the present stock. With the last-in first-out method the material is priced out at the rate paid for the last consignment in the present stock.

As a third alternative, the rate is based on the ave-

rage price for all the consignments. Finally, with the market price method, the material is charged at the prevailing market price. It does not matter in the long run which method is used in pricing out materials, but it is absolutely imperative to maintain uniformity in applying the rates.

Wastage Control and Shortage Prevention:- There are several areas where physical control over materials is required. Material delivery must be regulated. If possible, material delivery should be staggered to correspond with job progress. Off-site warehouse storage incurs extra transportation costs but on-site storage may result in thefts or losses due to lack of security. Large jobs may warrant use of on-site warehouse. The amount and value of materials determine how they should be stored. Any material handling system should be evaluated periodically for efficiency. If all material is placed in the warehouse, extremely high storage costs result. Blocks, reinforcement steel and scaffolding can be stored outside, while plumbing, electrical fixtures, and acoustic tiles must be locked up and sent to the job only when needed.

Locked doors do not always deter theft or mis-appropriation of materials. There is a tendency for a construction suprintendent who has a key, even if he is a responsible person, to take more material than is required so that he does not run out of material and hold up the job. Also, if he lends the keys to assistants, they may print duplicate keys. The storekeeper must have the only key.

Equipment:- It costs money to own equipment, regardless of the extent to which it is used. These costs, which are frequently classified as investment costs include:

1. interest on the money invested
2. taxes of all types which are assessed against the equipment
3. insurance, and
4. storage

Even though the owner pays cash for the equipment, he should charge interest on the investment, as money spent for the equipment could be invested in some other assets which would return interest to the owner. The possibility of earning interest on money is lost to the equipment owner when he spends the money for equipment.

Each year that the equipment is used the owner should deduct from its earnings an amount equal to the annual cost of depreciation. Since this money is retained by the owner, it reduces his net investment in the equipment. After the equipment has been used for the estimated depreciation period, expressed in years or units of production, the owner will have recovered its original cost through the reserve for depreciation.

The average annual cost of interest should be based on the average value of the equipment during its useful life.

Plant idle time should as much as possible be minimised if control is to be exercised over the cost of owning and operating plants, because, among others, the chief factors

affecting the operating costs are:

1. The number of hours it is used per year
2. The number of years it is used
3. The care with which the owner maintains and repairs it
4. The severity under which it is used

While it is advisavle to exploit the output of the plants to the uptimum it is also wise to keep a regular maintenance schedule over it in order to keep the cost of repairs at the minimum.

And before purchasing any plant it must be seen to be capable of contributing to the construction of work carried out at a fast rate of progress and at low cost. In effect, this means that the first consideration is:

1. The output per hour of which the plant is capable
2. The unit cost of the work which it performs

That this is so is understandable, for the output of the plant per hour influences the time taken to carry out the work, while work carried out at low unit cost contributes to the profit obtained and makes possible the submission of competitive tenders, this latter qualification being essential in the case of a contractor who tenders for work in open competition.

CHAPTER FOUR

4.0.0 Conclusion And Recommendations

4.1.0 Summary

After the assessment of the practice of cost control on all the four sites studies against the background of theoretical provisions in the form of systems and procedures it became abudantly clear that cost control procedures on our medium sized building sites are not being paid the deserved attention. And this piece strongly hold the view that an effective cost control scheme is an essential ingredient for the survival of any construction organisation. It will not amount to an overstatement to assert that while a good and effective cost control system is a cornerstone in the development and hence expansion of any firm, lack of it is also suicidal to any organisation.

It has thus been observed that attention on cost control centres are not based on the factors of production namely, labour, material, plants and overhead. This can be exemplified by the following not-so-exhaustive instances:

i. Capable hands have not been found to be given particular preference in the assigning of supervisory and hence managerial duties. Choice of personnel for managerial assignment is determined by years-on-the-job backed sometimes by technical skill which might not in turn be based on sound theoretical and technical education.

And there is still this world of difference between knowing the job as 'the assembly of components' and knowing why the components should be assembled the way they are assembled and why the choice of the components themselves.

ii. There has not been much initiatives in the material procurement system used by our construction firms, as procurement of material is hardly found to be outside the conventional methods of cash-and-carry, supply on specified fixed term account and the Local Purchase Order systems. Not much room, also, there is for the use of discretion to decide on the choice of material to be used from a range of suitable substitutes, by the contractors - though this could be blamed on the conventional contract terms partially.

iii. Plant acquisition (and use) system also needs improvement as a clear guideline is not readily available to inform the firms on which plants to own or to hire, and knowledge of the plant matching systems needs be acquired or refreshened.

Overheads cost control systems need be updated as major cost factors under this head are not reckonned with in the determination of prices, which have direct consequences on cost returns. The improvement generally on the cost reduction and cost control techniques under this heads will go a long way in allocating the plight of the medium sized construction firms in areas of liquidity and general financial problems.

4.2.0 Recommendations

To reduce uncertainty and risks the following must be observed carefully.

1. A detailed and responsive organisation must be set up within the firm to take care of cost control. This need not be an isolated set from the central working body, but the responsibility for the various cost control aspects must be assigned to appropriate officers individually within the firm.

2. A clearly defined areas of responsibility in the cost control department of course, must be assigned all the technical supervisory staff, and where necessary such officers must be educated in the particular areas they are wont to operate - ideally in the form of refresher courses. And also the need for effective cost control must be made clear to them.

3. There must also be an effective communication among the staff, both technical and administrative as the work of one officer complements that of the other.

Any break down of communication any where along the line means a construction to the process and hence reduced efficiency.

Information system must be developed.

4. Therefore, to achieve a responsive cost control a fully and carefully laid out plan must be readily available at any moment for comparison with progress.

5. Such plan must be simply presented so that it can be easily understood by the ordinary supervisory staff on the site.

6. The adoption of the Man Hour Unit Cost Report Form and religious application of its provisions (see page) which are self explanatory, is highly recommended.

7. Periodic budgets are also recommended, taking all known factors and a great deal of speculation into consideration, followed by comparison with actual performance.

8. Wages should be paid weekly, subcontractors should be paid monthly under contract, and for materials payments to be against monthly accounts. This if implemented will afford the accountant a substantial part of the outgoings for a more positive manipulation. There may then be a marked difference between the amount of liabilities accrued and the payments in respect of them.

9. Control measures should best be effective when applied simultaneously with the progress of the work, that is when it is an in-built phenomenon being applied consciously

as the work progresses. This has the advantage of easing the strain both mental and physical of devising and applying a control measure for each individual lapse detected at a later date. It also saves the cost of the off-set with which the progress must have gone out of the budget before the detection.

And thirdly, it also saves the cost to the firm of the consequences of going out of the budget.

A board of directors, being responsible to share holders for the financial outcome of its enterprise must report periodically. In order to do so, it must be able to identify sources of profit and loss and if there is a matter at issue, to account for these profits and losses. This can be done, of course, retrospectively, by initiating a detailed enquiry. Lessons are then available for incorporation into company policy, but such an enquiry may also be the occasion for action against some scape goat, a decline in confidence on the part of the market, the resignation of experienced members of the firms and so on It would clearly be better to introduce a form of control that would allow undersirable trends to be corrected as the particular enterprise proceeds.

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