

# A FRAMEWORK FOR COST MANAGEMENT OF LOW COST HOUSING

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**Key words:** Low cost housing, project environment, project organisation, procurement systems, cost management.

## ABSTRACT

Cost Management as a long serving discipline throughout the life cycle of developments is an inescapable requirement for effective and efficient procurement process. Cost management is influenced by several factors, which includes organisational arrangements or procurement systems, land, financing, the environment etc. amongst other things.

However, cost management has focussed mainly on commercial and social development and infrastructure of major cost significance through formal systems and procedures. Low Cost Housing is significant in terms of the aggregate cost of development and the overall benefit it brings to the society. The clients, stakeholders and promoters have limited access to formal procurement systems. This is responsible for the high incidence of informal systems used for low cost housing procurement in developing countries. As a result of this, low cost housing developments do not benefit adequately from the structured approach of the cost management discipline. The overall effect of cost management is to achieve value for money and even provide a greater number of houses.

This paper aims to propose a framework for a structured approach of the cost management of low cost housing.

## INTRODUCTION

As a result of the significance of housing in society, it is regarded as a social responsibility by all nations of the world. They, together with United Nations Organisations such as UNCHS (Habitat) have over the years pursued a variety of programmes and policies aimed at resolving the issue of inadequacy and shortfall of housing stock.

Developed countries have generally succeeded in the programmes [Miles et al; 2000]. In developing countries, poor housing delivery has been attributed to inadequate mechanisms and systems for (a) land allocation (b) funding (c) mortgage institutions (d) infrastructure etc.

Housing delivery is also affected by the poor performance of the construction industry as reported in literature [Adams, 1996; Aniekwu and Okpala, 1988; Mansfield, Ugwu & Doran, 1994; Ogunlana, Promkuntong and Jearkjirm, 1996; Wells, 1986]. The poor performance associated with small to medium sized indigenous contractors include

protracted delay in payment for work done, lack of capital, high fluctuations in work load, inadequate resources, technical expertise, managerial skills and other items. However it appears from these studies that the benchmark for project performance was based on western characteristics and environment.

For instance, long delivery periods for imported construction components and equipment, lower productivity levels resulting from low level technology and other inadequacies in the construction environment of some developing countries suggest that there is a need to establish reasonable project objectives as basis for assessing project performance.

Oladapo [1991] in a study of procurement systems and project organizations used for a major development in a typical Nigerian construction environment during the period 1979-1990 established that Nigerian indigenous construction firms dominated and performed reasonably well in the small market for simple low-rise buildings of small to medium size in value. These require low-level technology, are labour intensive, and require low-level management, given the characteristics of the environment.

All these studies are generally based on the formal procurement systems in the formal sector of the economy for commercial, social and infrastructure development.

Imbert [1990] also noted that in most literature and discussions of construction in developing countries, it is the formal delivery of built facilities, which predominates. However, a considerable amount and variety of informal construction constitutes a larger proportion of the total. In fact, informal construction has become a major factor in the provision of housing for low-income population. This is contributing in no small measure to the rapid urbanisation-taking place. Such construction has indeed been classified by Alexander [1986] as an advanced form of technology in Latin America.

Furthermore, the skills obtained in this type of construction are proving very useful with informal builders showing considerable ingenuity in the use of materials. A World Bank evaluation survey estimated that people building on their own in this manner could do so at costs as much as 30% lower than the conventional construction sector does [Rybcznski, Bhatt and Mellin, 1984]. This is a major potential for the establishment developmentally oriented procurement methods which site services schemes, an approach whereby serviced sites containing basic infrastructure are provided for people to build their own houses according to their means and way of life. Construction is usually undertaken on a self-help basis or with limited amount of hired help. The development is phased over a period of time while the owner lives in a small-completed core of the house [Imbert, 1990].

The various studies highlighted suggest that in order to achieve adequate low-cost housing delivery, the procurement systems would need to be restructured and adjusted so as to align formal sector interests with those of less formal.

Cost management as a long serving discipline throughout the life cycle of developments provides the basis for the establishment of the optimum costs of housing development. Effective and efficient cost management is therefore a critical success factor in the procurement of low cost housing.

