

GLOBAL CONSTRUCTION 2003

1st - 4th December, 2003

*Challenges of
globalization & capacity building in the construction industry of developing
economies*

**Proceedings of the first international
conference**

**Department of Building,
University of Lagos, Akoka-Yaba,
Lagos, Nigeria**

<http://www.bldconfunilag.net>

An Evaluation of Traditional Contract Method on Residential Building Projects

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Abstract

In order of priority of basic human needs, housing is recognized worldwide as second to food and comes before clothing. This high priority coupled with United Nations aggressive campaign for adequate shelter for all citizenry has forced governments of nations to embark on direct construction of housing units for their people. In Nigeria, government direct intervention in housing delivery to the masses took the form of traditional contract procurement. This paper reports the result of a survey carried out to know the performance of this procurement method in relation to time and cost overrun. Valid data from fifty-seven residential projects ranging from one million to one hundred million Naira initiated by government between 1993 and 1999 couple with questionnaires administered on Clients, consultants and contractors were used for the analysis was to establish whether there is significant difference between the mean time overruns and the mean cost overruns of traditional contract on residential projects of different cost categories.

The result showed that the traditional contract performs better in terms of time overruns (18.98%) when used to procure residential building projects of five million Naira and below. However the procurement method performs better in terms of cost overrun (9.13%) for projects above ten million Naira. Attempts were also made to know if a relationship exists between time and cost in each category.

Introduction

Shelter has been acknowledged to be one of the basic needs of humanity. It was therefore not surprising when the United Nations launched an aggressive campaign through government of Nations of the need to provide shelter for all. Its slogan housing for all by the year 200 was carried far and wide in all nations including Nigeria. Prior to this year 200, precisely in 1991, The Nigerian government had enacted into law the National Housing policy in an effort to ensure that all Nigerians own a decent housing accommodation at affordable cost. The National Housing Policy (1991) acknowledged that there is an acute housing shortage in Nigeria particularly in the urban areas. That also about five million new housing units would be required to overcome this shortage.

To achieve this aim of providing decent housing accommodation for the populace, construction must be embarked upon. And one of the many contract methods used in construction is the traditional contract procurement method. This method involves the appointment of an architect who leads the design team which is set up at his (architect's) recommendation. The other members of the design team are the Engineers, and the Quantity surveyor. In this method, according to Rowlinson (1987), the Architect most of the times takes the client's brief and then develops it into architectural form. The Engineers then come in for the structural, mechanical and electrical designs and detailed it up to a point where the various elements of the structure can be taken off and worked up into a bill of quantities by the quantity surveyor. After this stage, the builders or contractors are invited to tender for the construction part. Their tenders are examined, compared and the successful contractor is appointed to carry out the construction part of the project under the guidance of the architect.

According to Wahab (1987), this system has the singular advantage of competitiveness which often brings in low tenders. This method is however characterized by fragmentation. This fragmentation and complexity of projects according to Naoum and Langford (1984), place burden on the traditional method for managing building contracts. The National Economic Development office (NEDO) (1982) acknowledged the failure of the traditional method on timely completion of projects in the United Kingdom as compared to other procurement methods. In Nigeria, Osemenam (1992) confirmed this assertion that "the traditional method leads to long delays in project conception and delivery invariably leading to high cost of projects." However, the construction industry practitioners in Nigeria despite the known failure of the traditional methods still use the method mostly to procure their projects (Ojo, 1999). The guiltiest of this practice is the public sector clients (the government establishments) which is the largest employer of the construction industry in Nigeria, and some uninformed private sector clients. Though it cannot be said that the

traditional method is all together ineffective but that for certain projects alternative procurement methods could be more appropriate.

This study investigates the performance in terms of time and cost overrun of the traditional contract method on residential buildings ranging from 1 million Naira to 100 million Naira. It also examined the relationship between time and cost overrun in each cost category.

Research Methodology

This study was carried out through questionnaire survey. The questionnaire elicited empirical data on the performance of traditional contract method on set construction parameters such as cost and time of residential building projects procured using the traditional method. Respondents were also asked to identify the factors responsible for cost and time if there were any.

A total of fifty-five questionnaires were administered on construction industry practitioners in Lagos State. The questionnaires were administered to organizations selected by stratified random sampling from three main sources.

1 Clients (Federal/State ministry of works, local government, government establishments and educational institutions)

Consultants (Architects, Engineers and Quantity surveyors)

Contractors (small, medium and large sized)

A total of twenty-eight respondents completed and returned the questionnaire yielding a response rate of 50.9%.

