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A SYSTEM APPROACH TO EFFECTIVE PROJECT MANAGEMENT CONTROL

BY

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DECLARATION

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DEDICATION

To My Wife Olufunmilayo Irene,

and children Bisi, Folusho, Ranti

and Kemi.

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I am indebted to Prof. Jan Oleszkiewicz who initially encouraged me to undertake the task of preparing a Ph.D. thesis and for his guidiance throughout the period of preparation.

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I am most grateful to the entire staff of the Department for their interests either consciously or unconsciously. As it is, sometimes negative attitudes can act as inspiration.

Lastly, I have to place on record the contribution of late Prof. J. Kasinski who before he died was very prominent in finding my initial direction. May his soul rest in peace.

Tim. O. Mosaku

ABSTRACT

It is a pervasive tradition for the building process to be split up for a number of different parties to do different things at different times. There are many reasons for this but most important is the increased specialization in the process. This trend is likely to continue but yet there is need for integration since decisions taken in isolation may cause distruption or distortion somewhere along the line of the whole process.

This research has been attempted in order to investigate the ways by which rationalised decisions at the various stages of a project can enhance control and coordination throughout the whole process; that is from design to practical completion of the construction work.

The following factors have been found to hinder both the progress, control and coordination of construction programmes.

a) Design changes (sometimes made as late as the construction stage) which may be due to various reasons.

b) Design inadequancies.

c) Design priorities being at complete variance with other requirements as function, contract administration, construction practice etc. These should be mutually benefitial to all parties.

d) Management procedure adopted. (including the relationships between the various parties to the contract, and, office and site management of the contractor). Sometimes the practice is non-complementary.

e) Government involvement through the introduction of economic measures and regulatory sanctions.

This thesis takes the premises that coordination and control of building project are intrinsic parts of creative and functional design,, well established contract practice and procedure, and of sound construction practice; that the various parties involved at different stages of the project process do not have to think in isolation but rather to have in their contemplations what could be both the negative and positive effects of each others contributions to the realisation of a project management.

The success of any project will depend upon this ability to closely align the requirements of these various parties both in terms of cost, quality , functional values, aesthetic satisfaction and the ability to meet the comple-tion date. It will also depend upon the parties being able to realise the prime objectives for which they have been set up-without mutilating any of the project goals.

It then means that effective project development and management is a game where there should be no winner or loser. It is a game of compromises within acceptable tolerance.

The thesis itself consists of eight chapters. Chapter one highlights the general problems of the construction industry in Nigeria and develops a theme for the purpose of the thesis. Specific objectives were set and a brief account of methodology given to show how the proposed objectives might be accomplished.

An evaluation of the theory of the thesis concept was given in chapter two coupled with an account of what has been done along the same line by other researchers.

Chapters three and four provide the basic data for the development of the concept. Specifically an account of the procedural matters was rendered in chapter three while chapter four provides the information on the flaws existing in the application of the procedural matters discussed in chapter three.

In chapter five and six the concept and the basic application of proposed system were described. The concept developed is based on finding the common grounds where cooperation, hence control can be accomplished. Such information is then fed into a system operating on both feedforward and feedback control system. In other words the stability of the system is assured by the fact that both the feedforward (Ff) and Feedback (Fb) are equal for each stage of a project development.

The highlights of the advantages and disadvantages of both existing and proposed systems were stated in chapter seven.

Finally conclusions and suggestions for further research were recorded in chapter eight.

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CHAPTER ONE

1.0 INTRODUCTION

The overall performance of the construction industry in Nigeria has never been quite acceptable to an average citizen of this country. This is so because the management control and technical inputs are grossly inadequate in quantitative and qualitative terms at the various stages of the building process.

Militating against adequats management control and technical inputs are certain conditions under which the industry operates and which, unless corrected, will continue to retard the expected progress in the industry.

In this regard one would like to point out that practice and procedure pertaining to building project management as at now is to a large extent an adopted system from more advanced country. The adaptation of such a system or established standards, has unfortunately proved ineffective in the face of local norms and conditions. The attendant problems are numerous delays in the completion of projects, loss of integrity and lack of satisfaction by those operating within the system.

Additionally the construction market in Nigeria is dominated by foreign nationals who have come from a different background from the source of the

adopted system. Problems therefore arise of understanding and implementing contract conditions and terms. Unfortunately this aspect is usually ignored during the negotiation of a building contract.

The case of the illiterates and non-professionals who have infiltrated the system that is highly technical in nature provides a worse example than the case of foreign owned organisations. This has often led to confusion, misunderstanding and misinterpretation of purpose, resulting in delayed project execution and shoddy performance.

Controlled and coordinated performance can be a huge task to accomplish when the interaction is between various groups who understand what has to be done differently from one another and what has to be done is complex and technical in nature.

Lack of unified method of applying the adopted standard by both the professionals and their clients has hightened the horizon of control problems. This can be seen in the fact that the groups do not encounter, study and try to solve the same problems in the same order. This fractured approach is being buttressed out of ignorance and fear both by the government and the general public. Therefore the gap between the two (professionals and clients) is getting wider and wider and control more and more difficult to accomplish.

Beyond the horizon of the general symptoms are specific problems of the construction market in Nigeria.

Design and desin specifications do not always take into consideration the labour, level of technology, and material (including components) available for the implementation of a project.

Nigerian labour market is quantitatively encouraging but unfortunately it does not relate to the standard of design. As such there is slow, wasteful, and unsatisfactory production.

Designers are yet to appreciate that designs must be aligned with the available level of technology to ensure control not only of the quality of output but also the control of productivity. Design solutions have in most cases, been experimental and as such the control of both the quality of the building and the contractor's organisation have been badly affected. To restore order and promote control measures, design solutions must be found in a realistic assessment of consideration for the contractor's organisation.

Another factor affecting proper coordination and control is the aspect of materials and components specified for incorporation into the building. The subsequent arrangements for their supply and the

probability of their procurement can, and often does, throw out of balance the control of a project both in terms of prompt completion at the planned cost, and the user satisfaction. These problems arise as most materials and components are on importation, and invariably there is delayed supply and sudden increase following depressed economic activities. Both delayed supply, price fluctuation, and non-availability of the specified materials and components are mainly responsible for enormous amount of variations resulting in slow progress, additional claims, and a preference for a second choice. It has to be mentioned here that variations may change the basis of the original contract from competitive to negotiated especially that the contractor may use the situation to hold client to ransom to recover for a previous loss situation.

Ironically the government that stands to benefit more from a controlled construction industry (especially when it is realised that over 60% of any government spending is on construction) has not been too keen in playing sufficiently prominent role which will aid a controlled situation. Some of the government present regulatory actions have been either too restrictive discriminating or both. Some have overall negative effect. Consequently the interests of the various groups are divergent, and the parties

are no longer able to communicate efficiently with one another. Government can stimulate control more positively.

Nothing so far is suggesting that we are on the brink of technological changes which will affect the organisational structure of the industry. Most of our moves have been tactical rather than strategic. Therefore a lasting solution must be found not only by the members of the construction team but also by the government. Neither the government nor the various individuals responsible for the execution of the various phases of a construction project can take unilateral decision without serious consequences on the overall control of the industry.

1.1 The Need for the Research

The outlook of modern construction projects has changed considerably both in size, requirements, and complexity. This fact, coupled with changing techniques, and the relative shortage of skilled manpower and material resources, have focused attention on the need to apply the principles and practice of best modern management more widely and systematically in the construction industry in this country.

An urgent need has also been expressed for an improvement of the present approach to the management of construction project due to tremedous pressure

being exorted by the various governments, companies and individuals. This pressure is being generated by government's project oriented schemes such as development of new Federal Capital, creation of new states and other development programmes; the individuals becoming more conscious and more affluent etc. Such an overhaul will not only ensure that future demands are met adequately but also that the objectives of the persons concerned with the projects are met properly.

Current practice has come under serious attack so much so that one can safely say that the appraoch to project management can no longer be considered durable.

One other unfortunate dimension to the problem of the existing system is the fact that the construction industry in this country accommodates the gamut of illiterates with whom the professionals must work to realise the objectives of a project. Yet the realisation of a project goal through the cooperation of these individuals is by understanding a complex and unique body of procedures.

The industry has gradually, over the past several years, become enveloped in a maze of statutory enactments and common law precedents unlike most other industries. A basic understanding of the essence of this somewhat unique body of law has become a

necessary working tool for a truly professional individual within the system. It is through this maze of laws that the individuals must navigate their courses of performance to survive economically and satisfy their courses of existence.

To compound the problems associated with illiteracy within the industry is the fact that the contract agreement has been drafted with protesque and avoidable technicality. Its complex language conceals traps which only an experienced lawyer could be sure to avoid.

Another complication is the contingency approach to the project management by the various individuals or groups operating the system. This means that there is no one best way of managing all situations. It also means that the managers of the system are free to manage in any way that might fit their biases. As a result there has been mutilation and adjustment to the standard approach with its own attendant problems.

It is as a result of these shortcomings both on the part of the system and the system operators that the records of performance of the construction industry in this country have left much to be desired and it is why the image of the industry still remains haggard.

The project management control system in this country can be divided into three broad stages of operation as in the later models. There is a need

for boundary adjustment to promote harmony, cooperation, and coordination necessary for the realization of a controlled output. There is also a need to simplify procedure to ensure understanding among the various parties concerned.

1.3 THE AIMS AND OBJECTIVES

1.3.1 The Aims

This research has been undertaken to provide conceptual framework into the problems of coordination and control of the whole process of building project management that is from design stage to the 'practical' completion stage. The need arises from pressure that exists to see that most building projects must be comprehensive in assessing both their requirements and their implications in order to avoid unnecessary spending and waste of time while at the same time ensuring that the client gets value for money.

1.3.2 The Objectives

The prime objectives of the study therefore are:

(a) To examine the mechanics of coordination and control of the building project processes.

(b) To highlight the symptons of the present fractured approach to a building project, analyse them to establish which are likely

to stimulate an exchange of ideas between the various stages.

(c) To mitigate or remedy the impact of certain adverse elements and policies in the project environment.

(d) To evolve a project management control concept based on the knowledge of the problems existing in the present system.

(e) To provide an overall philosophy for, a method of thinking of, and an organised approach to, the planning and management of a building project by inducing the evolution of the system in use to integrated concept which will compensate for the short-comings of the present system.

1.3 LIMITATIONS OF THE STUDY

The study has been based on historical data and as such its application can only be seen in form of comparison of merits and demerits of both the existing and the new systems. The projects chosen for the study are mainly government projects but since the matters are similar to those concerning private developments, it is hoped that there should be no difficulty in applying the concept to privately owned projects.

1.5 THE PLAN OF STUDY

The first step towards the realization of the aims and objectives of the study has been an examination of the theory of the concept to ensure understanding. The second step has been to examine the present system in terms of procedure and performance analysis. Following from this a concept has been developed on the basis of the existing situation. A simplified method of applying the concept has been propsed and the merits and demerits of the existing and the new systems compared to stimulate implementationof the new system.

Finally certain conclusions and recommendations have been made to provide a framework for future work.

CHAPTER TWO

2.0 EVALUATION OF SYSTEM AND CONTROL TECHNIQUES

During the past few years there has been a remarkable growth in the number, size, and complexity of construction projects. Equally, a tremendous emphasis has been placed on improving the performance of the construction industry the world over.

The effective management, in terms of proper coordination and control of cost, timing and value of these capital investment projects, is important because of the large sum of money involved.

Obviously therefore the management of a project is not just to resolve the problems of its size, complexity and sheer number alone but rather the problems must be resolved within the framework of certain objectives.

The problems of a building project are of dynamic nature and must be treated by the application of dynamic technique. The concept of system approach holds considerable promise in terms of providing a single interlocking approach. By the application of this technique within a dynamic overall system concept, and with the aid of data processing equipment when and where appropriate, it should be possible to firmly guide the most complex projects towards minimum cost, on-time completion, and profitable operation.

2.1 System Concepts

The primary concern of the systems approach is that any system should be treated as a whole[1,2,3] and that, however, the individual interests should not go unrecognised.[4] The initial step, and which is one of the hardest, is to define what is meant by the particular system under consideration. This is done by first defining the objective of the system and then by identifying the parts bearing on the objective. These parts may then be grouped into subgoals to form subsystems.

Smith[5] defined a system broadly as a "group of interdependent elements acting together to accomplish a predetermined task" and that the objectives, interrelationships, and constraints of the system should be recognised and isolated, and in turn stated through the true universal language of a model.

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1. Johnson, R.A.; Kast, E.F.; and Rosonzwig, J.E., "The Theory and Management of Systems." McGraw-Hill, New York (1965).

2. Cleland, D.I.; and King, W.R.; "System analysis and Project Management." McGraw-Hill, New York (1968).

3. Optner, S.L.; "System Analysis for Business and Industrial Problem Solving." Prentice Hall, Englewood-Cliffs (1965)

4. Child, J. "Organisational Structure, Environment and Performance. The Role of Strategic Choice; Sociology 6(1) 1972 pp 1 - 21.

Siegel[6] has said that "thinking of systems simplifies generalization which in turn improves understanding. That this is true providing it is realised that the system is not what is being studied but that it is a model of the reality under investigation." It is, in another words, a way of explaining interaction of a phenomena and so increasing our knowledge of, and insight into their working.

Having these boundaries clearly defined means that not only the places where attention is required can be identified more readily but also that the source of attention will easily be known. For this reason boundary management is a key systems concept; management is centred on the systems' most critical areas.

The use of system puts one at a distinct advantage whether in matters of control of current situation or in adapting quickly to change arising in the technology of the process or in the environment.

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5. Smith, Gordon, F. "Preface to Dimitris N. Chorafas: Systems and Simulations. (Smith - the Vice President UNIVAC Operations Europe, Middle East and Africa).

6. Siegel, P.; "Management Information Systems" Petrocell, New York (1975). pp 6-7.

Hence Donald[7] defined system "as an integrated approach to a situation which will assist in understanding how the undertaking functions and hence in achieving more effective control".

If therefore system is for control purposes there is the need to formulate its policy and objective whether explicit or implicit, in terms of value judgements and consider how fully this policy and objective are understood and accepted by those responsible for implementing it. This then is the framework.

The systems' way of looking at events gives one the insightwhich if properly applied could lead to a more efficient or more effective management of a situation. Donald[8] draws a distinction between being efficient and being effective. Efficiency he defines as a concept of looking towards inputs and answering such questions as "what is the best way in which I can use my available resources?" Effectiveness he says looks towards outputs and the goals that are achieved. "What is the best way to achieve my objectives?" In practice both are inextricably

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7. Donald Archie "Management Information and Systems. Pergamon Press. pp 22-23 (1979)

8. Donald Archie, "Management Information and Systems. Pergamount Press. pp 10-11 (1979)

interwoven. One cannot ignore one at the expense of the other. But the need to recognise this fact is even more so in a building process where there are various individuals in charge of the different interfaces of a project development and where there is reciprocal interdependence. In this case the effectiveness of one stage has a direct bearing not only on the efficiency of the other stages but also on the effectiveness.

It follows therefore that the elements which form the basis of a system are not hypothetically constructed but rationally and delibrately chosen or discovered. The general characteristics of the behavioural and technological processes must be at hand before a system can be constructed. Hence it is possible to state that a complete scientific system is made up of fundamental laws which are supposed to be valid, if scientific conclusions are going to be reached by logical deduction. It is these conclusions which must correspond with the separate experiences. And it is this correspondence which tells much of the story of what goes on in experimentation concerning systems work.

Systems represent the study of a practical optimisation problem which requires a realistic representation of the system by means of a suitable model and the explicit and implicit formulation of

an appropriate performance criterion. The model must describe correctly at least the qualitative features of the practical system in the complete range of the probable operating conditions. This presupposes that the model of a given situation is built incorporating all aspects it wished to study. This model can then be used for analysis of the situation it represents and if it is a good model, for prediction as well as for planning. Hence Dimitris[9] defines simulation as essentially a working anology. Anology means similarity of properties or relations without identity. Where we are able to construct analogous systems, measurements or other observations made on one of these systems may be used to predict the reaction of the others.

It is therefore considered here that management is a system - facilitating process which, through various social, and technological activities utilizes resources, influences human actions, and plans change in order to accomplish a rationally conceived goals. The complexity of most systems necessitates some sort of management to ensure that each part performs for the benefit of the whole.

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9. Dimitris N. Chorafas "Systems and Simulations" (1965) page 15.

System approach will influence greatly the organisation structure in that it establishes the criteria upon which the boundaries of an organisation sub-systems can be founded. It has also looked at how changes in the organisation or its environment affect the definition of those boundaries.

2.2 Types of Systems

Lee[10] classifies man-made systems into four groups namely procedural, physical, social and conceptual. A procedural system is a collection of relative rules and procedures set up to help in decision making or problem solving; a physical system is a collection of physical elements connected or assembled for a given purpose: a social system in a group of people working together or banding together for a common purpose; a conceptual system is a theory or a model. However, the purpose for which the investigation is taking place determines which system model it will be best to set up. It may be necessary in certain cases to combine any or all the distinct types.

2.3 Characteristic of Systems

The elements of any system are:

(i) Inputs - these are the resources that initiate the system

(ii) Process - this is defined as the mechanism that transforms input - into outputs

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10. Lee A.N., "System Analysis Frameworks". Macmillan London (1969).

(iii) Outputs - these are the transformed inputs

(iv) Control loops - these are either feedforward or feedback information to regulate the system performance

The modes of working of a system according to Donald[11] can be analysed in the following categories:

(a) Static System (no change of state)

(b) Deterministic change of System state

(c) Probabilistic change of system state

(d) Adaptive, learning or self-organising mode of system state change

(e) Reactive and impactive mode of system state change.

The only need for control in static system is regular inspection to ensure that the framework is not altered.

In the deterministic system a level of performance is set which will need to be reset at certain regular intervals to maintain the original standard. This is similar to setting the level of performance for a mechanically operated system such as a car.

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11. Donald Archie "Management Information and Systems" Pergamount Press.

Probabilistic system shows signs of uncertainty as to what course the system will actually follow. In which case as what will happen on any particular occasion is not known, strategies must be developed for each situation to guarantee control.

Adaptive system is the one that learns from its mistakes, organise and adapt itself so that its reaction to specific stimuli changes as time elapses. This sort of mode of working has a frame of reference through which the stimuli are tested before any output is allowed to pass.

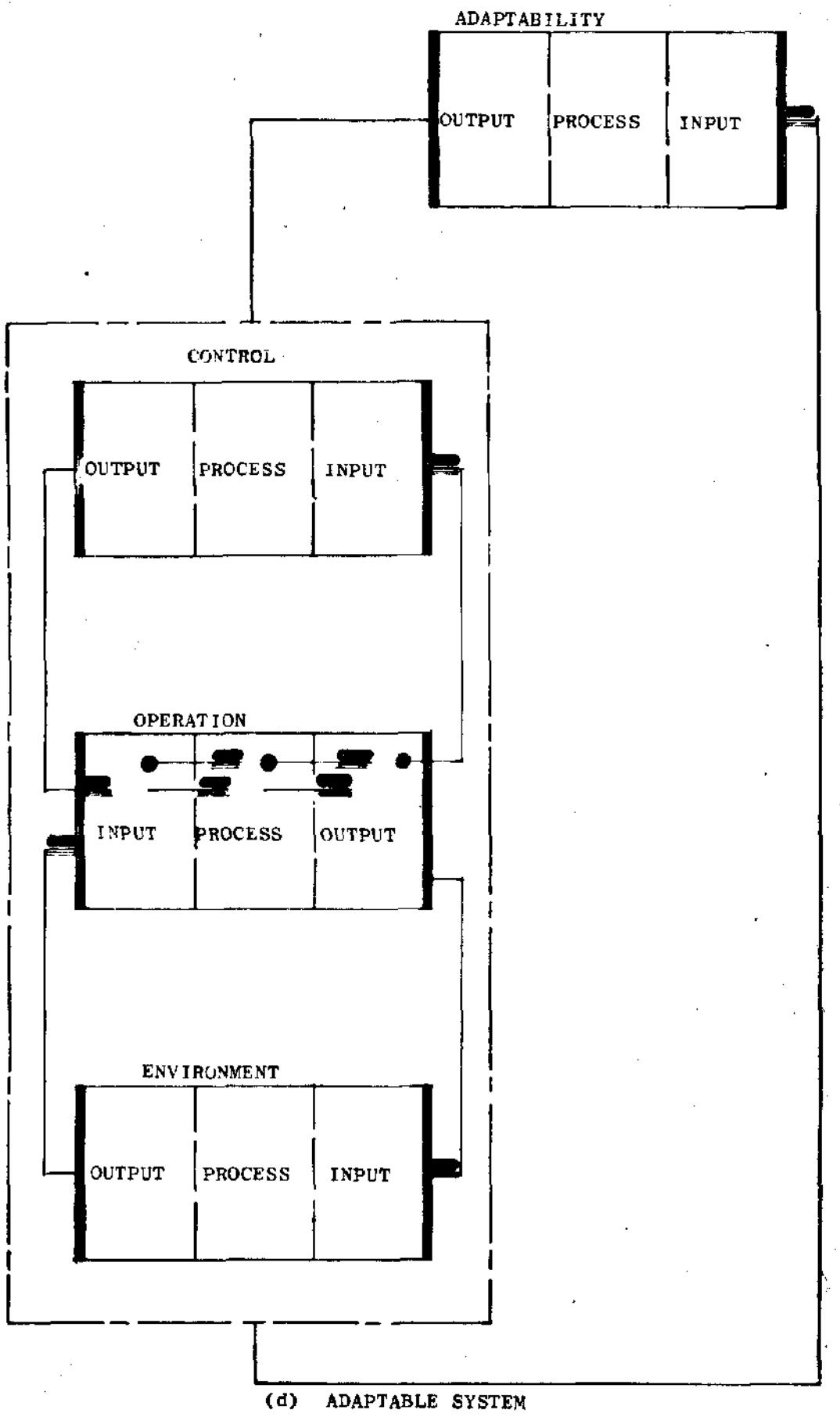
Most systems are treated as reactive in that their outputs are reactions to input stimuli.

2.4 Controls in Systems

Coordination is the efforts to assure a smooth interplay of functions and forces of all the different component parts of a system to the end that its purposes will be realised with a minimum of friction and a maximum of collaborative effectiveness. This in effect is the primary goal of a system. Control on the other hand is to limit the arbitrary, capricious, and erratic behaviour as may be exhibited by the system not only by setting standard but also through careful examination of the parameters impinging upon the system objectives.

Degree of control is related to the organic or mechanistic character of the system. Organic character relates to free-flowing communication and an open structure that depends less on lines of authority and mechanistic character relates to rigid chain of command that forms a path for the movement of information along an official channels of communication. This is bureaueratic system and construction projects are not quite susceptible to this type of control.

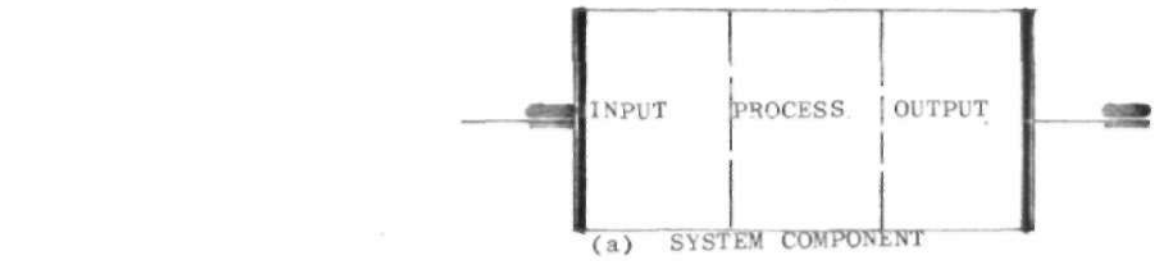
Current situations need to be controlled as they occur. Uncontrolled system may deviate from the agreed goals by increasing amount until a crisis situation occurs. Hitherto the control approach to a building project has been backward-looking rather than anticipatory. That is deviations are corrected after the fact, rather than anticipated. Therefore control approach at various stages of the development of a project will be a valuable first approximation of the process.



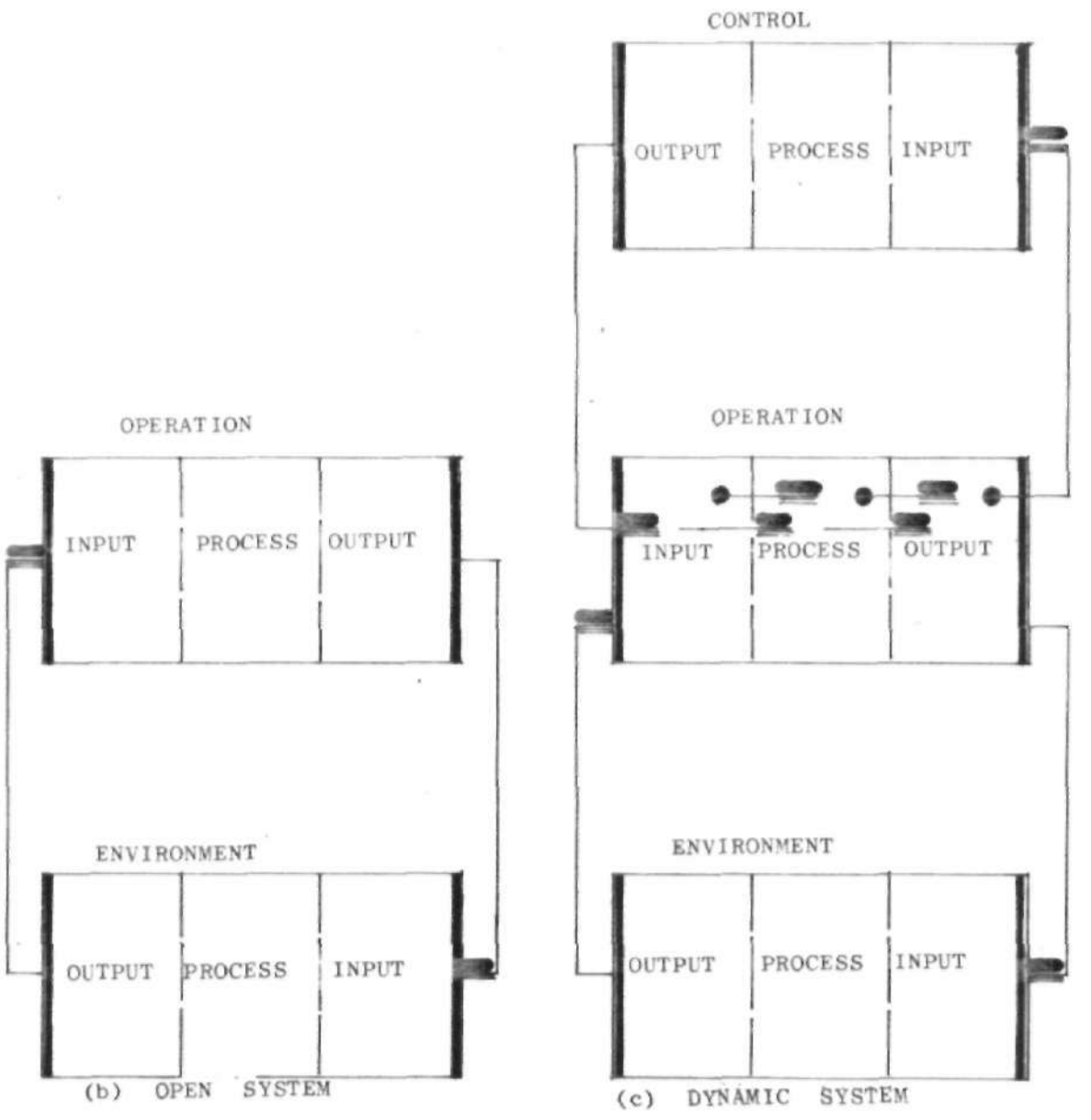
(d) ADAPTABLE SYSTEM

CHARACTERISTICS OF SYSTEMS

FIG 2.01



(a) SYSTEM COMPONENT



(b) OPEN SYSTEM

(c) DYNAMIC SYSTEM

CHARACTERISTICS OF SYSTEMS

FIG 2.02

2.4 Solving Complex Building Project Problems

There are so far, a few number of systematic studies aimed at solving the numerous and complex building project problems that have been suggested. This paucity of information has not helped in understanding, appreciating or identifying any suitable approach to an effective control of project management.

The relatively short span of time within which the approaches have been developed suggests that most of them are still subject to modifications in the face of new discoveries of more facts and problems arising from the new developments in project requirements and technology.

Approaches that have been developed so far were done independently of one another. There had been no cross-linking; meaning that their further developments can only be based on critical commentary of their readers and the acceptance of risks on the part of those wishing to grant their consents for the application.

Notable among these contributions are the concept of design and build, management contracting, and project organisational analysis.

The concept of design and build, though being applied in varying degree of sophistication, is simply to promote a closer association between the parties to a building contract in order to reduce

the incidence of misunderstanding; improve communication; increase individual commitment through greater teamwork, and identification with the project, and last, but by no means least to make the best use of contractor's knowledge of project construction management.

In certain instances the defined problems have been partially resolved and in other instances the definition of the problems is further broadened and more confusing by the use of this concept.

The concept of 'Design and Build' as proposed by Titmus[12] in his article titled 'Design and Build in Practice' has been seriously criticised by some people in that it attempted to provide solution to the problem of teamwork and can only be successfully applied where time is a critical factor. Aspects of cost and owner's functional requirements receive only marginal attention. The fact that matters relating to these issues are resolved once may at first seem an advantage but one must consider that owner whose mind is made at once is difficult to find. Besides the individual's perception of a situation may vary from time to time depending on his state of mind at the time the decision was being made.

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12. Titmus P.D., "Design and Build in Practice" Building Technology and Management April, 1982 pp. 9 - 12.

Design and build concept also overlooks other aspects of control measures which are very difficult to appreciate at the onset and which promotion of teamwork cannot resolve. Such problems usually rear their heads only at the construction stage. If these problems are to be resolved we shall have to revert to the traditional way of doing things. The only advantage here is that we need not contact the client again if the solution to the problem is to be found in the site methods.

Matters affecting initial decisions must be reviewed once again with the client if they relate closely to his choice or preference. This process of necessary reassessment of owner's choice or preference throws out of balance the initial time saved working as a team.

The revision of decisions well after the construction work has started is a principal problem which any design approach should endeavour to eliminate or mitigate.

Design and build is silent over the issue of whether cost is fixed or subject to plusages arising from construction site problems as well as other external influences in construction market. These can amount to a substantial sum of money for any organisation to bear on behalf of an individual

unless certain things will be made to suffer. A successful scheme is one that retains and performs the expectations of all the parties to it with or without a change.

Titmus reaction to a criticism of the design - build approach, which states the difficulty or the inadvisability of introducing variations into the scheme once construction has commenced, was that client might see it advantageous in a tight financial situation. As much as this may be true, one thing that should not be overlooked is the fact that variations do occur not just because the client feels that there is redundant cash to spend more on the job but perhaps because the originally specified materials can no longer be found on the market or cannot be applied successfully or for some other reasons.

Design and build and management contracting both rely to some extent on the architectural profession accepting a change of emphasis in their relationship with the contractor. On the other hand the contractor's own philosophy as to whether he employs 'in-house' designers, or an external practice selected for their past experience of a particular type of project, has a bearing on the attitude of the professionals towards design and build approach.

While the design and build approach has the obvious advantage of the contractor being able to contribute his expertise during the evolutionary state of the scheme in terms of construction methods and technology, other critical areas are only tangentially touched upon to the detriment of the project success. As will be shown later in the development of the concept of integrated project management control system,s conflicts do exist between the interfaces of a project development which are largely responsible for failure or success of the project.

Management contracting has been seen as another form of cost-plus contract. This view can be supported by looking at its semantic diagram fig. 2.06. The introduction of project management contractor between client and the consultants and between sub-contracting firms to work for the client, is an added burden on the clients payroll of professionals.

Project manager's position does not seem to favour direct interaction between client and the professionals. This interaction is a necessity for positive determination of client's requirements. Since transmission of the client's requirements is through the project manager, there is a chance of inconsistency creeping into either the quality and/

or quantity of the information being transmitted and where there is inconsistency there also is the probability of misunderstanding and misinterpretation at the execution stage.

Competitive tendences tend to vanish under management contracting when one looks critically at the situation during the design management stage of the system especially that the design team have the option to modify and remodify their judgement thereby contradicting the basis upon which the team may have been appointed. This means that the initial criteria for the appointment of a management contracting firm may have now been falsified by subsequent modifications.

The principles of the design and build approach have been applied as reported by Titmus[13] to confirm the advantages of the system. The demonstration projects included one multi-purpose building and the other a social services building. These are complex designs needing rapid and interwoven solutions to which figures 2.03 and 2.04 refer.

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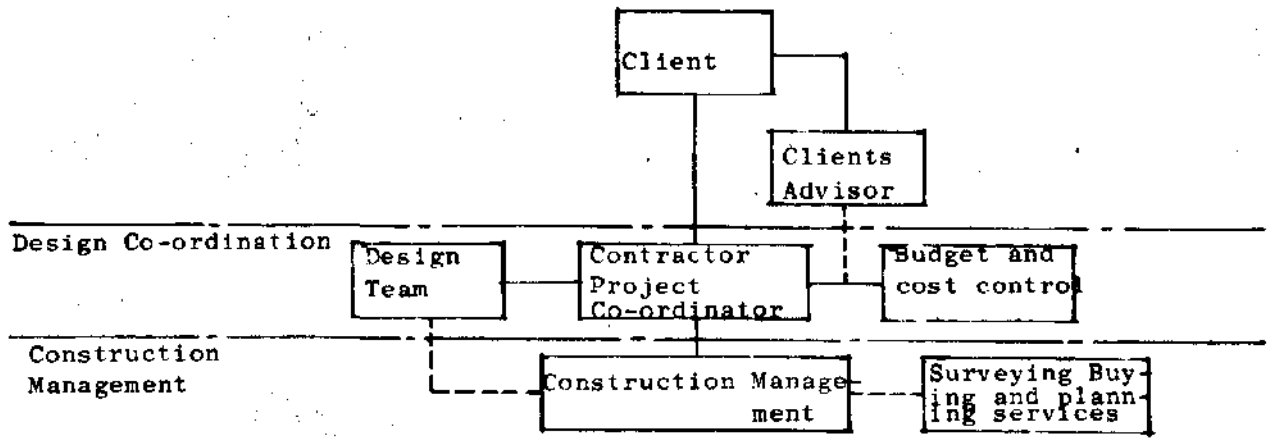
13. Titmus, P.D. "Design and Build in Practice" Building Technology and Management April, 1982 pp. 9 - 12.

One would hasten to point out here that the principles of interactive solution forms the backbone of the specification of a successful level of performance of the projects. This goes further to suggest that what is needed most to be emphasised is not in the relationship but rather in the information that could be generated for mutual understanding and cooperation. In other words emphasis should be placed on finding answers to the communal areas likely to bring conflicts as well as strengthening areas where cooperation already existed in order to specify a high level of project performance.

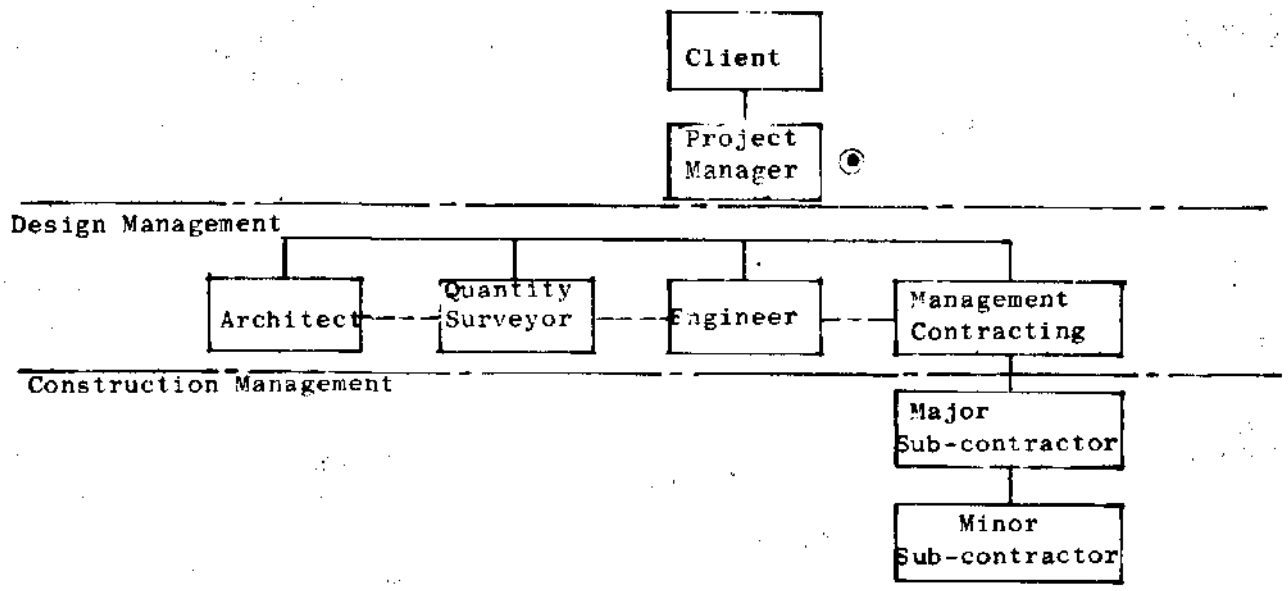
The first demonstration project demanded that the contractor's architect and engineers should incorporate within their design not only the requirements of the client, but also those of the prospective supermarket tenants, an old persons' organisation and because of the character of the surrounding area, the particular demands of the local authority.

The second demonstration project was a Social Services Building for a Borough. Again this required provision for a cross-section of persons of different background.

DESIGN & BUILD & CLIENT - CONTRACTOR RELATIONSHIP



MANAGEMENT CONTRACTING: CLIENT-CONTRACTOR-PROFESSIONAL RELATIONSHIP



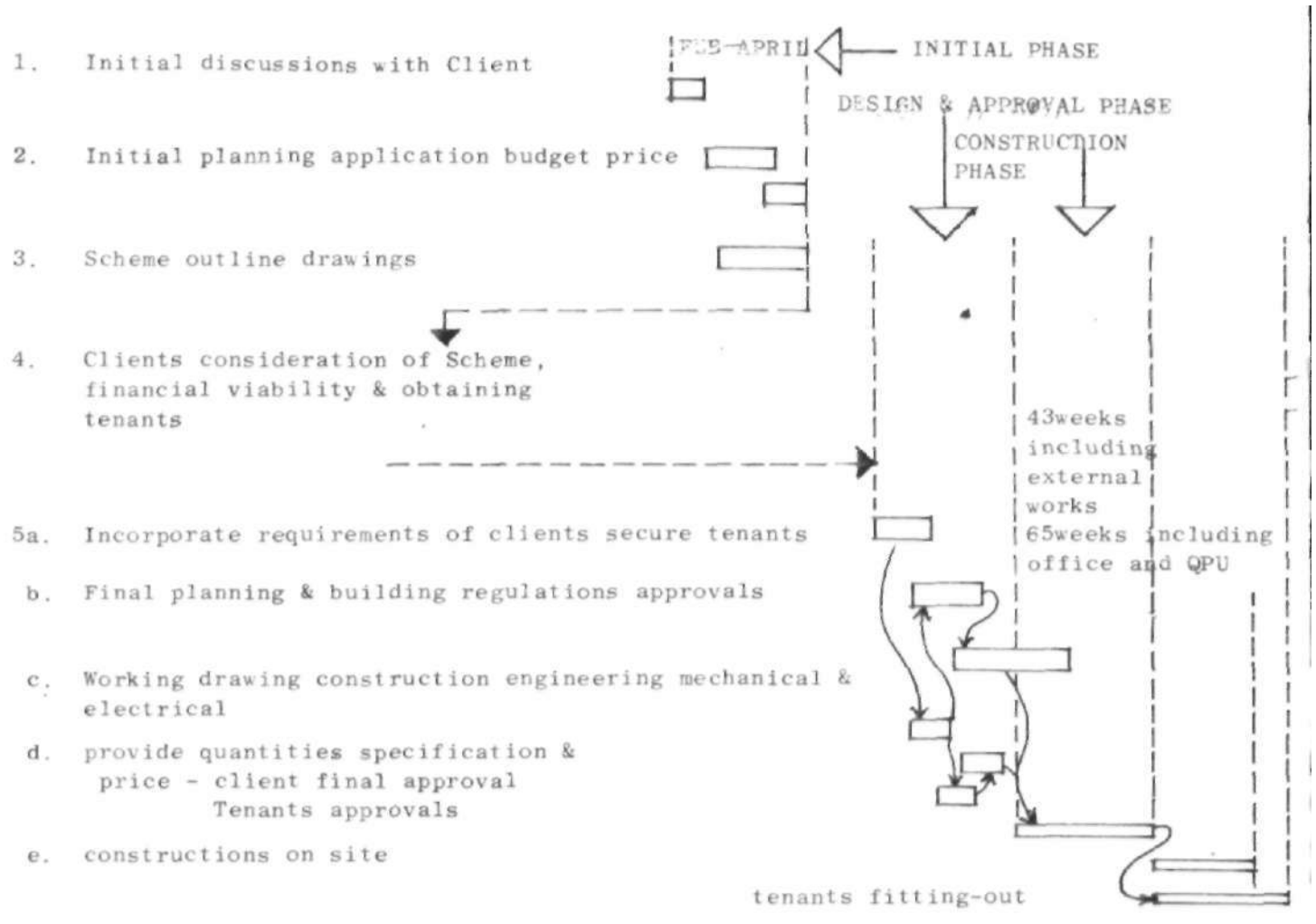
Ditect Lines of responsibility ———————

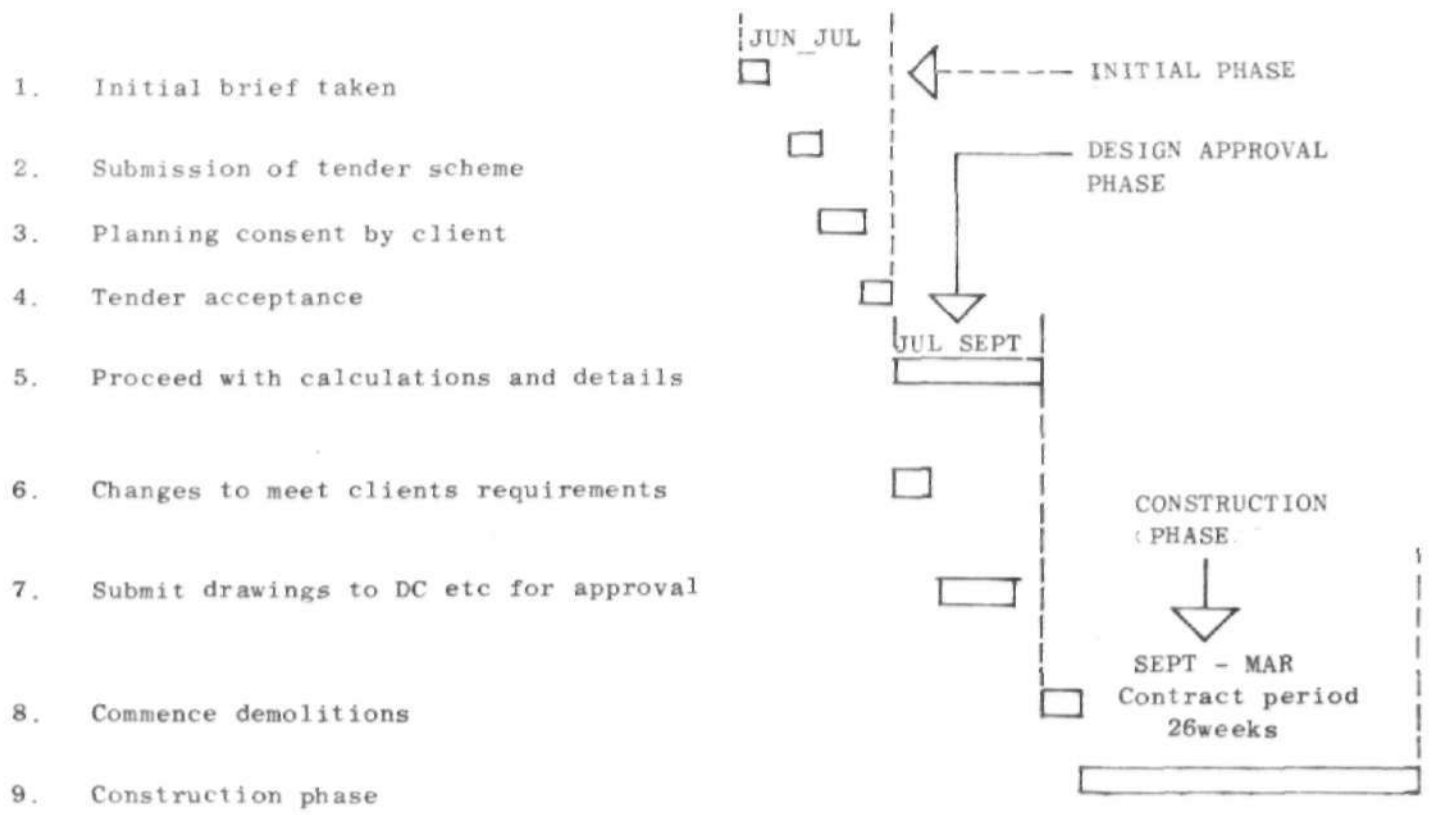
Functional Lines of responsibility — — — — — —

Optional depending on clients construction experience

source
BUILDING TECHNOLOGY AND MANAGEMENT APRIL 1982

FIG. 2.03





source BUILDING TECHNOLOGY AND MANAGEMENT APRIL 1982

FIG. 2.04

In the first case early discussions with the various age groups concerned, established various performance criteria and in the second case, a set of questions was drafted, following an early series of meeting, to obtain detailed brief on the project.