The paper aims to propose a framework for the cost management of low cost housing having regard to the environmental factors, project organisation and procurement system amongst other things.

## **A DEFINITION OF LOW-COST HOUSING**

The term Low-cost housing might mean different things to different people. For instance, in a developed country, USA, housing can be considered affordable for a low or moderate-income earner if that household can acquire use of that housing unit (owned or rented) for an amount up to 30 percent of its household income [Miles et al, 2000]. Mortgage lenders also use this standard as one important criterion in qualifying buyers of market-rate housing for mortgage loans. In developing countries, only up to 20% of the population who in actual fact constitute the higher income earners would be able to afford such housing units.

The low-income group in developing countries are generally unable to access the housing market through the mortgage institutions. Housing requirements for this group are both urban and rural based. In 1991, statistics indicated that about 70% of Nigerians fall in this category [National Housing Policy, 1991]. This situation has not changed.

Low cost housing for the low-income group are generally developed by the informal sector of the economy through unstructured procurement systems. Informal construction sector for the purpose of this paper will be understood to embrace all those individuals or enterprises engaged in unenumerated or unregulated construction activity including (but not restricted to) the self help construction activities of slum and squatter residents. It does not include any enterprises engaging in construction work undertaken by officially recognised organisations such as contractors [Wells, 1986]. Low cost housing schemes are also influenced by the characteristics of the construction environment.

## **CONSTRUCTION ENVIRONMENT**

Bennett [1991], in a major review of project management theory, established that the environment interferes with planned progress of construction projects. The less predictable the environment and the greater its potential effects, the more it must be taken into account in managing the development of construction projects.

A review of the results of hundreds of World Bank projects indicated that success or failure often depends on factors in the general environment outside the control of the project manager [Youker, 1992]. In the management of projects, a good understanding of the different features and factors within the environment that can have an effect on the project is essential. This can form a basis for analysis for overcoming or mitigating their effects on project performance.

Project managers, in addition to traditional project management functions, must set up a process to scan the environment, to identify potential problems, and to try to establish power relationships that can help them manage the key actors and factors on which successful implementation depends [Youker, 1992]. Figure 1 presents many of the



## **PROJECT MANAGEMENT, ORGANIZATION AND PROCUREMENT SYSTEMS**

Cleland and King [1983] provide a definition of the project management process in terms of its subsystems. These include organization, control, information, cultural, planning, and human subsystems within the framework of the organization, culture, techniques, and methodology. These subsystems provide the framework within which to identify the essential minimum set of tasks necessary for clients to create the circumstances for successful construction projects. From the systems theory point of view, all the subsystems are interdependent, interrelated, and at the same time subject to external influence of the environment [Walker, 1985].

In the management of projects, the organization subsystem establishes the pattern of interrelationships, authority, and responsibility between contributors, who are usually independent firms, to achieve the client's objective. The organization structure provides a basis for other subsystems to function properly and subsequently determines to a large degree the effectiveness of the whole process.

Walker [1985] has identified the major components of organization structure of projects as the client/project team integrative mechanism; the organization of the design team; and the integration of the construction team into the process. The organization of the design team may be the traditional/conventional, nonexecutive project management, or executive project management, while the method of appointment of the contractor may be selective competitive tender, two-stage competitive tender, competitive-serial tender, negotiated tender, management contract, separate trade contracts, or design and build.

Bennett [1985], in a review of organization theory applied to construction projects, established that there are three idealized types of construction projects, that have matching organizational structures; these in turn lead to procurement systems. These include standard constructions that comprise simple buildings, basic housing, and those that use programmed organization through design and build, turnkey, and package deal systems. Also, there are traditional constructions comprising a variety of buildings based on established method of technology resources and techniques. These use professional organizations through a separate trades approach or the general contractors approach, i.e., traditional/conventional approach or the contracting/construction management approach. Innovative construction includes developments that use problem-solving organizations through the construction management approach. These three types of professional organizations are idealized, and in practice there are many modifications and hybrid versions of the procurement systems. This is consistent with Walker [1985].

