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## Evaluation of Procurement Methods for Sustainable Environmental Development in Nigeria

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### Abstract

Sustainable environmental development connote or entails meeting the economic needs of people without destroying the resources that will be needed by persons in the future based on long range planning and the recognition of the finite nature of natural resources. However, the dart of uncompleted and abandoned projects that littered the environment calls to mind the procurement method employed to deliver such projects. This paper seeks to appraise the contributory effects of procurement methods on abandoned projects. The population considered was developmental projects that have been developed to construction stage. This was stratified on the basis of project facility types. Primary data were obtained through structured questionnaire on procurement methods employed, factors that influence the choice of the procurement methods and the effects of selected procurement methods on project delivery. Data collected was analyzed using mean-score item, Chi-square and Spearman rank-order correlation coefficient. The results revealed among other things that projects were procured on traditional method of design-bid-construct which is not proactive in meeting project objectives. The paper concludes that there is need to adopt proactive modern procurement techniques that could match client's objectives with project delivery.

**Keywords:** Abandoned Projects, Environmental Development, Procurement Methods, Sustainable.

### Introduction

Environmental development is the application of environmental science and sustainable development for curbing negative impacts of human-environment interaction and protecting the natural environment. The concept of sustainable development is a means to avoid conflict between economic development and environmental protection. This entails applying economically viable and eco-friendly techniques to sustainable development as a solution to environmental issues, finding ways to save and protect the environment and inflict minimal harm to natural resources.

Turner (2006) opines that the main aim of the construction industry is to deliver and maintain the built environment. The built environment comprises housing, educational, industrial, and commercial and infrastructure facilities. Infrastructure is a generic term covering the provision of electricity, communications, water, sewerage, gas, air, railways, harbours, roads and the like

(ONS, 2002). All these facilities may be either public work procured by a public authority such as government department, public utilities or private work procured by a private owner or organization or by a private developer (DTI, 2005). Nation states routinely embark on development projects to meet the needs of their populace. These projects, which are of a varied nature, are most times procured by a synergy of the public and private sectors of their respective economies.

Harvey and Ashworth (1997) and Fellows *et al* (2002) identify the characteristics that influenced the construction industry's ability to deliver the built environment as:

- Products are usually delivered at the client's premises;
- Products tend to be physically large and expensive;
- Design is separated from construction;
- There is fragmentation and extensive specialization;
- There is risk and uncertainty; and
- Price determination is usually based on a system of bidding.

These characteristics mean that the delivery of the built environment is project-based with the involvement of numerous participants whose responsibilities are set out in the contract.

Hobday (2000) defines project as any activity with a defined set of resources, goals and time limit while Newcombe (2003) defines project as a coalition of powerful (skillful & professional) individuals and interest groups. This coalition is necessary because of extensive fragmentation and specialization within the construction industry that necessitate the selection of appropriate procurement method to deliver the project.

The method and practices involved in the procurement of these projects contribute in no small measure to the success or failure of the project. This view was collaborated in the Council of Registered Builders of Nigeria (CORBON) document (2010) that the success or failure of a project is directly related to the effectiveness, efficiency and dexterity of procurement method employed. However, the dart of uncompleted and abandoned projects that litters the environment calls to mind the procurement method employed to deliver such project. Hence, this paper seeks to appraise the contributory effects of procurement methods on project performance/delivery.

### **Project Performance**

The construction industry's sole business is undertaking projects either in generating new buildings or refurbishing existing ones for a variety of clients. The construction process starts with a client realizing a need for a constructed product or facility. Various participants are then engaged to contribute towards the realization of the particular product or facility. Fellow *et al* (2002) concluded that construction is thus a project-based activity.

Hobday (2000) defines a project as a task or planned program of work that requires a large amount of time, effort and planning to complete. Nevertheless, other researchers have given different definitions at one time or the other to the term "project" (Newcombe, 2003; Turner, 2006). Irrespective of the definition or where the emphasis is placed, the aim of the construction sector is to deliver and maintain the built environment. However, Marwa *et al* (2006) opine that the delivery and maintenance of the built environment depend on the effectiveness, efficiency and transparency of procurement system. This entails performance measurement.