The approach here suggests that no matter what sort of relationship exists between the members of the team early exchange of views and of information is necessary to arrive at a definite scheme which tends to mould attitudes and create the kind of understanding, cooperation and control that are prerequisite to a successful project.

The various management structures of design and build, and management contracting and project management are illustrated in figures 2.05 to 2.09.

Design and build contractual link is between the owner and the contractor, and between the contractor, and the design team. Contractor in this case is not only responsible for the coordination of the separate design team but also for the complete building. The contractor may also be committed to performance specification for the project.

As a check on ensuring value for money and that content and quality are satisfactory, the client may appoint 'in house' staff or a separate consultant.

Unlike the management structure in the design and build, management contractor is appointed by the owner as additional consultant to those in the design group to give construction management service in return for reimbursement on a fee basis. The management contractor rather than being involved in the execution of any part of the project lets out each element of work on competitive basis to a number of specialist sub-contractors. In most cases the management contractor is responsible for the setting up of overall site establishment and general back up services, for the use of various specialist subcontractors. The underlying philosophy of this approach is to allow the contractor to become part of the client's team and for the total management function to be carried out in partnership with the members of the design team to the overall benefit of the client.

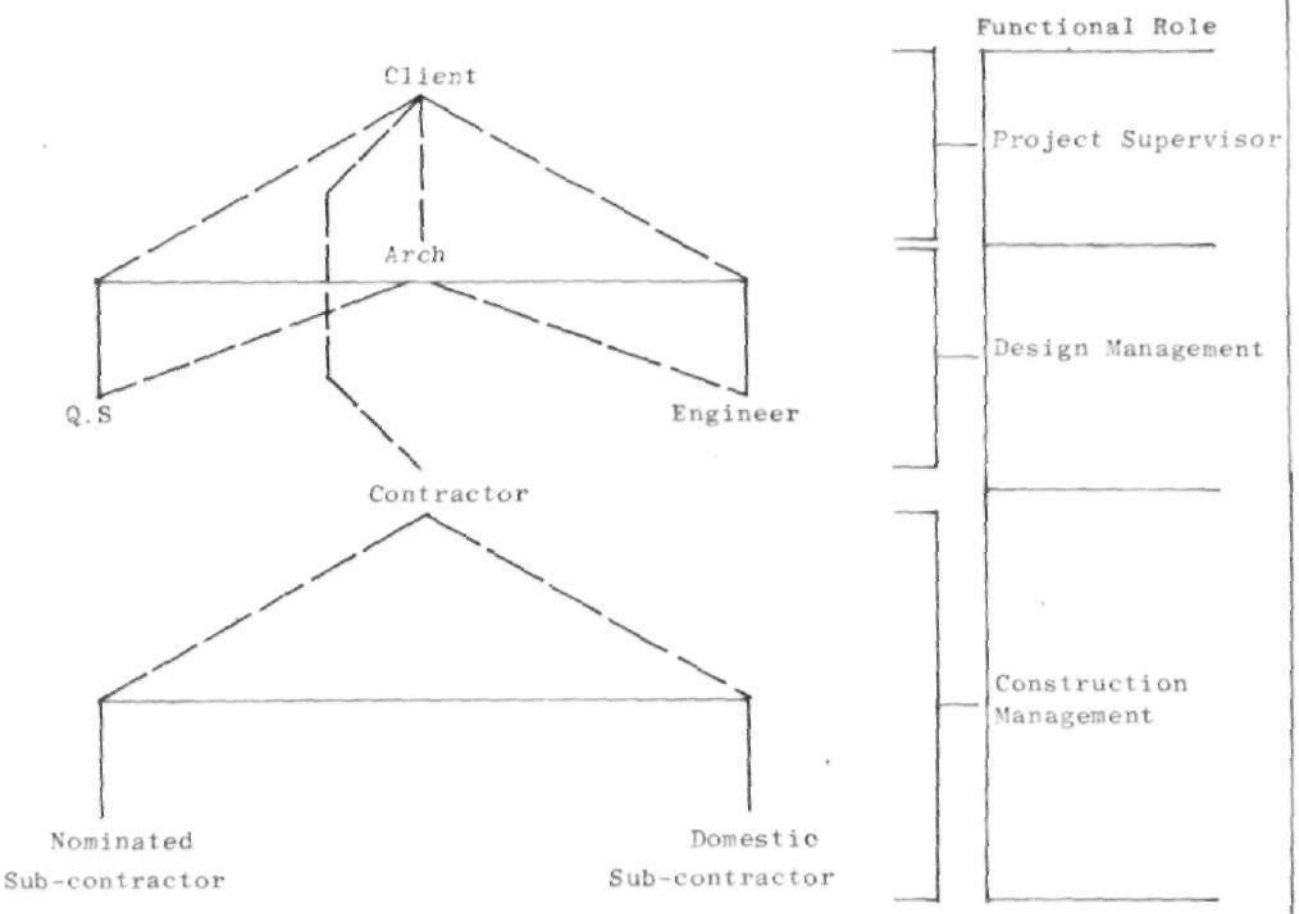
A notable research work providing a framework of understanding complex nature of building works is the organisational analysis of Project Management by Morris.[14] In this work Morris attempted to

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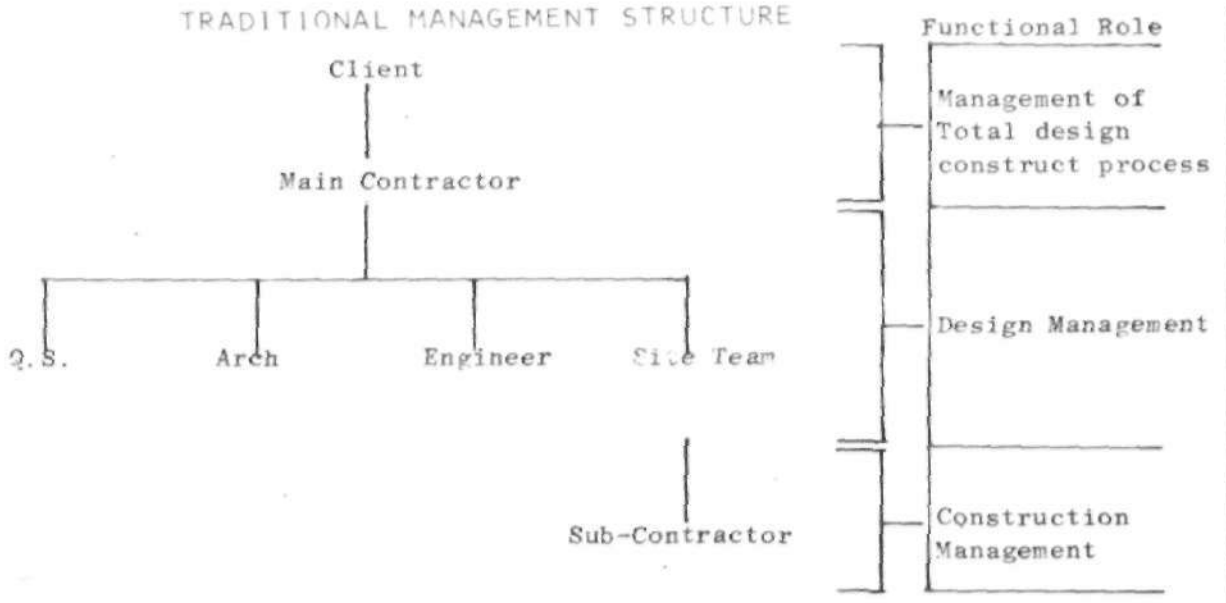
14. Morris, Peter, W.G. "An Organisational Analysis of Project Management in the Building Industry" Build International 1973 pp. 595 - 616.

harmonise relationship with defined organisational differences as relate to specific project by pointing out the dangers and minimising any disruptive effects that may exist.

The research method used in this work was based on investigation of the way in which the coordination and control on a building project varied in relation to the pattern of differentiation by using a model of the building process. Six projects were modelled, each one having a greater degree of overlap between design and construction than the last. The aim was to compare projects of differing size, speed and complexity, to see how the projects subsystems were interrelated in each of the different cases and to compare how the projects' integration varied with respect to their type of differentiation. Particular attention being given to the pattern of coordination and control at the Design - Construction interface.



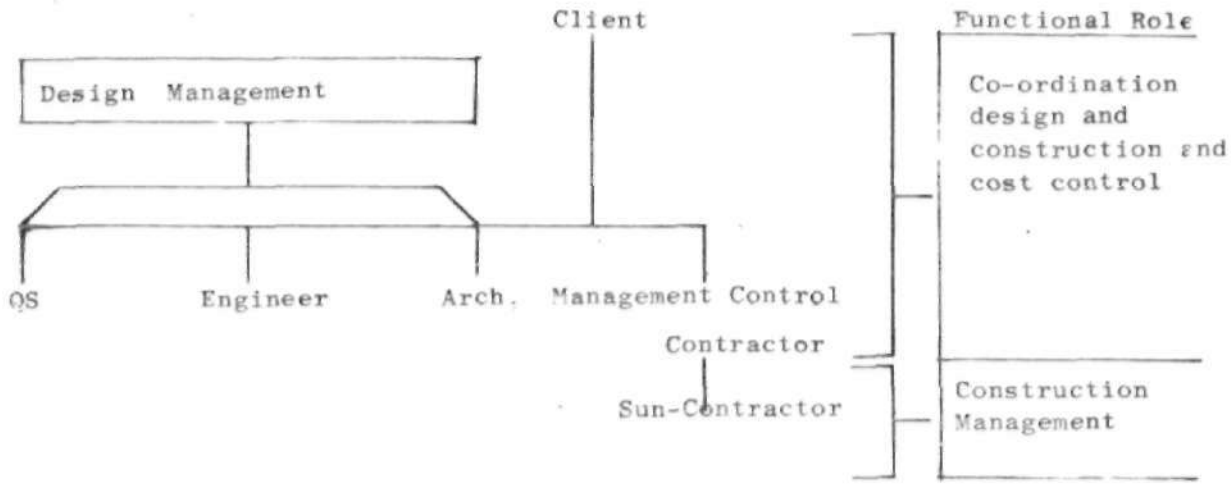
TRADITIONAL MANAGEMENT STRUCTURE



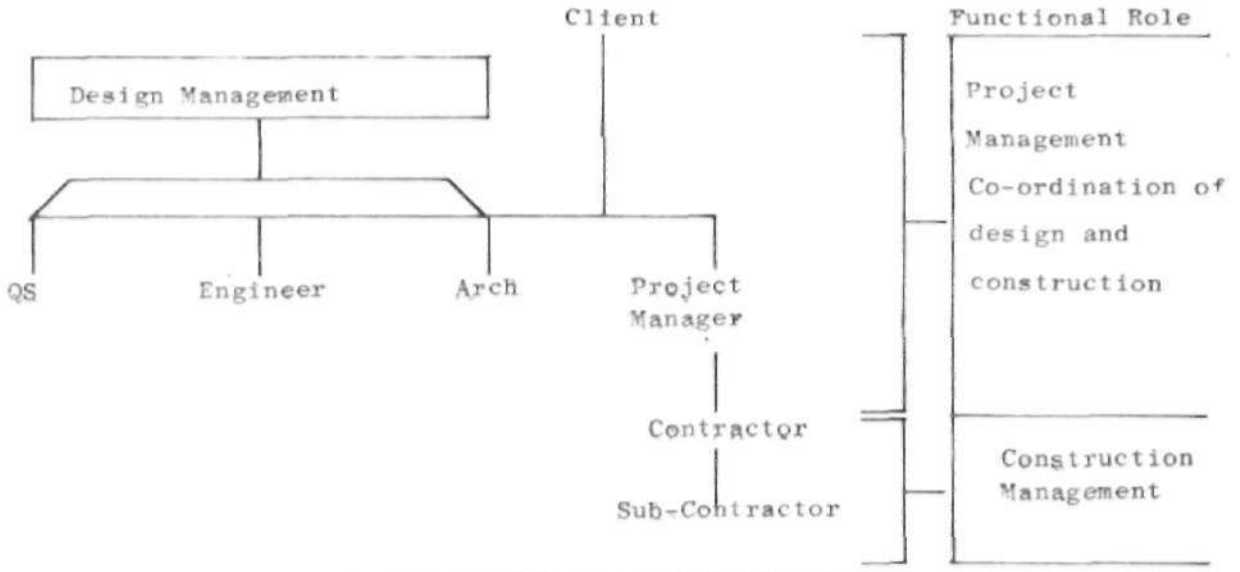
MANAGEMENT STRUCTURE FOR DESIGN AND BUILD

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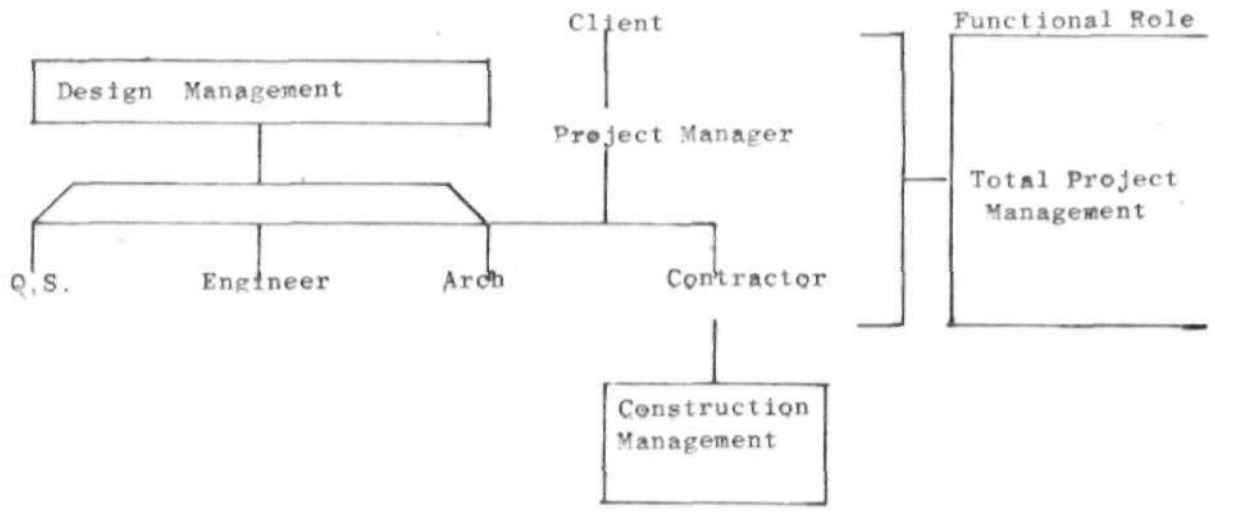
FIG 2.05



MANAGEMENT STRUCTURE OF MANAGEMENT CONTRACTING



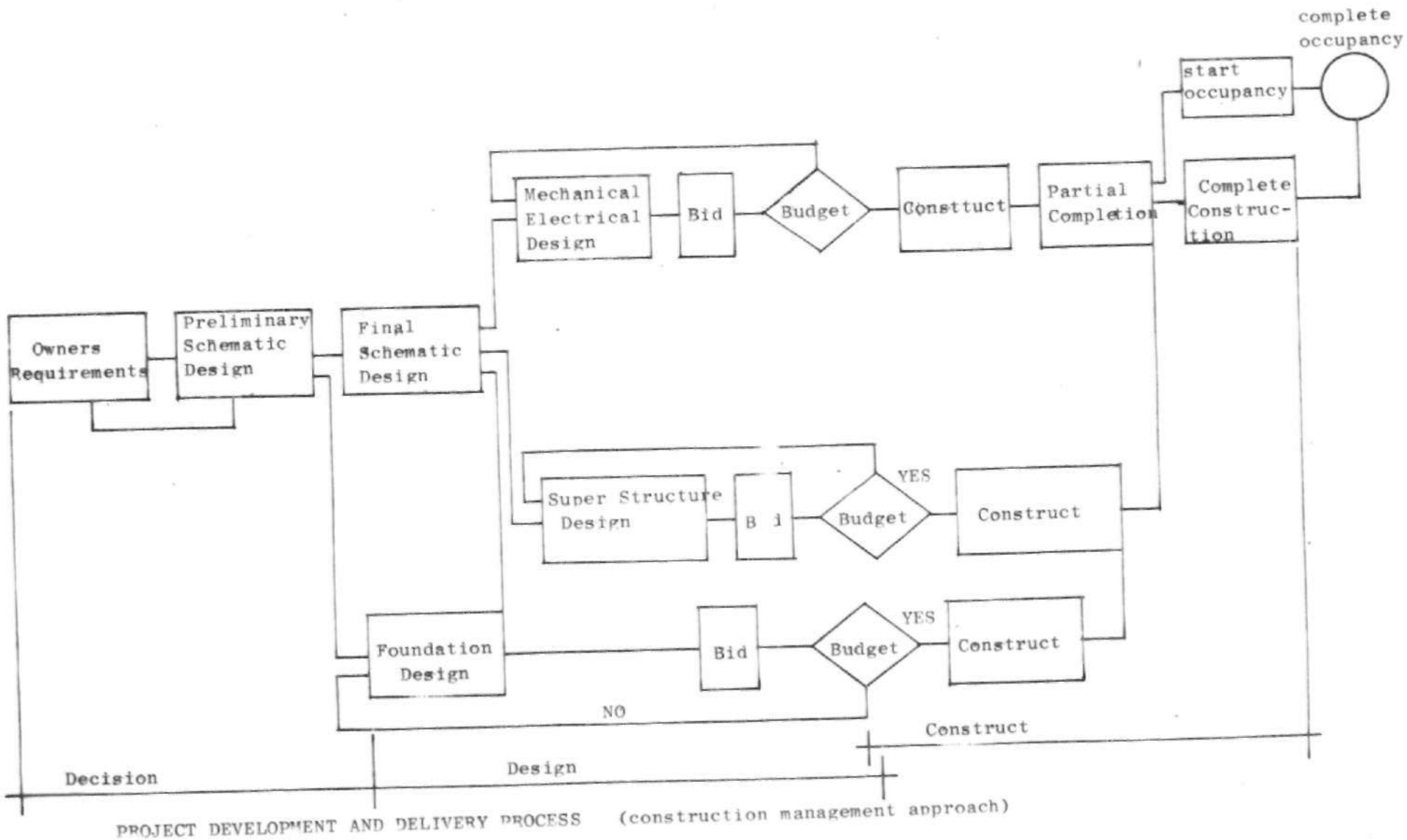
MANAGEMENT STRUCTURE OF NON-EXECUTIVE PROJECT MANAGEMENT



MANAGEMENT STRUCTURE FOR EXECUTIVE PROJECT MANAGEMENT

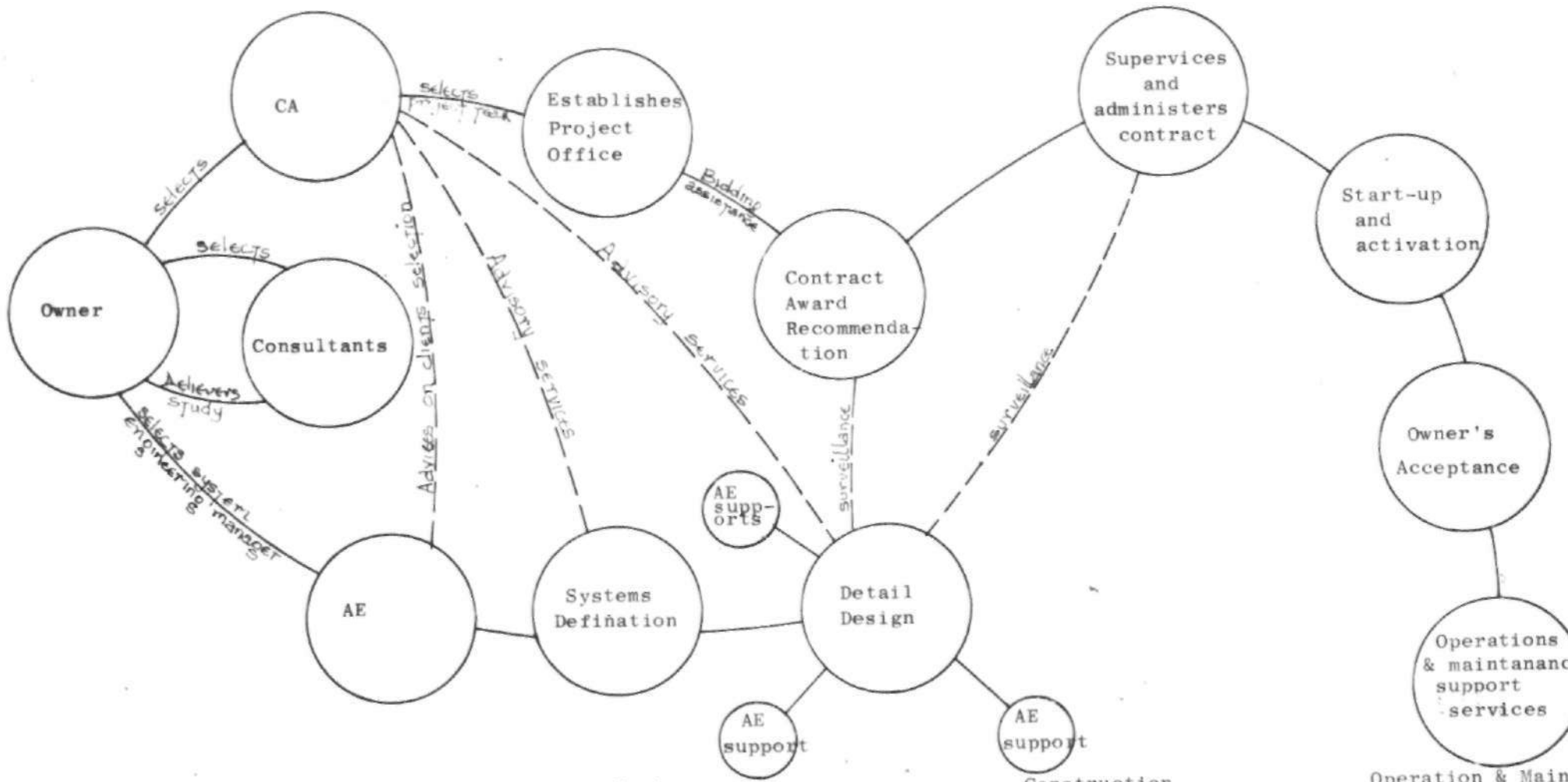
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FIG. 2.6



PROJECT DEVELOPMENT AND DELIVERY PROCESS (construction management approach)

FIG. 2.07

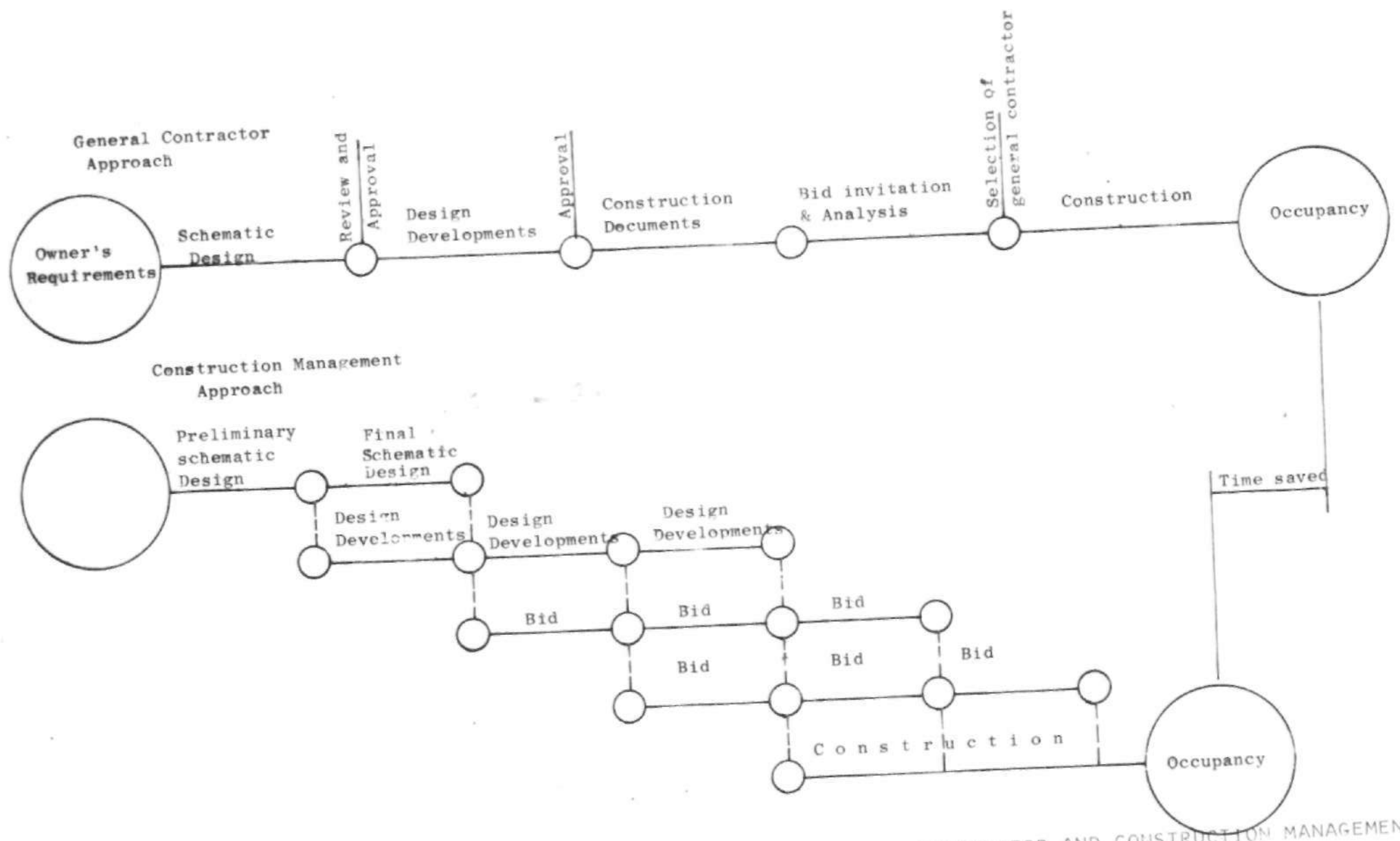


PHASE: Planning (decision) Design Construction Operation & Maintenanc

TASK: Engineering Studies Advisory Services Construction Supervision & administration

PROJECT EVOLUTION AND THE ROLE OF THE C.A.

Fig. 2.08



GENERAL COMPARISION BETWEEN TRADITIONAL GENERAL CONTRACTOR AND CONSTRUCTION MANAGEMENT APPROACHES.

FIG 2.07

The model has seven major subsystems: Sketch Design; Detail Design; Working Drawings; Billing; Estimating; Programming and Planning; and Construction. By plotting the sequence of activities on each case study the boundaries of the studies' subsystems were positioned. Interactions between the subsystems gave rise to the projects' sets of subsystem interfaces.

Degree of differentiation at each of these interfaces was determined by asking members of the project a set of questions. Principal dimensions of structural differentiation at interfaces between building project subsystems particularly with respect to the differentiation between Designs and Construction - were organisational and technological.

Measure of environmental differentiation at each of the projects' interfaces was obtained by asking the members of the projects to describe the degree of uncertainty and the rate - of - change that they felt at various stages of the projects and their answers were numerically scored.

General interface analysis revealed that when two or more parties were in reciprocal interdependence (that is when the outputs of each became the inputs of the other) then coordination between those parties was carried out by some form of meeting.

When the interdependence was sequential (that when there is a direct interdependence between two subsystems in a specified direction) however, coordination was more by plans and programmes than by meetins.

Secondly, the membership of these meetings was seen, generally, to be made up from the organisations most directly concerned, although this was not always the case when the interdependence between the parties was not reciprocal. Further, when the coordination was between Design and construction the membership of the meetings was frequently found to exceed just the group directly affected.

Lastly, the frequency of coordination was found to be dependent upon the amount of uncertainty and the rate-of-change of the project as felt by the parties concerned - that is upon the degree of environmental differentiation. The frequency of coordination was also generally found to be higher when the coordination was of a Design Construction kind and when the parties were in reciprocal interdependence.

The significance of Morris research findings are of tremendous impact in the attempt to provide a lasting solution to project management control problems. First it was possible to note that there are differences at the various interfaces of a

building project in terms of organisational and technological inputs, meaning that for any effective measure of control to be applied these differences will need to be normalised. The first step towards achieving this is to identify what differences there are between the various interfaces. The research has also stressed the point that building project management control can be greatly influenced by factors completely outside the control of the parties to the project organisation. These are the uncertainties and their rate-of-change at various stages of the project execution. This aspect of Morris findings has special implications in a construction industry that is still drifting and where the environmental conditions can easily exaggerate the position of things such as we have in Nigeria.

The present work differs significantly from Morris' in that the needs of the individuals making up a building project both in terms of nature and causes of their variations can be recognised and integrated to ensure the success of the project. This is even more necessary when one realises the reciprocal nature of interdependence between the parties and other environmental factors that tend to militate against project success. Morris' work has pointed to three essential areas for consideration if we are

to expect success. These are:

(a) an appreciation of the design process, of design costing and of process costing.

(b) a major expertise in production control, primarily programming and organisation design including quality control and materials management

(c) skill in tender evaluation and negotiation

and one should add a fourth one

an appreciation of peculiar environmental problems.

This is a wide spread of skill which requires that integrated approach to building project management is inevitable. These are large demands and it is this largeness which requires that understanding be met within the disciplines of systems approach.

CHAPTER THREE

3.0 A REVIEW OF THE OPERATING BUILDING PROJECT MANAGEMENT IN NIGERIA.

3.1 Government Inputs and Participation.

The National Development programmes require a considerable amount of resources to be diverted to building projects in one form or the other. The scale of the activities of the construction industry therefore is to certain extent regulated by the government programmes based on the available financial, manpower, and other resources.

Bold steps have already been taken by the Federal Government in the past years to solve the manpower problem. The establishment of Building and Road Research Institute and provision for courses in Building in most of our Institutions of higher learning can be seen as positive move towards this direction.

Government subsidies in the form of grants such as mobilisation fee and 'plant advance' to the tune of certain percentages of the contracts sums are good intentions devised to increase the scale of construction industry activities.

The present Government commitment to the "provision of shelter for all" has helped to highten the level of construction activities throughout the country.

Private investment has been encourared by the transformation of the Nigerian Building Society into a

Mortgage Bank that grants loan to both the private sector as well as Housing Corporations.

However in the face of austerity or during a dark economic recess, the government efforts towards capital formation for the construction programme have been dampened by sanctions such as ban on importation of essential needs for the survival of the industry.

The economic importance of the construction industry as illustrated by tables (3.1 and 3.2) must have stimulated the idea of the Indigenization Act. The aim of which was to increase the participation of Nigerians in the industry. Unfortunately, however, the Indigenization Act overlooked the technical demands of the industry's activities both in terms of management and technological input. These two essential attributes are conspicuously lacking in most of those now running the affairs of the undustry. This inadequacy tends to negate the good intentions of the Act.

It can therefore be seen that government plays an important role in shaping the course of the industry; the latter reacting sensitively to the former's actions either negatively or positively. It is this sensitive reaction that has led to widely fluctuating level of performance. It has also made it so difficult for the nation to get freed of economic stranglehold applied by other supporting nations.

Year	Total Capital Formation	Blds Landing	Other Const. Except Land Improvement	Land improvement plantation and Orchand Development	Transport Equipment	Machinery Equipment	All Construction as % of total
1960	2582.0	90.8	56.2	22.0	23.0	66.2	56.93
1961	505.0	91.8	59.4	60.4	22.8	70.6	49.57
1962	352.0	141.6	58.6	51.2	24.0	60.6	59.72
1963	393.0	144.0	75.6	66.8	36.4	70.0	55.88
1964	488.0	212.8	90.4	60.0	61.4	121.0	48.07
1965	615.2	205.2	116.6	73.4	54.6	157.8	53.54
1966	601.2	151.8	128.0	71.6	52.4	144.4	55.39
1967	483.6	142.0	139.6	52.2	43.2	100.8	59.43
1968	437.8	157.0	101.6	46.2	49.8	98.2	55.64
1969	550.0	194.4	176.8	30.4	69.7	116.1	60.69
1970	844.9	328.7	253.4	29.8	126.1	241.3	53.00
1971	1234.9	383.8	388.6	34.0	163.5	319.9	58.09
1972	1360.4	390.2	542.5	35.4	122.0	322.4	62.59
1973	1480.0	Na	Na -	87.4	254.9	92.4	28.02
1974	916.2	Na	Na -	88.9	300.0	123.8	49.13
1975	Na	Na	Na -	Na	Na	Na	Na
16years	10320.4	2634.1	2193.3	809.5	1403.6	2111.6	9805.69
Average	645.4	164.64	137.08	50.6	87.74	131.98	805.69

Table: 3.1 Role of Construction Industry in Capital Formation in Nigeria (₦ million) 1960 - 1975

Source: Economic Survey of Nigeria pp. 75 by Professor S.O. Olayide

CONTRIBUTION TO GNP

Year	Value In ₦ Million	Percentage of Total	Percentage of Total Labour Employed by the Industry
1960	85.2	3.80	22.50
1961	75.0	3.16	21.10
1962	79.8	3.03	19.43
1963	115.0	4.10	17.20
1964	132.0	4.53	13.89
1965	130.0	4.22	14.27
1966	160.0	4.98	9.33
1967	162.6	9.33	10.70
1968	144.6	4.60	10.97
1969	146.8	4.48	12.76
1970	192.6	4.38	15.12
1971	325.0	3.45	15.52
1972	460.2	4.12	18.81
1973	567.1	4.73	21.11
1974	710.8	5.41	20.40
1975	821.4	5.70	20.80
16 Years	4269.1	70.02	203.38
Average	266.82	4.40	16.46

Table: 3.2 The Performance of Construction Industry in Nigeria 1960 - 1975.

Source: Economic Survey of Nigeria (1960 - 1975) pp.93 by Professor S. O Olayide.

3.2 Background of the Construction Industry.

Construction industry in Nigeria, like in any other country of the world, is one of the largest single industry employing quite a large proportion of the country's labour market in the different categories, and contributing ernomously to the total Gross National Product.

Nigeria being a developing nation, the need for more construction works in growing at a rapid rate. The pressure being created as a result of this growing demand has led to the hurried development of the industry. Consequently the industry has become a clearing house absorbing into its system a lot of hampering situations to the detriment of its performance. For example there is the adoption of certain foreign socio-economic, cultural and political values which are at complete variance with our technical capabilities.

The construction market in Nigeria is very diversified and complex. These two situations add further intricacies that militate against perfect operation of the present system of building project management.

There are many varieties of projects both in sizes, nature, and complexities as there are those who are responsible for their execution. Inputs in terms of human, materials, and equipment resources vary from project to project. Apparently this appreciable

difference is a fact that is not yet fully appreciated by both the industry and the government.

Today therefore, the background of the project executors varies from that of highly technically qualified to that of totally untrained individuals. As one group is striving very hard to accomplish a desired goal, the other group is ignorantly doing the opposite. The aggregate of this situation is that the end result is a product of compromises and has render the performance of the industry far below expectation.

Doubts may even be expressed as to the legality of a contract that has been signed between two parties who might be having different views and/or understanding of the legal requirements as well as the project requirements.

A further point worthy of note is the fact that the Nigerian construction market is open to different nationals who bring along with them their own standards. In this case harmonisation is usually a problem especially that the operating system is from a source entirely different from the background of the nations dominating the market.

Other factor worth considering here is the fact that the supporting industries such as components and materials manufacturing industries are still to be

developed to the full capacity to subsidise adequately the needs of the construction industry. It is on these industries that the construction relies greatly for prompt delivery of quality buildings. Heavy reliance on the importation of these essential supports and ingredients has led to the poor performance of the industry both in terms of qualitative and quantitative output.

It is also worth mentioning that the performance of the industry, particularly with respect to project management has been seriously affected by the poor performance standard of our public utility services such as electricity and water supplies, transportation, communication and telephone system etc.

It is in the light of these and other unpredictable factors that Stone[1] asserted that a contracting industry posses problems of organisation additional to those arising where goods are made for the market. The uniqueness of the Nigerian situation has been stressed in the preceeding paragraphs.

3.3 Construction Types

Construction activities can be broadly classified into four main types within the framework of the Nigerian construction industry. In certain cases there are areas of considerable overlaps as well as areas that do not neatly fit into any grouping.

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1. Stone P.A. Building Economy Pergamon Press 1976

The four broad classifications include:

(i) Housing (ii) Non-residential

(iii) Industrial (iv) Engineering

Housing construction includes the building of single-family homes; high-rise apartments, low-rise housing schemes, garden-type apartment and the rehabilitation of existing housing units.

Private individuals are controlling this aspect but both the Federal and state governments, government parastatals and a few very rich individuals are now going into speculative housing schemes.

Classification as well as the registration fee vary from one employer to another (see tables 3.3 and 3.4).

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

In some instances certain clients have adopted the upgrading system, that is changing the category.

CLASSIFICATION ON CONTRACTORS

MAJOR BUILDING/CIVIL ENGINEERING CONTRACTORS

CLASS	PROJECT WORTH OR COST	REGISTRATION FEE
A	₦10,001 - ₦24,000	₦5o
B	₦24,001 - ₦100,000	₦100
C	₦100,001 - ₦999,999	₦250
D	1m. and above	₦500

Table 3.3

ELECTRICAL CONTRACTORS

CLASS	PROJECT WORTH OR COST	REGISTRATION FEE
E1	₦1,ooo - ₦2,000	₦20
E2	₦2,000 - ₦10,000	₦30
E3	₦10,000 - ₦24,000	₦50
E4	₦24,001 - ₦100,000	₦100
E5	₦100,001 - ₦999,999	₦250
E6	₦1m. and above	₦500

Table 3.4

Sourse: Development office Ahmadu Bello University Zaria.

Pages 52 - 55 are illustrations of the current registration practices by the various employers.

REGISTRATION OF CONTRACTORS AND CONSULTANTS

Applications are invited from qualified companies to register as contractors with the Kaduna State Water Board. The following are the various categories of registration and fee payable:

CIVIL ENGINEERING, ELECTRICAL AND MECHANICAL CONTRACTORS

Category	Value of Contract (₦)	Registration Fee (₦)	Usual (₦) Renewal Fee
A	1,002 - 6,000	20.00	2.00
B	6,002 - 12,000	30.00	2.00
C	12,002 - 20,000	40.00	4.00
D	20,002 - 40,000	50.00	4.00
E	40,002 -100,000	60.00	4.00
F	100,002 -200,000	70.00	6.00
G	200,002 -400,000	80.00	10.00
H	400,002 - 1,000,000	100.00	10.00
I	1,000,000 - 2,000,000	150.00	10.00
J	Ones - 2,000,000	200.00	10.00

Table 3.5

	Registration fee ₦	Renewal fee ₦
CATEGORY 2		
Consulting Architects and Engineers	50.00	5.00
CATEGORY 3		
Consulting Quantity Surveyors	50.00	5.00

	Registration fee ₦	Renewal fee ₦
CATEGORY 4		
Contractors for the supply of funitures domestic office equipment and drawing office materials and Stationery	50.00	5.00
CATEGORY 5		
Petty Contractors for the supply of uniform local building materials and other work not exceeding ₦1,000 fee payable ₦10.00		
CATEGORY 6		
Minor Works Contractors for the supply of manufactured goods other than food stuffs and value not exceeding ₦1,000 fee payable - ₦10.00		

Application forms are obtainable from the office of the Secretary, Kaduna State Water Board, after payment of the appropriate application fees to the Chief Accountant, Kaduna State Water Board, Kaduna. The application fees are non-refundable and the Board reserve the right to refuse the registration of any contractor CLOSING DATE FOR RECEIPT OF COMPLETED APPLICATION IS BOTH APRIL, 1977.

REGISTRATION CLASSIFICATION OF
AHMADU BELLO UNIVERSITY CONTRACT

CATEGORY	TYPE OF WORK	RANGE OF CONTRACTS SUM (₦ K)	REGISTRATION FEE (₦ K)
A	PETTY CONTRACT		
A1	Uniforms of Tailoring		
	Local building materials		
	Redecoration		20.00
A2	Food Stuff Contracts		50.00
B	MINOR WORKS CONTRACTS		
B1	Supply of Manufactured goods	1,000-2,000.00	20.oo
B2	Building loads drainage	2,001-10,000.00	
C	MAJOR BUILDING CONTRACTS	1,00100-24,000.00	50.00
C1		1,001.00-24,000-00	50.00
C2		24,007.00-1000,000.00	100.00
C3		100,001.00-999,999.00	250.00
C4		1 Million and above	500.00
D	ELECTRICL CONTRACTS		
E1		1.00-2,000.00	20.00
E2		2,007.00-70,000.00	30.00
E3		10,001.00-24,000.00	50.00
E4		24,001.00-100,000.00	100.00
E5		100,001.00-999,999.00	250.00
E6		1 Million and above	500.00

Table 3.6 (abco)

(REGISTRY DEPARTMENT: DEVELOPMENT OFFICE R/APP/104/Vol.8

REGISTRATION OF CONTRACTORS/RENEWAL OF REGISTRATION CERTIFICATE

Application are invited from suitably qualified contractors to register as Ahmadu Bello University Contractors in Category A to E. The application forms can be obtained from the Development Section of the Office of the Registrar, Ahmadu Bello University, Zaria. The following are the various categories of registration and their schedule of fees.