Oladapo [1991], in a study of procurement systems and project organizations established that 12 organizational arrangements based on design, develop, build and the traditional approach methods were feasible in the Nigerian construction environment. Eight of the systems were associated with foreign-managed construction firms and could be used successfully for medium to large size projects. However, the performance of these systems was closely related to the design input and managerial control exercised by the contractor in overcoming the management deficiencies of client and design team. Four of the systems, which are variants of the traditional approach, were associated with indigenous

construction firms and also could be used successfully for the small to medium sized buildings.

These options form the basis for alternative arrangements for project organizations. The selection of an appropriate organizational arrangement depends on the extent of the definition of the client's requirements/objectives, allocation of project management responsibilities between members of the organization, the simplicity/complexity of the project in terms of the size, technology of construction, and components, and the simplicity or complexity of the environment [Walker, 1985].

Taylor et al [1999] in a review of conventional and developmental procurement systems adapted Friedman's [1992] characteristics of developmentally oriented projects relative to conventional projects to include some elements of practice, which now enjoy policy support. The elements of practice include participation of community interests in the design and implementation of the project, use of local materials and labour intensive methods, appropriate technology, flexible management, local conflict resolution amongst other things. This provides a basis for sustainable economic growth and development of the community through employment creation and active promotion of small micro-enterprises.

Birrell [1996] in a study of French building procurement present three major approaches. These are: (a) Equipment/Grand project, (b) Complex/Large and (c) Simple/Small. Each serves a different segment of the building market as (a) is for large, prestigious government backed projects, (b) is for complex and large commercial projects and (c) is for simple small projects usually with local or vernacular constituents.

The salient feature of the simple/small approach is that the end product is simple and small and is generally used in small town or suburban or rural or semi-rural location. The success of the approach depends on the effective and efficient management of resources given the characteristics of the construction environment and local market participants. One local construction professional e.g. a Cost management professional/ Quantity Surveyor or Architect is recommended as the Project manager for the procurement process.

## **APPROPRIATE PROCUREMENT SYSTEM AND SOME CHARACTERISTICS OF LOW COST HOUSING**

On the basis of the review, the appropriate procurement system and some characteristics of low cost housing are as follows.

- Procurement systems: Modified traditional procurement approach as highlighted by Bennett [1985], Walker [1985], Oladapo [1991] and Taylor et al [1999]; and "French; small approach" with executive project management structure as highlighted by Birell [1996].
- Key elements of the project organisations include
  - Individual project sponsor representing the client body and stakeholders (e.g. Local Governments, Co-operative Societies etc.).
  - Individual client project manager providing single point authority and communications and instant decisions

- Cost and contract management responsibility.
- Design responsibility generally for pre-contract stage
- Local contractors
- Local specialist or trade subcontractors.
- Local community bank
- Management
  - Lean management
  - Management and capacity building training programme for small local and rural contractors and project participants
- Environmental Issues
  - Land issues
  - Location
  - Cultural
  - Sustainability assessment
  - Labour intensive construction method, local materials and standardisation, simple and basic methods of local and appropriate construction technology
- Infrastructure
  - Site and services scheme initially based on earth roads, water supply by wells and boreholes etc. for future phasing and upgrading.

## **COST MANAGEMENT – OVERVIEW**

Cost management may be considered from either the client's or the contractor's point of view. This paper would address it from the client's point of view. Cost management functions to monitor costs and initiate corrective action to keep the costs within budget or acceptable limits. This is the main management imperative. Cost control as a long serving discipline from project conception to completion and commissioning and even operation is at the heart of the management of the construction process and its importance does not have to be justified.

Flanagan and Tate [1997] identified that within the framework of a rapidly changing environment, four main pressures make it more difficult and even more important to control construction costs for clients and stakeholders.

The pressures include:

- Delivery time for a project is important.
- Clients requirements are more complicated
- Number of organisations involved in a project has increased (clients advisers, design team, construction group and stakeholders)
- Current practice in design where new ideas, techniques materials and components are used

These pressures would exert an even influence on cost management in the face of globalisation and privatisation.

Potts [1995] has identified that effective pre-contract cost management, comprise two essential components:

- The establishment of realistic budgets through cost estimating and modelling.
- Ensuring compliance with budgets as design evolves through the process of cost control.

On the whole, there are four major ways to estimate the cost of a building during the design stage, which are dependent on quantity and quality of information available at the time of the estimate is required [Potts, 1995]. Fig 2 illustrates the techniques.

