

A COMPARATIVE STUDY OF THE TIME AND COST PERFORMANCE OF LABOUR-ONLY SUBCONTRACTORS IN THE CONSTRUCTION INDUSTRY IN SOUTH WESTERN NIGERIA

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ABSTRACT

The main contractors are continuously involved in a process of transforming inputs (materials, labour and capital) into outputs such as constructed facilities but they are usually accompanied by subcontractors and financial institutions among other firms. This study therefore examined the performance of labour-only subcontractors in the Nigerian construction industry. The principal objective was to find if any significant difference exists between the time and cost performance of these speciality contractors. In achieving this objective, one hundred questionnaires were distributed to each of the four categories of respondents in the Southwestern region of Nigeria. 75, 88, 56 and 42 questionnaires were respectively filled and returned by the main contractors, labour-only subcontractors, clients and consultants in the study area. Descriptive, parametric and non parametric statistical techniques were used for the analysis. Results indicated that significant difference exists between time and cost performance of labour-only subcontractors. Their mean scores were 4.30 and 3.29 respectively. The labour subcontractor performed creditably well in project delivery (time) but there is always cost overruns when compared with the initial estimates of the projects. It was also discovered that subcontractors' time performance is sometimes at the expense of work quality as a result of the speedy execution of work at hand in order to pave way for another engagement. It is therefore suggested that project monitoring and supervision should be given a priority attention if this procurement method is to achieve its expected success.

Keywords: Construction Industry, Cost, Labour-Only, Performance, Subcontractors, Time.

Introduction

Several studies (Ward, 1976; Wahab, 1976; Chua, 1996; Loh and Ofori, 2000 and Adenuga, 2003) have identified the construction industry as one of the main engines of growth in any economy. It provides the infrastructure required for other sectors to flourish, provides housing as the basic human need and it is instrumental in providing national communications network (Palalani, 2000). The construction industry also provides significant employment opportunities at non-skilled and skilled levels.

In Nigeria and globally, different project execution methods had been used and these include Traditional, Design and Build, Project Management, Management Contracting, Direct Labour and Labour-Only Systems. According to Ogunsnami and Iyagba (2003), the downturn in the Nigeria economy from 1985 to 1999 had created recession in the construction industry that makes clients and consultants to think of cheaper ways of achieving constructions. This led to modifications of existing project execution systems in favour of labour-only system. The construction industries of many countries rely heavily on subcontracting. For example, Greenwood (2001) observed that recent publications show a shift in the attitude of main contractors to labour subcontracting in the United Kingdom and this finding is in line with Fagbenle (2006). Ng (1986) also affirmed that subcontracting is common in the industry because of uncertainties in construction demand. He stressed further that main contractors do not employ construction operatives directly, rather, they engage subcontractors. In this way, the main contractors can operate with substantially reduced overheads and ensure economic deployment of labour with greater mobility for the operatives. Wong (1990) submitted that subcontractors could work faster than directly employed labour their profit is only realized if they complete the work

with expedition. Subcontractors can also reduce main contractors' construction risks through proper execution of work within a set time frame. Debrah and Ofori (1997) also believed that subcontractors facilitate the work of the main contractors. Fryer (1982) regarded labour as an important resource in construction because it is the one that combines all other resources, namely, materials, plant, equipment and finance in order to produce the various construction products.

Loh and Ofori (2000) also noted that in Singapore, 60-70% of the work is subcontracted. Labour subcontracting has also been the feature of the industry in many other countries, including the United States (Gray and Flanagan, 1989) and Japan (Beardsworth et al. 1988). Hinze and Tracey (1994) who worked on some projects in Europe noted that on many projects, particularly building projects, it is not uncommon for 80-90% of the work to be performed by labour-only subcontractors. The International Labour Organizations (ILO) in its 2003 publication also reported that even in Germany where the construction labour market is still governed by a dense network of domestic regulations, the number of German companies employing more than 500 people have shrunk from about 130 four decades ago to only 50 in 2003. It further gave the instance of Germany, France and Finland where only about 25 per cent of construction workers are employed in firms with more than 100 employees. Advocates of this project execution system had however asserted that it gives cheaper, faster and better quality constructions than any other construction methods. The pertinent questions are: what is the most frequently used procedure for selecting labour-only subcontractors on construction sites?; what are the views of main contractors, clients and consultants on the performance of labour-only subcontractors in relation to time, cost, quality and safety?; what factors influence subcontractors' performance?; is the performance of labour-only subcontractors influenced by project time?; is the performance of labour-only subcontractors influenced by project cost?; does any difference exist between the time and cost performances of labour-only subcontractors on construction sites in the study area?. It is on the account of these claims that the study attempted to compare the performance of labour-only subcontractors in terms of time and cost.