Amaratunga and Baldry (2002) described performance measurement as a process of assessing progress towards achieving predetermined goals while Ismail *et al* (2009) was of the opinion that assessing the success or failure of construction project is to evaluate performance with respect to the extent to which client's objectives are achieved.

The Performance of different procurement methods on client's objectives in terms of time, cost and quality have been widely reported by other researchers. Konchar and Sanvido (1998) drew a

comparison of project delivery system in U.S.A. Molenaar *et al* report that design-build projects are delivered 33% faster than the traditional method of contracting projects. Furthermore, Sidewell (1993) reports a significant saving in time by using management contracting method as against the traditional contracting method.

Marwa *et al* (2006) conclude that procurement decision greatly impacts the performance of any project regardless of project delivery method. The effects of an ill-qualified procurement decision can be particularly critical to project performance. Therefore, the adoption of an appropriate procurement method can minimize several risks associated with project delivery.

### Procurement Process and Methods

United States of America Defense Acquisition University (2009) defines procurement as the acquisition of appropriate goods and services at the best possible cost of ownership to meet the needs of the purchaser in terms of quality and quantity, time and location.

Procurement may also involve a bidding process (i.e. tendering) depending on policy or legal requirements. In European countries and Nigeria in particular, there are strict rules on the processes that must be followed by public bodies with contract values as threshold dictating what processes should be observed (Procurement Act, 2007)

Generally, procurement involves making decision and to ensure a qualitative decision. Sanvido and Konchar (1997) identify seven steps involved in the procurement process as:

- Information gathering;
- Supplier contact;
- Background review;
- Negotiation;
- Fulfillment;
- Consumption, maintenance & disposal; and
- Renewal

Furthermore, DAU (2009) categorize procurement activities into two as illustrated in Figure1. The first category being direct (production related) procurement and the second being indirect (non- production related) procurement.

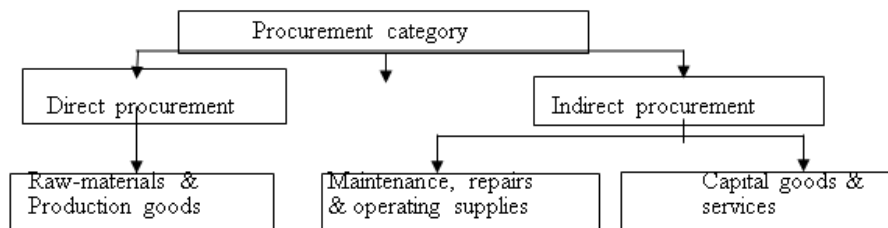


Figure1: Procurement category. Source: DAU (2009).

Procurement system establishes the roles and relationships among various participants in a project. Rwelamila *et al* (2000) was of the opinion that the various strategies employed to combine design and construction phases together to achieve a complex form of organization and actualize the project is regarded as procurement method. Kumaraswamy (1999) observes that procurement methods have evolved from traditional method of division of labour and specialization to modern method of collaborative and fast track procurement system. Therefore, procurement system can be grouped into the following four methods:

- Traditional/conventional method;
- Construction management method;
- Single source method; and

- Collaborative method.

### Procurement Methods and Environmental Development

The United Nations Environmental Programme (UNEP) document (2002) paraphrased sustainable development as

“Meeting the needs of people today without destroying the resources that will be needed by persons in the future based on long range planning and the recognition of the finite nature of natural resources”.

This definition does not exclude humanity from utilizing natural resources but rather calls for more effective management of resource utilization in other not to harm the planet or future possible users or uses of our resources. However, the dart of uncompleted and abandoned projects that litters the environment in Nigeria not only contradict sustainable development but also calls to mind the procurement methods employed to deliver such projects that resulted to abandoned projects.