Table 1 show the proportions of distribution and complete questionnaire according to the class of respondents.

Class of Respondents	No of Questionnaires Distributed	No of Questionnaires Returned
Clients	25	13
Consultants	15	6
Contractors	15	9
Total	55	28

Valid information of fifty-seven residential projects initiated and completed between 1993 and 1999 were supplied. These were divided into cost categories for the purpose of analysis as follows.

less than 1million naira (Group 1)

between 1million naira-5million naira (Group2)

- between 5million naira-10million naira (Grop3)
- between 10million naira-100million naira (Group4)

The following variables were analyzed as follows to determine the level of success achieved by the traditional contract method on the initial construction time and cost in each cost category.

- 1 Construction time overrun: It was calculated by the mean percentage increase on the initial contract period i.e $\frac{v_2 - v_1}{v_1} \times 100$, where v_1 is the estimated period of completion and v_2 the final construction period in months.
- 2 Construction cost overrun: It was calculated by the mean percentage increase on the initial construction cost i.e $\frac{v_4 - v_3}{v_3} \times 100$ v_3 is the initial construction cost and v_4 , the final contract sum.

The population mean was estimated by the sample mean.

Statistical analysis using the SPSS package of student t-statistic was used to examine relationships between the cost categories. The personian (product moment) correlation coefficient was also used to determine the relationship between the time overrun and cost overrun of each cost category. Analyses were carried out at 5% level of significance using the 2- tail test.

A null hypothesis which contends that there is no significant difference between the cost and time overruns of two cost category was tested. The purpose of these analyses is to establish if there is a "real" difference between the time and cost overruns of traditional contract projects of different cost categories. This will enable the client to decide the cost category in which the traditional contract method is most effective.

Results and Discussion

The objective of this analysis was to establish whether there exist a "real" difference between the mean time overruns and mean cost overruns of traditional contract residential projects of different cost category.

CONSTRUCTION TIME OVERRUN

According to Naoum and Langford (1987) there is no yardstick by which the construction duration of a project is measured. But it is common for contractors and consultants to use their expertise and esperience of similar projects to estimate how long a particular project should take to build. In view of this, the number of cases studied were compared with their estimated construction period.

Table 2 shows the mean time overrun over the estimated construction period and valid cases for each cost category.

Table 2: Mean time overrun of cost categories

Cost Category (Naira)	No of Valid Cases	Mean time Overrun%	Standard deviation
1m \$ below	15	32.34	33.25
1 m-5m	24	18.98	20.16
5m -10m	7	99.64	201.77
10m -100	11	52.89	46.45

The result in table 2 clearly shows that the traditional contract methods least overran (18.98%) its residential building projects of 1m-5m (Naira) cost range. The longest overrun (99.64%) occurred when the method was used for residential building projects of 5m-10m (Naira) cost range. The implication of these results is that, when the traditional contract methods is used to execute residential building projects, divided into these cost categories, projects in the 1 m – 5m (Naira) cost range would be completed first. Followed by 1m Naira and below,

The mean time overrun for each cost category was compared with other cost categories using the student t- statistic. This was done to test the null hypothesis that there is no significant difference between the mean time overrun of the cost categories. Tables 3, 4,5,6,7 and 8 show the results of these comparisons.

Table 3: the t- test result between groups 1 and 2

Cost Category	No of Valid cases	Mean time Overrun%	Standard deviation	Pooled	Variance	Estimate	Inference From test
				t-value	Degrees of Freedom	2-tail Prob	
Group 1	15	32.34	33.25	1.57	37	0.126	Not Significant
Group 2	24	18.98	20.16				

Table 4: The t-test result between groups 1 and 3

Cost category	No of valid cases	Mean time overrun%	Standard deviation	Pooled t-value	Variance Degrees of freedom	Estimate 2-tail Prob.	Inference From test
Group 1	15	32.34	32.25	-1.29	20	0.212	Not significant
Group 3	7	99.64	201.77				

Table 5: The-test result between groups 1 and 4

Cost Category	No of Valid cases	Mean Time Overrun%	Standard deviation	Pooled t-value	Variance Degrees of freedom	Estimate 2-tail Prob.	Inference From test
Group 1	15	32.34	33.25	-1.32	24	0.200	Not significant
Group 4	11	52.89	46.45				