Project Performance and Influencing Factors

Studies into the performance of the construction products have engaged the attention of many researchers (for example, Sidwell, 1983; Sink, 1985; Campbell, 1995 and Chimwaso 2000). Clients of the construction industry have measures for assessing contractors' performance depending on the type of client, projects and other related factors. According to Seeley (1996), the traditional project performance measures of cost, time and quality are frequently used to measure contractors' performance by clients. Sidwell (1983) identified factors influencing project time performance and concluded that client's experience, form of building procurement and project organizational structure are elements of a complex causal factor of project time performance. Several other factors affect project performance. Hatush and Skitmore (1997) grouped the factors affecting the environment of construction project under cultural, economic, political, social, physical, aesthetic, financial, legal, institutional, technology and policy. It was further argued that a project might be delayed because of a seemingly endless list of variables and that all delays usually cost money. Moreover, the neglect of quality has a detrimental effect upon time and cost performances. Other influencing factors identified include other non-traditional measures such as health, safety, material waste and management expertise (Smallwood, 2000), size and scope of project, clients influence with respect to clarity of requirements and avoidance of changes to the design (Akinsola et al. 1997).

Chuachan and Chiang (1989) undertook a survey of 100 building and civil engineering projects in Hong Kong, India, Korea, Singapore, Taiwan and Thailand. Their survey result led them to believe that the performance of a construction management team is influenced by internal and external factors which they classified as project, environment and management related. Ireland (1983)'s early work provided a more useful segregation on management factors from complexity factors. Using a case history approach on 25 high-rise construction projects, Ireland investigated two propositions: "The use of

managerial actions can reduce the time taken, reduce their cost incurred and improve the quality produced of high-rise buildings. Ireland's work has made a valuable contribution to the understanding of management related construction time performance. His conclusions relate to how management reacts to environmental factors, though environmental factors are not identified and discussed as independent variables. Dissanayaka and Kumaraswamy (1999) compared contributors to time and cost performance in building projects and concluded that procurement sub-system are less significant than the non-procurement related variables in predicting time and cost performance levels on Hong Kong building projects. Chimwaso (2000) evaluated the cost performance of public projects in Botswana by identifying the factors that influence construction cost overrun. His conclusion revealed that seven out of ten projects investigated had reported cost overruns and that the five influencing factors are incomplete design at the time of tender, technical omissions at design stage, additional work at the client's request, adjustment of prime sum and provisional sum costs as well as contractual claims. Besides the fact that these studies were targeted on Hong Kong, Indian, Taiwan, Thailand and Botswana building sites, they were limited to only two factors/variables of performance measures. Moreover, none of the studies was specific on a particular system of procurement.

At the local scene, Ogunsanmi (2000) comparatively studied the performance of labour-only contracting and direct labour procurement system in three states of Nigeria and concluded that labour-only contracting performed better than the direct labour approach. The management of labour-only contracts in the Nigerian construction industry was investigated by Adenuga (2000) and he concluded that the system is becoming an increasing prominent feature of the construction labour market. Dada (2003) studied the perceptions on measures of contracting/contractors' performance, taking a case study of Lagos States' indigenous contractors. His result indicated that there are no significant differences in the assessment and ratings of the identified measures of contractor's performance. Within the limit of these findings, no literature has addressed the issue of time and cost performance of labour-only subcontractors in Nigeria and this is what this study set to achieve.

Research Methodology

The population of the main contracting firms and labour-only subcontracting firms used for his analysis are those listed in the register of the Federal Ministry of Works and Housing (FMWH), otherwise known as Federal Registration Board of Nigeria. Presently, the Federal Registration Board has four categories of registration which are based on their contract values. Table 1 further shows the contract values for each of these categories.