CATEGORY A1 Petty Contracts Uniforms or Tailoring
Local Building
Materials, Redecoration

CATEGORY A2: Food Stuff Contracts fee payable - A1 ₦20.00
Fee payable - A1 ₦20.00
Fee payable -A2 ₦50.00

Applicants particularly, those re-newing are requested to note the changes in "A" Categories.

CATEGORY B: Minor Works Contracts

(1) Supply of Manufactured Goods (other than food stuff)

(2) Building, Roads and Drainage not exceeding ₦10,000.00

Classification is as below:		Fee Payable
B1	₦1.00 - ₦2,000.00	₦20.00
B2	₦2,001 - ₦10,000.00	₦30.00

CATEGORY C: MAJOR BUILDING CONTRACTS

Classification is as below:

C1	₦10,001.00 - ₦24,000.00	N50.00
C2	₦24,001.00 - ₦100,000.00	₦100.00

Classification is as below	Fee Payable
C3 ₦10000.000,001 - ₦999,999.00	₦250.00
C4 ₦1 million and above	₦500.00

CATEGORY E: ELECTRICAL CONTRACTS

Classification is as below	
F1 N1.00 - ₦2,000.00	₦20.00
F2 ₦2,001 - ₦10,000.00	₦30.00
F3 ₦10,001 - ₦24,000.00	₦50.00
F4 ₦24,001.00 - ₦1000,000.00	₦100.00
F5 ₦100,001 - ₦999,999.00	₦250.00
F6 1 million and above	₦500.00

Payment should be made to Ahmadu Bello University, Samaru in cresed postal or money order. Cheques will not be accepted. Completed application forms should be returned to The Registrar, Ahmadu Bello University, Zaria not later than 15th May, 1978.

The application fees are non-refundable and the University reserves the right not to register any contractor.

RENEWAL OF REGISTRATION CERTIFICATES

All those registered with the University in 1978 should collect renewal forms from the Development Section ofthe office of the Registrar, Ahmadu Bello University, Zaria. Completed renewal forms should be accompanied with the appropriate fees to reach the Registrar, Ahmadu Bello University, Zaria, not later than 15th May, 1978.

Source: Development Office, Office of the Registrar, ABU, Zaria.

Usually the mode of construction is in the traditional way but of recent system building approach is being adopted especially for government works.

The contract arrangement is normally with either a one-man company for private homes or small construction firms in the case of government projects. The advent of system building has necessitated the inclusion of large construction firms as these are the only companies with technical and organisational resources to carry out the operations.

In the second group are included those buildings for recreational, religions, social, institutional, educational, heavy industries and commercial purposes. This group is actually the mainstay of the construction industry in that it constitutes about sixty percent of the present country's annual volume of construction works.

The category of works under this group are usually large and require to be handled by professionally qualified builders who have organised themselves into large companies with adequate financial and technical resources. Works in this category are either financed by governments, private individuals or group of individuals.

Projects that are mainly associated with manufacturing, processing or production of commercial products constitute themselves into the third group. They include

chemical plants, refineries, generating stations, etc and they are usually expected to be constructed by large specialised construction firms.

Engineering projects are those designed and constructed by engineer. This category includes structures that are not primarily architectural in nature. They include various categories of public utility services such as highway construction, dams, harbours etc.

By their nature, most engineering construction projects are public financed.

3.4 Types of Employers

Employers can be grouped into three broad categories namely:

(i) Employer with non-consultant-design team

(ii) Employer with consultant-design team

(iii) Employer without any design team

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

The practice that obtains in this first case holds for the second case except that the design team undertakes to design for other organisations, projects

not requiring the preparation of bills of quantities. This is the practice between the Ministry of Work and other Ministries. The Ministry of Works assuming the role of consultant.

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

It should be noted that the first two classes of employer will, in addition to their own staff, employ the services of independent consultants for projects that are complex in nature and where bill of quantities form part of tender and contract documents.

3.5 Project Team

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

The Consultants form the design group and are responsible for the translation of the employer's wishes and concepts into graphical and visual appreciation. This translation is expected to be done in a manner that will comply with the socio-economic standing of the client and also guarantee the functional viability.

In any given building work the consultants include the architect, as the coordinator, the quantity surveyor, the structural electrical, and mechanical engineers. Both the electrical and mechanical services engineers are normally engaged in the case of large building projects.

The powers and duties are stipulated in the conditions of appointment.

The main contractor as well as both the contractor's own sub-contractors and the nominated sub-contractors and suppliers carry out the construction works. Their appointments and their relationships with one another will be elaborated upon in the next section of this chapter.

3.6 Construction Contractors Classification

There are three broad categories of construction contractors in this country. These are

(i) Big or large firms which are relatively few and predominantly owned by foreigners and in some cases in partnership with Nigerians. This group dominates the execution of large project throughout the country and especially government projects.

(ii) Medium firms which form the second group is a mixture of both foreign and indigenous ventures and they undertake projects smaller in nature than the first group.

(iii) Small firms are 'normally' indigenous and are restricted in scope of activities by their lack of organisation and resources. They operate most of the time at local level.

3.7 Contractor Awarding System

(a) Registration Processes

(i) The Contractors.

Except with a private client, any contractor wishing to undertake a government or public authority projects must first be registered with such an authority in the appropriate category.

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

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

The class into which a firm is registered is determined by the registration fee paid and how far the firm has been able to meet the requirements of the employing authority as stipulated. The fact that a firm has been registered does not guarantee the firm a job from the registering body.

Classification as well as the registration fee vary from one employer to another (see tables 3.3 and 3.6).

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

In some instances certain clients have adopted the upgrading system, that is changing the category of the firms from one level to another after assessing their perfrmances in the light of previous jobs executed.

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

(i) Name and address of applicant

(ii) Name of the Company in full

(iii) Office Address

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

(v) Jobs executed (with client or other clients)

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

(vii) Avialable resources in terms of money, equipment and personnel

(viii) Contract type for which application is being made (building, Civil Electrical etc) and category

(ix) Name and Address of Bankers.

(ii) The Consultants

In addition to its members having been registered under government statute, consulting organisations wishing to obtain government and parastatal projects will have to complete and submit prescribed forms with appropriate fee before they can be considered. In some other cases it is sufficient only to complete and submit an application form.

Invitation notice is usually given in the local and national dailies of widespread readership.

3.8 Project commission and Design Procedure

Having been registered by the various employing organisations, the design consultants have to institute follow-up action to find out where, when and which jobs are coming up and then to "lobby". Recently, however, design consultants have been requested to submit sketch proposals in competition among themselves but this practice is restricted to large government jobs.

As there is no need for registration with private employer, any design consultant can contact any private developer for briefing on his intended project.

(i) Preparing the Brief

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

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

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

More often than not the consultants and the client are located far apart. In which case consultation is not frequent and as such

certain issues do not get resolved or if at all, at a considerable travelling cost. The design process and the thoroughness of the design solutions may be seriously hampered.

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

(ii) Sketch or Preliminary Design

After this initial interaction between the parties weighing and crystalining ideas, the design-coordinator will proceed to make sketch design to be presented to the client for further consideration and approval.

The activities at this stage include detailed analysis of the brief and the preparation of an illustrative outline of the proposals.

An indication of the project cost will be prepared as well to guide the client decision and approval.

(iii) Final Design

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

There is more interaction between the design-coordinator and the supporting consultants especially that the drawings are now to be prepared in full scale for final presentation.

Full report with estimated cost will now be presented to the client for approval.

(iv) Design Details and Production Drawings

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

3.9 Scale of Professional Fee

On completion of the design and the approval of the estimated cost the fees for the various groups are calculated on percentage basis as stipulated by the government. These are percentages of the actual cost of the project (see appendix 2, regardless of the size and complexity.

Contract Awarding Body

This is a body set up by the employer to register, invite tenderers and select tenders for the jobs contemplated by the employer.

It is a practice usually adopted by governments and parastatals especially that the projects are public financed.

The composition of the Board is based on many factors depending on the organisation undertaking the job and the nature of the job itself.

3.10 Methods of Contract Award

Contracts are awarded based on the tenders received and other conditions as stipulated by the client being fulfilled by the tenderers. The procedures leading to the award are greatly influenced by the prevailing circumstances. However there are inherrent advantages and disadvantages in each of the methods, described below.

3.11 Tendering Methods

(a) Open Tendering:- This method of tendering is a common practice in the case of public functionaries. Advertisement is usually placed in widely circulated daily national newspaper asking for tenders for the proposed work. Local notices are also placed at strategic places in cases of minor works. The closing date to apply for tender documents and the time for

submission of the tenders are normally stated. Non-refundable deposit of between ten naira (₦10.00) to one thousand naira (₦1,000) is required to be made by every intending tenderer.

The advantages of open tendering are, by far outweighted by the inherrent disadvantages.

(b) Selective Tendering:- In this method competitive tenders are obtained by drawing up a short list of contractors of established reputation. This list is drawn up on every occasion the need arises to adopt this method of tendering. Like the open tendering it has advantages and disadvantages.

(c) Negotiated Contract:- This is usefully employed for construction work of difficult nature where the magnitude of the involvement is not known or where early completion is most important. Under a contract of this nature there is usually no time to prepare detailed drawings and bill of quantities. There is always the danger that the price obtained in this way might be higher than against competitive bidding unless the negotiators are experienced.

Another form of selection that can be classified under this heading is the serial system of contract. This system can ensure very keen prices. Here the contractors are requested to tender for one job, say, school. On the basis of that the successful tenderer will be contracted to build several other schools at the same rates.

(d) Cost Plus Contract:- In this method, all labour, sub-contractors, materials, plants, and so on are carefully recorded and documented: and to these recorded totals the rates that have been negotiated are added to give the final total cost. For example if the assumed negotiated rate for labour is 25% and the recorded labour costs as paid out by the builder to operatives is ₦40,000.00 (Forty thousand Naira) the amount to be added to the final account for labour will be ₦40,000 plus 25% of ₦40,000 = ₦40,000 + ₦10,000 = ₦50,000.

This method is employed by clients in such places where there is difficulty in obtaining labour and material, and transportation is difficult due to lack of access road, or where roads are not motorable. In such a case the contractors will be reluctant to tender.

(e) Cost Plus Fixed Fee:- A fee quoted in Naira is inserted in the contract instead of the percentage plusage in the cost Plus Contract. For this method a fairly accurate estimate of costs must be worked out so that the negotiated fee can be realistic and satisfactory both to the client and the builder.

(f) Target Cost with Variable Fee:- This is similar to the other previous two negotiated form of tender, the big difference being that the fee or profit

is fixed neither by percentage nor a set sum. Usually a fee in naira is set that can be increased or decreased by means of agreed percentage between the parties. For example assume the target cost of a project to be estimated at ₦100,000 (one hundred thousand naira) the percentage plus or minus rate agreed at 25% with a fee of ₦10,000 (Ten thousand naira). If on the completion of the project the cost is found to total ₦90,000 (Ninety thousand Naira) the builder's fee will be increased by 25% of the largest cost minus the final total cost i.e. 25% (₦100,000 - ₦90,000). In this case the builders fee will be ₦0,000 (25% of (₦10,000) = ₦12,500 (Twelve thousand five hundred naira). The reverse is the case where the final total cost is in excess of the target cost.

It can be seen, therefore, that a reasonably accurate estimate of the work would need to be worked out before going on agreement of this nature.

(g) Package Deal (All-in-Service):- So termed because of the all-in-service it provides. The agreement is usually between the employer and the builder who will perform the role of the other members of the building team. It is the method usually applied or adopted in industrial type of construction works. This method has a number of inherent advantages and disadvantages like the others too.

3.12. Invitation to Tender.

Tenders are invited using any of the following methods:-

(i) Tender notices in widely circulated newspaper and local notice boards

(ii) Letters to individual tenderers

(iii) Pre-qualification tender

Notice are usually inserted in widely circulated newspapers for a predetermined number of times by the employer. The notices limit the tenderers by specifying the category of contractors eligible to apply and requesting the payment of a stipulated non-refundable processing fee. This fee varies from employer to employer and project to project.

The usual methods of calling for tenders have been reproduced on pages 72 - 75 including application for prequalification.

TENDER NOTICE TO AHMADU BELLO UNIVERSITY REGISTERED CONTRACTORS AND CONTRACTORS REGISTERED WITH EITHER FEDERAL OR STATE GOVERNMENT IN THE EQUAIVALENT CATEGORIES

1. Because of the poor response to the last call for tender, the following tenders which were to close on 16th April, 1977, have been extended by another three weeks from the date of first publication:-

   AB/222 - Centre for Social and Economic Research CB and above.

   AB/87 - Workshop, Stores and Offices, Faculty of Agricultural - C3 and above.

2. Fresh tenders are hereby invited from Building and Civil Engineering Contractors registered under the categories indicated against the following projects and having at least 4 years experience with Ahmadu Bello University capital projects and or similar experience elsewhere in Nigeria:-

   AB/235 10 No. room I & J. Quarters, Main Campus - C2 & above

   AB/IAR (i) NAFPP Zonal Sub-stations at Dan Hassan (Kano State) - C3 & above

   AB/IAR (ii) N.A.F.P.P. Zonal Sub-Stations at Gushua (Borno - State) - C3 and above

   AB/IAR (iii) N.A.F.P.P. Zonal Sub-Stations at Mokwa (Niger - State) - C3 and above

   AB/132/1 6 No. Senior Staff Houses; 6 No. Boys Quarters, I.A.R., Mokwa - C3 and above.

AB/132/2 3 room - 6 No. 2 - room I. & J. Quarters

I.A.R. Mokwa (Niger - State) - C3 and above.

3. Contractors not previously registered with Ahmadu Bello University but are registered with either the Federal and/or State Government under the equivalent categories may tender upon payment of the appropriate Registration and processing fees as shown below:

Category	Registration Fee	Processing Fee
C2	₦100.00	₦200.00
C3	₦250.00	₦500.00
C4	₦500.00	₦1000.00
E4	₦100.00	₦200.00
E5	₦250.00	₦500.00
E6	₦500.00	₦1,000.00

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

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

6. All Tender Documents must be submitted in sealed envelope marked "CONFIDENTIAL TENDER FOR PROJECT NO AB/....." addressed to the Registrar, Ahmadu Bello University, Zaria and should reach him not later than 31st June, 1977.

7. The University Tenders Board is not bound to accept the lowest of any tender.

REGISTERED CONTRACTORS

INVITATION TO TENDER FOR THE CONSTRUCTION OF BUILDING AND SPORTS COMPLEX.

PROJECT NO: AB/99 New Faculty of Environmental Design Phase 11

PROJECT NO: AB/195 Educational Technology Centre

PROJECT NO: AB/215 New Building for University Press

PROJECT NO: AB127 Sports Complex and Gymnasium

1. Tenders are hereby invited from Building and Civil Engineering Contractors Registered under Category C4 and having at least four (4) years experience in Ahmadu Bello University capital projects, and or similar experience elsewhere in Nigeria, for the construction and complextion of the above listed projects.
2. Tender Documents may be obtained on application by post or by personal call on the Director of Works, Estate Department, Ahmadu Bello University, Zaria, upon payment of a non-refundable processing fee of one thousand naira (₦1,000.00) to the Bursar, Ahmadu Bello University.
3. All applications must be accompanied by the original copy/copies of the receipt(s) of the processing fee.
4. All Tender must be submitted in sealed envelopes marked "CONFIDENTIAL TENDER FOR PROJECTS NO AB/....." addressed to the Registrar, Ahmadu Bello University, Zaria, and should reach him not later than Friday the 19th February, 1977.
5. The University Tenders Board is not bound to accept the lowest of any tender.

APPLICATION FOR PRE-QUALIFICATION

Building Contractors registered in class F (1 million Naira and above) with either the Federal or Gongola State Works Registration Boards are hereby invited to supply for submission of tender documents for:- CONSTRUCTION HIGH COURT AND CHARIA COURT OF APPEAL, GONGOLA STATE YOLA, CONTRACT NO GSTS 59/76-77. The Consultant Architect for this project is:- MESSER DESIGN GROUP NIG. LTD., P. O. Box 346 MAIDUGURI. The size and design is similar to the High Court Building in Maiduguri near Post Office.

3. Only Contractors, who are capable and willing to execute the project within the agreed time and with first Class Workmanship should apply. If more applications are received as tenderers are required, the client reserves the right to select a limited number of suitable contractors.

4. Application should be addressed to:-

THE CHIEF REGISTRAR,
HIGH COURT OF JUSTICE,
GONGOLA STATE, YOLA.

to reach him not later than 1st March, 1977 at 12.00noon.

5. No payment of deposit should be made at the moment, but selected contractors will be asked to produce a receipt for a non-refundable deposit from any of the Sub-Treasuries in the state together with the submission of the tender.

The notice may give a brief description of the work or just the name of the project or its number. In addition, the closing date for the submission of tenders and the "protective" statement that the employer is not bound to accept the lowest or any tender, are often stated. The protective statements is probably added to correct the eroneous impression that the lowest tender will always be accepted.

In the case of selective tendering letters are sent out by post or by hand to the tenderers given information as in the case above. The processing fee may be waived in case one or two firms are being invited.

The third case is similar in every respect except that the following information must be given by the intending tenderer.

(i) Minimum contract value normally undertaken

(ii) Maximum contract value normally undertaken

(iii) Type of contract normally undertaken

(iv) Specialists works undertaken

(v) Specialists trades undertaken

(vi) Names of Bankers

(vii) Category of registration with the employer

(viii) Category of registration with the Federal Government or any other employer

(ix) Details of at least three projects completed during the last three years (within the contract value bracket of ₦1 million and

above) as follows:-

(a) Type of job and location

(b) Cost and date completed

(c) Name of client and the consultants

The date within which the information is to be submitted is stated in the publication. Upon the receipt of the information a list of contractors is drawn up and the eligible ones are sent letters of invitation.

3.13 Processing Fee

This is the amount of money deposited by each tenderer to off-set the cost of producing tender documents. It is non-refundable and varies from ten naira (₦10) to one thousand naira (₦1,000.00). Another claimed reasons for charging the processing fee is that it serves as a deterrent to those who may want to tender out of curiousity.

Cateogry	Contract Value	Processing Fee
B1 - E1	₦1.00 - ₦2,000.00	-
B2 - E2	₦2,001 - ₦10,000.00	-
C1 - E3	₦10,001 - ₦24,000.00	₦100.00
C2 - E4	₦24,001 -₦100,000.00	₦200.00
C3 - E5	₦100,001 - ₦999,999.00	₦300.00
C4 - E6	₦1 million and over	₦1,000.00

Table 3.7

Source: Development office Ahmadu Bello University, Zaria.

3.14 Tender Documents

Any contractor who has fulfilled the prescribed conditions by the employer is issued with tender documents. These documents are expected to be returned with the submitted tenders.

The nature of tender documents vary from project to project but the following documents are common to most projects.

(i) Set of Drawings

(ii) Tender Forms

(iii) Bill of Quantities

Specifications (where there is no Bill of Quantities)

(iv) Lump sum quotation from (where there is no Bill of Quantities)

(v) General Conditions of contract (for contracts without bill of Quantities).

At times, necessary information especially drawings are not made available to the tenderers in good time.

In certain cases tenders are invited when drawings are still being prepared. In such a case the tenderers apply rule-of-thomb method in the computation of tender figure thereby leading to false impression.

3.15 Submission of Tenders

When submitting the tenders it is a request generally that the following information be provided.

(i) Photo copies of registration certificate

(ii) Building works completed in the last three (3) years (indicating clients, locations, and values).

(iii) Building works on hand (indicating clients contract period, total values and stage reached at date)

(iv) Details of staff, stating their number, skill and qualifications.

(v) Details of facilities and their locations.

The submission is either by post or by hand and the submitted tenders are usually opened by a committee, (but rarely in the presence of the tenderers) which keeps the record of tendered figures and the completion time given by the contractors.

3.16 Contract Award and Contract Agreement

The committee, having noted the tendered figures, passes the submitted tenders to the quantity surveyor for appraisal and comments. Any suspected errors are noted for correction and clarification by the tenderer.

The quantity surveyors observations and recommendations are normally considered along with the following factors in making the award.

(i) Sufficiency of the tenderer in terms of resources such as materials, plant/equipment, money, and personnel.

(ii) Projects currently being executed (to determine workload of the contractor.

(iii) Previous performance on similar project with the client or elsewhere.

(iv) Whether registered with client (this is not strictly followed when the project is of sophisticated nature and when there is fear from the client that those contractors registered under him might not have been qualified otherwise to undertake such a project).

(v) The quoted tender figure and completion date stated by the contractor.

All the above points are supposed to have been considered before making the award but the following extract suggests that these points might only have been stated and not observed.

"A State Governor* disclosed that a review of the number of building contracts awarded to contractors had revealed that some of them had over-stretched themselves by accepting too many contracts."

In view of this, the governor added, "the following contractors had been stripped of a number of contracts as shown below."

X Construction Company to forfeit six building contracts out of eighteen; Messrs Y and Sons, lost six senior service building projects out of eighteen; while Messrs (W) had four plots taken from him."

---

*New Nigerian Newspaper 26th February 1977 page 20

Contractors with bad reputation are even awarded contracts as revealed below;

...." Towards the end of last year, the..... entered into an agreement with .... The contract was worth five million naira.... What amazes me is how could anyone be ignorant of the unsavoury reputation..... (The construction firm) has acquired in the northern states. We should be able to remember the .... inquiry which investigated the affairs of the .... in which .... (the construction firm) featured most prominently and this is one of the conclusions reached on the company.

"The government views with serious concern, the corrupting influence of...(the construction firm)

However, the successful contractor is communicated of his performance and asked to appear for the signing of the contract. For big project the signatories are the contractor and the representative of the client.

"New Nigerian Newspaper 26th February 1977 page 5.

During the signing period, the amount for liquidated and ascertained damages are inserted. This is the amount of money to be charged on the contractor in the event of his failure to complete the contract within the stipulated period without just cource. The same is done for the retention money which is deducted and may be used for any defects noticed within the specified period.

Some times the completion date for the contract is fixed during the signing of the contract.

Contractor hardly have time to go through the terms of the contract and neither is there any attempt ever to translate the terms to illiterate or non-English speaking contractors.

It is expected that the contractor should go back to the client's organisation for the collection of the contract documents after signing but if the contractor is not yet ready to commence work the collection may be delayed. Delivery of the clients representative's document especially for ministries' works serves as notice to their engineers that contract has been awarded.

On big projects mobilisation fee is usually paid to the contractors and in some cases materials such as cement etc. are supplied.

The quotations below expose the abuse of this kind gesture by some contractors.

*Contractors handling the Universal Primary Education (UPE) buildings in .... have been warned against converting materials meant for UPE to other private jobs.
Mr. ... decried the attitude of some of the contractors who sought to thwart the efforts of the government by not using the cement and other materials which the government helped them to purchase for the purpose they were intended"...

... *"He said the scarcity of cement had prompted the government to sell the commodity at the subsidised prices to the contractors. "But instead of seizing the opportunity to complete the building on schedule, many of you collected the cement to sell", the Commissioner added.

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*New Nigerian Nespaper 5th February 1977 page 13.

"New Nigerian Newspaper 1st March 1977 page 19.

....."Some of the contractors after collecting the mobilization fees simply abandoned the jobs after starting while others who made efforts to build used "extremely poor materials in order to maximise their profits".

Immediately after signing the contract agreement an initial meeting in held to

(i) introduce members of the team

(ii) discuss likely construction problems

(iii) discuss information required

(iv) ascertain date of site possession

(v) Any other issues.

Following the discussions at this meeting the issue of the sub-contractors and suppliers is resolved. These are either nominated or non-nominated.

Contract Administration and Execution

Relationship between Parties to Contract: The nature of contract award, the project, and the methods of appointment of the various groups, help in shaping the types of relationship that exist between the parties to a building contract.

There are generally two types of forms of contract agreement in use. One is for projects with bills of quantities and the second type without bill of quantities,.

"New Nigerian Newspaper 25th April 1977 page 28".

These two types of agreement forms differ essentially in the manner of presentation. Bill of quantities will be replaced by a copy of the contractor's 'Schedule of rates' in a contract without bill.

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

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

The problems of these various methods of appointment of the subcontractors are at times magnified out of proportion in relation to efficient supervision and control on the sites.

Supervision and Control

Project supervision and control is a joint responsibility of the architect on behalf of the client and the main contractor. However the various methods of appointment can make it quite difficult for both the architect and contractor to perform this role. It is usual, for example, that the services consultants would want to, and do, exercise control and supervision over their designs. Inveriably such designs are being installed by subcontractors appointed direct by the client. This situation has rendered it almost impossible to define the line of accountability on most building sites. As a result control of progress and workmanship can be quite difficult to monitor.

From time to time and as the work progresses changes and extra work may be introduced arising from one of the known causes such as

(i) Omission

(ii) Addition

(iii) Substitution/or alteration

These may be as a result of

(a) changes in owner's requirements

(b) differences in site conditions

(c) changes due to coordination problems

(d) mistakes

(c) inavailability of original specification

Such variations do constitute delays, disputes and claims.

It is also a provision in the contract conditions that in certain cases inspection and test of certain aspects be carried out by architect or his representative. This may lead to delay as well in that the process of inspection or test usually takes longer than expected.

Differences in matters relating to supervision and control are usually resolved during site meetings where all the representatives of the various interests are present. It is a kind of 'once-in-a-month' meeting meaning that the various groups representatives should keep accurate account of what is happening from day to day.

3.1.7 Methods of Payment

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

3.2.1 Summary and Observation

(a) Government Control Measures: The construction industry has a tremendous impact on the implementation of the national development programme. This is so because, nearly in all cases, investments in building accounts for over 60% of capital project. The building industry on the other hand reacts sensitively to any government actions and this may either be positive or negative reaction especially in the case of economic buoyancy or depression. An acceptable level of performance in the industry to a large extent is dictated by government interest in further development and improvement of both human and material resources. These are essential for our economic revival and survival.

Hitherto insufficient attention is being placed on the administrative problems of the industry as there are still no regulations for the control of practice and procedure that is now in operation. There is yet to be the right emphasis on the establishment of supportive industries to ensure the conservation of our foreign reserves being used up on importation of essential commodities for the industry.

The lack of control and directive by the government has serious repercussions on the effectiveness and efficiency of the construction industry with respect to the implementation of the national development

programmes. It seems, for example, incredible that anyone can start a building firm without qualification, experience, plant, equipment, or even business premises. This makes it hardly surprising that so many consumers get caught by the failure of construction companies. This permissive attitude of the government negates the good intensions implicit in the manpower development programmes as well as the Indigenisation Act.

We live in an age of consumer protection but the client (largely government) requiring this protection is now a collaborator with the contractors and the other professionals expected to render advice and services. Consequently the quality of our buildings today suffers substantially as a result of this non-cooperative attitude.

(b) Administrative Lapses: Faulty administrative procedures make a large contribution to the inefficiency in the industry. In the first instance the registration and categorisation of contractors have not only failed to achieve the purpose for which it is supposed to achieve, it has helped to introduce malpractices to the detriment of the entire industry. One of the good intensions of the registration is to ensure that only eligible contractors tender for projects intended by the client, but the following extracts convey the

impression that certain persons or individuals render such intensions practically useless

> ".... the tribunal observed that .... committed serious violation of the system of selective tendering by including ..... construction company in the short list of contractors for the hostel project."
>
> +"There was a misuse of the system of Tenders by invitation (same as selective tendering) in some cases, for corrupt purposes.
> There was a misuse of the system of negotiated contracts for corrupt purposes".

Requirements for the registration eligibility pre-supposes that nothing else matters if it can be shown that one has the money;or has been registered before for similar jobs as may be intended in the future and so on. This misconception has in the past led to the remark in the editorial column of New Nigerian of 26th April, 1977.

"New Nigerian Newspaper 12th March, 1972 page 5"

+"Defunct North Western State Government White Paper on the Report of Commission of Inquiry into the State Tender Board.

> *"Contract jobs require some specialisation and abundant technical know-how. It therefore behoves whoever goes into this line of business to be adequately equiped and capable of executing projects in time and according to specifications. Unfortunately, we have had too many contractors who are simply charlatans possessing no other qualifications except their official connections with which they win contracts .

The inflitration of unqualified contractor is a further wreck on the intensions of registration. While everybody can be a contractor it should be recognised that not every contractor can be a builder. The job of the building industry is specifically to building and not necessarily to contract.

Registration of contractors has been misinterpreted to mean a 'fund-raising' exercise by certain clients. This view is corroborated by the compilation of a long list of contractors with few in the categories in which their jobs mostly fall. This following statement can be checked for further facts .

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*Editorial Column New Nigerian Newspaper 26th April 1977 page 1.

> +"...more than 10,750 building contractors are now registered by the Works Registration Board of the Federal Ministry of Works.
> Mr. ..... said the Board registered 450 contractors under category B, 150, under category C, and over 10,000 under category A."

The appointment of consultant for the client's projects in certain cases requires similar procedure to that of the contractor's registration except that aspect of competition is omitted. The omission encourages maximisation of biases of the designer at the expense of other considerations.

Scale of professional fee is indicated by the total project cost - which in turn is dependent upon the standard of finish and/or complexity of the project. This basis for the assessment of the consultancy fee will militate against proper control of project limitations as the various group are not encouraged to apply principles of control.

The appointment of contractor is usually through competitive tendering which is wasteful in material and time and hardly achieve its objective. Introduction of high processing fee restricts the number of tenders to such an extent at times that the competitive

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+ New Nigerian Newspaper of 23rd February, 1977 pp. 19.

nature is removed. This processing fee have a way of re-entering future contract sum especially one out of many will win the present job for which tender has been submitted.

Delay in the publication of tenders, late communication of invitations to tender, and delay in the issue of tender documents especially drawings have serious effects on both the contractor and the employers. The contractors are forced to rush in their quotations because of insufficient time allowed, and the resulting tender figures are usually unrealistic.

The initial planning and thought put into the building project can, and often does, affect site progress, co-ordination and control of situation. The degree of variation orders as well as the standard to which the project is raised are the reflections of a deplorable initial project considerations.

CHAPTER FOUR

4.0 DATA ON PERFORMANCE APPRAISAL OF PROJECT DEVELOPMENT AND MANAGEMENT PROCESSES

Four large projects were used to illustrate both the inherent conflicts and/or harmony that may exist in the present system of approach to project development and management as described in chapter three (3).

Two basic strategies were used to bring out factors which will be needed for the formulation of the thesis concept.

One strategy was to review the case history of the project from conception to completion. In this regard a description of the nature of the project including the extent the function and subsequently the placing of the contract between the various parties was necessary in order to find explanation to any observable points of conflict and/or harmony as the work progresses.

The second strategy was to find factors bearing on the points of conflicts and/or harmony and subsequently to allocate to the various individuals to the parties, their own share of responsibilities. This was done through the analysis of the report throughout the duration of the project development and management processes.

Projects selection was based purely on the fact that one common system of contract award as described in chapter three should form the focal point upon which

the new system will rest. This is so especially that present system is the one to be tested and modified from the point of view of conflicts and harmony between the various interfaces of the system. By collecting points of conflict and harmony it is possible to gain an insight into the extent and the direction of the modification.

4.1 New University Bookshop

4.1.1 Background: The idea of a new bookshop was first initiated in 1972 when it became apparent that the present (Old) bookshop was incapable of adaptation both in terms of capacity and standard of amenities.

In 1973, some architectural consultants were approached and were provided with the brief of the proposed bookshop-reference being made to the University Bookshop Ibadan.

Preliminary designs were received and Egbor and Associates was accepted with some modifications.

4.1.2 Type of Structure: The new bookshop is a single square block structure with a total floor area of three thousand one hundred metre square (3100m^2). It incorporates a basement, a ground floor and a small central second floor. The functional division of the building is as follows:-

(a) Public Zone (2,600m^2)

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

(b) The Service Zone (500m^2)

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

4.1.3 Contract Award (Tendering Process): The method of tendering used in this project was the selective tendering procedure. After considering the tender sums submitted by the contracting firms selected, Messrs D. Alberto and Bogialla Limited was awarded the contract for a period of eleven months from the 6th day of June 1977. The accepted estimate or tender sum was one million and eight thousand two hundred and eighty seven naira forty kobo (₦1,008,287.40).

The consultants and other parties to the contract responsible for supervision are as listed below:

(a) Client: Ahmadu Bello University.

(b) Main Contractor: D. Alberto and Bogialla Limited a foreign construction firm with its head office at Kaduna.

(c) Consultants: Architect - Messrs Egbor and Associates with head-office in Lagos but with an area office in Zaria.
Quantity Surveyors: Messrs Qu-Ess Partnership with head office in Lagos but with an area office in Kaduna. Structural Engineers - Messrs Obi Obembe with head office in Lagos but with an area office in Kaduna. Electrical and Mechanical - Henri Mθs Partners with their head office in Kaduna.

(d) Sub-Contractors:- Electrical S/C - Messrs Zazzau Electrical. Suspended Ceilings - Messrs Barada (@ ₦60,770.00). Metal Windows and Doors - GMP Limited (@ ₦24,231.48). Demountable Partitions - Messrs Barade Limited Tanking - Messrs Jasimpton & Co. Kaduna.

4.1.4 Organisation and Administration: The supervision of this project was coordinated by the consulting architect Messrs Egbor and Associates from an area office in Zaria. They organised meetings.

The foreman of the construction firm has an office on the site and was resident in Zaria. However, other higher supervisory staff reside in Kaduna and only visit the site two or three times a week depending on the activities that were taking place on site.

Other consultants were not resident on site or in the town, as it was considered that the project was relatively simple, but visited the site as and when necessary.

In addition to the consulting architect, there was also the clerk of works on site representing the interest of the client. His duties were to report on the progress, the quality of workmanship, and inspection of other aspects of work which may conflict with the project objectives. Sometimes it required the clerk to works to carry out, or request for tests on certain elements.

4.1.5 Summary Highlights of Site Meeting Reports:-

The supervising architect Mr. Thakur arranged for the first site meeting for this project on the 9th of June, 1972 when the site has been released to the main contractor as the contract was being signed. The main purposes of this meeting as reflected in minutes were:-

(i) To introduce representatives of the various parties to the project.

(ii) To get all parties to mobilise their labour force to start off so as to keep to programme.

(iii) To discuss other problems.

The following firms were represented as folows:-

Egbor & Associates - Mr. S. Thakur

D'Alberto & Bogialla - Mr. S. Awento

" " - Mr. G. Lera

" " - Mr. W. Cox

Henri Mos - Mr. Shield

Gu-Ess Partnership - M.B. Abubakar

(a) Programme:- As at this meeting the main contractor had not yet produced a programme for the work and he was advised to endeavour to produce one during the next site meeting to take place by the month end.

It was pointed out at this meeting that an underground P & T cable ran across the building area and must be diverted to facilitate foundation works. The main contractor was then advised to contact P & T for the impending diversion and in addition should make necessary payments which will be reimbursible through architect variation order.

(b) Electrical Problems: It was pointed out that the present lighting layout conflicted with the structural covers. The Electrical consultant was instructed to confer with the structural engineer (who was absent) to resolve the problem. Electrical installation sub-contractors were to be invited by the Electrical designer to tender for the electrical work and to make recommendation to the architect for the final consideration and approval.

(c) Progress Report:- As at the date of this first meeting the main contractor had made some progress on the site as shown by the portion of the fence already erected and the number of trees felled. The second meeting came up on the 29th June, 1977. The highlights include:

(a) Review of Progress:- Considerable degree of progress had been made in that thirty two of the thirty six column - bases were already excavated and casting of the columns started.

Payment to P & T had been made for the diversion of the underground cable.

The electrical and the structural consultants were not present at this meeting so that the matters expected to be handled and reported by them were not reported.

Hitherto the main contractor had not produced a comprehensive programme but remarked that time was needed for the preparation of a realistic planning programme. Furthermore, the main contractor explained that the sub-contractors who had not been appointed will need to be part of a realistic programme preparation.

Interim certificates were issued to the tune of eighty five thousand and fifteen naira and eight kobo (₦85,015.08) and ninety two thousand six hundred and sixty one naira ninety one kobo (₦92,661.91) to the main contractor and the O.S. respectively. This was settled without delay.

The site seemed to have started very well as is usual of most new sites and this was remarked in the 'handing over note by Mr. Janusz Zielonka a senior Estate Architect. Mallam Buhar replaced Mr. Perrera as Clerk of Works.

(b) Insulating Materials for Roofing: The Architect drew the attention of those present at the meeting especially the O.S. to the use of alluminium sheeting for the roofing without any insulating material beneath and explained how unconfortable it would be to the users of the Bookshop particularly during the intense heat since air-conditioners were not likely to be provided in the building. The Q.S. was therefore instructed to explore and recommend the appropriate insulating material for the roof. The cost of this would be met by a variation order or from the prime cost whichever was appropriate.

...du Bello Universit...

The next meeting was scheduled for 20th July, 1977 and the key points of discussion include:

(a) Quality of Reinforcement: The Clerk of Works reported that no cube test results were available. The contractor was therefore instructed to send samples of concrete cubes used during concreting for testing in the Civil Engineering Department and the results sent direct to the Structural Engineer who apparently was absent once again. The Estate Department was to be copied.

(b) Underground P & T Cables: The underground P & T cables had not be diverted as yet by the P & T men despite the payment that had been made. However, assurance had been received that this would be carried out as soon as possible.

(c) Tanking: The Architect now authorised the main contractor to choose a specialist who would carry out the tanking to the basement but should stand gurantor in the event of bad performance or failure.

(d) Other Issues: Tender documents in respect of the ceiling, partitions, windows and doors had been sent out to the short-listed sub-contractors.

The date for the next meeting was fixed for 10th August, 1977. The discussion at this meeting was focused on:

(a) Test Results: The main contractor complained that results of cube tests by the Civil Engineering Department had not been obtained. The Clerk was authorised to collect the result especially that the Structural Engineer was living outside Zaria.

(b) Tanking: Messrs Gottschalk agents for water proofing membrane have been invited to quote for this item of work to the basement and that they would also guarantee their own work.

(c) Floor Tiles: The Quantity Surveyor observed the exhorbitant quotation for this item. The architect therefore instructed the contractor to purchase the floor tiles from Matef whose price was considered fair.

(d) Site Instructions: The Architect instructed the main contractor and informed all present that all site instructions if not issued on the proper consultant sheets should be entered in the site diary and later confirmed in writing by the party and copied to all who are involved.

(e) Interim Valuation Certificate: The Estate sent the interim valuation certificate dated 8th September, 1977 for sixty four thousand six hundred and eighty nine naira ninety seven kobo (₦64,689.97) being payment for the main contractor's work.

The next meeting was scheduled for 7th September, 1977 to discuss

(a) Programme and Progress: The construction was progressing satisfactorily and the main contractor had finished preparing work programme.

(b) Roof Insulation: The Quantity Surveyor suggested two alternatives for use in this case. These are

(i) Sisal craft 716mm double layer or

(ii) 25mm glass fibre.

(c) Nomination of sub-Contractors: The main contractor requested that the sub-contractors for electrical, windows and doors be nominated to curtail delays.

The next site meeting was fixed for 12th October but was not held due the fact that the architect was not present Rather a letter was sent re-scheduling the meeting for 2nd November, 1977. This meeting was well attended by all members except the structural engineer.

(a) Observation: The architect expressed dissatisfactien with the lukeworm attention being paid to the site meetings by Messrs Obi Obembe after he the architect had apologised for his unanticipated absence during the October meeting.

(b) Discrepancy: The main contractor pointed out the discrepancy between the quantity of steel as stated in the Bill of Quantities and the Structural drawings. It was indicated in the Bill of Quantities as two hundred tons (200 Tons) whereas the drawings showed it as two

hundred and twenty tones (220 tons). The Quantity Surveyor was then asked to sort this out.

(c) Electrical Sub-Contract: Henri Mos reported that tenders had been received from some of the sub-contractors invited. Mr. L. Hayab representing Henri Mos remarked that their recommendations were given to two of the tenders simply because the third tenderer submitted late. The tenders were as follows with their term:

1. Elequip Installations Nig. Ltd.,
   Tender figure - One hundred and thirty four thousand six hundred and forty nine naira (₦134,649.00).
   a - Prices of the item are fluctuating with effect from date of tender.
   b.- Import duties exempted from all material
   c - Fifteen percent (15%) payment on all orders

2. Akinpelu Electric Company Ltd. Kaduna.
   Tender figure - One hundred and forty five thousand two hundred and fifty six naira and sixty eight kobo only (₦145,256.68).

third, but the late tender to be received was:

3. Zazzau Electrical Engineers Ltd., Zaria.
   Tender Figure - One hundred and twelve thousand, three hundred and seventy two naira and eighty seven kobo (₦112,372,87).

Conditions:-

a - A further ($8,000,00) eight thousand naira is assured if the client will issue custom exemption certificate which will bring the tender figure to (₦94,372.87).

Prime costs to be added for dock systems and contigency.

The Electrical Consultants, giving some elaborate technical explanations, recommended the Enitan Akinpelu Electrica Company Company Ltd. despite their high tender figure of ₦145,256.68. The client however on receiving the tenders was captivated by the relatively low tender figure of the late tenderers i.e. Zazzau Electrical Engineers and the relative reliefs to be further enjoyed and therefore sought the advice of the Electrical Consultants through the Architects. This was given, with Messrs Enitan & Akinpelu Eletric Company still being preferred by the electric consultants.

The client finally decided to accept the tenders of Zazzau Electrical Engineers Limited and they were appointed the electrical sub-contractors by Architects letter Ref. EAPZ/104/01/05 dated 15th November, 1977. Valuation certificate Nos. 4 (Ref. AB/022/73/94 dated 14th October, 1977 for the sum of ₦67,250,88 was passed for payment to the contractor.

The next site meeting was scheduled for the 23rd November, 1977.

The site meeting was attended by all the professionals and contractors already employed for the contract Messrs Zazzau Electrical were also in attendance.

The electrical sub-contractors demanded to be supplied with:

1. Three (3) copies of drawings and specification.
2. Architectural drawings
3. Prime cost of docks.

They also pointed out that since the client cannot afford air conditioning that provision be made for Fans. They observed that the columns were already cast and as such the switches had to be repositioned away from them.

Messrs Egbor and Associates announced the selection of the following sub-contractors to carry out jobs for sums stated against their names:

J O B	CONTRACTORS	CONTRACT SUM
1. Suspended Ceiling	Messrs Barada Ltd.,	₦60,770.00
2. Metal Windows & Doors	Messrs NACO Ltd. QMP. Ltd.	₦15,375.90
3. Demountable Partition	Messrs Barada Ltd	₦24,231.48
4. Tanking	Jasimpton & Co.	₦32,113.00

Messrs Barade Ltd. were paid mobilisation sums of ₦15,351.00 and ₦9,633.90 respectively for the ceiling and pertition respectively.