Andy (2007) developed a model to formalize the dynamic hypothesis that the pattern of project escalation and abandonment is caused by the addition of new requirements during the project life cycle. This, he explained makes the clients and project managers come to conclusion about the viability of a project that is being undertaken. He postulated that the perception of project

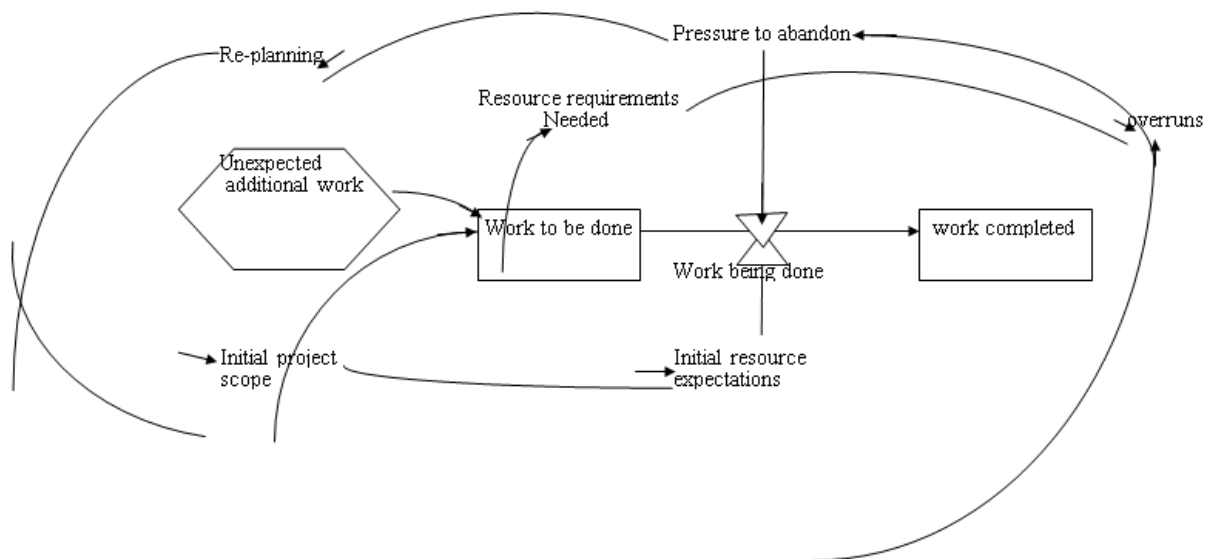


Figure 2: Project abandonment cycle; Adapted from Andy (2007)

viability is a non-linear function of schedule overruns and resource overruns. He defined schedule overruns as the ratio of the scheduled completion date to the initial completion date for the project. Andy (2007) further described resource overruns as the ratio of the work already done plus the work that needs to be done to the original amount of work that was anticipated. The model in Figure 2 vividly illustrates this phenomenon.

### Research Methodology

The methodology adopted for this study was questionnaire survey to collect data on procurement methods employed for construction projects; factors influencing the choice of procurement methods and the effects of selected procurement methods on project delivery. The population considered was developmental projects that have been developed to construction stage or delivered. This was stratified on the basis of project facility type (see Figure 3). Both probability and non-probability sampling methods were adopted to survey each stratum of project facility. A total of one hundred (100) questionnaires were distributed. Out of this number, eighty-one (81) were considered suitable for analysis. Data collected were analyzed using mean score items (MIS), chi-square and spearman's rank-order correlation coefficient. Figure 3 and Tables 1-5 show the analyses and presentation of data on the study.

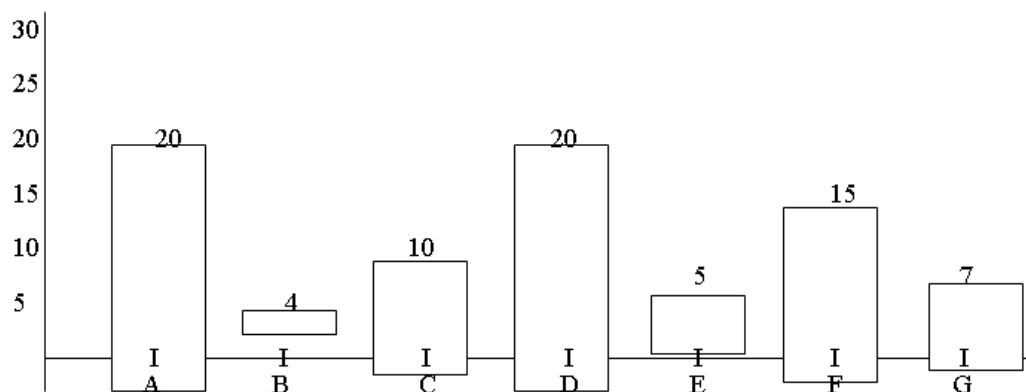


Figure 3: Stratification of the number of projects by facility types (20+4+10+20+5+15+7=81)