Based on this, construction firms registered under categories C and D were classified as main contracting firms while subcontracting firms are firms registered under categories A and B. This categorization was also arrived at from the preliminary study of on-going projects in the study area. A total of eight hundred and eighty (880) construction firms were registered under categories C and D while categories A and B have a total of two thousand, four hundred and sixty (2,460) registered firms. The statistically required sample size is calculated from the following formula (Sediary, 1994).

$$n = n \sqrt{\left\{ 1 + \left(\frac{n}{N} \right)^2 \right\}}$$

Where,

n = sample size

n^2 = S^2/v^2

n = total estimated population

v = standard error of the sampling population. Total error = 0.1 at a confidence level of 95% and $S^2 = (P) + (1-P) = (0.5) \times (0.5) = 0.25$, where P is the proportion of population element that belong to a defined class.

Four sets of questionnaires A, B, C and D were designed to collect information on the issues raised in the literature review and objective of study. Questionnaire A was designed solely for the main contractors in the building industry while questionnaires B, C, D were designed for labour-only subcontractors, clients and the consultants respectively. A total of one hundred questionnaires were distributed to each of the four categories of the targeted respondents and this covers the southwestern states of Nigeria. The states are Lagos, Oyo, Ogun, Ondo, Osun and Ekiti. From the distribution, 75, 88, 56, and 42 questionnaires were filled and returned by the main contractors, labour-only subcontractors, clients and the consultants respectively.

The mean scores for each of the performance measures (time, cost, quality, frequency of accidents, technical and overall performance) were also computed by using the following formula (Adenuga, 2003).

$$\text{Mean score (MS)} = \sum \left(\frac{f \times s}{N} \right)$$

Where,

S = score given to each factor

F = frequency of responses to each rating

N = total number of responses concerning the factors

The descriptive and inferential statistical techniques were used for the analysis in this study. They include percentages, Kendall's coefficient of concordance, Chi-square test, and the correlation coefficient.

Results and Discussions

In order to know the most frequently used procedure for the selection of labour-only subcontractors on construction sites, questions were asked from the respondent main contractors. The survey (Table 2) showed that the most frequently used procedure for selecting labour-only subcontractors on site is competitive bidding with discretion in selection (60%). This is followed by negotiated selection and price (21.3%), competitive bidding with attached condition (13.3%). A small number used the price quoted by labour-only subcontractors (2.7%). This might not be unconnected with the need to forestall the award of contracts to incompetent subcontractors who might want to use the quoted lower price as a trap for securing contracts. In addition, fifty two of the respondents, representing 69.3%, submitted that contracts are normally awarded based on best price from proven subcontractors. Twelve of the main contractors (16.0%) affirmed that preference is normally given to the lowest negotiated price from labour-only subcontractors when adopting negotiated selection. Regardless of the type of procedures used in this selection, nine of the respondents (12.0%) posited that the subcontract award was based on dividing the yearly work among labour-only subcontractors in order to maintain business relations.

The respondents in each of the four categories were also asked to assess the performance of labour-only subcontractors on their sites. This assessment was based on some identified measures of performance which are time, cost, quality, frequency of accidents (safety), technical and the overall performance. This was rated on a five-point likert scale of 1 to 5 (1-poor, 2 – satisfactory, 3-good, 4- very good, and 5- outstanding).

Kendall's coefficient of concordance test of agreement between the respondents was first performed in this regard. The results (Table 3) indicated significant agreement between the respondents in the ranking of the six factors.

A hypothesis was tested here. The null and the alternative hypotheses are stated thus:

H_0 – There is no significant difference in the ranking of the time and cost performance of labour-only subcontractors.

Hi – There is significant difference in the ranking of the time and cost performance of labour-only subcontractors.

Symbolically,

$$\begin{array}{lll} H_0 & : & \mu_1 \neq \mu_2 \\ H_1 & : & \mu_1 = \mu_2 \end{array}$$

The results, which are summarized in Table 4, showed that labour-only subcontractors performed best in project delivery (time) and least in terms of quality performance which of course is associated with cost overrun. The mean scores for time and quality performance are respectively 4.30 and 3.28. Cost performance was rated second from the rear in this circumstance (3.29). The results of the Chi-square test also showed a positive and strong relationship between time and overall performance of labour-only subcontractors. The results were however different in the case of cost performance as it shows no noticeable relationship with the overall performance. Their Chi-square values are 0.040 and 0.624 respectively for time and cost performance. These are summarized in Tables 5 and 6.

Again, the results of the correlation coefficient on the relationship among time, cost, quality and overall performance showed a strong and positive relationship between time and overall performance (0.444). On the other hand, a negative relationship exists between cost and overall performance (-0.081) of these specialty contractors and this is further summarized in Table 7.