The Architect recommended payment for interim valuation Nos. 7 & Ref. EAPZ/104/04/07 dated 7th February, 1987 for the sum of ₦81,714.51 and Ref AB/022/73/155 for the sum of ₦11,114.59 due to the Main Contractor respectively.

Meanwhile, the Bookshop management Board not satisfied with the progress of the Bookshop directed that a member of the Bookshop management staff should be present at subsequent site meetings and keep the Board informed through reports.

The site meetings held in January, 1978 heard of accusation and counter-accusations. The discrepancy in the steel had not yet been resolved and the Quantity Surveyors and the Structural Consultants were again instructed to find or recommend a solution to the problem.

Earlier on, the structural consultants had informed the Main contractor of their dissatisfaction with respect to:

a. Reinforcement bars having no cover in several areas and had been covered up with plaster. This implied that the required bond anchorage between the cement and the concrete was not obtained.

b. There were several honeycombs in several places.

The main Contractor refuted these charges (Ref. RLC/AO/4 dated /78 and blamed the structural consultants of perpetual absence to inspect works whenever the castings of concrete was made.

Messrs D'Alberto & Company emphasized:

1. The need to adhere to the programme by visiting the site while the formwork was being erected, bars arranged and concrate cast. However, the contractor maintained that if the consultant did not feel satisfied with the work he could order for the reopening of the suspected under-reinformed area for inspection to be compensated for the cost of executing such instruction if the reinformcement was found to be adequate. They also promised to ensure that they would despite the possession of the working programme keep the structural consultant informed when any future work is erected before casting for his inspection. The contractor complained of shortage of cement.

During the subsequent progress of the work, the structural Engineer, despite invitation, did not turn up to inspect the fabrication of the roof trusses then in progress and the casting of the high columns. In view of this and their often absence from site meetings, the Architectural Consultants wrote the Structural Consultant Messrs Obi Obember (Ref. EAPZ/104/Gen/60) dated 16/4/78 expressing their dissatisfaction over the poor supervision of the structural work. He was reminded

of the need for close and effective supervision especially as the work had reached a critical stage. Reinformcement and concreting for high columns had begun and the roof trusses were being fabricated.

On 31st March Mal. Ishaka Isa mentioned in his handing over notes that about 40% of the work has been completed but the work was progressing rather slowly.

The following site meeting was held on 26 April, 1980.

The site meeting was attended by representatives of the Contractors, Consultants and Sub-Contractors. Messrs A'Alberto was again experiencing cement supply shortage. The ceiling, partition, and window sub-contractors were to be contacted to expedite action on their deliveries. Henri Mos layout for lighting stands.

Structural Problems:

The Structural Consultants Messrs Obi Obembe having observed some discrepancy in the structural work instructed in a letter dated 6th April, 1978 that the Main Contractor as follows:

1. That before any concrete work is cast, they (the structural consultants) have to inspect the formwork, the placement of bars and the vibration of concrete due to the bad casting of the roof beam (section 6-6) on sheet 10 of the structural drawings. The structs were inadequately placed.

2. The two glaring faults observed by the Structural Consultants were the countless homecombs and the edges of the beam that were not straight as they should be due to improper vibration of the concrete and the later due to bad shuttering. The initial collapse of beam was attributed to bad construction procedure. They then issued instruction as to the procedure the contractor should use in the construction of the beam. The Architectural Consultant instructed the contractor to ensure that the construction procedure given by the Structural Consultant is to be adopted.

The Architect informed members present that the Client had consented to the provision of electrical and constructional facilities for the future installation of air conditioners.

The members complained of the problems caused by these variation at advanced stages of the work and expressed the fact that the client should have accepted the recommendatin to provide for this facility earlier on as climate in this part of the country during the dry season makes this facility a need and not a luxury. The Architect said the designers should have elements of costs, functional and aesthetic consideration.

Closure of Site

The meeting was attended by the Contractor, Architect, Henri Mos and Partners. The structural Consultants and most of the sub-contractors were absent.

The Architect noted with dissatisfaction the slow pace of the work during the last few months despite the elapse of the proposed date of completion (30/4@78).

The Main Contractor Messrs D'Alberto and Giampolli on 14/7/78 expressed their dissatisfaction with the attention being given to their interim valuation certificate Nos. 10 and 11 (amounting to the sum of Seventy eight thousand, two hundred and eighty nine naira and ninety one kobo - ₦78,294.91) issued by the Quantity Surveyors, approved by the Architect and recommended for payment by the Estate Department for the months of July and August.

On the 20th September, 1978, Messrs D'Alberto & Giampolli through a letter to the Architect and copied all concerned (Ref. SA/A0/39) gave a three days ultimatum for settlement in respect of interim valuation Nos 10 and 11 or they would close up the site.

During the 20th site meeting, Mr. Audu representing the contractor informed members of his firm's decision to close up site as from 2nd October, 1978 due to the client's failure to meet his financial obligation.

The University was suffering from financial problems due to the austerity measures introduced at the National level to help save the country from financial embarrassment.

In view of the above effect on the University, it wrote the Board of Directors for the Bookshop to be prepared to:

1. Pay economic rent for the structure they were using presently, or
2. To takeover the financial responsibility of the new bookshop (Ref B/CD/184/Vol.1/105 dated 29th September 1978).

Move to Re-Open Site:

After nearly one year of the closure of site the University's Director of Works in a letter (Ref. AS/127/AB 134/215) dated 27th July, 1979) to the Vice-Chancellor explained the need to re-open the site as early as possible if the University was to avert the eventual increase in costs of project due to inflation on labour, materials, plants and costs of remobilisation. He recommended the provision of six hundred thousand naira (₦600,000.00) which he felt would take the sturcture to functional completion.

In a letter dated 6th August the Vice-Chancellor accepted and approved the proposal. The Director of Works in a letter Ref. AB/134 dated 10th August, 1979 instructed the Architect copying all parties concerned of the instruction to re-open site and promised to effect the following:

1. Settle all outstanding bills in favour of the Main Contractor.
2. Settle issues relating to revision of contract period, claim on extra cost arising from the suspension were to be worked out during the course of the work as provided for in the contracts documents.

The Architect convened a meeting for the 12th of September, 1979. All parties involved were in attendance except for the Main Contractor (who had partially re-occupied the site) and the Structural Consultant - Messrs Obi Obembe. Items discussed included the following:

1. Re-commencement of work on site.
2. Financial implication.
3. Materials on site.
4. New likely completion date.

Compensation

The architect informed all that the basis of compensation would be:

Claims for delay.

Claims for re-mobilisation on site.

Materials

The Main Contractor, Sub-contractors and the Quantity Surveyor were to assess:

1. Materials on site

Personal (if any at all) materials required

2. implication (inflation)

3. Delivery periods.

Doors, Display and High Level Windows

Messrs GMP informed those present at the meeting that all materials were now available in the country, no delivery dates can be mentioned due to the discrepancy between the design drawing and the site dimension.

Partition and Ceiling

The Architect informed the members of the folding up of Messrs Barade Limited and said he would approach Arewa Limited if they would complete the work of Messrs Barade.

At the subsequent site meeting the Main Contractor confirmed receipt of payment in respect of interim valuation certificate Nos 10 and promised to re-start work tokenly promising to fully cooperate only after all outstanding payments in their favour had been made.

The Architect informed all concerned to document their claims for delay, re-mobilisation and inflation Messrs Zazzau Electrical Limited, the electrical sub-contractor informed the members of their unwillingness to resume on site until they had received payment for their claim of 2nd October, 1978.

Their claim had been approved for payment, but the Architect directed them to pass all future claims to be certified by the Electrical consultants - Messrs Henri Mos before being passed to Architect for approval.

Structural Conflict

The Principal Estate Structural Engineer while on a visit to the site gave direct instruction to the Main Contractor who was hesitant to implement it. The Architect on being told of this wrong channel of instruction on works, in a letter (Ref EAPZ/104/Gen/76) dissociated themselves from any resultant effects this instruction may have on the structure as this instruction should have been passed to the contractor through the Architect only.

However, the Estate Principal Engineer noted on the site diary on 17/10/79 of the structural discrepancy of the steel roof trusses and instructed the Architect to instruct Messrs Obi Obembe make good defects. Messrs Obi Obembe said after inspection that there was no remedy as fault was due to poor workmanship of the contractor and referred to their letters dated 6th July, 1979, 15th July, 1979. 28th July, 1979, 7th August, 1979 and 10th October, 1979 to contractor.

The Architect instructed as follows in respect of the structural work:

(a) The co-ordination and supervison and direct instruction to the contractor would be the sole responsibility of the Structural Consultant.

(b) The Main Contractor was to appoint experienced steel fabricators acceptable to Messrs Obi Obembe.

(c) All corrective work on the steel work would be carried out under the supervision of Messrs Obi Obembe.

Programme of Works

The Main Contractor had not produced a working programme due to the non-appointment and non-resumption of certain sub-contractors. Messrs Zazzau Electrical insisted on not resuming on site until the sum of ₦30,518.00 in their favour was settled. After this, they would resume and replace all damaged electrical works. The Quantity Surveyor had not prepared the stoppage of work due to non-payment. These debts were settled and work on site resumed. The abscondment from site of Messrs Barade Limited with the advance payment didn't cause any loss to the client since he had executed other works on the Senate Block work more than the advance payment and hence the client would recover the advance from payments due to Messrs Barade Limited.

4.2 A.B.U. NEW TEACHING HOSPITAL - SHIKA ROAD, ZARIA

4.2.1 Type and Purpose of Structure(s).

The new Ahmadu Bello University Teaching Hospital was originally conceived and designed as one thousand (1,000) bed hospital in May 1972. Based on this projection the authorities concerned approved the

feasibility studies and the preliminary drawings. Due to the large and complex nature of a modern and sophisticated project like this and the enormous cost to be borne by the client, the project was to be constructed in phases as follows:

Phase 1:

Phase one of the project comprises of laundry kitchen, central supplies and sterile department, obsterics and Delivery suite (Main Ward Block). The contract was signed in October 1977 and scheduled to be completed in June, 1979.

For the purpose of this study I'll limit myself to phase I only since it is the first and only phase under construction at the moment.

Phase IA:

This comprises of the Radiology, Accident and Emergency Operating Theatres, Pharmacy, Out patients, Physiotheraphy, Chemical pathology and related departments. This (IA) phase is yet to be awarded at the time of writing Phases I and IA are actually inter-department and the hospital cannot become operational without the completion of both phases.

Phase II: Staff Housing and Para-Medical Schools.

Phase two of the hospital project consists a medical school of Nursing and Housing Units, especially as the new hospital is some eighteen (18km) kilometres from the present hospital in Tudun Wada.

Other structures that are to be part of the Teaching Hospital complex are: Institute of Health Headquarters, School of Nursing and Laboratory Technology and the Medical School.

PARTIES INVOLVED IN TEACHING HOSPITAL CONSTRUCTION

CLIENT

CENTRAL - Federal Ministry of Health, Lagos

DIRECT - Institute of Health, A.B.U., Zaria

OVERALL - Estate Department, A.B.U. Zaria.

CONSULTANTS:

ARCHITECTS - Inter-State Architects - Jos

STRUCTURAL - Civil Structures Associates, Kano

MECHANICAL - Soboyejo Associates - Lagos

ELECTRICAL - Chris Fajemirokun Associate - Jos

QUANTITY SURVEYORS - Adesoye & Partners - Kaduna

EQUIPMENT SCHEDULE - Associate British Hospital Eqpt. Limited.

CONTRACT DETAILS:

CONSTRACT SUM - 20,402,227.95

COMMENCEMENT DATE - 29th January, 1979

COMPLETION DATE - 31st January, 1980.

MAIN CONTRACTOR - New Nigerian Construction Company-Kaduna

SUB-CONTRACTORS:

ELECTRICAL INSTALLATION & FITTINGS - Messrs Zazzau/ Lillieker Electrical - Zaria.

STRUCTURAL STEEL WORKS - Ace-Metal Construction (NIG) Limited.

LIFT INSTALLATION - F. Steiner & Co. Ltd.,

DEWAGE TREATMENT PLANT - BEWAC (Satec Ltd)

SUSPENDED CEILINGS - Engineering Supplies Ltd.,

PLUMBING INSTALLATION - Heden Nig. Ltd.,

MECH. INSTALLATION & PLANT - Mandillas Ltd.

DINNING ROOMS ROOF TREATMENT - Standard Safety Ltd.,

TREE PLANTING - Ministry of Agric. & Forest Research, Zaria.

NOMINATED SUPPLIES:

METAL DOOR FRAMES - Gottschalk - Kaduna

ALLUMINIUM ENTRANCE DOORS - G M P Ltd., Kaduna

SANITARY WARES - Gottschalk Ltd., Kaduna

4.2.2 **Organisation and Administration**

The parties involved in the construction is as reflected in the foregoing pages. Due to the complex and extensive nature of the project there was the need for close association of the works by the parties engaged.

The design Architects - offered post contract services which involved supervision of the whole construction project on behalf and for the client and co-ordinating the activities of other consultants on the site. In certain cases they also acted as arbitrators between the subcontractor and the Main Contractor in cases of simple conflicts. Generally, all the consultants were to provide residential supervisory services on site. This means that the consultants were to operate a site office - provided for by the Main Contractor - with a qualified resident site staff who would be able to make site decisions along

the lines of his specialisation.

The Main contractor - Messrs New Nigeria Construction Company provided offices, storage facilities, transport for consultants and generating (standby) plant in case(s) of NEPA power failure.

4.2.3 Co-ordinating Meetings and Reports:

Numerous meeting were usually held on site to effect control and co-ordination, the regular ones being the following:

Consultants Meetings

This was usually held once in a month with consultants, Main Contractor and some Sub-contractors in attendance. It was usually chaired by the Resident Supervisory Architect.

Contractors Site Meetings (Progress Review)

This meeting was usually held weekly sometimes monthly but preceeding the monthly consultants meeting. It was normally attended by the Contractor, Sub-contractors and sometimes the nominated suppliers. At these meetings review was made of the previous week's works and a programme drawn as to what was to be done the following week.

Reports

Copies of minutes of the Contractor's weekly site meetings were sent to the Resident Supervisory Architect who went through them to acquaint himself with the progress and problems of the contractor and subcontractors.

Similarly copies of the minutes of all consultants site meetings were sent to the Client and all parties concerned to keep them informed of progress and problems on site before they are communicated officially on items that might require their attention.

The Resident Architect used to submit to the Client the monthly progress report in which the progress and problems of the site were reflected. In certain cases, work was slowed down or even halted for one of the following reasons:

1. Lack of prompt and adequate policy decisions on certain matters. The Architect therefore would compile for the client the information required for action.
2. Lack of prompt appointment of certain subcontractors delayed the work and such subcontracts were also reflected under appointments pending.
3. Lack of settlement (or payment) of outstanding interim payment certificates due to the contractor, subcontractor and sometimes but rarely the consultant.

In the terms and condition of contract interim payment certificates were to be issued monthly and settled within twenty one days of receipt by the Client.

However, certain problems usually arose between various parties ranging from non-receipt of mails to the absence of the person(s) authorised to take action on them when received. The administrative problems involved in the

project were due to the involvement of several parties with the not too clearly defined role(s) e.g. the role of the Federal Ministry of Works and Min. of Health were not clearly defined thereby delaying actions or decisions on certain vital matters.

The initial delegation of duty of the Client to the Institute of Health and Estate Department without subsequent delegation of powers on financial matters. e.g. certifying and recommending or Architect interim payment certificates to the Federal Ministry for payment.

The supervisory client couldn't also appoint subcontractors to carry out works on the project, however, these administrative problems were sorted out later.

The spatial location of some of the subcontractors was such that they couldn't supervise or execute their works effectively.

Site Meeting Reports:

The major client - Federal Ministry of Health delegated the supervisory duty of the Teaching Hospital to the Estate Department of Ahmadu Bello University. However, the consultants pointed out for ease of administration and proper co-ordination that the delegation should include financial, this was later agreed.

Interstate Partnership had the sole responsibility of providing post contract Architectural supervision. However, due to staff shortages, Ahmadu Bello University Estate Department seconded Mr. Weblinski -- An Architect - with interest and specialisation on hospital design. The arrangement was made such that the university does not pay for the resident supervision it was itself providing.

The site meetings were to be attended by the representatives of the following: Consultants, Contractor & Sub-contractor.

Interstate Partnership - Jos
Civil Structures Associates - Kano
Adesoye & Partners - Kaduna
Estate Department, Zaria
Soboyejo Associates - Lagos
Chris Fajemirokun Associates - Jos
} CONSULTANTS

New Nigeria Construction Co. - Kaduna - CONTRACTOR.

Electrical Installation & Fittings
Structural Steel Works
Lift Installation
Sewage Treatment Plant
Suspended Ceilings
Plumbing Installation
Mechanical Installation and Plant
Tree Planting
Living Rooms & Roof Treatment
} Specialist Subcontractors

Though the meetings were regularly held on the last Thursday of the month, a number of the firms had no regular representative at such meetings. This was either due to staff shortages (rarely accepted) lack of transport facility by the firm's management or lack of appointment of such subcontractor. The meetings discussed issues centred on the project as follows:

1. Programme

The general programme was reviewed and the works checked to ensure that the programme was being adhered and where amendments were needed this was done. It also delibrated on the subcontractors that were required to resume work on site and the programme of their work was integrated into the master programme of works.

2. General Contractor

The Main Contractor would highlight the problems facing the site and the progress of the work. Where a delay was being experienced the cause of the delay would be examined and a solution proposed for action by the person or party concerned.

3. Sub-Contractors' Works

The meeting would discuss subcontractors works that were being carried out along with other Main Contractors works e.g. provision of electrical ducts for structures. The effects or (if any) the progress or delay being noted on the main works would be examined and solution suggested and if accepted would be communicated for action by the party concerned.

4. Matters Arising

The following report is that compiled from the reading of the available site meeting reports. It simply highlights the major issues relevant to the study that were discussed and therefore not a reproduction of the minutes of the meetings. Reproduction of certain communication (or their references) is only made where and when it is felt that it will further reafirm the point being established. From the record available to me at the Estate Department, the minutes of meetings discussed the phase 1 of the project.

The site meeting held in March, 1978 was attended by representatives of the Contractor, the Consulting Architects, the Civil Structural Engineers, Adesoye and Partners, Messrs Zazzau/Lilleker Electrical Company.

Programme

The resident supervisory Architect Mr. Wiblinski announced the award of the following subcontractor to the respective parties.

1. Plumbing Installation - Messrs Haden Nigeria Ltd.
2. Air Conditioning - Messrs Mandillas Ltd.
3. Supply & Sanitary Fittings - BEWAC Nig. Ltd.

However, the Main Contractor drew the attention of the members to the effects the award of the contract to Messrs Haden Ltd had on the overall programme and the completion time. Messrs Haden Ltd. had quoted a

period of one hundred and four weeks (104 wks) to complete the project whereas there was only sixty five weeks (65 wks) of the contract period remaining for the Main Contractor. This implied that the Main Contractor would have finished and handed over the works before a subcontractor to him (Main Contractor) would have even finished which is highly abnormal. The Architect appreciated the points raised by the Main Contractor and promised to point out the discrepancy for a solution.

The Main Contractor wanted to go on to highlight certain more inconsistency on the contract agreement but was advised by the Supervisory Resident Architect to commit all in writing. In the meantime a revised programme of works due to the sub-contract award was to be drawn up and agreed to by all concerned.

Structural Subcontractor

The structural sub-contractor Messrs Ace Metal Ltd was requested to provide a responsible foreman on site as the present foreman refuses to obey site instruction given to him by the consultants.

General Contractor

The Main Contractor informed the members of the provision of transport for the consultant's use. The Sewage Treatment Plants drawings submitted by BEWAC were not approved by Messrs Soboyejo Consultants and BEWAC are meeting in Lagos to discuss details and bring

out a final drawing that might be acceptable to all.

Electrical Sub-Contract

The Resident Architect reported that all ducts had been completed and would soon be taken over so that the Electrical subcontractor could start on his job. The Electrical Sub-contractor, Messrs Zazzau-Lilleker Ltd. reported that materials were in transit for the job.

Ceiling Subcontractor

Architect confirmed and instructed that all ceiling tiles and recessed light fittings to be metric 300 x 300 or 600 x 600 (mm).

April/May 1978

At this meeting all the consultancy firms were represented. The appointed subcontractors were present except for Mandillas Nigeria Ltd.

Programme

It was pointed out by the Resident Structural Engineer that the foreman for Ace Metal subcontractors still refused to obey instruction from those authorised to do so, this resulted in their holding up works for weeks. The contractor pointed out that if such delays persisted that he may have to make claims for extension of time.

The Electrical subcontractors reported the arrival of one hundred cartons (100 ctns) of material and requested the Main Contractor to provide storage facilities.

General Contractor

The Architect acknowledged receipt of the consultant transport vehicle provided by the Main Contractor. The contractor reported that mobilisation payment had not yet been made to the newly appointed subcontractors Messrs Haden Ltd. BEWAC and Mandillas were informed that no cheque had been received from the Federal Ministry of Health who had recently instructed that all future certificates for payment be made on a Federal Ministry of Health Standard Form, and signed by the Supervising Resident Architect. Mr. Joledo from Ace Metal on a site inspection after the meeting instructed his foreman to accept and obey instruction given by those authorised to do so.

Implications of Accepting Messrs. Haden's Tender

The problems raised by the Main Contractor during the site meeting of March, 1978 was followed by a letter from Messrs New Nigeria Construction Company pointing out the implications and their quotation of 104 weeks for completion and their stand on the proposed amendments to the Standard Form of Subcontract agreement to incorporate the special conditions contained in the tender. Part of the letter (Ref. TN/RO/318/78 dated 8th March, 1978) was directed to the University's Director of Works. It reads:

Dear Sir,

General: As Main contractors we are asked to prepare in conjunction with Haden Nig. Ltd., a subcontract agreement acceptable to both parties. We assume that the tender has been reported upon both technically and financially and we confine our remarks to matters of a contractual nature only.

Fluctuation Clause: A schedule of basic prices of labour and materials at date of tender is required.

Main Contractors Attendance upon Subcontractor: All items referred to are generally covered by the Main Contract except for the provision of special scaffolding, special hoisting equipment (2 No tower cranes and 1 No mobile care on site)specially contructed storage buildings and the provision of fuel. These attendances if required would need to be covered by Architects Variation Order.

Conditions Governing Payment:- The 20% advance payment without deduction, the initial payment to cover site installations and interim payments to cover site overheads and matters for monthly certificate by the Architect in the usual manner. The percentage of certified value retained of 5% differ from that of the main contract (10% to a maximum of 5% of the contract sum). If the subcontractor is not prepared to conform with the Main Contract condition, we would require interim certificates to be adjusted accordingly to release the excess of retention that would otherwise be deducted.

Technical Services Agreement: Authorisation to remit 10% of payments abroad to be issued by the appropriate authority.

Limitation of the amount of Liquidated Damages payable by the Subcontractor. We do not object to this providing that our own liability to the employer for delays directly caused by the subcontractor is similarly limited in amount.

Main Contractor right to set-off to be restricted to agreed sums between the respective parties: This qualification does not appear to vary the standard conditions.

Special Clauses 1 - 13

(1) Original tender not inclusive of Main Contractor's discount:- The subcontract amount should be adjusted by the addition of 1/39th. This qualification would not then be required.

(2) Customs Duty: Exemption Certificates to be provided by the appropriate authority.

(3,4,5,6,7 and 9) Concern technical cost matters.

(8) Cutting of holes and chases etc, by the Main contractor. This is covered in the Main Contract.

(10) Date for completion: We are particularly concerned with this aspect of the tender.

The subcontractor has requested a lengthy mobilisation period plus 104 weeks site working whereas only 65 weeks of the contract period remain.

This period is wholly unacceptable to us and we have aked the subcontractor to:

(a) Investigate the possibility of using locally produced materials so as to be able to complete under floor drainage work at an early date. This would require the approval of consultants.

(b) Reconsider in the light of our programme and the contract completion date the mobilisation period required and the installations programme for the subcontract works.

Should we be instructed to enter into subcontract agreement which delays the Contract Completion Date, we would expect to be allowed an extension of time in accordance with Clause 23 of the main contract in order to accommodate the subcontract works and reimbursement for costs incurred under clause 24.

(11) Concern employed requirements.

(12) Sectional completion: We deem this is all in accordance with clause 16 of the Main Contract.

(13) Not applicable to this subcontract.

Providing that Haden Nigeria Ltd, can reduce the time required for the completion of the subcontract works to a period acceptable to both the employer and ourselves, we have no objection to entering into a subcontract agreement incorporating the above amendments.

The site meeting held on the 5th of June, 1978 discussed the contractual problem involved in the appointment of Messrs Haden Ltd as subcontractors on the project.

The Architect informed members present at this meeting that "Sectional completion" would enable the contractor to finish his work and handover while Messrs Haden continue to finish their work and handover at a later date since it was almost practically impossible to complete the work any earlier.

Haden Ltd. attributed their lack of mobilisation on site to:

The lack of payment of mobilisation fee due to them:

- Absence of a secure store on site
- Absence of details of sanitary ware.

The contractor assured them of storage facilities but observed that they (Main Contractors) couldn't remit any sum to Messrs Haden because they have in turn not received such payments. They explained that the normal monthly valuation would be followed.

Progress Reports: The progress report for May, 1978 indicated in brief that delay experienced on site was as a result of a number of factors, the main ones being:

Lack of Adequate Information: The absence of enough information especially on details of drawings. There was not yet a written policy regarding the method of payment.

Appointments Required: The appointment of contractors for the supply of sliding and folding doors. The nomination of a contractor for the overhead tank.

Shortages

There was inadequate water supply from the water board and electricity board NEPA. In order to alleviate the problem the Main contractor was using water tankers to fetch water from the water works which is almost 10km from the site.

The generating plant on site was supplying the Main Contract essential plant. This power cuts from NEPA were affecting the electrical sub-contractor in the installation.

Delays

The delay experienced was the non-installation of under floor services due to late appointment of sub-contractor.

The progress report of May, 1978 a period of one year of the preceeding one showed that certain shortcomings mentioned had not been tackled by the party concerned.

Appointment Required

The sliding and folding doors, steel gates and rollers supplier had not been nominated. The nomination of a sub-contractor for the erection of an overhead water tank.

Shortages

Mandillas Ltd. had not established site office let alone to start off their works. The Quantity Surveyor and the Structural Consultants had not yet provided resident supervision on site.

Delays

The delays experienced was due to the non-payment of Contractor by the Client. This had led to the contractor reducing his work force as interim payment certificates Nos 19, and 20 with total value of ₦106,000.00 is still outstanding.

APRIL '79

The progress report for April, 1979 sent to the Client indicated that Federal Ministry of Health had not yet taken a decision regarding the tenders for kitchen, laundry and mortuary equipments. Some of the consultants had not yet provided a resident supervisor. However, assurance have been given of the appointment of a Quantity Surveyor to resume on site shortly.

Shortages

A number of materials and equipments had been ordered from overseas and were still being awaited. The Federal Ministry of Health is to issue user certificates to allow for exemption of custom duties on the equipments.

Delays

The delays experienced in the contract were enumerated and attributed to the following:

Lack of prompt payment to contractor, subcontractor. Interim certificates Nos. 25, 26, 27 and 28 to the value of ₦1,166,000.00 still outstanding.

This consequently led to late payments to subcontractors who sometimes abandoned the site and would take a very long time to re-mobilise even after payment had been effected.

Government introduction of form 'M' inspection at the ports of shipment further delayed the works as the imported materials and equipment awaited the inspection for months.

The non award of contract for built-in equipments, has delayed the works as the building works couldn't be reasonably carried beyond the point of convenient fixing of these equipments. As pointed out earlier the non-issue of user certificates for custom duty exemption further delayed clearance even at our own ports.

These delays have an adverse effect on the cost of the project as claims following extension of time were enormous.

Effects of Non Payment of Certificates

As pointed out in the progress report submitted to the client, the non-payment of certificate by client adversely affect the rate of progress and quality of work due to the general reduction in the labour force and supervisory staff. In certain cases, the subcontractors withdraw their services only to re-occupy the site a long time after payment had been made to them; thus affecting the programmes of works followed by claims for redundancy, fluctuation and application for extension of time. Take for example for four consecutive months, the interim valuation certificates Nos. 25, 26, 27 and 29 amounting to ₦1,166,000.00 due to Messrs New Nigeria Construction Company Ltd. was not paid The Company wrote to the consulting Architects highlighting the problems experienced by them and likely effects. The letter Ref. AN/TNU/1130/79 dated 5th October, 1979 speaks for itself.

Dear Sir,

Ahmadu Bello University Teaching Hospital, Zaria: PHASE I

We wish to place on record once again our deep concern over the delays in payments of the above works.

Payments now due on Interim Valuations 25, 26, 27, 28 as certified by the Senior Resident Architect amount to over ₦1,166,000.00.

We understand that instructions have been given to the Federal Ministry of Health to hand over the administration of the Contract to the Federal Ministry of Works since the middle of last month. Immediately prior to this, we have information that the Federal Ministry of Health had completed all due processes and were on the point of issuing a cheque in payment of certificate 25 and 26. The change of policy regarding the administration of the Contract is now being used as an excuse for further and unnecessary delays in payments.

You are well aware of the adverse effects these delays in payments have on our programme of work. While we have continuously strived to make progress under similar situations, the nominated sub-contractors and suppliers have not been so readily co-operative and we have had to submit an application for a further extension of time to 30th June, 1980 in our letter RC/SI/244/79 of 19th March, 1979. While we are still awaiting a reply to this letter, please note that we are

investigating the effect of the current delay in payment on our revised programme and will submit to you in due course an application for a further extension of time, should we consider this necessary. The last time we experienced a similar delay over the payment of Certificates Nos. 21 to 24, it is on record that some of the nominated sub-contractors reacted sharply. For example Messrs. Bewac abounded the site on or about 4/5/79. We received payment on 22/6/79 and effected payment to Bewac on 25/6/79. Bewac did not re-mobilise, however, until 26/7/79.

It is not the responsibility of the Contractor to finance this work on the scale we are being asked to, and we would appreciate your good offices in drawing the attention of the Client to the increased costs likely to arise as a result of any further delays to the contract attributable to his actions in contravention of the provisions of Clause 30 of the Conditions of Contract.

SITE MEETINGS OF APRIL/MAY 1980

PROGRAMME

The Resident Architect informed the meeting of Hadens resumption on site with an increased work force and instructed the Contractor to integrate Messrs Haden and Mandilas programme of works in the main programme.

Lifts - Messrs Steiner the lift subcontractor had not resumed on site. The contractor had written the firm and also sent a member of his staff to ascertain their dates of resumption on site.

The Electrical subcontractor was working normally and his programme of works had been integrated in the main programme.

Messrs Paramount Ltd, the subcontractor for the overhead tank had started work but have had to stop for the non-arrival of crane to complete the last phase of the tank creation.

The Engineering Supplies Ltd had not yet resumed on site due to the non arrival of their imported materials.

CONTRACTORS PROGRAMME

Contract award for: Fixed Hospital Equipment, Laboratory furniture and storage cupboard not yet awarded.

The Architect informed the meeting of the completion of the first ducts works in the kitchen. The second required structural drawings which had been issued recently.

Supervision

The Main Contractor having received payment due on outstanding certificates has increased supervision on site by providing two additional foremen and a project

manager Mr. Griffiths with a considerable increase in the labour force. In order to facilitate easy coordination and maintenance of high quality performance, the contractor's weekly meeting were being held regularly.

Electrical Subcontract

The construction of the sub-station set out according to Architects drawings, with louvres installed as specified. The P & T should be followed up for the supply of telephone lines and installation time table as all payments in respect of this service had been made on interim payment certificate No. 10.

Airconditioning - The operating theatre revised layout of air conditioning trunking not yet ready. The testing of the A/C system would require a lot of water to be supplied by the contractor. Mr. Weblinski therefore suggested the blocking of the steam to provide water for the test in June.

Mandilas Ltd reported the expiration of import licence since March, 1979 with abortive efforts to renew same. They were reminded that responsibility for timely renewal of import licence was solely theirs.

CEILINGS:

The ceiling layouts had been drawn up and Engineering supplies reported the receipt of one container of ceiling materials on site while the rest of the four containers were awaiting transportation to site as ship arrived on 3rd April 1979 and was off-loaded on 14th April, 1979.

Messrs Steiner the Lift's subcontractors were not represented at these meetings and Dr. Podolack was advised to get in touch with Messrs Steiner when next in Lagos.

SITE MEETING OF JUNE & JULY 1980

The reports of June and July discussed the problems, performance, and demands of the various parties.

PROGRAMME

The mechanical engineering consultants, Soboyejo Associates were to carry out feasibility studies for the supply of permanent water supply for sewage farm which had been omitted in phase 1 and included in Phase IA.

Stainer Limited, the lift subcontractor has not yet resumed on site and no information was available about him. The Architect therefore sent out a warning letter dated 11th June, 1980.

Messrs Engineering Supplies Limited wrote on 2nd July, 1980 to inform all concerned of their inability to continue with the contract. However, the Main contractor objected to the reasons given in the letter. Messrs Zazzau Electrical had applied for extension of time with subsequent claims to be dealth with by the Quantity Surveyor, Architect and Electrical Consultant.

CONTRACTORS PROGRAMME

It is worthwhile to note that after the full resumption on the site of the Main Contractor after settlement of outstanding valuation certificates a new programme of works had only been made six months afterwards. This the contractor remarked was due to the non appointment of subcontractors for essential works like the Fixed Hospital equipment, Laboratory furniture and storage cupboard.

Supervision

The Contractor pointed out that Civil Structures Associates were not supervising the structural works as they should and the Architect instructed them to ensure increased supervision of all structural works. The contractor also observed that the Supervisory Resident Architect had increased its labour force to 430 labourers by June, 1980 to ensure adherence to the new programme.

ELECTRICAL SUB-CONTRACT

The setting out of the substation toward the block was discussed but the decision is pending and to be made by Project Architect. It was reported that the P & T had not responded positively despite receipt of payment.

Air Conditioning

There was no information whether the revision of 'trunking' layout was ready so that the Mechanical Consultant were to chase this up and report their findings.

The Quantity Surveyor pointed out that it was the duty of the Main Contractor to provide water for the testing of the Sewage Farm. However, the subcontractor was to make good all faulty works, which were to be inspected and vetted by the Mechanical Consultant before the test is embarked upon.

Ceiling Subcontractor:

The ceiling subcontractors Messrs Engineering Supplies were not attending site meetings and weekly co-ordinating meetings. No further materials had been supplied to the site.

The lifts subcontractors Messrs Steiner Ltd. was not represented.

Paramount Water Tank subcontractors reported the completion of four tanks for 'ward blocks' in the next two weeks as ordered cranes had been cleared at Lagos seaport.

4.3 Kashim Ibrahim Library Building

4.3.1 The Background: This project was first commissioned in April, 1970 and the construction works began early 1971. Between the period of project commission and commencement of site work certain initial decions were needed to be taken. These included the issues of appointment of the architect who happened to be Egbor and Associates; the arrangements for payment, the relationship between Nigeria and Oversea partners

especially in consideration of the huge size of the project, as well as other preliminary items which had bearing on the project initial decisions.

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

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

(2) Spread payment for the project over three (3) years.

(3) Split the job into three classes that is

(a) that part that can be financed direct by the university including builder's works, fittings, plumbing, drainage, preliminaries, and contigencies.

(b) that part for which technical aid or deferred payment may be sought including electrical services, airconditioning, lift, telephone, fire alarms, and burglar alarms.

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

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

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

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

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

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

A further proposal was made which sought a complete redesign of the scheme to reduce the present level of amenities.

The disadvantages of this are:

(i) double payment of professional fees to all consultants.

(ii) time lost for taking the brief once again, for redesigning and preparing contract documents.

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

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

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

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

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

Having resolved these initial problems a contract was entered into between the University authority and the main contractor Messrs A.G. Ferrero on the 3rd February, 1972 for the construction of the library which is to have capacity for 500,00 volumes and 2,000 readers.

4.3.2 The Highlights of Site Meetings: The following observations were made from initial and subsequent meetings.

Mandilas and Karabaris acted in dual capacity hence two separate fees.

Bursar felt that the idea of consultant determining the allocation of fund was irregular since such allocation determines the level of their earnings.

Subcontractor' appointment was questionable especially that this was done before the acceptance of quotations.

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

The university was no longer given a chance to go through the design in relation to the break down of costs submitted by the Quantity Surveyor in his post plan.

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

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

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

The contractor was warned to use Adebo rate as this was going to affect the project cost.

Negotiation for a resident architect was to increase the cost by 5 million more than planned.

Contractor was appointed on 3rd February, 1972 and acceptance was confirmed on 14th February, 1972. By 24th of March, there were still no complete sets of drawings necessary to confirm certain materials orders. This gave rise to claim right from the onset.

The appointment of electrical subcontractor was still to be made and therefore his work could not be included with the planning of floor and foundation works.

Contractors requested confirmation if the set of drawings with them were the latest and whether or not to proceed with the work.

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

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

As at 4th April, 1972 information needed from structural engineer regarding bending schedules was still not received and the resident architect has had to travel to Lagos in respect of same. This has kept the Contractor waiting.

During the excavation work the contractor had damaged underground cables of the P & T and he was asked to request P & T to submit estimate which must be agreed before diversion.

At a formal site meeting held on the 28th April, 1982 it was observed that the diversion of telephone line by P & T might affect line of engineering services.

Before this meeting, records showed that there had been communication between the various parties concerning clarification and confirmation of specification and instructions and particularly on items that were not available.

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

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

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

The reasons for this contradiction were:

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

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

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

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

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

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

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

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

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

The Librarian having had further discussion with consulting service engineer felt no more need for a second lift especially when the storey height is only three. In the same breath the Quantity Surveyor was quoting for the supply and fix lift and emphasizing that if installation was delayed until building was completed, the cost might rise by 30 - 40%.

Prime cost sum showed wild variations between allowed and quoted sum, as can be seen in the following cases:

(a) P.C. Sum = ₦320,000 + ₦16,000 profit

Quotation received = ₦364,272 + 5% profit

= ₦382,485.60

Difference = ₦64,485.60

(b) P.C. sum = ₦40,000 + ₦4,000 profit and

Quotation received (lowest),

= ₦135,589.00

Difference = ₦94,589.00

(c) P.C. sum = ₦140,000.00 including profit and attendance.

Quotations received = ₦502,502.00 (lowest)

= ₦435,729.60 (highest)

Difference = ₦362,500.00

This situation might have been as a result of a number of factors ranging from inadequate information by the designer for the initial estimate, to the possibility of the subcontractor taking advantage of the situation

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

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

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

Five months after the contract had been awarded to the main contractor, a new Electrical Engineering consultant was appointed, following the death of the original consultant, to produce a revised electrical scheme in two months hence. The mechanical consultant by this time was still promising to produce details of ground floor drainage. At this meeting the Quantity Surveyor was not present therefore discussion on cost of reinforcement to type C columns was deferred. Certain cases of doubt regarding the use of alternative pipes in preference to cast iron for sub-floor drainage and the drilling of holes in fibreglass sunshades were referred to mechanical consultant, and suppliers respectively. This doubt or enquiry suggested a missing gap in the information system. Enquiry for the number of fixing points is a manifestation of inadequate detailing.

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

Later the same month instruction was issued to omit fibre-glass sunshades to north and south elivations and also from contract details of alternative to be provided later.

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

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

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

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

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

Yet another problem faced was the unsuitability of the A/C plant for the plantroom necessitating the contractor to carry out further works on the plant room through the issue of varition order.

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

Air Condition Test 18th February, 1977

On February 18th, 1977 the electrical subcontractor Messrs Mandilas in charge of installing and AC plant, without prior information to the Librarian, Main Contractor, Electrical Installation Subcontractor switched on the AC plant. The vibration and noise that folllowed created panic within and around the library building. The ceiling in Arts and Social Science readers area collapsed. The unpleasant occurrence led to a subsequent effort to first of all detect or find out the cause, those whom it can be attributed to and a solution.

On the 23rd February, 1977, on the order of the resident Architect Mr. Thakur, and in the presence of:

1. Mr. Akran (Mandilas) Limited.
2. Mr. Lawson (Structural Engineer).

the AC blower was switched on for short periods, the following observations were made:

(a) The ceiling began to sag in some areas especially the Arts and Social Science reading area.

(b) Strong vibration were felt in the structure around the blower.

(c) The electrical switch gear panel on wall was shaking violently.

After recording these observations, the Resident Architect Mr. Thakur convened a special site meeting of the Consultants, contractor, subcontractors and client on the 20th April, 1977.

At that meeting the Architect Mr. Thakur brief members of the Air Condition test incident and enumerated the damages done and later conducted them round the library where the damage could be assessed. Mandilas after their preliminary inspection insisted that the plant had no fault and could still be used. The electrical engineer from the Estate suggested that the fault of the intense vibration of the A/C unit might be attributed to the non-steady voltage provided by NEPA. He said he had observed that the power generated and distributed by NEPA was in the range of 340 - 360 volts.

The Engineer from Mandilas Limited Mr. Tolawani informed the members that if the voltage provided is not between 380 volts and 400 volts the air conditioning equipment just won't work, and recommended that NEPA be approached to provide a 3-phase supply to the library to enable the plant enough power to function smoothly.

The summary of these site meetings tells of the problems facing parties to the project development and management processes. Apparently these problems are partly self-made by each of the parties and partly by the systems inherrent difficiencies. They form the basis of the concept of this thesis.

4.4 Junior Staff Housing - University of Sokoto

4.4.1 The Background: The project comprises the construction of (50) fifty junior staff houses and the associated site works.

Seven University approved contractors listed on their register were invited to tender. These contractors were then provided with tender documents from the consultants office on 8th May, 1978 with the tender closing date fixed at 31st May, 1978.

Six out of seven tenderers submitted and these tenders were opened by the University tenders sub-committee on the date of receipt at about 1.00 p.m. The tenders were then analysed as reported here for the purpose of selection of the contractor for the project.

4.4.2 The Highlights of Site Meetings: Even though the nature of this project differs significantly from those of the other three, the records of site meetings showed that project development and management problems are essentially alike.

The first of thirty meetings records delt with Pre-contract arrangements. At this meeting all pending matters concerning the contract and agreements, site management to facilitate progress; decision on subsequent site meeting intervals and venue, mode of communication;

appointed of subcontractors; finances and payments; and finally the issue of quality control of building works, were trashed out.

Time interval between the pre-contract meeting and the next meeting which was to be first site meeting was just over one month. At this meeting some of the points discussed in the previous meeting were still unresolved. For example programme of works was not submitted by the contractor even though time for completion of work was stated along the tender sum. One wonders therefore the rationality of the stated time. Another examples were the issues of land acquisition which the cleint has not ironed out before awarding the contract and the contractors own fault not to have taken an insurance policy as yet.

It is also to be noted here that even some steps already taken were incomplete. For example NEPA was contacted regarding timing of power supplies to site but further statement such as "decision" to order generator would shortly be made as detailed in the bill or quantities" suggests that information taken to NEPA was not complete and as such NEPA is not likely to know the extent of requirements. Also at this meeting objections were being raised as to the quality of materials for concerte work found on the

site, as well as the consultant's specifications regarding block moulds which the contractor could not find on the market. It is interesting to note the consultant himself pointed it out that the contractor tendered on the basis of this information and therefore it was the contractor's responsibility to locate such items on the market.