Table 6: The t-test result between groups 2 and 3

Cost Category	No of Valid cases	Mean Time Overrun%	Standard deviation	Pooled t-value	Variance Degrees of freedom	Estimate 2-tail Prob.	Inference From test
Group 2	24	18.98	20.16	-2.01	29	0.054	significant
Group 3	7	99.64	207.77				

Table 7: The test result between groups 2 and 4

Cost Category	No of valid cases	Mean time overrun%	Standard deviation	Pooled t-value	Variance Degrees of Freedom	Estimate 2-tail Prob.	Inference from test
Group 2	24	18.98	20.16	-3.04	33	0.005	Significant
Group 4	11	52.89	46.45				

Table 8: The t-test result between groups 3 and 4

Cost Category	No of valid cases	Mean time overrun%	Standard deviation	Pooled	Variance	Estimate	Inference from test
				t-value	Degrees Of freedom	2-tail Prob.	
Group 2	7	99.64	201.77	0.75	16	0.464	Not significant
Group 4	11	52.89	46.45				

The results revealed that, residential buildings costing between ₦1 m -₦ 5m and ₦ 10m and above had a significant difference. That implies, the traditional contract method performs better in terms of completion period on residential building projects costing ₦ 1m- ₦ 5m than similar projects costing ₦ 10m and above.

COST OVERRUN

The amount, which a project could cost is usually the responsibility of the quantity surveyor. The project cost is usually set at the beginning of the project and this is called the initial cost. Clients however are less worried by this initial cost but rather "interested" in an early prediction of the total amount he will have to pay and the variance between this prediction and the actual final cost (Sidwell, 1984).

Table 9 shows the mean cost overrun for each category and tables 10, 11,12,13,14 and 15 show the results of the t-test performed between the cost categories.

Table 9: the mean cost overrun for the cost categories

Cost Category (Naira)	No of valid cases	Mean cost of Overrun	Standard deviation
1m & below	15	34.55	48.22
1m-5m	24	11.59	13.91
5m-10m	7	16.92	35.78
10m & above	11	9.13	18.03

From table 9, projects of ₦ 10m naira and above least overran their initial cost estimates in comparison with the others. One reason by which the performance of projects costing ₦ 10m naira and above could be explained is the possibility of strict enforcements of the terms of contract. This reduces unnecessary claims by contractors. Comparison was

made between the mean cost overrun of all the cost categories using the student t-statistic at 0.05 significance level. Tables 10, 11, 12, 13, 14 and 15 show the results of these comparisons.

Table 10: The t-test result between groups 1 and 2

Cost Category	No of valid cases	Mean cost overrun%	Mean cost overrun%	Pooled	Variance	Estimate	Inference from test
				t-value	Degrees of freedom	2-tail Prob.	
Group 1	15	34.55	48.22	2.21	37	0.05	significant
Group 2	24	11.59	13.91				

Table 11: The t- test result between groups 1 and 3

Cost Category	No of valid cases	Mean cost overrun%	Mean cost overrun%	Pooled	Variance	Estimate	Inference from test
				t-value	Degrees of freedom	2-tail Prob.	
Group 1	15	34.55	48.22	0.86	20	0.4	Not significant
Group 3	7	16.92	35.78				

Table 12: The t-test result between groups 1 and 4

Cost Category	No of valid cases	Mean cost overrun%	Mean cost overrun%	Pooled	Variance	Estimate	Inference from test
				t-value	Degrees of freedom	2-tail Prob.	
Group 1	15	34.55	48.22	166	24	0.11	Not significant
Group 3	11	9.13	18.03				

Table 13: The test result between groups 2 and 3

Cost Category	No of valid cases	Mean cost overrun%	Mean cost overrun%	Pooled	Variance	Estimate	Inference from test
				t-value	Degrees of freedom	2-tail Prob.	
Group 2	24	11.59	13.91	-0.61	29	0.55	Not significant
Group 3	7	16.92	35.78				

Table 14: The t-test result between groups 2 and 4

Cost Category	No of valid cases	Mean cost overrun%	Mean cost overrun%	Pooled	Variance	Estimate	Inference from test
				t-value	Degrees of freedom	2-tail Prob.	
Group 2	24	11.59	13.91	0.44	33	0.66	Not significant
Group	11	9.13	18.03				

Table 15: the test result between groups 3 and 4

Cost Category	No of valid cases	Mean cost overrun%	Mean cost overrun%	Pooled	Variance	Estimate	Inference from test
				t-value	Degrees of freedom	2-tail Prob.	
Group 3	7	16.92	35.78	0.62	16	0.55	Not significant
Group 4	11	9.13	18.03				

The t-test statistic results revealed that there is a significant difference between the mean cost overrun between residential projects costing ₦ 1m-5m and ₦ 1m and below. That means it can be stated with confidence (95%) that there is a difference between the costs of two categories. All other comparisons did not produce any significant difference. The implication is that when a client employs the same contractor for his residential projects costing ₦ 1m-5m and ₦ 1m below, the extra cost incurred over and above the initial cost of group 1 will be more pronounced than that of group 2. For other comparisons, the extra cost incurred over and above their initial costs will not be pronounced in comparison with other cost categories.