From the results in Tables 3-7 and the discussions, the null hypothesis is rejected and the alternative hypothesis is accepted instead. That is, there is significant difference in the ranking of time and cost performance of labour-only subcontractors. The result support the view of Wong (1990) as well as Debrah and Ofori (1992) that labour-only subcontractors could work faster than the directly employed labour and that labour-only subcontractors facilitate the work of the main contractors

Conclusion

The data collected from the four categories of targeted respondents and the results of the statistical techniques have clearly established that significant differences exist in the time and cost performance of labour-only subcontractors on construction sites. Also, labour-only subcontractors performed creditably well in terms of project duration (time) but sometimes at the expense of quality of work. It was further revealed that cost and time overruns are normally involved in the process of upgrading work to the desired quality by the client. In most cases, clients and main contractors tend to be deceived by the time performance of these specialty contractors but there is always cost overrun when compared with the initial cost estimate(s).

It is therefore recommended that for subcontracting to be worthwhile, there must be proper project monitoring and supervision by the main contractor. By this way, the quality of work could be controlled to a very large extent.

This comparison has been made for only time and cost performance of labour-only subcontractors; it will be more desirable if the same comparison could be tested for other performance attributes of labour-only subcontractors. Moreover, comparative analysis with other procurement methods should also be investigated. This is with a view to knowing the cheapest procurement method(s).

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Appendix

Table 1: Categorization of Construction Contractors by the Federal Registration Board of Nigeria

Category	Old Value	New Value
A	Up to ₦50,000	Up to ₦ 2 million
B	₦ 50,000 – ₦ 250,000	Up to ₦25 million
C	₦ 250,000 – ₦ 2 million	Up to ₦100 million
D	Over ₦2 million	Above ₦100 million

Source: Federal Registration Board (2004)

Table 2: Main Contractors' Procedures for Selecting Labour-Only Subcontractors

	Main Procedures			Sub Procedures		
	Procedural Type	Response	%	Procedural type	Response	%
1	Competitive Bidding	10	13.3	Lowest Bidder	2	2.7
2	Negotiated Selection and Price	16	21.3	Lowest Negotiated Price	12	16.0
3	Negotiated Fixed Unit Price	2	2.7	Best Price from a Proven Subcontractor	52	69.3
4	Competitive Bidding with Discretion in Selection	45	60.0	Sharing Work to Maintain Business	9	12.0
5	Accept Price Quoted by Labour Subcontractors	2	2.7	Relationship with Subcontractors	0	0.0
6	Others	0	0.0	Others	0	0.0

Table 3: Kendall's Coefficient of Concordance Test for Time and Cost Performance

No of cases	W	X ²	Df	Significant
30	162	45.508	10	0.000

Table 4: Rating of some of the Performance Measures of Labour-Only Subcontractors by the Respondents

S/N	Performance Measures	Response rate					Mean score Rank
		1	2	3	4	5	
1	Time performance	0	6	10	14	45	4.30
2	Overall performance	3	5	20	43	3	3.47
3	Technical Performance	0	6	45	14	10	3.37
4	Frequency of Accident	1	6	38	28	2	3.32
5	Cost performance	0	7	39	29	0	3.29
6	Quality performance	0	10	35	29	1	3.28

Table 5: Chi-Square Test Between Time Performance and Overall Performance of Labour-Only Subcontractors.

	Value	df	Assmp. Sig. (2-sided)
Pearson Chi-Square	10.024 ^a	4	.040
Likelihood ratio	5.935	4	.204
Linear-by-Linear association	4.546	1	.033
N of valid cases			

Table 6: Chi-Square Test Between Cost Performance and Overall Performance of Labour-Only Subcontractors

	Value	df	Assmp. Sig. (2-sided)
Pearson Chi-Square	1.757 ^a	3	.624
Likelihood ratio	2.480	3	.479
Linear-by-Linear association	0.229	1	.632
N of valid cases			

Table 7: Pearson Correlation Coefficients of Assessment of Some Performance Attributes of Labour-Only Subcontractors

	I	II	III	IV
I	1			
II		.035	1	
III			.165	1
IV				.058
				1
I	-	Tirne performance		
II	-	Cost performance		
III	-	Quality performance		
IV	-	Overall performance		