One or two things might have happened in this case.

(i) The contractor did not try to find out at the time of tendering whether or not such things were in fact available.

(ii) The contractor may be aware that such things are in fact not available on the market but it was too early to complain - get the job first and then complain to make claims.

(iii) The contractor might be unwilling to undertake any market research on behalf of anyone when there was still no assurance that he might get the job.

(iv) The desinger did not check on this problem before committing himself on paper.

As at the second meeting the issue of land acquisition has constituted a delay and contractor indicated that he would need to make claim. In the subsequent meeting this matter took a different turn that suggests, that proper coordination was not there especially when the consultant hinted that the contractor might have been

magnifying the issue out of proportion. It was pointed out by the consultant that as the contractor had not attempted to start work on the said sites it was not possible to establish whether or not the farmers might be hostile. In fact when the contractor actually started there was no resistance or harrassment from the farmers. However, one would not expect that the contractor should take the risk of entering the site without proper documents from authority, more so when he was left alone.

These extracts and other information similar to those already recorded, form the bulk of the problems jointly caused by the parties to the contract and to which answer should be found either by removing completely or minimising such problems.

4.4.3 Tender Reports

Tender Results

2.1 The following were the tenders received for examination and analysis:

	NAME OF TENDERER	TENDER FIGURE	COMPLETION TIME
(i)	Kueppers (Nig) Ltd	4,834,601.70	Section 1-6 months Section 2-8 months Section 3-10 months Date for possession 4 weeks after signing Contract Tender valid for 3 months.
(ii)	Northoo Const. Co.	No tender	No tender
(iii)	Zuru Building const. Co. Ltd.	2,022,325.30	Not stated in tender documents but confirmed by letter of 5.6.78 Section 1-7 months Section 2-9 months Section 3-12 months
(iv)	Alhaji Sidi Aminu Sarkin Sharifai	1,997,398.30	Not stated in tender documents but confirmed by letter of 2.6.78 Section 1-4 months Section 2.8 months Section 3-12 months
(v)	A.G.D.G. & Sons	2,104,269.50	Section 1-4 months from possession Section 2.5 months ditto. Section 3-6 months ditto.

Tender Analysis

The quantity surveyor estimated based on the priced Bills of Quantities was ₦2,360,850.10.

Analysis of the submitted tenders is as follows:

Name of Tenderer	Tender Figure	Corrected Tender Figure	Percentage Increase/ Decrease on Builders Work
(i) Kueppers	4,834,601.70	4,834,601.60	-
(ii) ZBCCL	2,022,325.30	2,019,758.05	0.13%
(iii) Alhaji Sidi Aminu Sarkin Sharifai	1,997,398.30	1,987,940.00	0.51%
(iv) A.G.D.G. & Sons	2,104,269.50	2,095,761.40	0.435%
(vi) SMA	2,039,089.20	2,042,839.30	0.197%
(vii) Angus Builders	3,44,943.42	3,44,943.42	-

KUSPERS (NIG) LTD

Arithmetical Erros;- There were no arithmetical erros. Rates used in the tenders:- generally these are much higher than could reasonably be accepted for this type work.

Preliminaries: the preliminaries are considerably higher than all the other contractors and represent 9.18% of the total tender figure. Around 5% is the normal figure.

Schedule of Basis Prices: The prices are high and some given as ex Lagos attract transportation costs.

Daywork Rates: Labour rates are high and the addition of 130% on plant is excessive but this probably anticipates the amount of mechanisation Kueppers would wish to bring to the job.

Time for completion: An overall completion time of 10 months is quite practicable in view of the standard of Kueppers organisation.

Suitability for acceptance: There is no doubt that this contractor is well qualified to undertake the project but his prices are far too high and thus his tender is not recommended for acceptance.

ZURU BUILDING CONSTRUCTION LTD.

Arithmetical Erros: These amounted to an increase of ₦2,567.25 but because this only represent a small percentage increase on the builders work we believe the contractor would stand by his price.

Rates used in the Tenders: Certain are too low including concrete, grano and render. The totals for siteworks and roads are low and again this may be reflected in the quality of works the contractor could afford to produce. A labourers rate of ₦1.40 per day is unrealistically low.

Prelimanaries: These are ₦96,167.00 and represent about ₦4.75% and are therefore rather low.

Schedule of Basic Prices: From the information given basic prices were reasonable with the exception of cement which is lower than the market price per ton.

Daywork Rates: Labour rates are too low being almost the same as the basic rates and a material addition of 80% is too high, the average being just over 30%.

Completion time: As a result of the low tender figure it is unlikely that the contractor could afford sufficient labour and plant to complete even within 12 months.

Suitability for acceptance: The arithemetically corrected Tender figure is 14.87% below the QS estimate and this reflected in the very low tender rates. It is doubtful that the project can be executed properly at this price. It is noted also that with the exception of the preliminary items all the rates are exactly as the tender submitted by Alhaji Sidi Aminu Sharifai. As a result both tenders should be cancelled as there inclusion will detract from the processes of selection and assessment of genuine tenders.

This Tender is not considered suitable for acceptance.

ALHAJI SIDI AMINU SARKIN SHARIFAI

As a result of this contractor submitting identical rates to Zuru Building Construction Co. Ltd. his tender should be cancelled.

Also for the similar reasons as noted under 3.5. his price is unrealistically low being 15.80% below the QS estimate and for this reason alone is not considered acceptable.

ALHAJI GARBA DIKKON GANDE & SONS

Arithmetical Errors: These amounted to an increase of ₦8,508.10 and it is therefore anticipated that the contractor will stand by his tender.

Rate used in the Tender: These seem reasonable generally and comparable with the QS figures although totals for roads, water supply and electrical works are low as a result of some particularly unrealistic rates.

Preliminaries: these represent about 5.2% of the total tender and thus are acceptable.

Schedule of Basic Prices: in respect of the basic materials listed these seem reasonable.

Daywork Rates: The daily rate for artisans at ₦9.00 is higher than one would expect however percentages extra for materials and plant of 35% and 40% respectively are average.

Time for completion: a period of 6 months from possession of the site has been stated by this contractor.

Suitability for acceptance: the rates are generally consistent and the tender figure seems realistic. We consider this tender should be considered for acceptance.

ALHAJI SIDI MAMMAN ASSARAKAWA

Arithmetical Errors: the small error of ₦3,750.10 below the correct figure is unlikely to make the contractor withdraw his tender.

Rates used in Tenders: In comparison with even the lowest tenderers the rate for blockwork is low at ₦8.50^2 and concrete rates are underpriced.

Preliminaries: 8% is higher than one would expect.

Schedule of Basic Prices: Prices are comparable with market prices.

Daywork Rates: These all seem reasonable.

Time for completion: They propose to complete the work in 6 months.

Suitability for acceptance: There is a certain amount of inconsistency in the basic rates. However, this tender should be considered for acceptance.

ANGUS BUILDERS CO. LTD

Arithmetical errors: there were no arithmetical errors.

Rates used in tenders: generally rates are high particularly concreting, site works and roads.

Preliminaries: these represented 4.4% of the tender and therefore were surprisingly low for a company of this type.

Schedule of basic prices: Material prices ex Lagos are reasonable.

Daywork Rates: acceptable.

Time for completion: Stated as 6 months.

Suitability for acceptance: The tender is very high being 3.56% above the QS estimate and as a result should not be considred for acceptance.

RECOMMENDATIONS

From the above analysis of tenders there are two contractors who we recommend are considered for the project:

	Tender
Alhaji Garba Dikkon Gando & Sons	₦2,104,269.5
Alhaji Sidi Mamman Assarakawa	₦2,039,089.2

The difference between the two tenders is ₦65,180.30.

We refer to Unisok PPU paper P.P.C 6/4 1st May, 1978 and to the comments made regarding Alhaji Sidi Mamman Assarakawa and recommend therefore that the contract be awarded to Alhaji Garba Dikkon Gande & Sons for ₦2,104,269.50.

CHAPTER FIVE

5.0 THE CONCEPT OF INTEGRATED PROJECT MANAGEMENT CONTROL (IPMC) SYSTEM

5.1 Intoruction:

The building process in the primitive age was a one man affair. The building was needed by him for shelter and protection against adverse climate and attack. It was a simple matter for him to look around for whatever materials were available and put them together the way he wanted them.

It was easy for him to get the feedback of an unsatisfactory system and a new method could be tried until the best solution for that time and with those materials was found. Since the whole mechanism was going on within the mind of one individual success and/or failure can easily be observed.

Today however, the situation has changed in all its ramifications. There are now complex buildings for multiple clients/users requiring the services of multiple design teams to design and be constructed by multiple contractors and sub-contractors.

In other words building process had developed into a complex system involving the conceptual, physical and organisational inputs by these various parties at the various stages. These inputs in themselves are intricate in that they require peculiar

decision making process born out of special considerations and different rendering.

The unique characteristics of cónstruction process have in the past led to a number of development and suggestions aimed at improving the general performance of the industry with respect to contractual relationships.

While one agrees with these efforts, even inspite of their shortcomings in certain areas, it is recognised that creating a blemish-free relationship will not provide all the answers to the complex problems of building project. There are still some loop-holdes and loose ends to plug and tie up especially in an industry that is still transitory. Quite apart from this, the appropriateness of the previously proposed methods in the face of local conditions is even more questionable. Our socio-cultural, socio-economic, and political maturity together with the stage of technological advancement require us to look into other parameters in an attempt to improve the performance of the construction industry.

The central theme of the previously developd systems has been to find a way of bridging the gap between the various parties to a building project by splitting up the project into a series of sub-system and/or redefining or rearranging responsibilities. This is hoping that the various keys groups and their interactions can be identified more readily and thus their management can be made more easy.

All in all the emphasis of the various approaches, excepting organisational analysis of project management that pursued a different course, has been on changing the roles of the parties involved in the process of a project rather than specifying the performance level of a project. Restating the contractual relationships between the members of a construction project over and again cannot oblitrate the problems arising from individual and organisational differences.

Rearranging or redefining responsibilities will perhaps operate smoothly in a construction industry where there are remote possibilities of external disturbances and other such factors that may mutilate the internal structure. After all a system is as good as the operator of the system.

It therefore means that changing the structure is probably not the answer but changing the approach to the operations of the structure. The structure is rigid but the approach to the operation is flexible enough to accommodate possible interference.

The answer to complex building project problems lies not only in the types of relationship and the effects of relationships on the management of the project, but also in what to do to make the established relationships work. Where what to do is not clearly defined and established, relationships can be very vague

and where the relationships are vague, control of the situation cannot be proper if at all such a control exists.

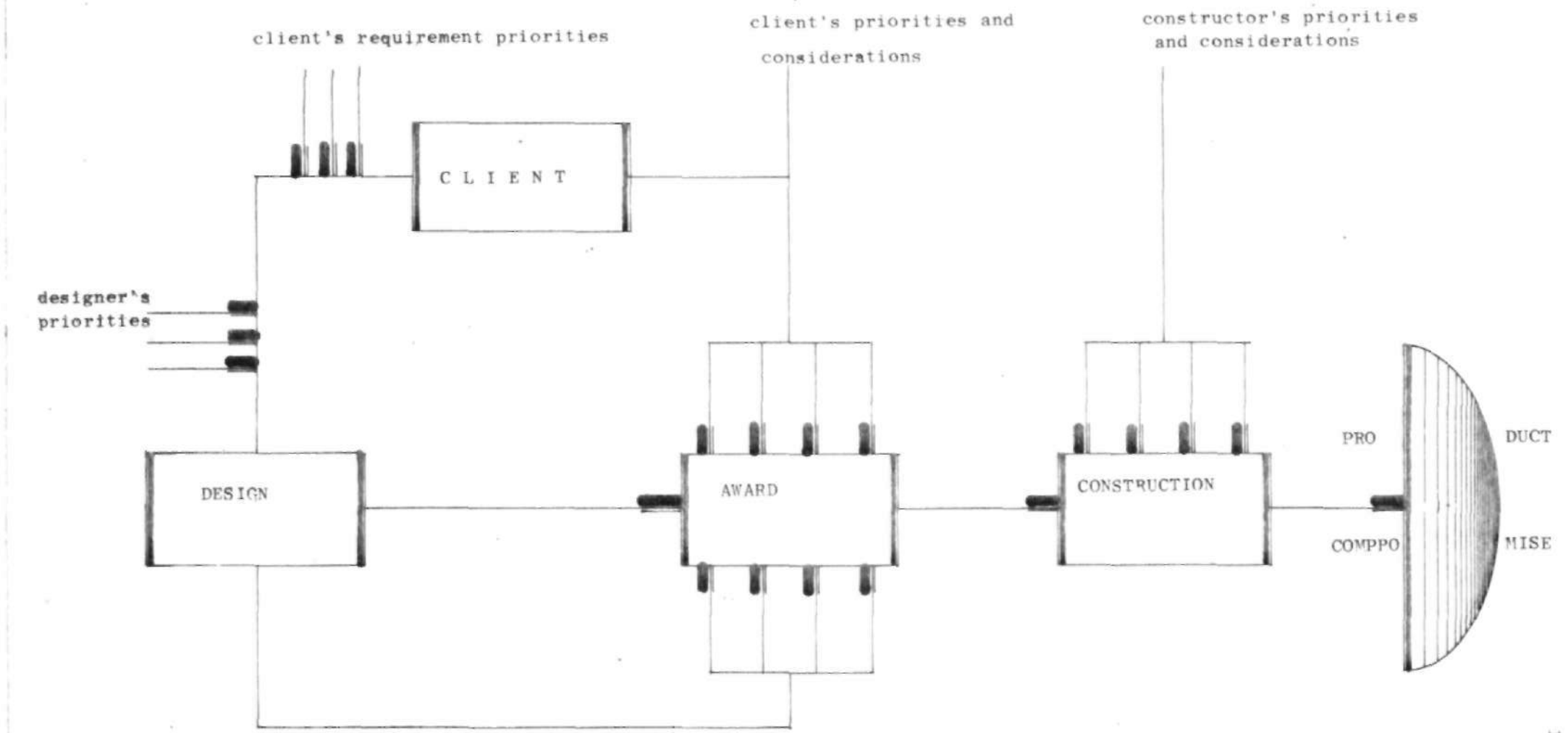
Also solutions to the complex problems of building project are more of finding an association between the management of the groups than the management of each group responsible for the development of the various stages. Here we are to find the relationships or rather the areas of mutual interests that may affect the project performance and then link these up in a smooth contractual relationship. The management of each stage in this case is regarded as a subsystem of a whole system which if studied in isolation can only produce efficiency and effectiveness within its own framework. Efficiency and effectiveness of a building project can only be seen in the light of one common objective which requires the controlled inputs and process from all the parties. Finding an association between the management of the subsystems suggests that there will be a cross-fertilisation of information and ideas between the parties thereby making the whole process more interactive and therefore more integrated.

Effective management decisions, ones that lead to both individual achievement and organisational results, are difficult to obtain and to implement especially in today's turbulent environment of our construction industry. This is partly because those

who are to make the decision are confronted with difficulties that involve continuous change in type, scope and complexity regarding their areas of responsibilities. It is for this reason that new decision making procedures are being sought to cope with these problems. Integrated Project Management Control (IPMC) system approach which appears to hold considerable promise for our construction industry in Nigeria is based on the interactive management decision making in the light of information and communication, technical, and management procedures, as well as the economic, social and political realities that exist in the industry. In a way it is a system view of the industry in which problem solving becomes the central consideration and the focus is on dynamic and changing interactions between behavioural, technical and control decisions. IPMC is an approach intended for use to weave together all the fragments of a building problems and to find a solution which will accomplish one recognised integrated objective.

5.2 Conflicts in the Control of the Present System

It has been established that whatever form of relationship we tend to formulate, the development of building project will involve the design, the award, and the construction, processes and that the eventual building itself will be a product of compromise between the three interfaces.



PRIORITY INPUT DIAGRAM FOR STAGE REDISATION

FIG 5.01

Figure 5.01 shows the relationship of a conventional method of project development in a systematic order and the various ways by which information for the phase development enter the system. In a situation of this nature problems arise as a result of conflicting priority inputs at the various interfaces of the development. At the design stage interface the client's as well as the designer's interests must be harmonised. Both the client and the designer may be an individual or groups of individuals or unidentifiable individuals. In certain cases the client may be knowledgeable or ignorant of the project requirements. Local tension usually results in a situation of this nature when reviewing the design decisions which will guarantee an acceptable solution.

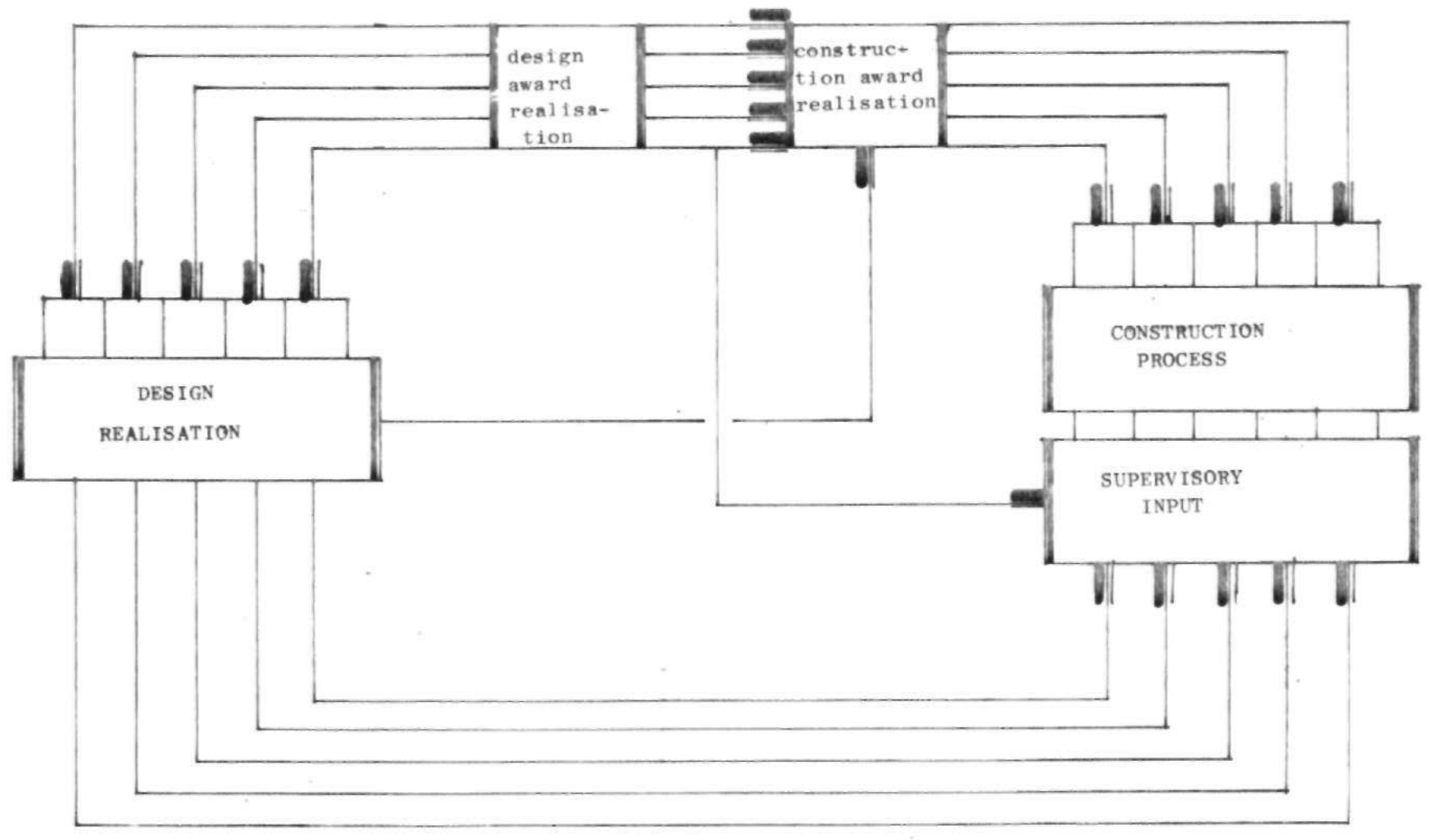
Local tension is also experienced at this stage as a result of the need to compromise the biases of design organisations rendering services towards the promotion of the project. These people and their various organisation have certain uniqueness about them that may be conflicting and at variance with one another. These conflicts tend to shape the characteristics of the inputs towards achieving a common goal. Further complication at this stage is the fact that the various organisations perform their tasks independent of one another each starting when the other has stopped.

The degree of the project complexity can also be seen to increase the level of conflicts in the sence that such projects usually require the inputs from multiple client/design groups. In certain other cases there is the added problem of the ultimate users who may not even be known at this stage.

Control inputs at the award stage by design groups is a marginal one in that the client dictates most of the terms. Position of the design groups in fact at this stage is in advisory capacity as no further contract exists once this stage is reached. The award stage is essentially an affairs between the client and the contractors who, he the client must have had on his register. At this stage the contractor is more like a 'bergar' who has no choice but to take what has been offered him. No sooner the contract has been signed and the work has begun on the site the contractor is full of vengeance which he must exploit to the fullest within the context of the contract terms. He the contractor is now fully librated and can speak out his mind on matters relating the conduct of his profession. The contractor can, and often does, take advantage of this situation to introduce variation, to do shoddy job and so on which will reflect badly on the other parties.

One interesting point here is that the role of the contractor having earlier been determined as that of a passive receiver of information gives no opportunity to the other two parties to know the extent of what the contractor knows about what has to be done. The discovery of unsatisfactory performanee, though may be annoying, will be difficult to control.

Construction controls as well as construction practice ought to be aligned with design solutions to ensure that the physical structure is a true reflection of design solution. Unfortunately this situation is not promoted by the current approach as the two interfaces are distantly executed from one another by groups of individuals who may have had no prior knowledge of each other. This situation creates profound problem when resolving construction decisions in matters relating to resources management and site coordination. Here it is assumed that the contractor should have to follow the designer's 'suggestions' but that the latter will be handy to render advice as may be necessary or alter his views in the light of present facts. Chaotic situation will ensure when the project is complex and the 'present' facts are numerous.



STAGE CONTROL PROBLEM DIAGRAM

FIG. 5.02

Uncontrollable situation can also ensure as a result of variations arising from hasty decisions at the onset by the parties to the project development. At times these variations have been found to be subject of a separate contract. It was found in a case that variation resulted in the Quantity Surveyor preparing separate estimate and the contractor submitting his own estimate for negotiation. The disparity in the two estimates was so great that one feels that one of the parties perhaps did not do a thorough job or the other took advantage of the situation.

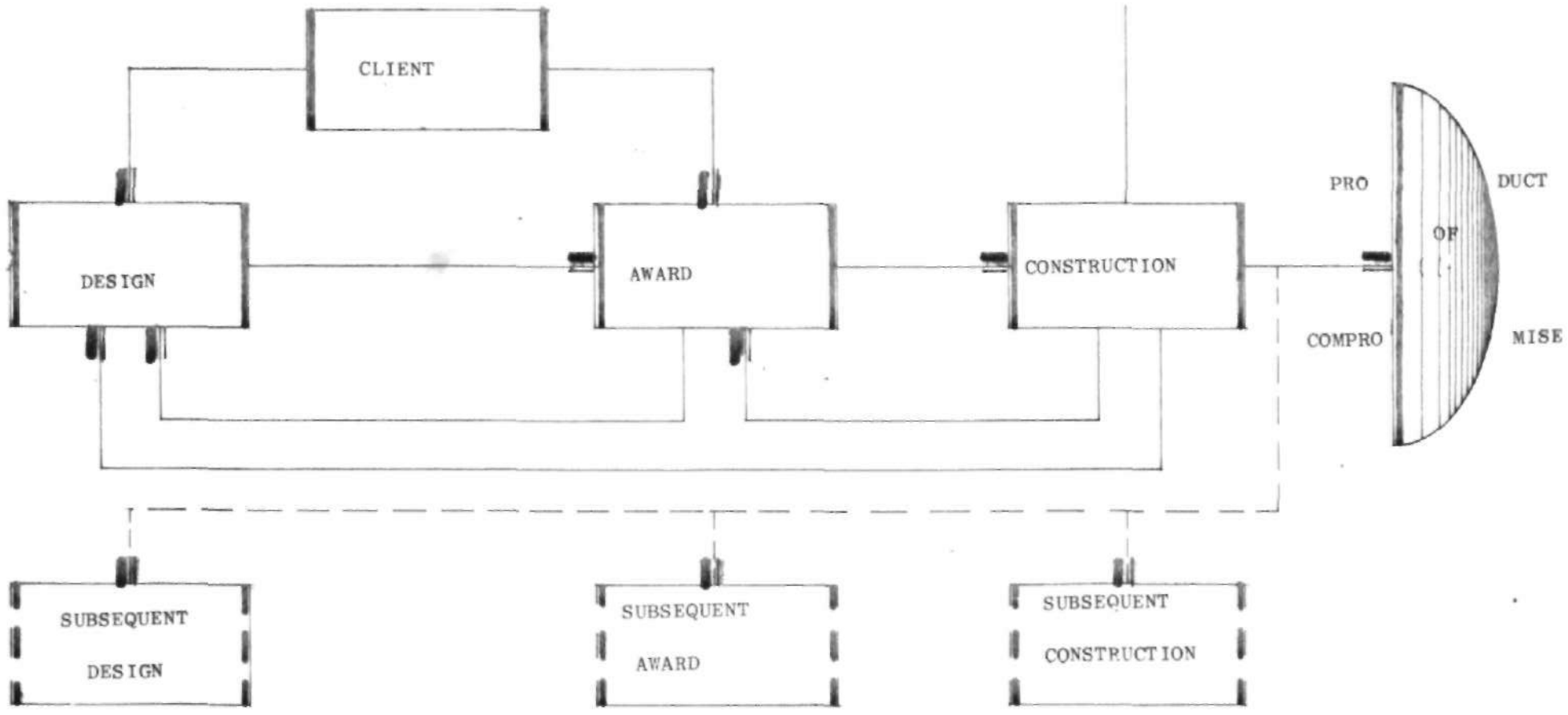
The illustration in figure 5.02 is to show the extent of contradictions at the various stages of project development. The emphasis here is on the implications of appointment and selection of the parties taking part in the project realisation. The appointment of the consultants to render desired services can create design coordination and control problem. The implication of the separate lines from the award centre is that each consultant has been commissioned directly by the client and where the client has no internal technical expertise acting on advisory capacity control and coordination of the consultants activities is difficult.

At the contract award stage the client normally selects both the main and sub contractors from a list of those who have been registered by his organisation. Usually we have the main contractor responsible for the total project but the selection of sub-contractors for the installation of the other services by the client presents supervision problem. In the first place the selection is sometimes late into the commencement of site occupation by the main contractor. Such late selection serves as disturbances to the strict adherence to project programmes. It could also lead to poor cooperation between the site supervisors.

Worse still is the supervisory input from the consultants who have been found to have direct access to the installation sub-contractors thereby issuing counter instructions to one another. This situation had led to accident and control problems. Accident was found to occur on a site because after the installation of electrical services by the electrical sub-contractor, the designer of the electrical services issue instruction to the sub-contractor to test the installation without knowing that other operatives for other contractors were in contact with danger points.

One interesting point here which the client has never stopped to check is the fact that the late selection of sub-contractor could, and often does, lead to inflationary trend. Hence it was found that most provisional sums and prime cost sums originally allowed hardly suffice for the purpose they were intended. The situation might have been different if the selection was done before the acceptance of the final tender sum.

The illustration in figure 5.03 is an indication that to reach the level of performance expected, the 'production line' of a project development must rely on feedback control loops between the various interfaces. This indication confirms the fact that there might have been hasty decisions in respect of certain matters or certain conditions have actually not been considered. The volume of information in the iterative feedback can be used to measure the thoroughness of the earlier decisions. The less the volume the better are our earlier decisions. The emphasis here is not to eliminate completely the iterative feedback information but rather to minimise it, more so that the feedback information is to remind us of the problems we have not resolved properly and that now affect our progress and/or to remind us of those we have had no time to resolve.



ITERATIVE AND CUMMULATIVE FEEDBACK LOOPS

FIG. 5.03

The cummulative feedback loop tells us of our experiences on the particular project but unfortunately these experiences cannot be useful any more on the present job. If we are lucky it may form part of our control inputs for a new job.

5.3 Theoretical Assumptions

(a) Building process considered as a system shows the characteristics of a socio-technical system requiring a shift from a mechanistic or cybernetic control theory approach.

(b) In a socio-technical system both feedforward and feedback loops are in operation at the same time. There is a double loop that leaps forward and backward iteratively based on the time period chosen for control purposes.

(c) Being a Socio-technical system the control measure must be more anticipatory than backward looking.

(d) This must be so because the response time in the control of building operation is too slow to be effective with a feedback system alone. This problem is particularly noticeable where previous decisions or choices are necessary to be revised from time to time in the face of certain adverse conditions.

(e) Such forward and backward revision of choices or decision fundamentally will alter the course of the organisations as at present envisaged.

(f) A revision of any decision may have been necessitated by lack of proper consideration of the factors or aspects impinging on that decision.

(g) The characteristics of such factors, though complex, can be determined in advance if control of a project development is to be achieved.

(h) The control of a project requires the need to state in writing, the organisations goals and objectives from which starategic and tectical plans of action are developed.

(i) As there are many organisations as there are many individuals charged with the task of a project development, these goals and objectives will be conflicting unless the theory of corporate decision-making process is employed.

(j) Corporate decision making will operate on the following assumptions:-

  (i) corporate policy is established by persons occupying certain role positions in the system.

(ii) the behaviour of these persons is determined in part by role prescriptions, and in part by personal motives.

(iii) perceptions of corporate resources, alternative actions, utilities, and probabilities of outcomes will be affected by role-induced experiences and by personal experiences.

(iv) policy proposals by different executives will reflect these divergent perceptions and motivations.

(v) corporate decisions will represent compromises among these, affected by the power of proponents as well as the logic and realistic data.

(k) Principles of Corporate decision making will eliminate the uncertainties relating to project requirements as well as the individuals requirements at the various interfaces of the project development.

(l) The corporate decisions will lead to coordination and control within the framework of a construction project.

(m) Coordination and control require the ability to predict within a limit of accuracy that line of thought and the general behaviour of the several parties connected with the process as well as the prediction of the general behaviour and situation of the project.

(n) For maximum efficiency and effectiveness the system must develop data banking and retrieval systems supported by good communication and functional management practice and all must be related to external factors which may affect project development control.

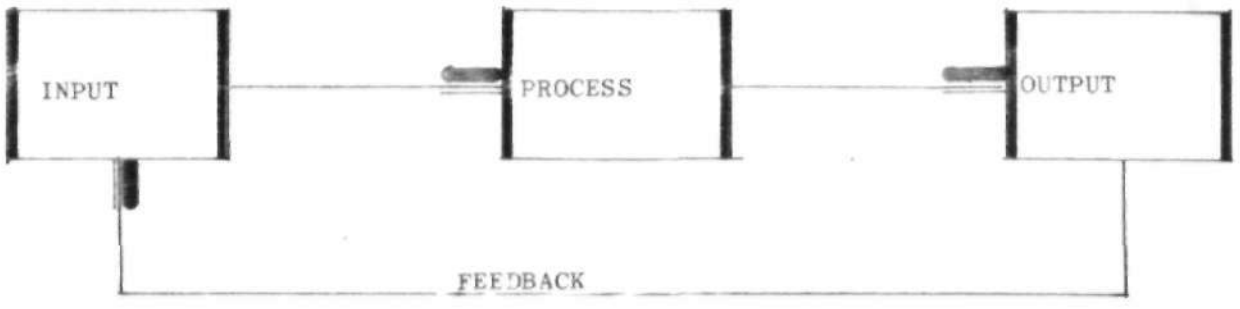
(o) These information can be equated to the intersection equations of sets in an analogous Venn diagram.

5.4 The Proposed Structure of the IPMC System.

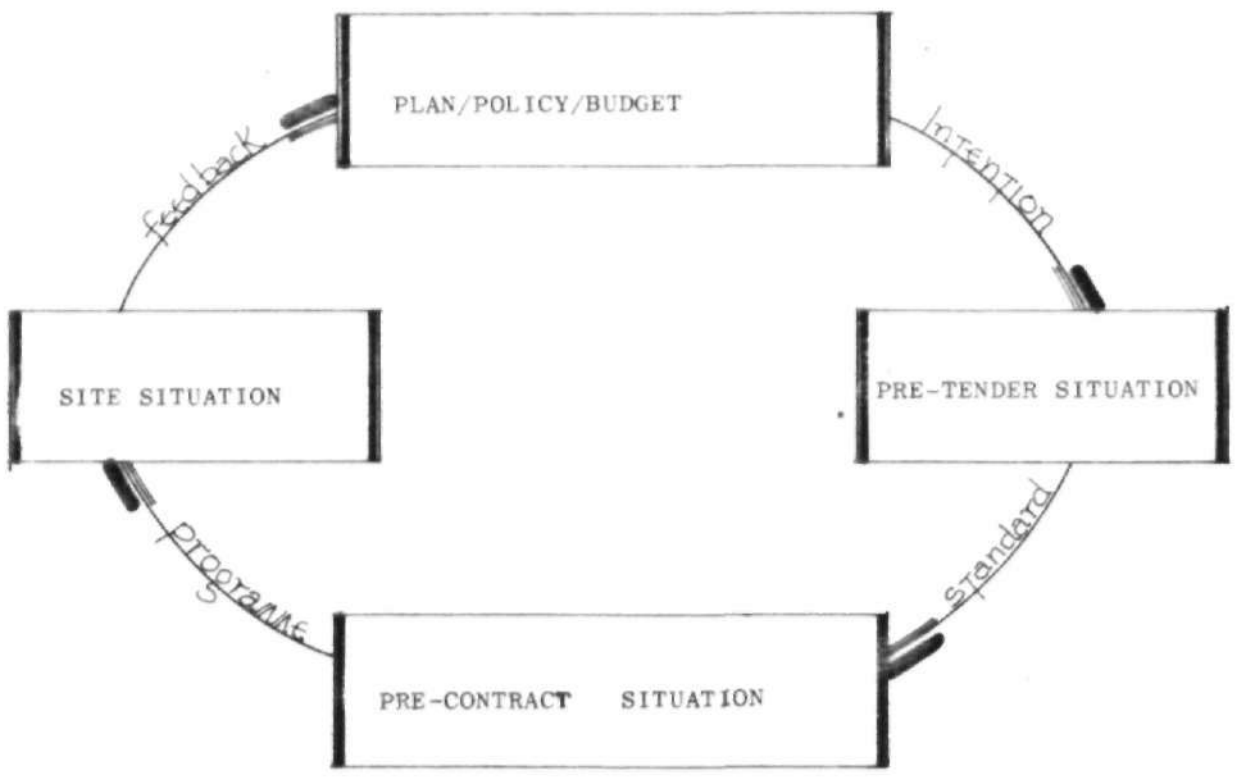
In a simple conceptual control system the input - process - output can easily be linked up by the feed-back loop and the relationship is represented by the "Model of control system Type 1. Plate 5.01.

The system applies to a situation where a product is being manufactured and the output quality tells of what may be going on in the production line. If the output quality is below the specified standard, the input variables are then altered and/or the processing adjusted. In which case the output provides the feedback for the system.

In another situation the output obtained still provides the feedback necessary for corrective action or improvement. In this case only the feedback provides experience which will be used on a similar job in the future endeavour rather than on the same job which we have just completed. This is similar to companies

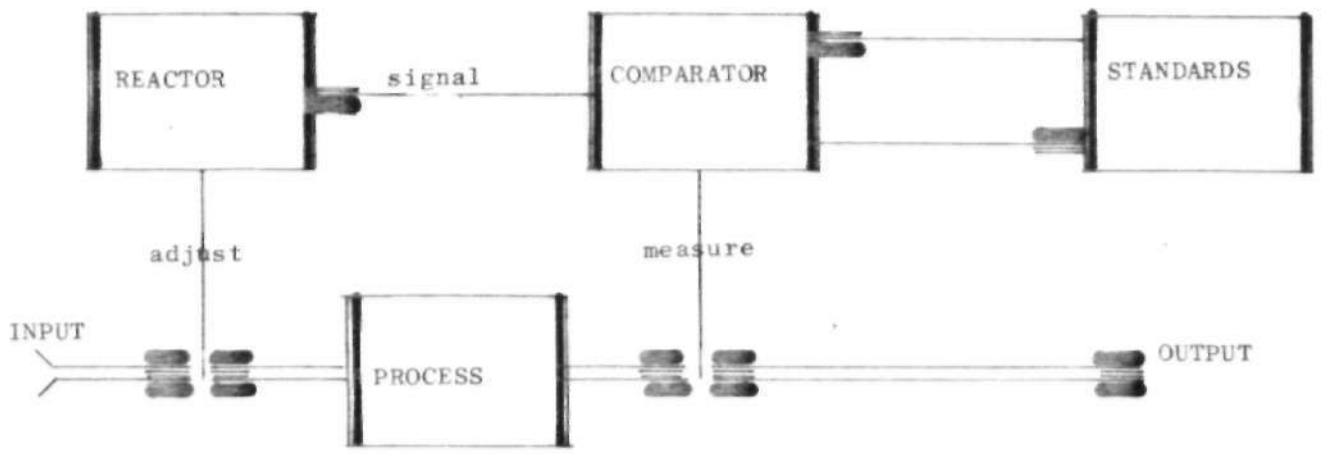


MODEL 1

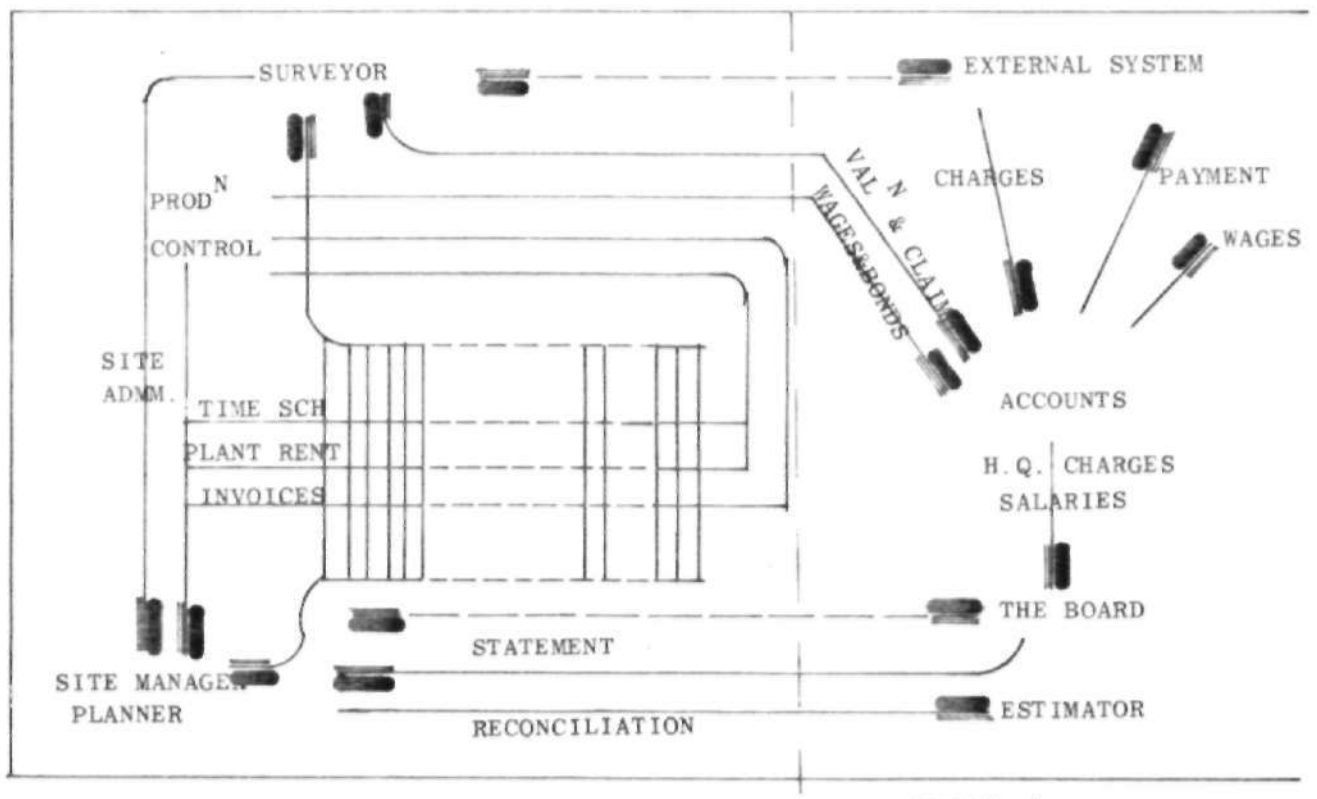


MODEL 2

PLATE 5.01



MODEL 3



MODEL 4

SITE FIRM

A MODEL OF A COST ACCOUNT SYSTEM

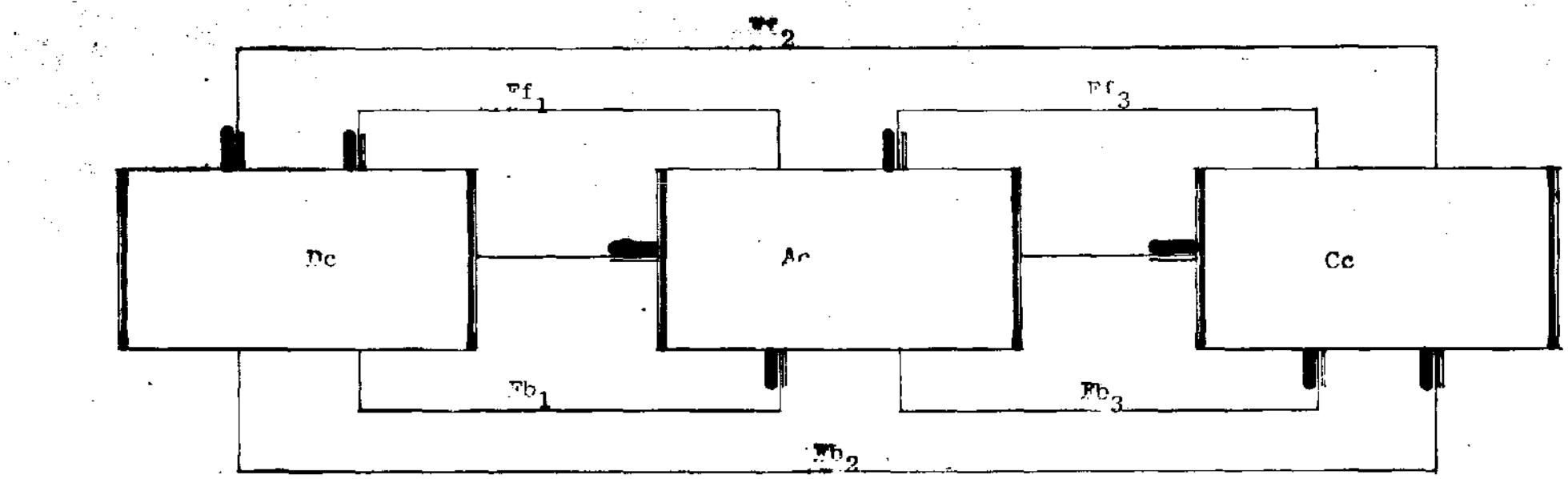
PLATE 5.02

plans where everything is followed through in accordance to an agreed policy. This is represented by the 'Model of Control System Type 2. Plate 5.01.