The Personian (product moment) correlation coefficient was used to establish relationship between cost and time overrun for each cost category. Table 16 shows the personian correlation coefficient for all the categories.

Table 16: Pearsonian correlation coefficient results

Cost categories (Naira)	r- value	P - value	Inference
Less than 1m	-0.013	.482	Weak negative relationship
1m-5m	+0.099	.321	Weak positive relationship
5m-10m	+0.99	.000	Significantly strong relationship
10m& above	+0.672	0.012	Significantly strong relationship

The Pearsonian correlation coefficient results mean that for a residential project less than ₦ 1m (naira) there is a negative correlation. This means that cost and time overruns in this cost category change in opposite direction. For instance an increase in time leads to a decrease in cost. This is contrary to economic theory, particularly for construction project. The relationship though is weak and not significant; hence it can be safely assumed that there is no statistical relationship between the two variables. But for cost category of 1m-5m (naira) the relationship is positive i.e. an increase in time overruns leads to increase in cost. However, the relationship is weak and not significant.

For cost category of ₦ 5m-10m (naira) there is a perfect positive correlation between time overrun and cost overrun. The relationship is also significant and it can be concluded 100% level of confidence that the time overrun led to the increase in the final cost of the project. Likewise for cost category of ₦ 10 m (naira) and above, there seems to be a perfect positive correlation between time overrun and cost overrun. The relationship is significant. That means it can be said with 95% confidence that the time overrun caused the increase in cost of the project with in this cost category.

Conclusion

The provisions of adequate housing have been accepted by government of nations as basic. The traditional contracting method being the most widely used procurement method was evaluated on the initial cost and time between ₦ 1m and ₦ 100m

Based on this study, the traditional contracting method performs far better in terms of time when used to procure residential building of ₦ 5m and below than the higher cost categories. The reason adduced for this is the reduction of number of participants that are involved in such low cost projects in comparison to high cost projects (10m naira and above). This reduction certainly shortens the communication line, making it more effective and coordination easier. As regards cost, the traditional contracting method however,

least overran (9.13%) its initial cost when used to procure projects above ₦ 10m (naira). This performance is due to the fact that for contract of such category clients demand strict enforcements of contract terms to reduce contractors unnecessary claims.

The time slippages of residential projects costing 5 m (naira and above led to the cost slippages as revealed by the personian correlation coefficient. Hence every effort should be made to reduce time slippages of such residential projects in this category in order to reduce cost overruns.

References

- Naoum, S.G. and Langford, D. A (1984). Management Contracting: Review of the System. Proceedings of 4th international symposium on Organization and Management of Construction, CIBW-65 ,Vol3 July. pp.1013
- Naoum, S.G. and Langford, D.A (1987). Management Contracting, In: Managing Construction World wide. A publication by CIOB. Vol 1, pp.43-54.
- National Economic Development Office (1982). Faster Building for industry. HMSO. London, 1982
- Ojo S.O.(1999). An Evaluation of procurement Methods in Building projects in South Western Nigeria. An Unpublished Msc. (Construction Management) Thesis Obafemi Awolowo University, Ile- Ife..
- Osemenam, C.A. (1992). Management Contracting and National Construction Policy. A paper presented at the joints Seminar Organized by Quantity Surveyors registration Board of Nigeria and Nigerian Institute of Quantity Surveyors. September.
- Rowlinson, S.M. (1987). Comparison of Contracting Systems for Industrial Buildings Managing Construction World wide. A publication By CIOB.vol. 1. 4-5.
- Sidwell, A.C (1984). The Measurements of Success of Various Organizational Forms of Construction Projects. Proceedings of 4th International Symposium on Organization and Management of Construction. CIBW -65 vol.1, 283 -289.
- Wahab, K.A (1987) Alternative Strategies for Project Execution. *Construction in Nigeria*.iv(3),4-11.