### Legend

- |  |                                    |
|--|------------------------------------|
| A- Residential/Dwellings                               | B - Roads                          |
| C- Industrials/factories                               | D- Commercial/shopping complex     |
| E- Educational/schools                                 | F- Offices (both simple & complex) |
| G- Institutional (e.g. Hospitals, Recreational centre) |                                    |

Table 1: Usage of Procurement Methods

Procurement methods	Frequency	Chi-square value ( $\chi^2$ )
Traditional method	52	1.568
Construction management method	20	- 0.012
Single source method	9	- 0.556
Collaborative method	0	- 1.000
Total	81	

Table 2: Assessment of Procurement Selective Factors by Clients/ Consultants

Selection factors	Mean Values	Rank Order
Certainty of cost	1.778	1
Price competition	1.185	2
Flexibility/variation	1.185	2
Certainty of time	0.864	4
Responsibility point	0.593	5
Quality desired	0.432	6
Risk involved	0.222	7
Complexity	0.125	8
Completion time	0.125	8

Table 3: Assessment of Procurement Selective Factors by Contractors

Selection factors	Mean Values	Rank Order
Certainty of cost	1.185	1
Price competition	1.333	2
Certainty of time	0.864	3
Flexibility/variation	0.740	4
Responsibility point	0.593	5
Completion time	0.494	6
Quality desired	0.346	7
Risk involved	0.296	8
Complexity	0.185	9

Table 4: Correlation of Assessment on Procurement Selective Factors

Selection factors	Assessment by client/ consultant (Rx)	Assessment by contractors (Ry)	di	(di) <sup>2</sup>	
Certainty of cost	1	1	0	0	
Price competition	2	2	0	0	
Flexibility/variation	2	4	-2	4	
Certainty of time	4	3	1	1	
Responsibility point	5	5	0	0	
Quality desired	6	7	-1	1	
Risk involved	7	8	-1	1	
Complexity	8	9	-1	1	
Completion time	8	6	2	4	
Total	43	45	-2	12	

Using Spearman's rank order correlation Coefficient

$$r = \frac{1 - 6 \sum (d_i^2)}{n(n^2 - 1)}$$

Where di= difference between ranks (Rx-Ry)  
 n= number of selection factors  
 r = 0.9 (positive)

This implies that there is a high correlation between selection factors and procurement method used.

Table 5: Causes of project abandonment

Causative factors	MIS Value	Rank Order
Overruns (cost& time)	4.272	1
Changes in scope/variation	4.198	2
Delay (by parties to contact)	3.238	3
Uncontrollable circumstances	2.543	4
Dispute	2.161	5

### Discussion of findings

Responses were received from eighty-one (81) projects surveyed, representing 81% response rate as shown in Figure 3 which illustrated the distribution of projects categorized by facility type. Table 1 shows that traditional method of procurement with a chi-square ( $\chi^2$ ) value of 1.568 is prevalent in the study area while Table 2 and Table 3 shows the assessment of procurement selective factors by two different groups of clients/consultants and contractors respectively. Furthermore, Table 4 revealed that there is a high correlation between selection factors and procurement method in use ( $r=0.9$ ). Table 5 highlighted the mean score item values of causative factors of project abandonment which are attributes of traditional procurement method. These findings are consistent with Andy (2007) project abandonment cycle shown in Figure 2.

### Conclusion

The selection of appropriate procurement methods is crucial to the successful delivery of project development and this enhances the built environment. However, the prevalent use of traditional method of procurement does not ensure efficient utilization of scarce resources and this contradicts the vision of sustainable environment.

In view of the findings and conclusion of this study, there is need to integrate and adopt modern procurement techniques that could match client's objectives with project objectives. These techniques should be considered and integrated into the practice or policy of public procurement system in Nigeria.

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