Situation may sometimes arise where there is the need to observe and correct errors or deviation before the output stage is reached to avoid crisis situation or to obtain quality output. This is a condition where the input can be altered to improve the observed deviation immediately something unusual has been noticed. This situation is represented by the Model of Control System Type 3 Plate 5.02.

Model of control system type 4 Plate 5.02 represents a situation where both the internal and external information are required for reconciliation with the overall policy before any action is taken on any issue and the results finally compared with the planned expectation. This situation requires corporate activities of the various arms of the organization as specified from one centre.

Each of the four examples illustrates either the control of quality, build-up of experience or monitoring of progress. Of necessity the building system must embrace these characteristics for control purposes. Control of quality is needed for the work situation during the construction process. The experience helps to ensure that we come to grip with



Dc = Design centre

Ac = Award centre

Cc = Construction centre

f_{f1} = feed-forward information between Ac and Dc

f_{f2} = feed-forward information between Cc and Dc

f_{f3} = feed-forward information between Cc and Ac

f_{b1} = feed-back information between Dc and Ac

f_{b2} = feed-back information between Dc and Cc

f_{b3} = feed-back information between Ac and Cc

CONTROL MODEL OF I.P.M.C. SYSTEM

FIG. 5.04

facts relating to the establishment of data bank on matters of environment and work situation. Monitoring process guarantees that the work programme is strictly adhered to, and when we notice that a loss situation is being approached, an appropriate corrective action can be instituted.

In order to perform these tasks the control diagram of an IPMC system will operate on feedforward and feedback information both working together to keep the system in a state of equilibrium. This situation is diagrammatically represented in figure 5.04. The required information for both the feedforward and feedback loops concerns the forces shaping the control of each stage of the project development as represented by the central blocks (DAC) of the IPMC system diagram. The information is the force required to keep the system in equilibrium at any one stage of the project development.

The feedforward (Ff) information are problems causative variables and the feedback (Fb) are problems curative variables. It is therefore more essential to obtain the (Ff) information from the very onset to guarantee the system stability. The establishment of the (Ff) information also guarantees the establishment of the (Fb) since both must be equal in magnitude.

In other words, for every (Ff) there is a balancing (Fb). Therefore the stability constant (Sc) of the system can be represented thus

$$Sc = \frac{\Sigma F_i f_j}{\Sigma F_i b_j}, \quad \begin{matrix} i = 1.....n \\ j = 1, 2, 3 \end{matrix}$$

$$= \frac{\Sigma F_i f_j}{\Sigma F_i b_j} = 1$$

In other words $\Sigma F_i f_j = \Sigma F_i b_j$ suggests that we can maintain a controlled situation surrounding the development and execution of a project.

The numerical quantity of either variables will depend upon the prevailing situation at any given time. This means that each project must be treated on its own merit using the above formulae only as guidelines.

For the design stage interface (Dc) the number of (Ff) can range from 1 → n. These are coming mainly from two sources of the DAC interfaces. That is the award stage interface (Ac) and the construction stage interface (Cc). There is a third source which has been omitted delibrately from the system diagram because the variables from this source are common to every interface and can therefore be considered constants for any project development. These are the external variables which tend to be general rather than specific

in nature. They are contained in the area marked (4) of the analogous Venn diagram in the next section.

The Ff input variables for the award stage interface (Ac) are coming from the construction stage interface (Cc). This system of Ff and Fb variables going in and out of the system suggests that a great deal of overlap must exist between the various interfaces of a project development sequence.

Central link arrows represent the direct inputs of the stage controllers of the system. These are usually left uninterfered with during the project development sequence and this is so because the inputs along these arrows normally do not affect the project success or failure.

The application of feedforward control system is manifested in:

(i) operations where the time lag in a feedback system would make it useless as a control method

(ii) a system where the feedforward command loop gives laid down procedure to be followed in certain predetermined circumstances especially in matters for decision making.

To be successful Ff control loop requires that:

(a) all or at least most of the possible disturbances to the system are known in advance.

(b) the necessary corrective action for such type of disturbances is determined in advance

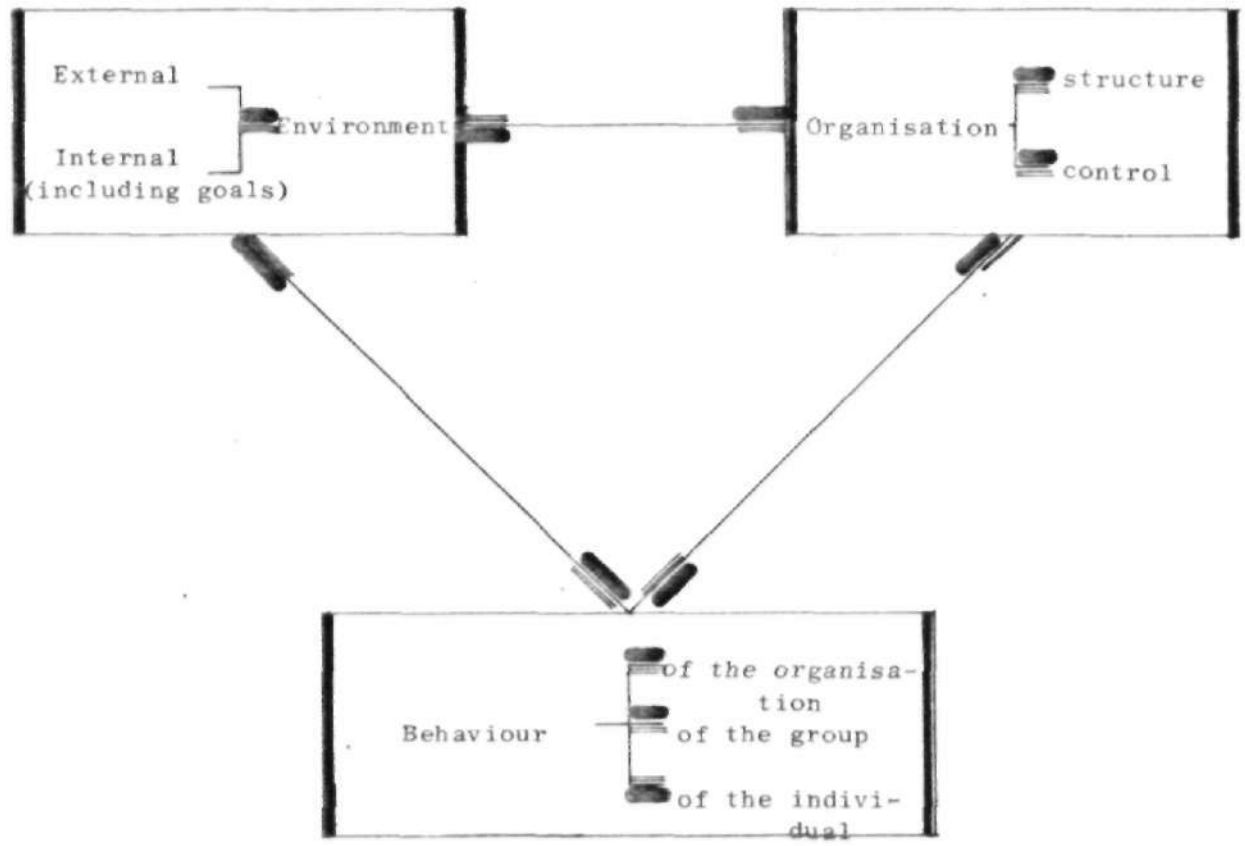
(c) the Ff loop works without fault, that is there are no mistakes in diagnosis of the disturbances and no failure in the application of the predetermined corrective action.

5.5 Identification of Basic IPMC Variables.

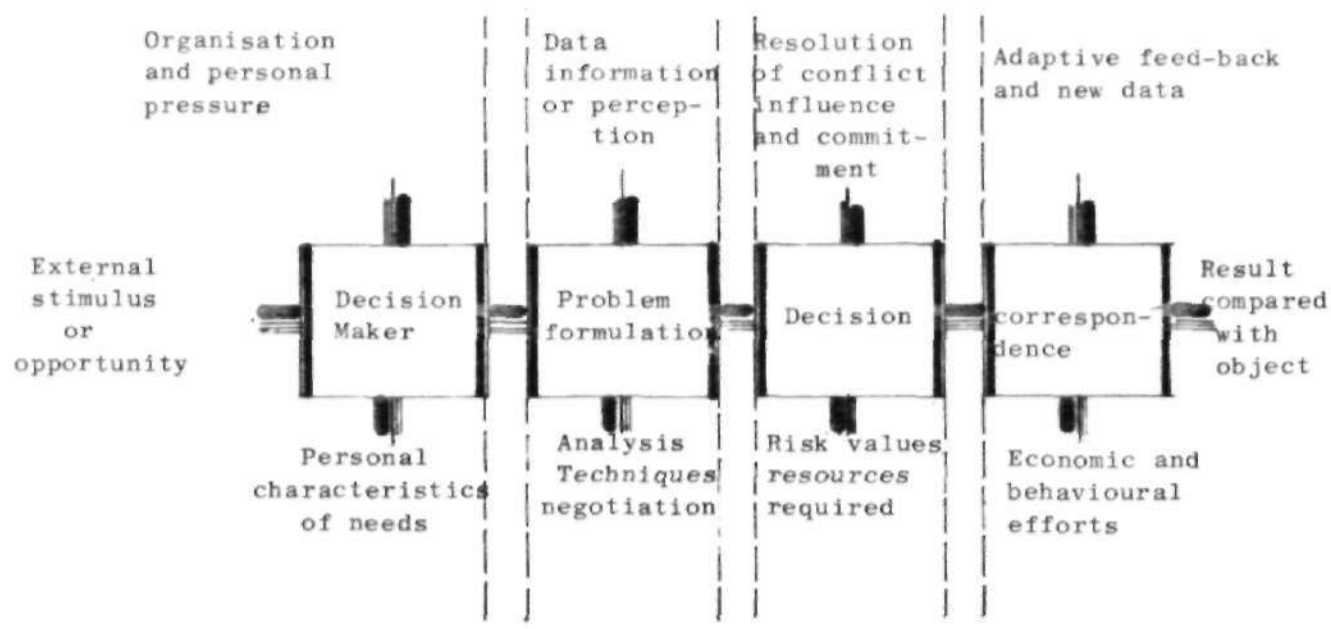
5.5.1 Basic Decision Process

The existence of a building contract is a manifestation of the fact that an individual or a group of people wish to attain a certain common objective-the provision of a building. The parties to this agreement are faced with a number of problems such as how their tasks are to be carried out and in fact to what extent. The fact that the stages of these tasks are of reciprocal nature while the organisations as well as the individuals are different further stresses the complexity of the problems.

The first part of answer to these questions is by setting up a project organisations in which the total task is subdivided into several identificable entities and these are assigned to the various parts of the process and the people involved. This is seen



MODEL 1 TRIAD



MODEL 2 DECISION MODEL PLATE 5.0

illustrated by the DAC diagram in the last section. After defining the tasks to be performed by each arm of the project force assigning them to the group of people involved, comes the bigger task of specifying the manner in which the task should be performed.

In this regard the concept of the 'triad' which is that of constant adaptation will be a good first approximation. Each part of the triad (see Plate 5.03 - model 1) needs to adapt to changes that occur in the other parts and as the various parts are subjected to different inertia and response - time characteristics, conflicts are bound constantly to emerge. The use of corporate decision making techniques as stated in section 5.3 will help to normalise this situation.

Realisation of a building project development requires a choice decision on certain input variables bearing on the project performance. These decision-makers severally or individually may be affected by certain conditions as illustrated in Plate 5.03 model 2. From the illustration it can be seen that decision-making consists of a number of phases, and involves more than merely choosing from among a number of alternatives or inferring from experience. It shows that both behavioural and analytic factors must be included in order to have a correct description of decision-making

Although the decision model attempts to incorporate behavioural and rational aspects of decision-making, such a model does not explain what happens in actual decision-making. For example it assumes that a rational choice can be made between conflicting values and that problem-solving is an orderly progress. It also suggests that the decision-maker can rank all the sets of consequences. There is, of course no human being that can solve problems in a completely rational manner.

5.5.2 Nature of Variables

Figure 5.05 represents the centres of activities in the development of a building project. The sectors of the circles show the areas of overlaps in the input fields or areas of common interests whilst the rest of the circles represent areas of responsibilities which can behandled by each centre alone.

Area of common interests between Dc and Ac centres is represented by (1.4). The area of common interests between centres Ac and Cc is shown by (2,4) whereas the central portions of the sectors, (4) forms the common ground. The area of common interest, between Dc and Cc is denoted by (3,4).

Being sectors of common interests required that careful analysis must be carried out of the variables in these areas before any form of decision should be taken and commitment accepted. This is when the project success can be guaranteed. These interests constitute uncertainties about each interface of the project development. These areas of common interests are termed uncertainties because both the participants and situations are changing. The extent to which they can be also unknown.

Specifically (1,4) are factors that both the designers and the client must resolve together regarding the latter's requirements and how best they can be met, the project requirements and certain contract conditions. The factors in (3,4) relate to the need for cooperation between the design office and the construction site which will ensure smooth production progress and quality workmanship. This requires examinations of site practices, standard of technology as well as certain contract conditions. Matters contained in (2,4) related to the factors shaping contract award and the subsequent project execution.

The analogous Venn diagram confirms that the equilibrium state of figure 5.04 can be represented by the following mathematical equations:

$Ac \cap Dc = x/x \in Ac$ and $X \in Dc = Ff_1 = Fb_1$

$Cc \cap Dc = x/x \in Cc$ and $x \in Dc = Ff_2 = Fb_2$

$Cc \cap Ac = x/x \in Cc$ and $x \in Ac = Ff_3 = Fb_3$

The combined equation gives:

$Ac \cap Dc \cap Cc = x/x \in Ac,\ x \in Dc$ and $x \in Co$

The three equations of intersection provide the field of search for the feedforward information to be resolved in respect of any project development to ensure its success. If the search is not complete or it is not thoroughly carried out there is a chance the project may fail one way or the other. The feedback information has been identified as curative variables and these represent the compromise decisions reached through interactive participation at every interface of the DAC diagram and which are also represented by the same equations of intersection of sets. These variables determine the actions needed to be taken during the project development stage to avoid crisis situation.

Of interest to us here is to note that both the client representing award stage interface and the contractor representing the construction stage interface must be reviewed thoroughly by the designer in the light of his own biases in order to produce hitch - free design which will enhance project execution. The larger the area of intersection the nearer we get to union equation and the better the project control. The common

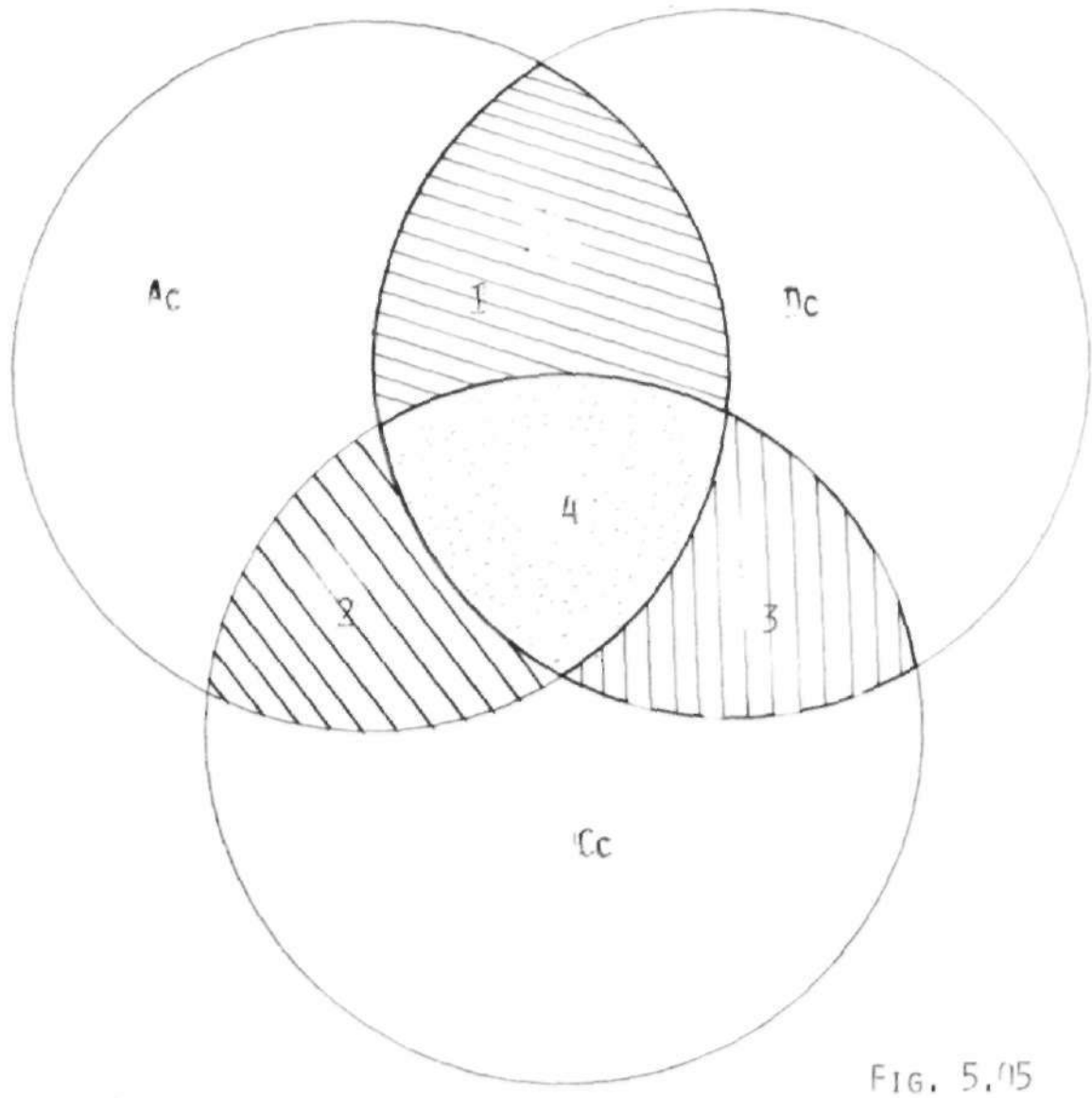


FIG. 5.05

ANALOGOUS VENN DIAGRAM OF OVERLAPPING ACTIVITY CENTRES:

ground of interests are those variables that must be thoroughly discussed during the contract award stage by the stage controllers. These variables cannot be dictated by one peron alone as is the case with the present system. The process of implementing this approach will be thoroughly discussed in the next chapter.

5.6 The Basis for the Application of IPMC System

When buildings are completed and occupied, they take on life of their own and the processes of decision from the design stage to the practical completion stage are quickly forgotten. To an ordinary person or an onlooker the buildings that are standing represent the dreams of the clients, a valid design idea of the designer, and a quality handiwork of a master constructor/builder.

The thought process and the decision process are intricate and complex and what gets built in the end is usually a product of compromises during both the design stage, the award stage, and the construction stage. A building project may therefore be considered as been brought to maturity through the skilled efforts of the various individuals connected with it. These skilled efforts of the individuals, unfortunately occur at different stages of the process leading to the maturity of the project. As a result, problems arise of orderly sequential decisions on a long time scale.

It is therefore necessary to provide a critical commentary on some of our contemporary problems in the design and the fulfilment of the physical and social environment.

From historical perspective, there has been a great change in our attitudes to the problems of design and to the way we go about setting or establishing design criteria. Attempt is being made to raise the standard of physical and social well-being, and in consequence, an increase regard for the comfort and utility of buildings. Additionally there is a growth in scale and complexity of the buildings. To attain these objectives and requirements seem only possible by resorting to experimental design and use of materials and unothodox construction methods. There is a departure from the norms which were implicit in the traditional buildings to explicit norms resting on an empirical basis. This departure represents a retrograde step in the design quality. In certain cases requirements are basic but in other cases there is nothing to carry over.

Concurrent with these changes has been a rapid exfoliation of technology in every field; production installations are becoming more and more complex. This change in technology and greater complex society result in clients not being able either to specify

their needs or to judge when these needs are satisfied. It is also becoming very difficult for the clients to communicate their needs in a language for the other parties to comprehend. Conflicts also exist between the architectural values and personal values on the one hand and between these values and construction practice on the other hand. These conflicts are militating against sound compromise. In other words parties connected by a project today rarely share a common opinion and 'culture'. Some do not exist as an identifiable persons and neither is the eventual user of a building known until well after it has been erected. These facts tend to add to the burden of the parties in reaching a common objective.

It is to be able to reach this common objective that the IPMC system concept has been developed. The successful application of the proposed system depends on heavy reliance on the development of the following areas bearing on the core of the system.

(1) Problem Analysis Techniques

(2) Efficient and Effective Information communication Techniques

(3) Functional Management Techniques.

The IPMC system though essentially suitable for the execution of government projects, its principles can also be applied with resound success, to a private project development.

5.6.1 Problem Analysis

Success or failure of a building project development will depend upon the degree of analysis applied to the problems associated with it apart from identifying the nature of the actual problems. If the parties connected by the building project fail to identify the real problem correctly then the solutions proposed will be out of place and the project will fail. The reverse will be the case if real problems are correctly identified.

The approach to problem analysis should be systemtised but in doing so it must first be established that the problems we are trying to analyse are not independent of one another. In the case of a building project the degree of overlap has been shown in the earlier section of this chapter. Secondly, the approach to problem analysis is not intended to be, nor should it be allowed to become, a straight-jacket. The basic purpose of analysis is to provide a framework which will help to develop in the decision maker a systematic approach.

Four basic components parts of problem analysis which can provide the decision maker with a practical, systematic, and profitable analysis are as follows:

(a) Statement of what is wrong

(b) Getting the facts

(c) Statement of Objectives

(d) Limitations of solution expected

In the development of a building project today the first initial problems are associated with proper definition of user needs at the design stage. This is so because the anonymousity of users especially in housing and urban development projects defy any form of grouping or generalisation. Therefore rigid adherence to one style will not produce acceptable solution. The logic of the situation rests on the hypothesis that the quality and appropriateness of design solution will greatly influence the quality of the produced building.

It is in this regard that Gurth Higgin and Neil Jessop[1] agree that if the study of a client's needs - financially, aesthetic; functional and social - is to be complete, the sponsor (architect) will have to know the needs of the client very intimately, whether an individual or an organisation. That he will also need to undertake a similar thorough study of relevant building resources to ensure that the best possible solutions to the employer's needs are found. The architect, no matter what his particular expertise, will obviously need assistance if this dual task is to be performed adequately

1. Gurth Higgin and Neil Jessop "Communications in the Building Industry 1965 pp. 18

The amount of information needed to do this is such that even the architect, the man whom one would expect to be best qualified to undertake it, is unlikely to command sufficient knowledge, particularly in the fields of technology and costing, to be able to do it all alone. It is suspected that this very important aspect of the building process is at times not done adequately because the original sponsor has not realised, or is not willing to accept, the need for the application of a wider knowledge than he himself can easily command.

This situation can give rise to difficulties, particularly at later stages of the building process when undiscovered needs or unexpected solutions appear. Even if the investigation is adequate, equally serious difficulties can arise if enough trouble is not taken at this time to ensure that the brief which embodies it is the subject of full understanding and agreement by all parties.

It is at this point in the building process that the possibility of a conflict of values can first show itself. If, as is usually the case, there are several members of the design team sharing the work of constructing the brief, anyone of them, but particularly the one in the role of sponsor, can unbalance the whole by a two single minded pursuit of perfection

for these aspects that are his special concern. The architect/sponsor, for example, will be tempted to maximise architectural magnificence at the expense of time, cost, or technological considerations and the builder/sponsor to maximise profit at the expense of architecture and clients financial outlay.

The complexity of the building process requires the corporate efforts of individuals whose minds should be fertile in their ability to abstract, imagine and idealise. Such minds should neither be restricted nor bias to analyse and project but be open to new ideas. It is in this manner that one can try to achieve a measure of coordination and control or at least one can avoid the blundered approach in which all methods other than one are ignored. In this way it is hoped that an interchange of idea and knowledge between design and construction will be facilitated. It will be presumptuous of anyone to claim to have all the necessary knowledged and idea.

The quality of current and recent buildings is inadequate . The causes can be connected with the organisation of the building industry in this country and the relationship between contractors and consultants. It is therefore suggested that professional

attitudes and contractual arrangements be changed in line with modern construction methods. This is saying that we need to find a correlation between the problems of the various interfaces of the building process line. For example most of the contractors operating within our construction industry lack the ability to understand or at least appreciate the requirements of the projects they undertake. Analysis of sits information will therefore provide useful guide at the design stage interface to ensure that the design is not too far for available technology on the site. It is the lack of analysis of this nature that has led to poor quality work as well as low productivity on many sites.

Relating design to site practices, the available level of technology and environmental determinants will ensure smooth progress in addition to those already mentioned above as well as minimise variations arising from non-availability of specified materials and components and non-buildability of design proposals.

Effective or optimum use of total building resources depends primarily on better control of the amount and phasing of effective demand. This requires consultation with all those involved in the process, not the least building contractor. This situation

for example has implications for tendering and the overall performance of the industry.

In other words because of the uncertainty, a particular organisational structure is bound to develop. Some firms may not be willing to handle more than a contract of specific sum and nature because they want to minimise overheads, reduce number of operatives on permanent payroll. One reason probably why highly qualified personnels are missing today on our sites. The result is not far fetched - shoddy jobs.

Whereas big firms can adapt by taking on ranges of contracts in different areas, small firms fight against uncertainty in two ways. They take on as much work as possible during boom periods and as a direct consequences they work at such a pace as to ensure continuity of workload during troughs in demand. In an uncertain market the ongoing workload is valuable to him and he will be loath to complete that work until the next job is secured. In order words the individual contractor often has a horizon of effective demand which does not stretch further than the end of his current contract. It is therefore not surprising to note that contractor is at times so unconcerned about the progress especially where additional claims can be made as a result of delays or work changes.

It has to be realised that client's stake which is the building is an investment that yields no interest until after completion. If all times were to be measured back from the 'ready for occupation date that is the moment when theoretically the asset becomes valuable to the client, a burden may have to be borne of something in the order of 20 - 25% delay usually experienced.

Effort must be made in this regard by the people concerned to act in concert rather than unilaterally to ensure that potential demand is manisfest as effective demand. Closer link with the contractor is necessary to increase their horizon of effective demand and enabling work to proceed faster.

5.6.2 Efficient and Effective Information Communication

Parties to a building process are capable of exercising their own judgement well or inadequately. They are limited beings as regards their powers of perception and deduction. They may fail to grasp the significance of some information presented to each other. Their judgement in a particular situation depends upon the communicated information with which they must work. This is influenced by organisation interrelationship and personalities, of which their personal motivations introduce their own factors.

The amount of information that can be digested and handled at any one time by the individuals is limited. Yet it must be realised that too little information is fraustrating and too much is embarrasing. It should also be borne in mind that the quality of information given will go a long way in making the right decision as to what is expected to be done and how it should be done. A wrong sort of information or an unincisive information often leads to uncertainties and confusions.

Decision making behaviour will be affected not only by personal factors but also by the structure and organisation of the body responsible. The main problem here will probably be the communications network within the parties, the way in which responsibilities are defined and assigned and the degree of participation in the making of the decisions.

If no good communication exists within the various parties work may be done by one part of the organisation in ignorance of facts possessed by another part. Therefore, for information to be freely contributed and shared, one pre-requisite seem to be that all concerned must be dependent upon one another. To ensure that there is no distintegration or fragmentation of the communication network, information should be explicit and incisive, and the deligated authority

clearly defined. There should be scheduled meetings for interaction when experiences can be shared and/or modified. In this regard for example external factors such as postal system etc must be taken into consideration by the convenor meetins in relation to the location of the various parties.

The magnitude of work changes depends upon a number of factors not the least important of which include the thoroughness of site investigation undertaken prior to the design,completeness of the working drawings available at the time of preparation of the estimate or proposal, and unpredictable circumstances during construction stage. The records of variations and the disparity between the allowed sum of money for contingencies and the used-up part of it suggests that tenders are often invited on bill of quantities prepared from incomplete information.

Quality of site works as well as the effective control and coordination are affected by communication gap. Want of information causes delays. Therefore the supplied information at any given time must be adequate both qualitatively and quantitatively. This must be properly communicated in precise and comprehensible language if the IPMC system must work.

5.6.3 Functional Management

Complex nature and composition of the construction industry should be recognised as a major factor determining efficient and effective productive performance.

Separation of design from construction lends more support to the unsatisfactory situation. The design of a building determines the sequence of site operations as well as the methods which can be adopted in carrying out the operations. This in turn will affect the distribution of resources to be employed. Therefore there is a significant relationship between design and construction of building which will determine the level of productivity and management of resources. Lack of pre-contract planning by the design team can nullify much of the time-consuming efforts in the application of modern management techniques and the improved methods of programming and controlling building operations.

These apparent latent implications should be meticulously evaluated at the design stage to ensure proper control and coordination. The lack of this hitherto has led to excessive and expensive variation orders and delays.

Delays to various parts of a project do occur due to eventualities such as late delivery of materials, procastination on the part of the contractor

or his sub-contractors, protracted inspection and approvals, shortage of labour, strikes and industrial troubles, unusually inclement weather, enforced retardation of work to suit client or other contractors on site and financial problems.

These problems occur in all contracts whether firm price or prime cost but they are more difficult in firm price. With prime cost the cost is always paid by the owner.

In the preparation of all general conditions of contract, it is therefore necessary to anticipate and provide for such work changes and delays and perhaps to place a legal liability on one or all of the parties to accept financial responsibility for them. Usually the contract conditions provide that the owner can make changes to the work without vitiating the contract, and that they shall be valued by the owner's consultants and the contract price adjusted accordingly. In addition if the work is delayed, the consultant is empowered to extend the contract duration under certain circumstances. This aspect of conditions of contract leaves room for manipulation that renders control difficult both in terms of progress and cost.

It has often been said that good people can make any organisation effective. It has also been found that ambiguity in an organisation is a good thing in that it forces teamwork, since people know they must work together and cooperate to get anything done. Teamwork is expecially relevant in team sports; although coaches may spend hours practising against a visiting team the actual game situation is one of ambiguity for both offensive and defensive players. During the practices, however, the coaches develop players who want to cooperate and work together most effectively. To do this players need to know the part they are to play in any cooperative effort and how each player relates to the other. Coordination is required to design and maintain these systems of roles. Coordination and control within the framework of construction project require the ability to predict within a limit of accuracy the line of thought and the general behaviour of the several parties connected with the process. It also requires to predict the general behaviour of the project itself. The present fractured approach does not aid coordination and control. The situation is approaching an extreme when the appointment of subcontractors is long after the main contractor has occupied the site.

Bishop[2] notes that construction industry exercises less control over its market than the manufacturing industries. Firms in the construction industry therefore, are compelled to manage their affairs within an atmosphere of uncertainty and have to be able to do so without incurring the cost of low utilisation of resources. This air of uncertainty has led to a number of conditions that help to shape the behaviour of contracting firms which are slippery organisational structure and policy, unprogressive attitude to the project execution and so on. Bishop further emphasises that these responses to uncertainty have the undesirable effect of reinforcing the uncertainity from which management seeks escape.

This, he says, is because sub-contracting and the lack of commitment of resources to specific ends, make it difficult for any organisation to exercise effective control over processes and hence over the commitment of resources. The present system of contract award can easily sow a seed of disunity. This aspect

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2. Bishop Donald "Productivity in the Construction Industry" Aspects of the Economics of Production ed. D.A. Turn George Godwin Ltd. 1975 pp. 58 - 95.

has been elaborated upon in section 5.2 of this chapter. Perhaps one should re-emphasise again here that administrative lapses can, and often does, lead to poor level of performance both in terms of money, time, and quality of building as a product.

CHAPTER SIX

6.0 APPLICATION OF INTEGRATED PROJECT MANAGEMENT CONTROL (IPMC) SYSTEM.

6.1 Introduction:

The building project management has three distinct phases, as has already been highlighted, which are greatly influenced by the degree of sophistication put into our analytical, communication and information, and functional management, systems.

It has been shown that the current system in operation leads to loss of time and money, unsatisfactory functional performance as well as leaving rooms for all sorts of social abuses. These are direct results of insufficient attention to analysis, communication and information, and the management of these various phases of building project.

Control measures at these stages is of utmost importance if the industry is to make the necessary impact on our economy. It is also a very important step toward achieving the individual projects objectives and the organisations objectives.

Lack of proper analysis leads to uncertainties which are recurring from the design stage through the contract award stage to the construction stage. Poor communication and information dissemination aggravates the problems of uncertainties. Of course

functional management approach cannot be applied in an air of uncertainties.

An effective control system therefore is one which tends to remove these recurring uncertainties. The effective control system as is being proposed here attempts to remove or control uncertainties at:-

(i) Design Stage

(ii) Contract award stage

and (iii) Construction Stage

6.2 Design Stage Uncertainty Controls

These include:

(a) determination of user's needs and delineation of user's needs from wants

(b) determination of user's psychophysical, ergonomic and socio-psychological needs.

(c) determination of construction production needs in relation to site conditions and stage of technological development.

(d) determination of construction cost-reduction parameters without necessarily sacrificing standard through judicious use of design knowledge and experience.

6.3 Contract Award Stage Uncertainty Controls

These include:-

(a) Rational approach to the appointment of consultants and acceptance of design that guarantees value for money.

(b) Rational approach to the registration of contractors.

(c) Rational approach to the determination of building project cost and subsequent selection of contractor.

(d) Rational approach to the avoidance of in-built Social, economic and political problems as relate to project success or failure.

(e) Rational approach to the prevention of disputes arising from breach of trust requiring arbitration.

5.4 Construction Stage Uncertainty Controls.

These include:-

(a) Promotion of team spirit among all the parties involved

(b) Promotion of coordinated supervision techniques

(c) Promotion of efficient information recording and transimission techniques to monitor progress and avoid delays.

(d) Promotion of efficient decision-making technique for prompt action as and when necessary.

6.5 **Phase One:** Controlling Design Uncertainties:-
Developing a Design Philosophy:

6.5.1

John Paterson[1] remarks that from time to time it is necessary to reconsider what one means and feels about design rather than just mouthing the words. He also feels that some peculiar anomalies in the view of design are already known, but that there are a great many more areas which need to be examined and thought about if the construction industry as a whole is to make a proper contribution to the society. These in his view, involve user participation in the design process and how a designer can work in an environment of the user participation.

This view arises from the suspision that one man's flash of inspiration cannot guarantee the fact that what he as a designer wants is what the user wants and how he the user wants it. Hence Albert Ikomi[2] has said that 'there is an increasing discrepancy between architect, clients, and contractor in their perception of shared experience, shared appreciation and shared discourse'. The multiplicity and the

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1. Paterson John "Information Methods" Design and Construction Wiley.

2. Ikomi Albert "Appreciating Complex Architectural Problems" Illustrated case studies, Ph.D thesis, University of Pennsylvania, U.S.A. 1979.

complexity of projects today coupled with multiplicity of users and functions require that these views be seriously considered in our approach to finding a design solution. Such projects simply cannot adequately be solved by an architect locked within a crystallized style.

Most of our designers today are rather pragmatic and rigid in their approaches. As it has been remarked in chapter three rigid adherence to one style and approach will not produce acceptable solutions. Proper consideration will be necessary for assessing aesthetic, functional, and cost values. Hence Stubbins[3] remarks that to be regarded a good architect one's work must be sound by all the measure of professional performance - beautiful, functional, meet the deadlines and within budget. Architecture, in the end, is what gets built and what gets built is usually a product of compromises during construction stage. He continues by saying that 'architects whose thinking is too far ahead of their own time may find their influences and effectiveness diminishing by the time the project has been completed.

Nowhere can this be more so than in this country where the level of awareness and technology is at a low ebb. This then means that in architectural practice there

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3. Stubbins Hugh "Architecture: The Design Experience" John Wiley and Sons N.Y. 1976.

may be no free expression of thoughts. The various individuals who have stakes in the development of the various projects as well as the projects themselves have some uniqueness about them that will alter free expression of thoughts.

Many other things are opposed to free expression of thoughts. One of such things is lack of time on the part of Nigerian architect to diagnose and adapt his foreign-acquired' experience to our social and cultural needs. The reason for this can be traced in this remarks by Adeyemi[4] where he observed that the Nigerian experience in conventional architectural practice is most recent. He also observed that the impressive mud structures common to areas historically defined as Western Sudan including parts of Hausaland and the Brazilian houses of Lagos were handiworks of master builders who created such structures without the benefit of drawn plans. In his view in the contemporary architect therefore has no historical base either within the pre-colonial Nigerian Society or in the period of the colonial administration but gained considerable prominence during the post-war development era.

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4. Adeyemi E.A. "The Ecology of Architectural Practice in Nigeria", Tropical Architecture August/September, 1981.

Finally he remarked that the changing ecology of the Nigerian practice necessarily demands, especially during this period of the "oil euphoria" a review of the existing code of professional conduct for architects.

The architectural educational system contributes to the magnitude of the problems as it lays great emphasis on conceptual design, originality, radical thinking and so on. All heady stuff to teach and to learn. The combination of these well engrained attitude during the training of those now in profession, with exposure to the contract system which might encourage some inflation of the architectural ego will prove even more controversial. Adeyemi himself realises this when he says that if however the architect must play the consultant role successfully he would require to orientate his Western Style architectural education to the cultural and social reality of the Nigerian Society. In the first place, the conflict arising from the low technological capacity of Nigeria in comparison with rapidly advancing technology that allows for creative adventurism can, and does affect the level of architectural practice.

There is no question but that in the new world of architecture which is on the horizon we must be creative within the framework of the budget, time

constraints, technological and political maturity, and harmonious functionalism.

Designer is expected not only to design to meet the expectations of his clients who in recent years are more conscious, but also to take care in his design the site production problems as well as blending his design with environmental expectations. Stubbins[5] summarises it this way:-

> 'Practical solution is an approach that tries to find the appropriate physical form for each building in terms of its basic purpose which usually is a combination of practical, social aesthetic and psychological objectives'.

This is not to say that every designer does not use some assumptions about these architectural problems. The fact is that these assumptions are more implicit than explicit and are often based on a series of strong baises that are poorly spelled out and not systematically related to one another.

It has been said before that the designers who give the world the most powerful forms do so by electing to solve only a few of the problems posed by a given

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5. Stubbins Hugh "Architecture: The Design Experience John Wiley N.Y. 1976.

programme. There is strong evidence today in your society that the designers are striving very hard to evolve their own and unique characteristics. It is believed that this can only be done at the expense of certain acceptable norms and standards.

The word 'design' has undergone a transformation for which our orthodox design descriptions are inadequate; there are special problems that the wider social context of design at a certain scale and for which most practical methods are ineffective.

6.5.2 Determination of User's needs and delineation of user's needs from wants.

Most clients can state their needs in clear and praecise terms but majority hardly can differentiate their needs from wants. There is therefore the need for proper counselling between the designer and the client to ensure that what is needed is what is provided.

Unfortunately designers by their training have held on firmly to certain norms and standards not necessarily in conformity with current trends.

The establishment of user needs will therefore include the application of:-

(a) Psychophysics

(b) ergonomics

and (c) social psychology in addition to

and after the normal briefing when basic information about the general outline has been established.

The application of the (a), (b) and (c) factors will interact with the designed physical environment. The notion here is that a building that is functionally successful for a client may be found inadequate for another client. Mosaku[6] has observed that social status and sense of value affect the degree of casual damage and vandalism in building designed for different groups of people using the same specifications. He also observed that the life style of the occupant will reflect the use to which provisions in the buildin will be put. This means that user analysis is a very important aspect of design procedure.

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6. Mosaku T.O., "The Study of Building Performance" M.Sc. thesis University of Manchester Institute of Science and Technology 1968.

The stages of analysis at this level are as follow:

Basic Information

1. User In Put
   - Purpose/function
   - Size of requirement/capacity
   - Resources required and available
   - Time required/Delivery date
   - Project policy/Special requirement
   - Location
   - Economic life

Porject Acceptance and Allocation of Project Team

2. Desiener
   1st Input
   - Examine Own Resources
   - Prepare programme
   - Accept project

Design Information

3. Designer
   2nd Input

	Site Data	User Analysis
-	Site details	Physiological needs
-	Relevant Regulation and Codes	Phychological needs
-	Climatic condition	Social Values cultural Value

Alternative Schemes based on site data and basic information	User choice of material and special items based on analysis

Further work on the design from this stage should be based on the priority rating of the client

6.5.3 Determination of Construction Production needs and Cost reduction parameters.

6.5.3.1 Design Analysis and Processes:

More often than not the design of our buildings is some step ahead of the available technical and other resources. The design is also done without consideration for both the prevailing political and industrial climates which frequently impose sanctions that will retard construction progress on the sites.

Design analysis is a necessity that may eliminate most of these problems whilst at the same time fostering integration of processes and teamwork.

There is a correlation between design and site production. Factors shaping this correlation are:

(i) Materials

(ii) Methods (System)

(iii) Men

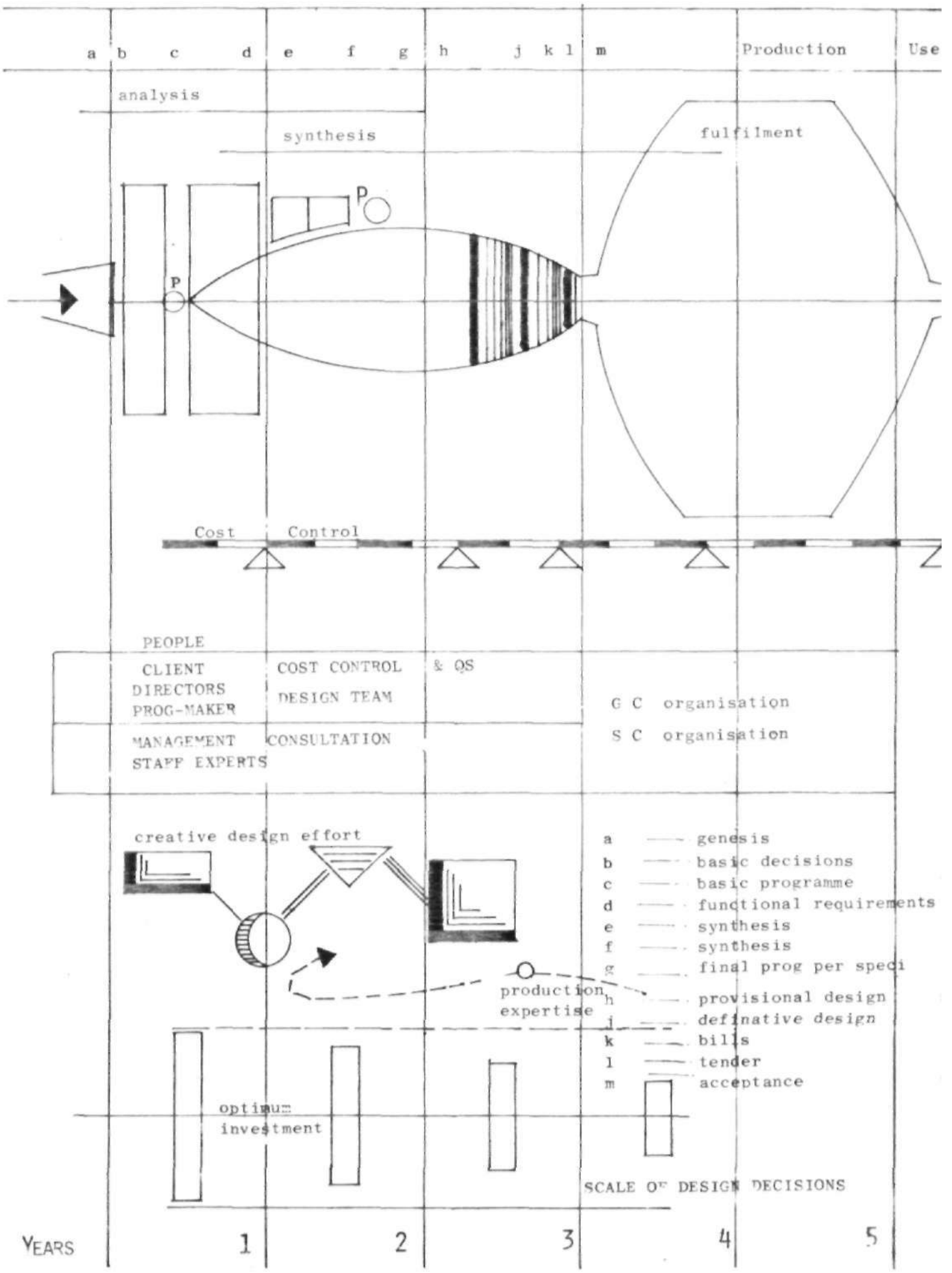
(iv) Machines

Each of these four factors (4ms) will play prominent roles in the speed of construction, quality of construction and cost of construction. Therefore their influence must be controlled at the design analysis stage.