The process of cost estimating and modelling should be carried out by computers (IT) in order to allow for iterations to be rapidly performed.

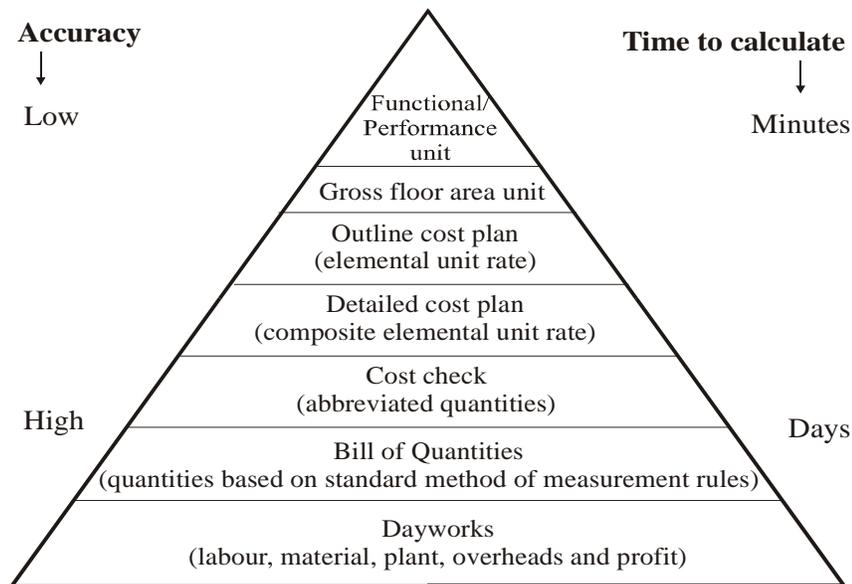


Fig 2 – Estimating Techniques Triangle Source: Potts [1995]

Potts [1995] has also explained that the aims of the clients post contract cost control system are:

- to enable the client to approve changes to the contract sum before such instructions modifying the works are given to the contractor;
- to enable the client to budget effectively for the anticipated expenditure;
- to enable the cost effect of any major change to be seen in the context of project as a whole;
- to enable avoiding action to be taken if the total cost appears to be escalating unduly.

Cost management is an active role, which commences on day one of the project with the control and management of design, and continues through procurement and construction of the project, to completion and settlement of accounts.

Cox and Townsend [1998] noted that traditional cost management approach focuses on compliance with budget estimates, rather than pro-active management of value, in the delivery of a client's construction needs. There are, therefore a number of limitations associated with the traditional approach to cost management in construction.

Strategic cost management which has been widely used in many other industrial sectors for sometime involves benchmarking supply market information on input costs overheads and profit levels and the development of cost models against which competitive prices can be analysed [Cox and Townsend; 1998]. This leads to more visible cost and price information, which provide a basis for identifying areas and targets of cost reductions without affecting profit margins. A comparison table of the strategic and traditional cost management approaches are presented as Table 1.

Attribute	Strategic Cost Management	Traditional Cost Management
Cost visibility	Open-book/transparent	No visibility for client
Pricing structure analysis	Considers contractors use of different approaches	Assumes 'competitive' pricing for all situations
Management approach	Pro-active cost reduction	Reactive cost containment
Incentives	Considers appropriate use of incentives	No real consideration of incentives

Table 1: Strategic and Traditional Cost management compared Source: Cox and Townsend [1998]

Another major tool for cost management is value management, which is a cost control technique for ensuring completion at the most economic cost without loss of quality. The technique requires a systematic review of each element of the project and every item of equipment within the project, questioning purpose and cost in order to identify savings. It aims to remove unnecessary content or over specification from the project.

It is also necessary to state that the potential for making savings reduces while that for making changes to design and construction result into additional cost as the project progresses. Thus, to obtain best effect, any cost saving reviews must be started sufficiently early. During this same early period, management structures, controls and procedures must be established to improve and maintain performance and avoid the cumulative effect of change, delay, rework and disruption.

## **PROPOSED COST MANAGEMENT FRAMEWORK**

The review of cost management theory firmly focussed on international construction and projects of major cost significance. However, the same principles are appropriate to low cost housing as the as they are for other projects.