Materials influence on progress of work depends on whether or not they can easily be procured. Delay in procurement leads to loss of production time - Non-availability leads to variation orders resulting in revision of drawings and hence prolonged duration

DESIGN STAGE & REPORT

DESIGN ANALYSIS



of contract period, increased cost, and replanning of contract programme. Scarcity creates high market values giving rise to fluctuation and claims.

Methods and machines will influence rate of production and quality of work. Slow production means delayed returns on investment and poor quality results in unsatisfactory performances.

Materials requirements in terms of user choice must be ascertained as in step one following these steps having carried out user analysis:

(i) Prepare a list of alternative materials for each items of work in the project.

(ii) Discuss the relative advantages and disadvantages of each with client.

(iii) Note the clients choices in order of preference.

(iv) Prepare enquiry notes to be sent to suppliers giving details, as contained under tendering procedure, of the client's choices.

(v) Receive quotations and accept on basis of ability of supplier to comply with conditions and requirements.

(vi) Incorporate accepted materials in the design after signing an agreement.

It should be noted that this process is being undertaken concurrently by the design team in collaboration with project manager or a quantity Surveyor. The design team at this stage are preparing geometric alternatives.

Design uncertainties relating to methods and machines can be resolved through the knowledge of production expertise. This can be provided by the project manager reviewing the current practices, suggesting alternative techniques to simplify site problems in the light of the construction market. This then leads to the preparation of methods statement to be compared with that required of the tenderer to be submitted along with their labour tender.

Construction project is still very much labour intensive in Nigeria. It is at the design stage that effective utilisation of labour can be planned. This fact seems not to be appreciated by the designer as yet. Substitution of labour for mechanical requirements has been found to affect productivity on the projects selected for case studies.

In other cases the idle time of highly expensive item of equipment buttress the fact that design and construction methods were not properly aligned.

The following considerations may aid the alignment of design possibilities and the construction practices:

(1) Pay visits to the sites and offices of the likely tenderers to collect relevant data on construction practices particularly with respect to:-

(a) types of equipments on the sites.

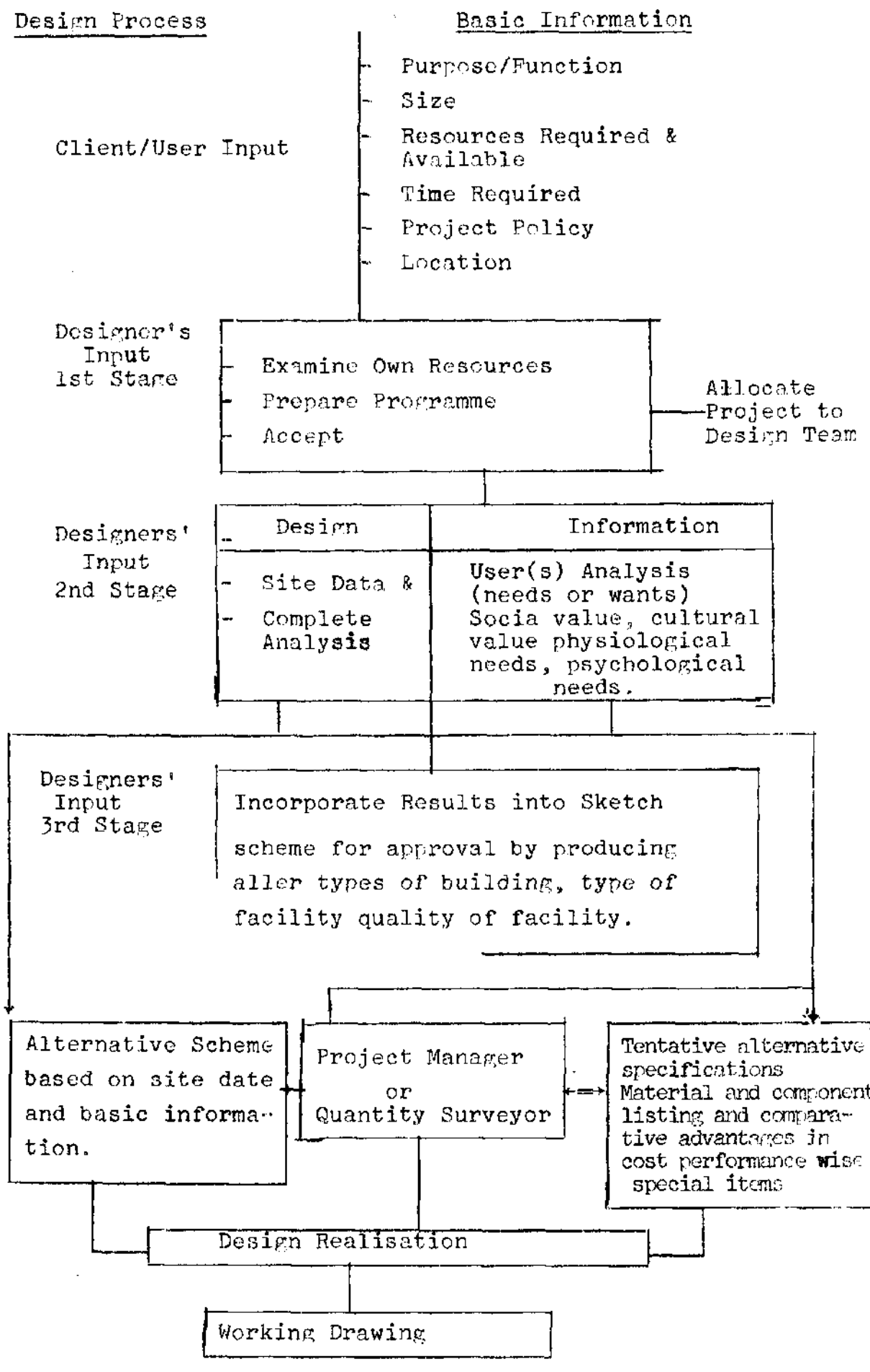
(b) programming techniques.

(c) level of supervision.

(d) calibre of labour.

(e) general attitude of workers, and their relationship with the top management.

(2) Request for information and methods statement from contractors who may be willing to tender for the job after they in turn have been given vivid description of work to be done. These information then becomes construction methods variables for the feed forward control loop.


Design Process
Basic Information
Client/User Input
Purpose/Function
Size
Resources Required & Available
Time Required
Project Policy
Location
Designer's Input 1st Stage
Examine Own Resources
Prepare Programme
Accept
Allocate Project to Design Team
Designers' Input 2nd Stage
Design
Site Data &
Complete Analysis
Information
User(s) Analysis (needs or wants) Socia value, cultural value physiological needs, psychological needs.
Designers' Input 3rd Stage
Incorporate Results into Sketch scheme for approval by producing aller types of building, type of facility quality of facility.
Alternative Scheme based on site date and basic informa-tion.
Project Manager or Quantity Surveyor
Tentative alternative specifications Material and component listing and comparative advantages in cost performance wise special items
Design Realisation
Working Drawing

(3) A thorough study of the requirements of the job being designed to ascertain characteristics.

6.5.3.2 Preparation of Bill of Quantities

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

The preparation of the Bills of Quantities is in strict accordance to the standard methods of Measurement of Building Works (Smm).

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

(i) Taking-off of materials or labour including all allowances.

(ii) Abstracting to obtain net quantities of materials or value of work.

and (iii) Billing in the prescribed (Smm) units attached to the Bills are:

(a) Description of works

(b) Instructions to persons tendering

(c) Tender Form.

(d) Articles of Agreement.

(e) Conditions of Contract.

(f) Preliminaries.

(g) Trade Premables.

In themselves there is nothing wrong with the terms expressly contained in these sections except one or two instances that require, reappraisal. Hence a rearrangement of the 'Trade Preambles' section will be necessary to suit the present proposal of this thesis.

Trade preambles section should be split up into two:-

(i) Materials Section

(ii) Workmanship Section.

'Materials section' gives the full specifications of the materials in accordance with a known standard and all other conditions. Against this are placed the measured quantities of materials required for a given job.

'Workmanship section' gives the description of work to be carried out including the manner of execution. Any special requirements and conditions are also to be attached including volume of work.

This breakdown is essential since this thesis proposes a split - up of the tendering methods in order to alleviate certain problems of materials supply, labour utilisation and control.

The 'Split-up' approach will nullify certain clauses in the preliminary section, such items as:-

(a) Licenses of materials (in part).
(b) Ordering of materials.
(c) Test and Samples
(d) Materials delay (in part of delays)
(e) Imported materials
(f) Prime Cost Sums
(g) Provisional Sums.

In the present method the condition of contract allows for variations and fluctuation arising from changes in and prices of, materials to be used. This thesis proposals presuppose that negotiation for materials supplies is between the owner and the suppliers under firm agreement which may or may not fluctuate. In any case if there was need to substitute the use of one material for the other a choice is readily made from the approved list of the owner's choices.

This thesis also presupposes that a perfect set of construction documents has yet to be prepared, and the owner whose mind is completely made up is yet to be discovered. Hence on the list it is proposed to obtain approval for a range of his choices at the outset to avoid unnecessary claims. This approach leaves us with variation arising out of genuine mistakes.

Having taken care of minor alterations both in the conditions and the preambles, it is suggested here in this thesis that the method of calculating the

quantities in the bills be changed to reflect the actual quantities of materials plus allowances and the actual volume of work to be done.

For Example whereas:-

		QTY	UNIT	RATE	₦ K
1.	Excavate oversite to remove vegetable soil average 150mm deep and remove from site informs the contractor what to do.	300	m^2		
2.	Mild steel bar reinforcement in columns, beams, lintels, slabs etc. 25-12mm Diameter bar does not inform him what to do.	300	Mg		
Also					
3.	Plain insitu Concrete 1:10 - 20mm aggregate in: 50mm Blinding tells the volume of work but not the quantity of materials.	50	m^2		
Neither does					
4.	Prepare, prime and apply two coats emulsion paint on: Rendered Wall..... tells the quantity of paint.	120	m^2		

It follows therefore that in one case the contractor is told what to do and the volume of what to do. In another he is informed of the weight of material and where to put the weight.

Examples of items (1), (3), and (4) should be alright for "tendering for labour" only.

Materials needed for items (3) and (4) surely can be determined through known processes of estimating. When this is left in the hands of contractors a number of consequences can be expected.

(i) Prices vary more widely as a result of different considerations and selection process more confusing.

(ii) There will be differences in application resulting in substandard work etc.

The case of items (2) is even more confusing in that structural calculations tell not only the diameters and numbers of bars for a given job but also the allowances to be made. One needs to visit our sites to see the extent of wastages of this item as a result of not billing in numbers and lengths.

Important issues here are:

(a) Materials tender should be sparate from

(b) Labour tender.

In which case there is need for accurate calculations of quantities of materials to be used for a given job so as to control material cost. This should be supported by appropriate and adequate specification write-up.

The labour issue is simpler since the present billing system is mostly in volume of work' rather than quantities of materials.

Done this way, requisition can be made to the suppliers as to the exact quantities and specification of materials to be supplied. This will control excesses and in some cases - 'patching up' since quantities of materials match volume of work. It will also ease as well as accelerate site measurement for interim payments.

(a) Materials Estimating

Certain items are usually quantified by volume and are in fact sold by the same unit. Such case should not present the quantity surveyor with any difficulty since the unit of billing is the same as unit of sales in the market as well as the unit of application.

Such homogenous cases need only be supported by appropriate description and specification when placing the order. An example of this is the 'hardcore' material or backfill.

Some other materials such as concrete are measured by volume but are heterogeneous. In which case there is a need to find the exact volume of its component parts before placing order.

For example the quantities of dry materials that will give us 651.2m^3 of concrete by absolute volume method will be derived by following steps.

Specific Granty (S.G.) of

Cement = 3.15
Sand = 2.65
Aggr. = 2.60
$1m^3$ of Cement = 144Kg
$1m^3$ of Sand = 1660Kg
$1m^3$ of aggregate = 2550Kg

Absolute Volume of Material

$$= \frac{\text{Wt of material}}{\text{S.G. of material}}$$

Concrete 1:1½; 3 mix Water/Cement Ration = 0.55

Coarse aggregate 19mm (¾")

Take 0.1 m^3 = $1dm^3$ of Cement, Sand, and aggregate.

i.e. 144Kg, 160kg, and 150Kg respectively.

1 part of cement = $\frac{144 \times 1}{3.15} = 46$

1½ part of sand = $\frac{160 \times 1.5}{2.65} = 91$

3 parts of Sand = $\frac{150 \times 3}{2.60} = 173$

Water = $\frac{144 \times 0.55}{1} = 79$

abs. Vol. = 389

i.e. 46 + 91 + 173 + 79

But 1 litre = $1dm^3 = 10^{-3}m^3 = 0.389m^3$

Amount of materials per m^3

Cement = $\frac{144}{.389} = 370Kg/m^3$

Sand = $\frac{160 \times 1.5}{0.389} = 610Kg/m^3$

Aggregate = $\frac{150 \times 3}{0.389} = 1160Kg/m^3$

Water = $\frac{144 \times 0.55}{0.389}$ x 200Kg/m^3

$\therefore$ for 651.2m^3 of Concrete

Cement required = $\frac{370 \times 651.2}{1000}$ tons

= 241 tons

Sand Required = $\frac{610 \times 651.2\text{m}^3}{1600}$

= 248.3m^3

Aggregate Required = $\frac{1160 \times 651.2\text{m}^3}{1500}$

= 504m^3

Water Required = 200 x 651.2 litres

= 130240 litres

OR $\frac{130240}{4.5}$ galls

= 28942 galls

It is therefore first necessary to gather all known volumes of concrete whether in foundation or in slab, together and apply the calculation to obtain total quantities of each of its component parts bearing in mind their design mix composition, which will be used for the calculation of each type of concrete specified.

This same method can be used to arrive at the quantities of materials required for mortar jointing and plastering.

The case of numbered items such as standard doors, china clay and the like are, of course, straight forward in that the numbers are extracted along with the specification and sent direct for quotation. The emphasis here is that materials should be estimated using known methods.

(b) Materials Schedule

Record of materials needed for a given piece of work can be kept as follows supported by adequate specification. This record is estimated from quantities obtained through the normal processes of taking-off established in the Smm.

INSTALLATIONS

(i) 15cm rain water pipe

(ii) Total length = 145m

(iii) Fire Clay sinks

Total Number = 9

(iv) W.C. Suite.

Total Number = 9

(v) 1.4m Chrona Towel Rails.

Total number = 5

MATERIALS	NO	LOCATION	QUANTITY
A CEMENT	1	Foundation and Starter Columns	23,18 tons
	2	Wall Below Ground Floor	3.51 tons
	3	Concrete in Ground Floor Slab	28.68 tons
	4	Mortar for Hollow Sand-crete blocks in the Ground Floor	33.41 tons
	5	Concrete Fill to Hollow Blocks	2.40 tons
	6	Mortar for Hollow Blocks filled with concrete	3.63 tons
	7	Concrete in First Floor Slab	19.10 tons
	8	Mortar for Hollow Sand-crete blocks in the First Floor	30.33 tons
	9	Concrete Fill to Hollow Blocks (in the First Floor)	2.34 tons
	10	Mortar for Hollow Blocks Filled with concrete	3.46 tons
	11	Ground Floor Columns and First Floor's	21.50tons
	12	Beams	19.48 tons
	13	Roof Slab and Cutters	43.94 tons
	14	Plaster and Render	17.49 tons
	15	Floor Finish	7.55 tons
		TOTAL	221 tons

MATERIALS	NO	LOCATION	QUANTITY
SAND	1	Foundation and Starter Columns	35.45m^3
	2	Wall Below Ground Floor	12.38m^3
	3	Concrete in Ground Floor Slab	39.57c^3
	4	Mortar for Hollow Sand-crete blocks intthe Grould Floor	138.50m^3
	5	Concrete Fill to Hollow Blocks	3.31m^3
	6	Mortar for Hollow Blocks Filled with Concrete	15.11m^3
	7	Concrete in First Floor Slab	26.38m^3
	8	Mortar for Hollow Sand-crete blocks in the First Floor	126.76m^3
	9	Concrete fill to Hollow Blocks (1st Floor)	3.24m^3
	10	Concrete fill to Hollow Blocks (1st Floor)	3.24m^3
	11	Ground Floor & First Floor Columns	2.28m^3
	12	Beams	26.91m^3
	13	Roof Slab and Gutters	6.91m^3
	14	Concrete in Staircases	19.56m^3
	15	Plaster and Render	49.22m^3
	16	Floor Finish	9.48m^3
		TOTAL	501. m^3

C

MATERIALS	NO	LOCATIONS	QUANTITY
AGGREGATES	1	38cm for filling Hollow Blocks TOTAL	$4.16cm^3$ $\frac{10.85}{15.01}=15m^3$
	2	20cm Foundations and starter Columns	$50.90m^3$
	3	Ground Floor Slab	$59.14m^3$
	4	Ground Floor Blockwork	$6.62m^3$
	5	First Floor Blockwork	$6.67m^3$
	6	Ground & First Floor Columns	$4.56m^3$
	7	Beams	$33.82m^3$
	8	First Floor Slab	$32.76m^3$
	9	Concrete in Staircase	$32.12m^3$
	10	Roof Slab and Gutters	$13.64m^3$
		TOTAL	$259m^3$

D

MATERIALS	NO	LOCATIONS	QUANTITY
Granite Chipping	1	Floor Finish	$16.95m^3$
		TOTAL	$17m^3$

REINFORCEMENT

MATERIALS	NO	LOCATIONS	QUANTITY	UNIT PRICE	N:K
6.00mm Iron rods	1	COLUMNS	No 43 Wt 0.10tons		
	2	First Floor Slab & Beams	155 0.35		
	3	Roof	314 0.70		
	4	STAIR-CASES	17 0.70		
		TOTAL =	2.00tons		
10.00mm Iron Rods	1	Foundations	190 0.99		
	2	First Floor Slab and Beams	1446 7.4		
	3	Roof	533 2.70		
	4	Stair cases	21 0.10		
		TOTAL =	12 tons		
12 mm Iron Rod	1	Foundations	29 0.25		
	2	Columns	27 0.24		
	3	First Floor Slab and Beams	184 1.60		
	4	Roof	126 1.10		
	5	Staircases	12 0.08		
		TOTAL =	4.0 tons		
16mm Iron Rod	1	Columns	147 2.05		
	2	Roof	1 0.01		
		TOTAL =	3.00tons		
20mm Iron Rod	1	Columns	43 0.86		
	2	First Floor Slap and Beams	78 1.6		
	3	Staircases	40 0.07		
		TOTAL =	3.00tons		

MATERIALS	NO	LOCATIONS	QUANTITY	UNIT PRICE	N:K
25mm Iron rod	1	First Floor Slab and Beams	No 73 Wt 2.6tons		
		TOTAL	= 3.00tons		
23cm Blocks	1	Well of D.P.C.	910		
	2	Ground floor and stair room Block Work	9295		
	3	First floor Block Work	8438.4		
		TOTAL	18643.4		
15cm Block	1	Ground Floor and Stall room Block work	922		
	2	First Floor Block work	902		
		TOTAL	1824		
Timber Pieces 30 x 370		FRAMEWORK to GROUND FLOOR Beams (1), (2), (3), (4), (5), (a), and (6).	984 Pieces		
50mm Plywood		Doors Types A	35 Pieces		
80mm Plywood		Doors Type B	15 Pieces		
0.625 Celotax		Ceiling	158 Pieces		
Roof Trusses		Roof Tresses	24 Number		
Roof Sheets		Roofing Sheets(Alluminium)	239 Sheets		
Bitumens Felts		Roof Slab and Roof Gutters	683.88Kg = 0.70tons		

LABOUR SCHEDULE:

No	OPERATION	WORK CONTENT	Zr	At	Total m/h	%R	N : K
1.	Clearing of Site						
2.	Arrange Electricity and Water						
3.	Set out Building						
4.	Temporary Building and Fence						
5.	Erect mixer & Water Tank						
6.	Excavate Column Based and Trendes	186m^3					
7.	Escavate Oversite 15cm	1792m^2					
8.	Bends Place Steel Bars in Foundation	2 tons					
9.	Concrete base & Strip Foundations	84m^3					
10.	Bend Place Steel Bars in Ground Columns	0.40tons					
11.	Formwork to Ground Columns	53m^2					
12.	Concrete Ground Columns	3m^3					
13.	Blockwork from Foundation to D.P.C.	191m^3					
14.	Return Fill around Foundation	110m^3					
15.	Filling Hollow Blocks from Ground	17m^3					
16.	Hardcave filling 15cm	129m^3					
17.	Shettering to Ground Floor Slab	129m^3					
18.	Concrete Ground Floor Slab	714m^2					
19.	Bend Place Steel bars in Ground floor Columns	1 tons					
20.	Shutten to Ground Floor Columns	41m^2					
21.	Concrete Ground Floor Columns	9m^3					
22.	FWK to 1st Floor slab beams and stairs	503m^2					
23	First Fix Electrician						

No	OPERATION	WORK CONTENT	Zr	At	Total m/h	%Pr	M:K
24	Ground Floor Blockwork and lintel	1032m^2					
25.	Bend place Steel bars in First Floor, Slab beams and Stair	15 tons					
26.	Concrete 1st Floor Slab beams and Stairs	85m^3					
27.	Strip FWK to 1st Floor Slab, beams & Stairs						
28.	Bend Place Steel bars in First Floor Columns	1 tons					
29.	Formwork to First Floor Columns	35m^2					
30.	Concrete First Floor columns	3m^3					
31.	First Floor Blockwork and lintels	980m^2					
32.	FWK to Roof Slab beams & Gutters	443m^3					
33.	Second Fix Electrician						
34.	Bend Place Steel in Roof Slab, beams and Gutters	5 tons					
35.	Concrete Roof Salb Beams Gutters	17m^3					
36.	Second Roof Salb	171m^2					
37.	Strip Formwork to Roof Slab, Beams and Gutters						
38.	First fix plumbers						
39.	Bitumeous Felt	308m^2					
40.	Fix M.S. Angles, Bates and Bars	974 No.					
41.	Second Fix Plumbers						
42	Fix door, Window Frames & Mullions						
43.	Third Fix Electrician						
44.	Scaffolding						
45.	Plaster, Render Wall Tiles	5322m^2					

No.	OPERATION	WORK CONTENT	Zr	At	Total m/h	%Pr	N:K
46.	Final Fix Electrician						
47.	Glazing	806m^2					
48.	Fix Door Frames	134m^2					
49.	Screed Florring	1020m^2					
50.	PVC. Tiles	316m^2					
51	Grano Flooring	862m^2					
52.	Carpentry and Fitting						
53.	Weld M.S. Bars Handrails to Saairs	158No					
54.	Painting and Decoration	6469m^2					
55.	Demolish Temporaty Building & Fence						
56	Level Clear Site						

6.6 Phase Two Controlling Contract Award Uncertainties

6 6.1 Rational Approach to the Appointment of Consultants and Registration of Contractors

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

Traditionally architect is expected to be contacted first before the others and he is supposed to coordinate the activities of the others. Today there is the

general feeling that client as the owner of the project also reserves the exclusive right to appoint other consultants with or without the eventual 'expected Coordinator's knowledge.

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

The haphazard approach has a lot of inherent disadvantages ranging from social abuse to unsatisfactory performance, cost and function wise.

The following approach may ease the continuous pressure on the client which is now the case.

(1) Advertise project envisaged for competitive design.

(2) Advertise for cost estimate preparation.

(3) Appoint project planning Committee to consider submissions and other conditions.

(4) Allow short time space between submission and the appointment of the project planning committee to avoid undue interactions.

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

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

Registration of contractor seemingly rational has its own loop holes which renders the process unsatisfactory. It is required of the intending contractors to supply certain informations which cannot be verified. Therefore false claims are often made.

Compilation of a list of firms does not guarantee that those on the list are the best for the project being envisaged.

The contractors on the list of the client also constitute pressure group capable of taking advantage of their 'power' or opportunity. It is more so in that they have to pay a prescribed sum for a place on the list.

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

(1) Register contractors on the basis of project on hand.

(2) Avoid long period of relationship to minimise social abuses.

(3) Appoint a temporary project tender committee/ Board.

Contract Award:

Determination of the market potential will be necessary in arriving at a decision on who the contractor should be especially as this will affect their (Contractors) overall performance. The certainty or uncertainty of market will affect the organisational structure of construction firms as to what they can do or want to do and who they retain on their payroll. The pre-registration requirements may not be ideal in this regard.

It is therefore first necessary to appraise government policy regarding development plan, level of private investments, and the timing of the implementation before registration of contractors. This is to shut the door firmly against 'looters!

Additionally the project requirement will need to be ascertained on individual basis for stratification of the contractors especially that each project has its own characteristics. This is to eliminate having to get committeed to one particular contractor, qualified or not qualified for the job on hand.

The advent of sub-contracting business is a way of promoting a more positive value for specialisation. This situation helps to create more uncertainty as the number of separate and independent organisation's increases.

In the main, since sub-contractors are usually smaller they normally develop the attitude of holding back for fear of uncertainties in the market situation for as long as possible.

Also in most cases because they are directly appointed by the owner, control over their activities on the construction site is difficult. They rely on owners to get job not the main contractor.

The aspect of 'Time and Progress' in which it is stated thus:-

"The contractors attention is drawn to his responsibility for the coordination and programming of subcontractor's work. The contractor is expected to arrange suitable programmes with his subcontractors and to check regularly that such programmes are adhered to. Where delays arise in connection with subcontract works, the contractor will be expected to have been aware of such at an early stage and to have taken appropriate action defined in the sub-contract document by giving of such notices as may be required in preparation of the determination of same. Determination shall not be effected without the prior consent of the architect but request for extension of the contract period on the ground of delay by sub-contractors will not be considered unless the contractor can establish requirements."

This conditions must have been inserted with certain good intensions. Unfortunately it is hardly observed. Condition of appointment of sub-contractors

leave no room for its application. One may ask how realistic it is for a contractor to do as specified above effectively when the appointment of some sub-contractors are made during the progress of the work.

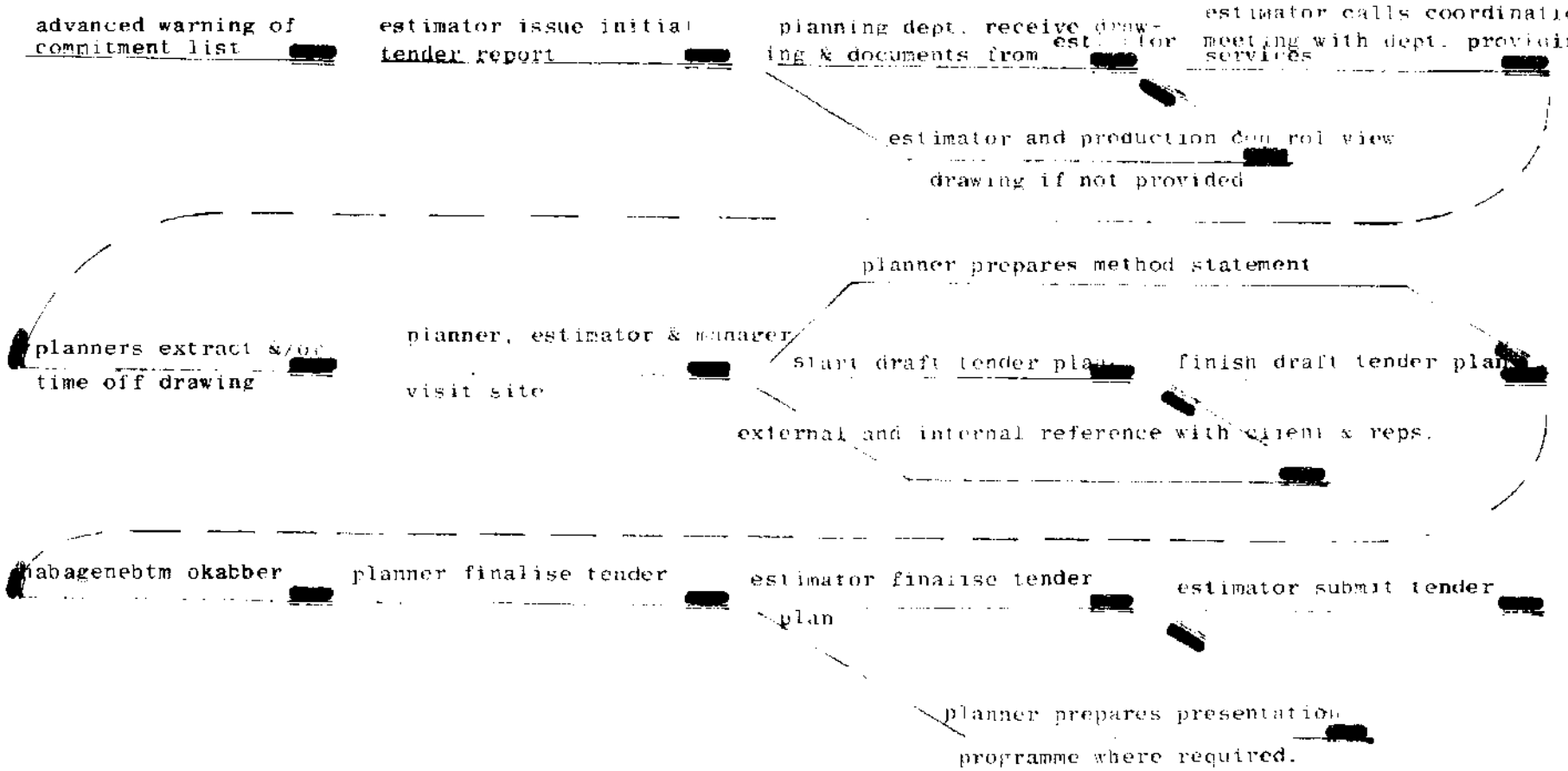
Tender Board/Project Planning Committee.

The idea of tender board in itself is not bad but its function is misplaced and the stage at which its participation is required is wrongly timed.

The function of the board is essentially to advise on the project to be undertaken and the selection of the contractor. This unique position tend to impair both the judgement and decision of the board members. Objectivity may be subdued by rivalry and in the end cooperation throughout the duration of the project will be quite difficult to accomplish.

Participation of the board at the tender stage is not helpful to the course of the project if it is the same board that took the decision initially on the anticipated cost of the project. The problem is how realistic is the discussion on the submitted anticipated cost. If therefore the same board is to decided on what to spend and what to accept there can be no realistic deductions. Everything may be based on false premises.

the problem



TENDER PLANNING STAGE - SEQUENCE OF EVENTS

FIG. 6.02

(e) The rules themselves will not be susceptible to government or other external sanctions which will render them ineffective.

(d) The players can actually play the game

Tender rules are neither stated adequately, nor adequately at least not in the sense that public accountability can best be served. The tenderer is left at large to choose an approach of his own to arrive at a tender figure which is now compared with other submitted tenders under a standard practice. The quantity Surveyor's estimate of the project becomes the yardstick or a 'court statute'. It should be an ardous problem for a tender board', particularly inexperienced board, to determined the authenticity of the tender figure which is based on the theoretical manipulation of the quantity surveyor on the one hand and the "practical" calculation of the contractor on the other hand.

There is the general tendency to assume that contract documents can substitute tender rules. These documents only contain information pertaining to the basis upon which the individual competitors can arrive at a tender sum following his own approach. These documents invariably contain loads of irrelevances as well as ambiguities. These inherent deficiences coupled with doubtful approaches have tended to reduce the probability of a realistic tender sum. It has been mentioned somewhere else in this thesis that tenders are often invited on bills

of quantities prepared from incomplete information leaving important details to be settled by variation orders. As a result one gets a false impression of the actual costs of projects in the country today because control is slack, practices are faulty and a lot of unnecessary claims have to be made upon the owner's financial resources.

Preparation of tender figure for a project is strictly on the basis of the experiences of the individuals on similar projects carried out in the past as well as the prevailing situations. This condition renders ineffective the laid down principles and strict adherence to the rules creates problems for both the tenderer and the body receiving it. The 'cut and fill' approach comes into play particularly in the case of public works. Ironically it is the rapidity of change of government sanctions and the public attitudes that are responsible for the distortions in the seemingly established approach.

It is evident, therefore, that contractors must price on the basis of the conditions which they expect to meet during the contract and include an allowance for possible disorganisation arising from variations and government policy as well as the public attitudes.

A successful tender must be based on sound principles and a realistic approach. This entails certain guidelines which are dependent upon the structural definition as well as the policy of the organisation, technical ability and the available resources for the project execution.

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

Apparently these qualities are lacking in most of our contracting firms today who have to rely on external aid and unfortunately governments' attention has not been firmly arrested to effect a change for the better.

Two basic things may and do arise as a result of these deficiencies. There will be cost-over-run or cost under run, and time over run plus poor quality work.

It is against this background that modification of the existing approach becomes quite appropriate in order to obtain realistic estimate.

New Arrangement for Tendering

Project cost is determined by:

(a) Cost of manpower or (Mp) times

(b) Activity time (At) per unit plust

(c) Material cost (Mc) plus

(d) Plant cost (Pc) plus

(e) Profit (Pr).

These can now be denoted by the following abbreviations:-

Cost of manpower	Mp
Activity time	At
Material cost	Mc
Plant cost	Pc
Profit	Pr.

The cost of any item of work as described in the Bill of Quantities normally follows the under mentioned procedure

Mp x At + Mc + Pc + Pr = Cost per unit. This means that for a blocklayer laying a

block wall will earn

Hourly rate x Labour constant + cost of block and morter + tools money. The cost of any assistant will be added up the same way.

The addition of all these for every item in the building builds up to make the project cost that is Mp At Mc Pc Pr is added to another Mp At Mc Pc Pr of every item in the building to arrive at the project cost.

Since this procedure is expected to be followed by every tenderer the prize variation of any project should be quite close and less confusing to those who are to make selection. Unfortunately this is not so of tender figures usually received in this country.

The areas of possible great disparity in the contract sum, quite apart from those already enumerated in this section can easily be identified. There are:

(i) Material cost (Mc)

(ii) Activity time (At)

(iii) Profit allowed (Pr)

These seem to be the uncontrollable factors. The only controllable factor is the hourly rate as stipulated in the NJIC (National Joint Industrial Council) in which the country has been divided into zones. The rate of pay in each zone has been stipulated including all the necessary allowances for each grade of worker.

Material cost can be controlled to a certain extent if the government can take appropriate action especially that most of the building materials are imported. However since the buying of material involves private arrangements between individuals it will be assumed that the price is uncontrollable.

In the new approach to the calculation of project cost materials and special items costs can be isolated.

(a) because it is not under the control of the contractor and

(b) because it is closely associated with over 50% of the sources of variation either as a result of non-availability or delayed delivery.

This can form the basis of one tender as will be described later.

The basis for a second tender will be the labour and plant aspect as these are strictly contractor's own obligation.

The split-up has a number of advantages as will be noticed in the next chapter. It is sufficient to say here that the main concern in the preparation of the Bill of Quantities seems to be the provision of a common basis for the contractors wishing to tender rather than emphasing what has to be done and the amount of materials needed in the case of each job. Even where description are provided, these are burried in the preambles. This practice makes pricing quite tedious and uninteresting.

6.6.3.1 Tendering for Materials and Special Items

Leslie Chadwick,[7] lecturer in Financial Management, University of Bradford Management Centre has observed

> "Time are getting hard boys, money's getting scarce, may be an old song but very true of the current business environment."

In the light of economic recession in Nigeria today coupled with other environmental constraints, this observation should not be taken lightly. The industry has become so pre-occupied with labour productivitity that it has tended to ignore the productivity of the capital employed.

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7. Chadwick Leslie "Materials Management Profitability and the Conctruction Industry Building Technology and Management. Feb. 1982

Building materials and special item supplies impose a major constraint on the productive capacity of the construction industry in this country as we rely heavily on their importation. As a result there is scarcity leading to highly competitive prices of what constitutes over 50% of the building costs.

There is also delayed delivery retarding work progress on sites as well as subsequent fluctuation resulting in claims which client must bear. Non-availability of these essential specified commodities has led to variation orders involving a revision of architectural drawings. Such revisions in most cases involving substitution of alternatives constitute a loss situation to the client in that no longer can the first choice be satisfied either because the substitute is inferior or superior. These are all contradictions of the original bargain.

Delayed delivery will temporarily halt site progress. This halting - progress affect both the firm and the owner. A firm may have nowhere else to divert his labour resources and therefore continues to pay for workers who are idle on the site. Delayed progress result in extension of time and possibly monetary claims from client apart from the fact that the clients expected returns on investment is also postponed.

Table 6.1

	Materials Cost %	Labour Cost %	Overhead %	Profit %
Construction Industry	51	29	13	7

Cost Profile of the Construction Industry.

Table 6.2

	Materials Cost		Labour Cost		Over Head Cost	
Construction Industry	% Increase in Profit		% Increase in Profit		% Increase in Profit	
	2% Cut	5% Cut	2% Cut	5% Cut	2% Cut	5% Cut
	14.6	36.4	8.3	20.7	3.7	9.3

Effect on Profit of Cutting Costs.

Table 6.3

Construction Industry	Return on Capital employed %	% Reduction Required		
		Materials Cost	Lobour costs	Over Head costs
	18.3	7.51	13.21	29.46

Cost Reduction Required to Increase Return on Capital Employed by 10%

SOURCE: Building Technology & Management Feb. 1982 PP8.

Chadwick's tables have shown how important materials Costs are to the industry and as such materials management is one area in which substantial savings could be made and profitability increased.

Materials management in a sort of way has been introduced into the design scheme in the manner suggested earlier. The recommendations in this section is to add another dimensions which may oblitrate or correct some, if not all, of the problems highlighted above.

At the design stage the management of materials includes the user's analysis to determine need from want and the ground work to establish whether or not what are about to be specified are procurable. The subsequent specifications must take into consideration and findings at this stage to avoid crisis situation later.

A project manager has been charged with the responsibility of linking up the design team with the suppliers after approval has been granted by the owner regarding which materials and components are to be used.

After such an approval has been granted the project manager is to send out enquiries to prospective suppliers and ask for quotations for each item in the unit of measurement as will be contained in the bill of quantities. Further information to be given will include:-

(i) Quality required

(ii) Where and when required

(iii) Approximate quantity

(iv) Statement of any special conditions.

Acceptance of the received quotation is then sent to the supplier(s) and a contract for the supply of the items listed is signed.

This early agreement between the designer the client and the suppliers forestalls the dangers of non-availability, fluctuation and late delivery.

After the preparation of the bill of quantities full specifications of the required items and their exact quantities will now be sent together with the conditions of contract in the normal way stating each others obligations.

FULL DESCRIPTION OF ITEMS	QTS	UNITS	RATE	₦ : K

6.6.3.2 Tendering for Labour:

In tendering for Labour three factors are to be considered:

(i) Activity time (At)

(ii) Porfit allowed (Pr)

(iii) Zonal rate (Zr)

It should be noticed that Zr has been substituted for (Mp). This is so because the hourly rate for each grade of worker in each zone including tools money and/or equipment cost has been determined by the NJIC. The use of the nationally established rate will minimise the disparity between the tendered sums of the competing firms and reduce the selection problems since there are now two factors which will be considered along side other policy matters.

The two factors are:

(i) Activity time (At)

(ii) Profit allowed (Pr)

The use of arbitrary hourly rate has now been removed.

Therefore labour cost (Lc)

= Zr x At + % Pr

Unit Lc = Zr At + % Pr

Total Lc = Σ(Zr At + % Pr)

The (At) inserted plus the submitted method statement by contractor should allow the persons considering the tender sum gain sufficient insight into the possible completion date and the quality of workmanship.

If time is the determining factor the mean (At) of all the tenderers can be taken and the one with closest time is used

JOB DESCRIPTION	QTY	UNIT	Zr	At	% Pr	Total

In addition tender enquiry schedule for labour should include those significant factors which will affect the contractor's management and which are not in the schedule, such as:

(1) Size of contract and type of building (whether storey building or bungalow)

(2) Location.

(3) Type of construction.

(4) Start and completion date of contract

(5) Special restrictions.

6.7.0 Phase Three: Controlling Construction Uncertainties

6.7.1 Promotion of Team Spirit and Coordinated Supervision

Mosaku[8] has observed that the relationships of those concerned in the mounting and executing of building works have tended to be based upon the assumptions that contributions can be complete in themselves, and that each will aim at sequential finality so that subsequent ones may follow on".

The inherent dangers of this observation has been uncovered in the control of the uncertainties at the other two previous 'phases'.

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8. Mosaku T.O., "Study of Building Performance." M.Sc. thesis 1968 University of Manchester Institute of Science and Technology.

Perhaps the greatest single influence shaping the present day construction process has been the continuance of this adversary relationship implicit in the normal contract procedure.

The design process often down to the smallest details is carried out by architects and other consultants without reference to those who ultimately will be engaged on the building work.

Contractor, along side his competitors then fights for the job in the financial sense and, having won the contract is thereafter regarded as lacking in trustworthiness, competence and interest in the quality of the finished product. The consultants on the other hand are, in contract terms, whiter than white, the guardian of the client's interest and the public good.

As a result of this, the contractor understandably wishes to avoid more than necessary liability and is positively discouraged from taking initiatives. The contreact clearly spells out the role. His job is to ask for information to be supplied and within the rules of the game, to be ready with a claim if it is not forthcoming at the right time and in sufficient detail.

The contractor for many years has remained in this position of passive receiver of information who is expected to do what he is told to do. This practice militates against cooperation and team spirit.