For instance, the four main pressures influencing cost control would need to be related to low cost housing. Project objectives in terms of time, cost and quality should be established based on labour intensive methods, use of local and appropriate technology and

use of local materials amongst other things. Cost estimates should be based on these data while they should be specified in the Bills of Quantities and other Contract documents. All contract documents should be simplified.

The proposed cost management framework is as follows:

1. Strategy
  - Identification of housing needs within a geographical location
  - Identification of environmental issues, technology, cultural, regulations technical capabilities etc.
  - Sustainability and environmental assessment
  - Market survey: materials and resources availability, construction market capacity and capability, local cost escalation trends etc.
  - Procurement systems, project organisation: stakeholders
  - Briefing
  - Appointment of principal professionals
  - Establish cost model: budget estimate based on cost plan etc.
  - Land acquisition + building permission
  - Prepare feasibility study, cost benefit analysis and funds/cash flow
  - Prepare project master plan embracing all activities and participants from conception through construction and commissioning
  - Overall management strategy
2. Design and tender documentation
  - Prepare implementing manual and management guidelines
  - Design to cost plan (schematic and detailed drawings)
  - Cost checks and reviews: Priced Bills of Quantities
  - Life cycle costing and maintenance issues
  - Value management
  - Basic or simplified conditions of contract
  - Tender documents: Bills of Quantities, specifications etc.
  - Design flexibility: provide for expansion and upgrading and constructability.
  - Stakeholders participation in design
  - Pre-qualifications
3. Tender process
  - Issue of documents
  - Tender briefing; Clarification of design; technology, specifications and quality control, completion time, project organisation, flexible management, conditions of contract, payment procedures, conflict resolution procedures, materials and resources purchasing strategy etc.
  - Tender analysis, interviews and selection
  - Contract award
  - Cost checks and reviews
4. Construction
  - Contract organisation, management, and administration.
  - Monitoring and cost control
  - Constructability reviews
  - Bills of Quantities as materials purchasing document

- Payment procedures through community bank
  - Commissioning
5. Project evaluation
- Analysis and review of cost plan
  - Data bank and updating etc.

On the whole, the effectiveness and efficiency of the management of low cost housing and community projects lie in the establishment of a project strategy embracing objectives, project characteristics, project organization, procurement systems, management systems and procedures and the effect of environmental factors. The implementation of the project should be carried out in accordance with the project strategy, and with a special focus on cost management throughout the duration of the project.

## **CONCLUSION**

Major projects and projects of cost significance require project participants to bring variety of high level of expertise in the establishment of a project organisation and synergy. These include expertise in terms of procurement systems, environmental analysis, design and cost management as well as project management amongst other things. The expertise required for low cost housing and in fact community projects would in addition focus on how to stimulate sustainable economic growth and development in society.

For the cost management professionals or quantity surveyors, it involves the management of small projects of social significance, which provides the basis for sustainability of the economy. It also provides a basis for cost management profession to impact and reshape the communities and environment.

The proposed framework provides a suitable checklist for the cost management of low cost housing in both formal and informal housing sector of the economy. The generic procurement system and organisational structure established, aligns formal and informal systems. Thus, the framework is capable of being used to manage costs within the informal procurement system.

The paper clearly demonstrates that Cost management is central in the organisation and procurement of low-cost housing. Infact, there is need to develop a set of criteria and database for cost management of low cost housing, which is based on appropriate technology, labour intensive methods, local materials and standardisation amongst other things.

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## **BIOGRAPHICAL NOTES**

Mr. Murtala Oladapo has been involved in all aspects of Quantity Surveying and Project Management since graduation in 1974 in a variety of projects in capacities as Assistant, Project Quantity Surveyor/Manager, Project Director and Project Management Consultant. Such projects include secondary schools and university buildings, secondary and tertiary hospitals, embassy buildings, bank buildings, office blocks and other commercial developments and housing schemes. Milestone projects include Cost management of Office complex for Federal Ministries at Abuja for Federal Capital Development Authority of Nigeria; and Project management for 30-Storey Union Bank Headquarters Building, Lagos, Nigeria. He is currently Managing Partner of Murty Associates as well as Murty International Limited.

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