Sceptism and suspicion are the off-shoots of both direct and indirect commission of consultants as well as the appointment of nominated and non-nominated subcontractors and suppliers. This renders coordinated supervision practically difficult if not impossible. The practice of nominated subcontractors and nominated suppliers, apart from constituting a source of unrealistic Prime cost sums and Provisional sums, constitutes retardation of the site progress.

(1) Coordination of the consultants activity should be done by the architect by virtue of his being the closest to the client and the first to be appointed.

(2) Indirect commission of other consultants through the architect may be advisable where the clients organisations is not technically equiped to deal with many consultants at a time but provided that arrangement for the payment of their (other consultants) dues has been crystalised and penalty spelt out in the case of a breach of trust.

(3) Direct Commission of consultant and the appointment of subcontractors and suppliers may be adopted where the client's organisation has the technical personnel to deal with the multiplicity of such other organisations.

(4) The issue of subcontractors and suppliers should be handled at a much early stage of the project process.

(5) Since the project completion date as well as the quality of performance on the site is usually the responsibility of the main contractor, the coordination, control and monitoring of progress of site operations should be made to rest firmly in his care.

Getting Paid for the Job

One of the greatest problems militating against satisfactory execution of the project programme is finance. It causes disunity discord, confusion, and slow progress. It has been found to cause delays as well as breach of trust.

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

To avoid delay of work progress as a result of delayed payment it is proposed that:

(1) Project account may be opened in a convenient bank after working out the details of the project programme, and duration of the project.

(2) how much may be required for the project within certain regular periods throughout the duration be determined or estimated.

(3) a list of all the parties that may make claims and their representatives be submitted..

(4) the format for making claims and recognised mark of the certifiers be decided and designed.

Valuation will be made in the normal way or as prescribed somewhere else in this thesis and certified by person(s) specified in the conditions of contract for interim payments.

This same procedure for payment will be applicable for consultants especially if appointed by architects.

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

6.7.2 Promotion of efficient information and communication links and avoidance of delays.

No job of construction is a standard task. New problems requiring creative management arise constantly, demanding immediate application of resourceful inventiveness.

Unfortunately this fact has not been fully appreciated by those who are responsible for making building contract. It explains why one project was successful and the next a failure even if undertaken by the same person.

Many contractors often assume that they have the organisation and competence to fulfill contract requirements and meet completion schedules, but these assumption evaporate in the face of necessity.

A lot of intangibles are burried in the requirements of a contract documents resulting in loss of motion, chaos, and confusion due to improper organisational details. Faulty administrative procedures make a large contribution to inefficiency in the construction industry. Some of them involve contractors in great wastage of time and effort on site and resulting in additional cost which may not be recoverable except by a general increase in tender prices.

In the development of the concept, and as earlier in this chapter suggested design specifications should be rationalised especially with respect to both user and project requirements. Particularly so that the required items are sometimes difficult to procure in the market plus the fact that the firmness of client's mind cannot be guaranteed.

To cope with these problems the principle of non-optional solution may be applied at the design stage whereby alternate decompression and compression is used. Designer having tabulated all known factors of delay in rank order the reversal of the order should be possible with known consequences. This will be possible in the light of the project goal. Definition of project goal may be in terms prompt completion time and at planned cost, good quality work aesthetically, functionally and structurally. This, supported by sound record keeping will enhance progress.

It is usual to issue further drawings and details to the contractor, and it is a fairly common practice to list their numbers and titles on architects instructions which provide no other information. The drawings may be different from previous issues as they frequently carry minor corrections or work which is different from the earlier drawings or at times work which is different from that included in the contract. How is an illiterate, or any contractor for that matter, to know? Even when there are notes on each drawing to say that alterations have been made there is usually no detailed explanation of the extent and nature of such changes. Contractor is therefore presented with a problem.

Sometimes variations are implicit in the drawing. This means that the contractor must request or confirm receipt of instruction, amend his orders, adjust his stocks and reconsider his programme. If there is no clear information and instructions from the architect or supervising officer he is required under the contract to proceed with the additional work and to find out if variations are actually required. It is expected that the contractor should subsidise this lapses from architect's office by a great unpaid additional effort. This sort of additional sacrifice has to be paid, for one way or the other.

To avoid 'loading' the estimate of extra work delays and reduce contractors uncertainty, therefore, the following precautions should be taken.

(1) Check and recheck drawings before leaving the drawing board against copies of the contract drawings and against items in the contract bills. This will ensure that unnecessary variations are avoided and will as well explain and amplify requirements which were already in the contract.

(2) Further drawings should carry sufficient informations as regards:

(i) Reference to the work affected.

(ii) Purpose of the work - whether addition, omission, alteration, clearance of discripancy etc.

(iii) Identification mark of the relevant drawing.

(iv) Location of the job affected.

(3) Description of the work to be done in the form of specification.

(4) Numbers, volumes and dimensions of the work.

(5) Notes on labour and materials used as agreed between the site supervisor and the client's representative.

(6) Information should be transmitted to all parties that may be affected or may need to play a specific role in the determination of the outcome of such instruction particularly the quantity surveyor who needs to know promptly and with fair degree of precision, the nature of the changes for the prupose of valuation. The supervising officer should also have to know whether variations are significant in contract terms.

In addition to the above information to be carried in respect of the job to be done a further information will need to be added to give complete picture of what is happening. This will ensure that no duplication fo work is done as well as minimise the contractor's administrative problems.

(1) Clear statement concerning the numbers, dates and titles of all drawings superseded by the new drawings specifically stating that they are no longer to be used for the contract.

(2) The numbers, dates and titles of all new drawings which are being issued, with the instruction that they are to be used for the work upon receipt with no further delay.

(3) Any further information which may affect work progress and financial commitment should be clearly stated.

The obvious advantages of this approach can be seen as stated in the opening paragraph. Perhaps what should be added here is that the situation will be less confusing and as such will avoid costly errors.

Efficient execution of sub-contractors work is dependent upon advance planning and regular communication between all parties architect, main contractor and the sub-contract. There are many cases of poor or non-existent contractor.

The main contractor, in particular, has responsibility to the sub-contractor in setting up and maintaining good communication, in providing proper attendances and services and in ensuring that all ancillary works by other trades necessary for the smooth and efficient flow of work are carried out at the proper time.

6.7.3 Promotion of Quality Control System:

Improved quality of workmanship on building sites is dependent upon architect-design solution to common details or standard problems especially in the face of acute shortage of qualified manpower and supportive technology. Also on the quality of site personnel as well as the contractor's and other supervisory's contributions.

About 50% of building failures are due to faulty design. This is so because most of our designers will like to insist on not wanting to violate their design freedom or demea. their professional dignity by trying something dramatic. Good design solution after all are based on build-ability, simplicity, functionalism, and durability. These are sound professional educational knowledge supported by experience.

Architectural education places too little emphasis on construction technology and site practices. This view is buttressed by the specification of workmanship and tolerances which are practically impossible to achieve and in worse cases also irrelevant to the given situation. The infamous scissors and paste type of specification still making regular appearances, is composed entirely of sections . c lled out of the old documents full of contradictions and irrelevances.

Ironically too, emphasis on building materials science is in the schools of buildings and not in the schools of architecture even though the important consideration in selection of materials is not in the purchase price but in the availability and applicability on construction sites. Therefore when architects commit themselves to specifying materials and a component it is difficult to relate this to the background knowledge which might have been used as a basis for their judgement. It is neither on the basis of education received in selection and specification nor is it on the knowledge of material

science. Invariably, they rely mostly on the manufacturer's model specification thus transferring the risk on to the contractors who do not read specification until it is too late. This has an effect on standard of workmanship and tolerances.

Designer must endeavour to design out faults and not to design them in at the original specification or drawing board stage. Mosaku[9] has remarked that poor quality work could be as a result of contributory negligence of both the design and execution. The institution of defects liability period is at least a recognition of the contractor's own share of the blame but what happens beyond this period has never been linked up with original bad specification. Appendix (6) shows a list of defects at the handling over stage of one of the projects used as case study. Mosaku[10] has also observed that materials specification in certain cases has not altogether been based on the working performance but on trial and error. This tends to get corrected as the make good operation is being carried out.

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9. Mosaku T.O. "Critical Appraisal of Lagos University Buildings Research Paper 1970.

10. Mosaku T.O. "Maintenance Records: Designers Guide Research Paper Archiforum No. 1 Zaria 1976.

Much as the designer may endeavour to provide rational solutions the attitude of the site personnel may still seriously hamper the quality of workmanship. It was found that workmanship problems were caused predominantly by lack of care on the part of the trade-smen, rather than by lack of skill or knowledge. Poor workmanship, therefore, is inexcusable in certain cases. It reflects badly on the management training and supervision. Roberts[11] has said as a result that "the generally accepted remedy to this situation is not simply to have more supervision, but to have more able supervision".

Nigeria that has a very low supervisor/operative ratio must not only train more but also improve the quality of their training. It is ludicrous to suggest that today's site supervisor can adequately learn the necessary skills simple from experience alone. This route is fraught with difficulty and is based on misconception that adhoc training can be better than planned training. The pitfalls of experience alone are often apparent, particularly in the smaller companies without the specialist back-up resources from the head office.

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11. Roberts W.G. "Innovation in Materials and Technology Makes a Major contribution to Defects and Failures in Building". Building Technology and Management May 1982 pp. 16.

Problem of social abuse particularly the "infamous saying that 'one good turn deserves another' makes it difficult for most client's supervisors on our sites not to turn their blind eyes on poor quality work. Repeated complaints on a badly executed job suggest that both the supervisor and the contractor might have been playing for time. These supervisors are maligned figures in the industry who may have considerable influence on quality of work.

Modern production techniques demand a higher degree of accuracy in detailing than the traditional rebated system which incorparated scope for adjustment during the assembly process. The industry is not fully aware of the implications of the evolution of industrial building methods. It continues to rely on methods of communication, control and sequences or erection of traditional processes.

Designer must be prepared to specify tolerance in design and to insist upon them, and the amount to which the contractors are prepared to control accuracy during construction and the relationship between contractor, sub-contractor, and manufacturer in maintaining required standard of control.

Often on our sites dimensional limits showed lack of consideration for the accuracy achievable within resonable costs. The problems of 'fit' were rarely dealt with explicity in design and clauses related to

tolerances included in the general specification were often regarded as a ritual which bore relationship to job requirements.

One of the main difficulties was an apparent lack of working knowledge of available standards, these tend to be used as 'blanket' clauses in the specification rather than related to specific assembly details or to the method of attaining improved levels of accuracy.

Areas of conflicts in dimensional coordination and quality control include:

(a) Supply of manufactured components to be fixed well after construction of their "housing" e.g. mechanical plants and air-conditioners or door frames.

(b) Misunderstanding between designers, manufacturers or contractors occurs when the permissible deviations on, or definition of critical demensions are not given or made clear from the drawings.

(c) As the number of interrelated critical dimensions increase the chance of misfits, the number of critical points in assembly should be kept to a minimum.

Design of many fixing devices do not have sufficient capacity for adjustment on site. This has led to cutting away part of an already existing member which may seriously affect its quality and performance.

Such inconsistencies may have been as a result of:

(i) Architect not recognising that the variability of construction lay outside the limits as specified unless some rectification was necessary which was then brought to his attention.

(ii) Architect not having sufficient confidence in tolerance specification to justify them in practice.

(iii) Architect unwillingness to accept delays resulting from work being carried out strictly according to specification. By turning a blind eye he allows the contractor to make good as he thought fit.

(iv) Architect seems to feel that he had no way of bringing pressure to bear on the contractor to ensure quality or to rectify faults. One difficult area which needs examination is the extent to which sactions can be imposed against failure or reward given for success.

On the other hand contractors inconsistencies may have been as a result of:

(i) Assumtion that corrections are normal part of the building process.

(ii) Not being fully aware of what sanctions could be applied by project architect against misfits or substandard work.

(iii) Split responsibility between subcontractor and the main contractor which tends to aggravate this problem of quality control unless where these responsibilities are clearly defined and understood by all parties.

Improvement on quality control:

(a) Greater care should be exercised by architect and members of design group in emphasing critial dimensions and specifying the required level of accuracy for each stage of design.

(b) If standard are to be maintained then architect cannot afford to abdicate his responsibilities towards specifying and checking accuracy in the building process.

(c) Contractors on the other hand must see their responsibilities to exercise quality control over the accuracy of production. It is also important that contract structure should be coherent and the responsibilities of manufacturers

and subcontractors and the contractors' relationships with those other parties be clearly defined.

(d) Standard performance specification should be stated against work to be done rather than in the general specification contained in the preambles which contractors do not read.

(e) Education and training of both the designer and contractor should compensate each other in the areas of conflicts.

Roberts[12] reminds us finally that "quality is a function of time and cost· clients and architects should not expect a 'silk purse' building for a 'snow's ear'. More often than not most jobs are programmed on tight time schedules and budgets in Nigeria today. No allowance is ever given to limitation of the contractors market both in terms of estimating and project execution capabilities. The variability of tender figures can be very great thereby suggesting that cost as yardstick for selection of contractor may be misleading.

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12. Roberts, W.G. "Innovation In Materials and Technology Makes A Major Contribution to Defects and Failures in Building" Building Technology and Management May 1982 pp. 16.

CHAPTER SEVEN

7.0 MERITS AND DEMERITS OF PRESENT AND IPMC SYSTEMS

The application of a new system is bound to meet with resistance and objections naturally. This resistance is even more likely to be stiffer in the case of a system that treads the toes of a number of parties such as in the building project development. It is therefore necessary to run a commentary on the merits and demerits of both the existing and the new systems in order to stimulate acceptance and implementation.

New system can cure a number of the existing ailing problems but itself must be polished and refined as time goes on to increase its significance. We are living in a world of shifting ideas. We can never be sure that our conceptions represent the truth or that our formulations are unique and solidly determined.

Both the present and the proposed systems operate at three distinct levels - the design, award and construction. Therefore the essential differences are in the mechanics of operation rather than in the sequence of the interfaces. While the present system has a fractured approach, the proposed system tends to integrate. Fragmented or fractured approach tends to compatimentalise and when we compatimentalise little is known of what is going on in other areas of the project.

This becomes obvious if one looks at the present approach to project development and management processes.

7.1 The present System: Merits and demerits of the present system can be summarised as follows:-

(a) Design

Merits - An obvious advantage is the fact that the designers are encouraged to produce more innovative architecture based on the basic information received from the client.

Demerits -

(i) Freedom of architectural expression leads to biases not favourable to clients/users.

(ii) Freedom leads to experimental solutions rather than rational solutions with the result that materials and methods are specified without consideration for availability or non-availability.

(iii) Lack of materials and/or technical capacity lends support to most projects being rife with delays during construction stage.

(iv) No proper basis for capital funding, purchase of and investment in, equipment, and development of efficient processes if the contractor can never be sure of what the design team can produce next.

(v) Poor information flow due to lack of understanding of the problems of the other team members emanates from the design.

(b) Contract Award

Merits:

(i) It has been going on for a very long time and accepted by many people who are apparently used to it

(ii) It has worked in many cases to people's satisfaction.

(iii) It can easily be manipulated as a result of wealth of knowledge now available on it.

Demerits:

(i) Registration of contractors as being practised now encourages nepotism based on political affliation and ethnicism; patronage as a result of long association with client organisation and who may wish to distribute jobs on equitable basis.

(ii) No guarantee that the job on hand can be handled by such favoured contractor.

(iii) Registration processes concentrate more on being fair to the participants than ensuring quality output.

(iv) Tender deposit and processing fees policies now in vogue appears to be spawing undesirable off-shoots.

(c) Cost Control

Merits:

No apparent advantage in the present system except for the fact that the client may realise some income through the various registrations and deposits.

Demerits·

(i) Tender and tender documents take considerable resources to produce in terms of measurements, calculation and pricing. The processes are repreated for each contract giving rise to a considerable outlay of resources, for only one tender is accepted in the long run. The awareness by the tenderers of abortive tendering excercise leads to an addition of up to 5% recovery factor on building cost. This recovery factor is of course included in every successful tender· and yet it was to save cost and resources that the system was originally designed.

(ii) In certain cases the inability on the part of prospective tenderers to price building works on their own has led to the appointment of independent estimator with the following distinct disadvantages;

(a) estimate can only be a rough guide especially that the capacity and capability of the contracting firm cannot be competently essessed.

(b) cost control and monitoring of progress cannot be effective.

(c) contracting firm cannot come to grasp with reality of the works to be done as allowances made by the independent estimator are not known.

(iii) Estimator cannot possibly relate his prices to reality especially that the items in the bill of quantities are priced in accordance with records of a previously executed similar project. The approach is bound to be more speculative.

(iv) The bill of quantities system provides no feedback for the designer, nor is it a useful management tool for the contractor. Inspite of the time and care in the preparation, the contractor can only order materials from it at his own risk, and so in the main re measures the work for ordering purpose. Very often, some of the work is measured even yet again for the final account involving resources for three measurements.

(v) The language of the Standard Methods of Measurement and the Bills of Quantities is not the language of a common people usually found on the construction sites.

(vi) During construction the contractor has no incentive to control cost of building and often has large incentives to increase it. For example it is common practice in some cases to tender job low and make money on changes and extras later.

(vii) The fact that an estimator's prices and subject to adjustment by the governing Board of an organisation often leads to decisions to price certain items most likely to become of a factor in variation high whilst the others are priced low to compensate thereby making the total come out to the predetermined figure. This is not to say that firms are immoral, they are merely operating a system.

(viii) Contractor is not often provided with basic information in many cases, essential to his price - e.g names of nominated subcontractors, and suppliers etc.

(xi) Prime cost sum and Provisional sum are often misleading as these become subject for negotiation later on during the progress of site work.

(d) Production Control

Merits: Obvious merit is to the contractor who is ever ready to take full advantage of the uncertainties of design and contract award system to make claims.

Demerts:

(i) Contract supervision can be muddled up as a result of lateness in appointing subcontractors as well as the method of appointment.

(ii) As a result of the inherent disadvantages of committing huge amount of money to a job that may not be won, contractor is less inclined to accept more responsibilities in terms of organising for the job in the event of not winning the tender. Therefore subsequent winner will begin to organise for the execution of the project only after winning.

7.2 The IPMC System:

The IPMC system has its own merits and demerits which can be summarised as follows:-

(a) Design:

Merits:

(i) Design decision is more on the basis of interactive participation with inputs from the various parties to the project development and management.

(ii) Reduces the risk of designing for the specifying of non-available technology which often causes delay and poor workmanship.

(iii) As a result of further understanding during the exchange of views among the parties information can be more precise and more meaningful.

(iv) Ensures complete analysis which makes design more practical oriented than being utopian.

(v) Induces flexibility in the designer as cases are treated on their own merits to satisfy required condition.

Demerits:

(i) Allows no free expression of thought and may thereby tend to kill innovative architecture.

(ii) Inability to adapt may force some designers out of job.

(b) Contract Award:

Merits:

(i) It removes nepotism and other social ills associated with registration processes.

(ii) It ensures that the job on hand and the contractor are matched thereby reducing the risk of poor workmanship and slow site progress.

(iii) It promotes team spirit as appointment or selection is purely on merit as opposed to the feeling that one person might have been employed through 'contracts'.

Demerits:

(i) It requires time to test and accummulate knowledge for effective application.

(c) Cost Control

Merits:(i) Simplifies tender preparation techniques to reduce abortive cost or recovery factor usually added to contract sum.

(ii) Easy comparison of contractors' rates for tender selection.

(iii) Preparation of the bill of quantities allows for easy cost checks and valuation processes for interim payments.

(iv) It provides feedback for the designer as well as being a useful management tool for the contractor. For example the tabulation of cost benefits at the initial stage provides the designer easy reference point whilst the contractor is able to monitor his progress on the basis of actual rather anticipated figures.

(v) Simplicity in the preparation also denotes simplified language as well as relevant message.

(vi) Minimises variations and fluctuation which often result in extra cost of building projects.

(vii) Buying of materials on contract agreement guarantees savings in paying buying commission usually added by the contractor and in some cases guarantees award of discounts.

(viii) Can be related to National cost Indices as the cost parameter is standardised.

(ix) Considerable gain in time as prior agreement and contact had been ensured.

(x) Reduces the speculative aspect of tendering and the contractor is paid for only the job done.

(xi) Greater opportunity to provide data for cost planning.

(xii) Government sanctions may be avoided due to early negotiations.

Demerits:

(i) Proper coordination between supply rate by the client and the production rate of contractor may be difficult.

(ii) One extra person to contract may introduce a further area of conflict.

(d) Production Control:

Merits:

(i) Most decisions being based on analytical and corporate decision process promote swift progress on sites as well as guaranteeing control.

(ii) Progress on site can be measured more easily as a result of methods information presentation.

(iii) Rate of output of contractor will provide guide on the duration as well as the quality of workmanship.

(iv) Site supervision and delayed inspection is reduced due to the fact that not only is the right specification given but also the right quality in the right quantity is given.

Demerits:

(i) Contractor's responsibility is considerably reduced and may therefore be unwilling to cooperate.

CHAPTER EIGHT

8.0 CONCLUSIONS

8.1 Summary of Observations:

(a) Hitherto the industry is fragmented thereby making coordination and control very difficult. As a result a number of approaches have been adopted which were aimed at developing interrelationships between the various parties to building project development and management. Apparently the forces that determine the bond between these parties were never clearly stated. Therefore there is a vacum in the present system that need to be filled.

(b) The integrated project management control system disregards the nature of relationships and concentrates on developing the concept of interactive or corporate decision making approach in order to determine the forces binding the relationships. In other words the integrated approach which may yield the desired objective of a project development and management concerns more with the promotion of understanding between the parties that are related one way or the other. The analogous Venn diagram Fig. 5.05 shows us the areas where this understanding must be sought and in fact what each party to a project development and management should understand about the other party. The IPMC diagram Fig. 5.04 shows how such information can be passed on from one

centre to the other in a socio-technical system of a building project development and management.

(c) The extent of understanding or information needed can vary from time to time depending upon such factors as the individuals concerned the nature of the project environmental conditions and so on. Therefore Integrated Project Management control (IPMC) system is only a framework of the field of search for information required to promote understanding between the parties as well as to achieve the overall project objectives.

(d) The basis for the application of this system is dependent upon the development of effective and analytical approach to problem solving, effective technique of information dissemination, and the development of functional management techniques. This requires the presence of a logical and adaptive mind ready to operate in an atmosphere requiring teamwork.

(e) Success of the system is also largely dependent upon government's attitude especially that certain sanctions that may be introduced may help to shape the course of the system. Acceptability of a new proposal depends very much upon the government interest to enforce rules that may be quite pungent at times provided of course it can be justified. In Nigeria today the situation in the construction industry needs a bit of polishing to do to

it to ensure not only harmony but also a higher level of performance.

(f) IPMC can be applied to gain a common objectives which must project development and management processes seek to achieve. This common objectives are manifested in time and cost savings as well as personal satisfaction of the various individuals who may have a stake in it. Personal satisfaction is not easy to establish and neither can it be quantified. This is particularly so in that the individuals that come together to develop a project always have different interests to serve. This situation renders personal satisfaction a relative term of a compromise of conflicting interests. In other words the IPMC system utilises the idea of first seeking approval on every issue where conflicts may ensue.

8.2 Areas for further Research:

It has to be remarked that there can be no optimum solution to a given problem. Vacums do occur from time to time requiring attention. This may be as a result of new development or just for the fact that an omission had occured in the solution proposed earlier. Therefore the IPMC cannot be an exception to these rules.

Further research can be carried out in the areas of determination of the absolute volume of variables required for control purposes with particular reference to project and personalities involved. In this regard it may be necessary to classify project as well as personalities so that data bank can be established from where relevant information can be retrieved more quickly and more accurately. Such data only need to be updated from time to time in the event of any new developments.

Research will be appropriate too in extending the areas of intersection of the three project development interfaces. See Fig. 5.05. The bigger the area the better the degree of understanding between the parties and the nearer we are to obtaining the equation of union. This is approaching the situation when the parties to a project development can be personalised to be the user. In other words it is either that buildings must become prototype or users must become stereotype or both must occur together since the users and the developers (client, designer and builders) must of necessity remain separate individuals.

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APPENDIX 1

ARCHITECT _____ PROJECT _____ COST _____

CLIENTS _____

NIA LOG BOOK	197___	month 1	2	3	4	month 1	2	3	4	month 1	2	3	4
2.1 inception	brief taking												
	outlining brief												
	advising on consultants appointment												
	detial site and soil analysis												
2.2 preliminary design	detail analysis of brief												
	preparing describing and illustrating outline proposals												
	cost analysis												
	meeting of client for approval												
2.3 final design	preparation with structural engineer												
	full scale drawing in presentation form												
	full report with estimated cost clients approval												

Appendix 1 (cont'd)

ARCHITECT _____ PROJECT _____ COST _____

CLIENTS _____

NIA LOG BOOK	197__	month 1	2	3	4	month 1	2	3	4	month 1	2	3	4
2.4 design detail and production drawings	detailed drawing with specification												
	site plan in detail												
	structural drawing interrelated												
	bill of quantities and cost cheks												
2.5 from tender to completion	tender procedure taken throughanddrawingapprove												
	final detail drawing												
	site supervision												
	final report												
SUPERVISING ARCHITECT REMARKS													

APPENDIX 2

CONSULTANCY FEES PAYABLE BY THE PUBLIC SECTOR

The Federal Military Government has approved with immediate effect a new scale of fees payable by the public sector to Consultants whose services are required in the fields of Architecture, Engineering, Estate Management, Land Surveying and Quantity Surveying. The renumeration of the Consultants will be determined on sliding scales of fees depending on the nature and estimated cost of the work and the degree of difficulty.

SCALE OF FEES FOR CIVIL ENGINEERING WORKS

Civil and Structural Engineering Works have been classified into two categories.

These are:

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

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

The Consultancy fees payable for each category are as indicated in Table 1 and 2 below.

TABLE 1

Structural work in buildings and other stractures where a Consultant/Architect is appointed by the Employer.

Cost of Project	Class of Work	Proposed fee as a percentate of cost of project
Up to ₦250,000	Class A Class B	2.5 2.25
Next ₦250,001 - ₦1,000,000	Class A Class B	2.25 2.00
Next ₦1,000,001 - ₦2,000,000	Class A Class B	2.00 1.75
Next ₦2,000,001 - ₦5,000,000	Class A Class B	1.75 1.50
Next ₦5,000,001 - ₦10,000,000	Class A Class B	1.50 1.25
Next ₦10,000,001 - ₦20,000,000	Class A Class B	1.25 1.00
Balance Over ₦20,000,000	Class A Class B	1.00 0.75

TABLE 2

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

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

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

(i) Preliminary design, sketch design or design 20%

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

(iii) Full supervision of construction works 20%

Fees for assistance in construction works are to be negotiated.

SCALE OF FEES FOR MECHANICAL/ELECTRICAL WORKS IN BUILDING

The scale of fees based on the payable cost of project respect to the Mechanical and Electrical Services are shown in Table 3 below.

TABLE 3

Cost of Project	Fees payable as percentage of cost of project %
Up to ₦250,000	1.00
Next 250,001 - 1,000,000	0.85
Next 1,000,001 - 2,000,000	0.75
Next 2,000,001 - 5,000,000	0.65
Next 5,000,001 - 10,000,000	0.55
Next 10,000,001 - 20,000,000	0.45
Over ₦20,000,000	0.35

In addition to the amount payable from Table 3 a charge of 2 per cent of the cost of the Electrical and Mechanical equipment installed is payable.

SCALE OF FEES FOR ARCHITECTURAL WORK

The scale of fees payable for Architectural Works is shown in Table 4 below:

TABLE 4

Cost of Project	1st Stage %	2nd Stage %	3rd Stage %	Total %
Up to ₦250,000	1.23	2.0	1.25	4.5
Next 250,001-1,000,000	1.0	2.0	1.25	4.25
1,000,001-2,000,000	1.0	2.0	1.0	4.0
2,000,001-5,000,000	1.0	1.5	1.0	3.5
5,000,001-10,000,000	0.5	1.5	1.0	3.0
10,000,001-20,000,000	0.5	1.5	0.5	2.5
Balance Over ₦20,000,000	0.5	1.0	0.5	2.0

Repetitive work for any project up to ₦20 million in value will be charged for at the rate of 50% of the values shown in Table 4. However where the value of a project involving repetitive work exceeds ₦20 million, negotiations based on a sliding scale should be carried out to determine the fees payable. Partial and rehabilitation work on an existing building will be treated as a new project and the rates in Table 4 shall apply.

SCALE OF FEES FOR QUANTITY SURVEYING

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

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

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

Category C All civil engineering works.

The scale of fees approved for the three categories are shown in Table 5 below.

TABLE 5

COST OF WORKS	CLASS OF WORKS	PRE-CONTRACT %	POST-CONTRACT %	TOTAL %
Up to ₦250,000	Class A	1.25	0.75	2.00
	Class B	1.00	0.65	1.65
	Civil Engineering	0.30	0.70	1.00
Next 250,001 to 1,000,000	Class A	1.15	0.50	1.65
	Class B	0.85	0.45	1.30
	Civil Engineering	0.25	0.60	0.85
Next 1,000,001 to 2,000,000	Class A	1.00	0.35	1.35
	Class B	0.85	0.30	1.15
	Civil Engineering	0.20	0.50	0.70
Next 2,000,001 to 5,000,000	Class A	0.85	0.30	1.15
	Class B	0.75	0.25	1.00
	Civil Engineering	0.20	0.40	0.60

Table 5 (cont'd)

COST OF WORKS	CLASS OF WORKS	PRE-CONTRACT %	POST-CONTRACT %	TOTAL %
Next 5,000,001 to 10,000,000	Class A	0.75	0.25	1.00
	Class B	0.65	0.20	0.85
	Civil Engineering	0.15	0.35	0.50
Next 10,000,001 to 20,000,000	Class A	0.65	0.15	0.80
	Class B	0.55	0.15	0.70
	Civil Engineering	0.10	0.30	0.40
Balance Over ₦20,000,000	Class A	0.60	0.10	0.70
	Class B	0.50	0.10	0.60
	Civil Engineering	0.10	0.25	0.35

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

SCALE OF FEES FOR ESTATE MANAGEMENT SERVICES

The Scale of Fees for Estate Surveyors and Valuers in accordance with the various types of services they offer shall be as shown under Categories A, B, C, D, E, and F below:-

Category A

This involves the valuation of freehold or leasehold properties for all purposes.

Value	Fee payable as a percentage of value
The first ₦100,000	1.00
The next ₦900,000	0.50
The next ₦1,000,000	0.25
The next ₦2,000,000	0.15
The next ₦6,000,000	0.10

For properties whose values exceed ₦10,000,000 especially negotiated agreement will be entered into on the bases of sliding scale.

Category B

This involves the valuation of Furniture, Fixtures, Trade Stocks, Fittings and contents of hotels and public houses, and effects for all purposes. The fee payable will be 3 percent of the valuation of these items as settled and will include the preparation of an inventory.

Category C

This will involve the valuation of Plant and Machinery, equipment and installations for all purposes.

Value	Fee payable as a percentage of value
The first ₦250,000	2.00
The next ₦50,000	1.00
The next ₦100,000	0.50
The next ₦300,000	0.25

Where the total valuation exceeds ₦500,000 fees will be negotiated on the bases of the sliding scale.

Category D

This involves the sale of freehold and leasehold properties, trade stocks, plant equipment and machinery.
The fee payable will be 3.5 per cent of the amount realised on the sales.

Category E

This involves the letting of furnished and unfurnished premises, buildings on farmlands, equipment and installation.

Categogry F

This includes management, maintenance of property, feasibility and viability reports and studies, checking and reporting on properties, equipment and installation.
The fee pauable will be installation.

SCALE OF FEES FOR LAND SURVEYORS

The scale of fees for Land Surveyors in accordance with the various types of services they offer shall be as shown under Categories A, B, C, and D below:-

Category A

Value of Property	Fees payable as a percentage of value
The first ₦50,000	3.50
The next ₦150,000	2.00
The next ₦800,000	1.50

The fee payable for the surveying of property which exceeds ₦1,000,000 in value will be charged at 1 per cent of the value of individual plot.

Category B

Spot heighting and contouring

Acreage	Fee payable per acre(₦)
The first 10 acres	50
The next 90 acres	10
The next 400 acres	5
The next 1,500 acres	2
Above 1,500 acres	1

Category C

Spirit Levelling and Bench marking

Type of Job	Fee payable per km. (₦)
Tertiary levelling	150.00
Secondary levelling	200.00
Preliminary/Geodetic levelling	300.00

Category D

Control and Engineering Surveys

Type of Job		Fee payable per km. (₦)
(i)	Preliminary Investigation	200.00
(ii)	Plan Metric Control Surveys	
(a)	Tertiary Survey	400.00
(b)	Second Order Survey	600.00
(c)	First Order Survey	800.00
(iii)	Engineering Survey e.g. Roads ect	
(a)	Level and open country	300.00
(b)	Broken and thick forest	500.00
(c)	Rugged and swampy country	700.00

Fees for clearing, studies, Reports and o-her surveys where required, will be negotiated.

REIMBURSABLE EXPENSES

In addition to the charges payable under the scales of charges, reimbursement to Consultants shall be made where applicable, in respect of transport, accommodation, computer rental and other specialised services. The total amount of refund to all consultants in respect of any one project shall not exceed 1 (one) per cent of the estimated cost of the project. (Note 7).

CONDITIONS OF ENGAGEMENT OF CONSULTANTS

Where the services of Consultants are required by Ministries, Corporation and other public agencies, the terms and conditions of engagement other than method of remuneration shall, for the meantime, be as approved by the various professional bodies, that is the Nigerian Society of Engineers, the Nigerian Inistitute of Architects, the Nigerian Institute of Quantity Surveyors, the Nigerian Institute of Surveyors and the Nigerian Institute of Estate Surveyors and Valuers.

In all cases the Employer after consultation with the Consultant at the preliminary design stage, shall fix the estimated cost of the works and determine the fee, payable before an agreement is signed. No subsequent revision shall be applied to the fee so.

APPENDIX 3

TENDER BREAK-DOWN

The analysis of the unit rates from the prices Bills of Quantities is shown on the following two pages.

	Unit	Alhaji Sidi Aminu	ZBCCL	SMA	AGDG	Angus	Kueppers	C.3
		₦	₦	₦	₦	₦	₦	₦
Excavation	m^3	1.50	1.50	1.10	2.00	4.10	4.20	2.00
Concrete 'A"	m^3	60.00	60.00	65.00	75.00	130.00	142.00	85.00
Reinforcement	Kg	0.75	0.75	0.50	0.60	0.98	1.10	0.80
Formwork	m^2	6.00	6.00	7.00	6.00	15.00	14.00	6.00
50 x 200mm purlin	m	2.50	2.50	1.75	2.00	4.25	6.60	2.30
Aluminium Roofing	m^2	12.50	12.50	10.00	11.00	17.95	18.60	12.00
Insulation	m^2	1.00	1.00	4.00	4.50	8.20		4.00
215mm Blockwall	m^2	10.00	10.00	8.50	10.00	16.00	23.20	10.00
6 Blade Aluminium louvre carrier	Set	15.10	15.10	17.50	18.00	22.75	18.40	16.50
1 x 700mm louvre blade	No	2.00	2.00	1.75	2.25	3.25	2.00	2.00
Timber door in metal frame	No	38.00	38.00	50.00	48.00	60.50	151.00	52.00
50mm grano	m^2	5.00	5.00	13.00	15.00	23.50	28.00	18.00
12mm Render	m^2	1.50	1.50	2.25	2.50	3.25	3.80	2.00
lyrelean	m^2	3.50	3.50	4.00	4.50	6.40	4.00	4.00
Emlsion ;aint.	m^2	1.75	1.75	2.00	2.50	2.10	3.60	2.00
Gloss paint	m^2	2.00	2.00	1.50	1.50	2.35	5.80	2.20

Appendix 3 (cont'd)

	Unit	Alhaji Sidi Aminu ₦	ZBCCL ₦	SMA ₦	AGDC ₦	Angus ₦	Kueppers ₦	Q.S. ₦
Flat Assestos Cement Ceiling	m^2	3.00	3.00	4.00	5.00	5.75	9.40	4.50
15mm gms pipe	m	4.00	4.00	2.75	2.00	4.95	5.20	3.50
20mm gms Conduit	m	3.00	3.00	1.25	1.00	1.60	4.20	1.50
$2,5mm^2$ pvc Cable	m	1.50	1.50	0.40	0.50	0.35	1.00	0.60
$1,5mm^2$ ditto	m	1.00	1.00	0.45	0.50	0.20	0.50	0.30
Siteworks	lot	30,320.75	30,320.75	67,848.35	79,360.50	145,829.10	72,284.60	80,090.90
Roads	lot	31,543.75	31,543.75	50,282.00	38,744.50	114,799.10	97,136.80	70,030.00
Water Supply	lot	50,793.00	50,793.00	51.585.75	40,976.50	80,981.20	121,155.20	57.140,00
Electrical Generation & Supply	let	208,596.00	208,596.00	172,524.15	159,868.30	265,788.85	390,504.30	250,035.00
Prelimineries		71,240,00	96,167.00	164,000.00	108,500,00	151,400.00	444,000.00	120,000.00

APPENDIX 4

MATERIAL FLUCTUATION CLAIM SHEET

CEMENT

ITEM NO.	SUPPLIER	DESCRIPTION OF MATERIALS	INVOICE DATE	INVOICE NO	QTY	PRICE Basic ₦	PRICE Invoice ₦	INCREASE ₦	DECREASE	OMISSION	ADDITION
1	Alh. U. Shugaba	Bags of Burham Cement	3-2-79	101	80 bags	4.50	6.50	2.00	-	-	160.00
2	" " "	" " " "	13-2-79	106	321 "	4.50	6.50	2.00	-	-	642.00
3	" " "	" " "	17-2-79	114	280 "	4.50	6.50	2.00	-	-	360.00
4	" " "	" " " "	25-2-79	121	200 "	4.50	6.50	2.00	-	-	400.00
5	" " "	" " " "	3-3-79	127	1036"	4.50	6.50	2.00	-	-	2072.00
6	" " "	" " " "	26-3-79	133	2496"	4.50	6.50	2.00	-	-	5616.00
7	" " "	" " "	18-4-79	133	1200"	4.50	6.50	2.00	-	-	2700.00
8	" " "	" " " "	22-4-79	110	1791"	4.50	6.75	2.25	-	-	4029.75
9	" " "	" " " "	4-5-79	144	4200	4.50	6.50	2.00	-	-	8400.00
10	" " "	" " " "	21-5-79	146	600"	4.50	6.50	2.00	-	-	1200.00
11	" " "	" " " "	1-6-79	150	600"	4.50	6.25	1.75	-	-	1050
12	" " "	" " " "	5-6-79	154	3600"	4.50	6.25	1.75	-	-	6300.00
13	" " "	" " " "	5-6-79	157	1800"	4.50	6.25	1.75	-	-	3169.00
14	" " "	" " " "	6-6-79	161	1800"	4.50	6.00	1.50	-	-	2700.00
15	" " "	" " " "	8-8-79	164	1800"	4.50	6.00	1.50	-	-	2700.00
16	" " "	" " " "	13-8-79	168	1800"	4.50	6.00	1.50	-	-	2700.00

APPENDIX II (cont'd)

MATERIAL FLUCTUATIONS CLAIM SHEET

ITEM NO.	SUPPLIER	DESCRIPTION OF MATERIALS	INVOICE		QTY	PRICE		INCREASE	DECREASE	OMISSION	ADDITIONS
			DATE	NO		Basic ₦	Invoice ₦	₦			₦
1.	N.C.I. LTD	12mm M. S. Rod	20-3-79	52482	2 Tons	360	560	200	-	-	400
2.	" "	12mm M. S. Rod	28-3-79	54793	18 Tons	360	510	150	-	-	2700
3	" "	16mm M. S. Rod	28-5-79	-	5 Tons	360	510	150	-	-	750
4.	" "	16mm M.S. Rod	28-5-79	54793	3 Tons	360	500	140	-	-	420

APPENDIX 4 (cont'd)

MATERIAL FLUCTUATIONS CLAIM SHEET

TIMBER

ITEM NO.	SUPPLIER	DESCRIPTION OF MATERIALS	INVOICE		QTY	PRICE		INCREASE	DECREASE	OMISSION	ADDITION
			DATE	NO.		BASIC ₦	INVOICE ₦	₦			₦
1	Alhaji M. Salaka	1"12"x12'	22-3-79	58	779 Nos	4.00	7.50	3.50	-	-	2726.50
2	" "	2"x12"x12"	12-4-79	59	700 Nos	7.00	11.00	4.00	-	-	2800.00
3	" "	1"x12"x12"	12-4-79	11	1481 "	4.00	7.50	3.50	-	-	5183.50
4	" "	2"x12"x12'	15-5-79	60	1450 "	7.00	11.00	4.00	-	-	5800.00
5	" "	2"x12"x12"	8-6-79	69	1450 "	7.00	11.00	4.00	-	-	5800.00
6	" "	1"12"x12"	22-6-79	72	1600 "	4.00	7.50	3.50	-	-	27,910.00

APPENDIX 5

TYPICAL FINAL ACCOUNT SHEET

SUMMARY

BILL NO. 1	- Preliminaries		95,500.00
BILL NO. 2	- Block 1		275,893.65
BILL NO. 3	- Block 2		223,443.20
BILL NO. 4	- Block 3 & 5		333,810.40
BILL NO. 5	- Block 4 & 6		569,603.20
BILL NO. 6	- External works		279,748.50
Variations	- Executed Additions		305,495.46
	Total Works Executed	-	2,081,494.41
	Material on Site	-	- -
			₦2,081,494.41
Add	Fluctuations Labour -	87,377.45	
	Materials -	158,317.75	245,695.20
	Gross Valuation		₦2,327,189.61
Less	Retention 5% (Limit) -	92,282.00	
	Release 2½% 1,000.00 -	25,000.00	67,282.00
			N2,259,907.61
Less	Previously certified Mobilisation Release -	184,566.00	
	Certificates 1 - 13 -	1,876,101.25	2,060,667.25
	Amount Now Due		₦199,240.00

RECORD OF DEFECTS AT PRACTICAL COMPLETION INSPECTION

UNIVERSITY OF SOKOTO

JUNIOR STAFF HOUSING

Handover inspection Friday 6 March 1981.

(A) Works general to the building

BLOCK 2

House No. 17

Zaure:- a) Make good cracked floor acreed.
b) Make to operate or replace wardrobe door locks.

Bedroom 1:Found locked at time of inspection.

Bedroom 2: a) Make to operate or replace wardrobe door locks

Squart: a) Provide pull chain for high level eistern.

Corridor: a) Make good cracked floor screed.
b) Make good wall around socket outlets.
c) Form groove in beam for rainwater escape.

Kitchen: a) Clean and make good screen wall.
b) Make good wall around socket outlet.
c) Complete paintwork.

House No. 18.

Zaure: a) Make good cracked walls.
b) Make good wall around socket outlet.

Bedroom No. 1:
a) Make good cracked floor screed.
b) Make to operate or replace wardrobe door locks.

Bedroom No. 2:
a) Make good cracked floor screed.

Bedroom No. 3:
a) Make good cracked floor scoreed

Squat: a) Provide pull chain to high level cistern.
b) Make to operate defective bib tap.

Corridor: a) Make good cracked floor screed.
b) Make good wall around socket outlet
c) Form groove in beam for rainwater escape.

Kitchen: a) Clean and make good screen wall.
b) Complete paintwork.
c) Make good cracked wall.