Post Contract Cost Management Practices of Contractors in Nigeria

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Abstract

It is a well-known fact that a lot of problems have arisen during the construction projects implementation; out of which, the main distinctive problem is cost overruns. Cost overruns are evidently frequent problems in the construction industries of many developed and developing countries. Once the construction projects implementation begins, the project's costs rarely remain static. There is need for cost control on the part of contractor in order to guarantee profit and ensure the continued achievement of long term goals of the company. This study was therefore carried out to examine the post contract cost management practices of contractors in Nigeria. The study examined the frequency of use of contractor's cost control methods and their effectiveness. A cross-sectional survey research design was adopted for the study. A structured questionnaire was used as the principal instrument for collecting data from respondents. Random sampling method was used to drawn up sample from the population. A total sample of eighty (80) was drawn from these collections of building construction contractors of various categories (small, medium and large) from Lagos, Nigeria. Thirty four (34) were completed and returned representing a 44% response rate. Frequency, percentage, mean score, spearman rank order correlation and analysis of variance were used in analysing data collected for the study. Findings reveals cost projection measure is the most frequent cost control method used by contractors, while actual versus forecast reconciliation (labour/material/plant) is regarded as the most effective control method. Expatriate and partly expatriate contractors agree on the effective cost control methods in the construction industry. It was recommended that building contractors should ensure reliable and accurate cost estimating, the quantification of actual costs for labour, equipments and plants should be done on site during construction to ensure cost control on construction sites. The feedback which requires adjustments during pricing future estimates should be kept and updated in the form of bills of quantities. This study further recommends contractors should embrace cost control methods which ensure close monitoring and reporting of work progress and cost performance. This is very important for effective cost control process during post contract stage. The report also claimed that IT integration is the only way to get quick and accurate reports to solve cost overrun and its associated problems identified by several literature and professionals.

Keywords: Construction project, cost control, cost overrun, Nigeria, post contract.

1. INTRODUCTION

The construction industry is vital to the national economy and is an important industry worldwide, providing the infrastructure and buildings on which all sectors of economy depend. The construction industry continually is becoming more global, hence there is need for it to establish a competitive position in local, national and global markets. Reference [1] highlighted that during the past two decades, the global marketplace has changed, and most of the engineering and construction firms have had to deal with many new competitors. The market place includes projects of dramatically different types, size, complexity, requires extensive professional and trade skill. Additionally, the construction industry in the market place has created a need for understanding global dynamics and competition, developing new and innovative cost management system, and taking actions to maintain world-class leadership

Construction projects involve several inter-related activities. The management of large projects is usually quite complicated and therefore challenging for many construction clients. According to [2], complex and interrelated activities of construction work generate problems for an effective cost control process. This is also the result even when the same set of activities is repeated on construction site. The resources used for an activity may vary depending on a number of factors, amongst which is weather condition, supervision of the works, late delivery of materials, rework, accidents and damages. Keeping proper record of costs incurred during the construction process is a great challenge.

Economic recession has hit the world including the construction industry very hard and fast in time past, producing a negative effect on the availability of finance by client. This was confirmed by [3], who stated that "World recession has generally produced a shortage of funds for capital purposes and construction in general". Many projects under construction have been abruptly terminated by the client and a number of the prominent and prestigious projects delayed or scope reduced as a result of financial issues. This churns up the issue of carrying out a thorough cost planning and cost control measures during the entirety of a construction. The financial

control of any construction project commences at inception and continues until the issue of final certificate. Construction contract is hitherto separated into two major stages, namely, pre-contract and post-contract stages. The pre-contract stage is the period culminating from inception stage to the selection of contractor. The time from signing of the contract until the final certificate is termed the post-contract phase.

Reference [2] reckoned that the financial muscle of client has affected the construction especially as a result of economic melt down and recessions in the economy at strategic periods of the year. This financial crunch leads to the suspension of construction projects, termination of contract, construction work temporarily put on hold or to a great extent, reduction in the scope of the project. At present, contractors are struggling for survival and the continued existence of the realization of their long terms goals and objectives. There are very few building and infrastructure projects in the market for tender by majority of contractors, as the majority of the projects are been undertaken by few reputable contracting organizations. High competition among contractors forced them to get some job with reduced profit margins or even on cost price. They started cost reducing remedial measures like cut-down labours and staffs, vacating office spaces, amongst other things. This invariably has brought up the real importance of implementing effective cost control process at the post contract stage of the procurement phase.

Cost management consists of cost estimation and cost control. Project cost estimating involves developing an approximation of the costs of the resources needed to complete project objectives [4]. On the other hand, [5] stressed that cost control is the continuing process to keep the project within cost objectives and satisfy client's needs. Cost control system should serve as a link between the cost estimate and the actual construction cost. Its main objective is to maintain costs within the restrictions of the cost estimate or construction budget. It is carried out to reduce to the bearest minimum the deviation of the final cost from the initial cost.

Cost control is a key element of the construction management phase of a project. According to [6], the contractors' costs control system comprises the following purpose; first to provide a means of comparing actual with budgeted expenses, second to develop a database of productivity and cost performance data; and third to generate data for valuing variations and changes to the contract. Cost control at the post contract stage is very important for contractors since it determines how profitable their contracts will turn out. There are several factors affecting the process of controlling cost during the construction phase of construction projects in the Nigeria construction industry. Based on the background information aforementioned, the project report seeks to assess the post contract cost control of contracting organization on construction projects in Nigeria.

The aim of the study will be guided by the following specific objectives:
1) To identify the present cost monitoring and cost control methods adopted by contractors during construction phase
2) To examine the effectiveness of the cost monitoring and cost control methods used during the construction phase.

The study will examine the following hypotheses;
- There is no agreement among indigenous, expatriate and partly expatriate/partly expatriate contractors on the effectiveness of cost control methods during construction phase of project
- There is no significant relationship between the frequency of use of the cost control methods and the effectiveness of the cost control methods as used by contractors.

This paper would make a potential contribution to construction industry development in Nigeria. The study highlighted the effectiveness of the different cost controlling and monitoring methods in different construction scenarios or strategy. The study is set out to provide valuable insight to construction firms and the country at large, by promoting effective utilization of minimum available resources during construction. This study analyzed the present cost monitoring and control methods in practice among construction contractors in Nigeria. The paper is divided into four parts namely; introduction, literature review, research method, results/discussion and conclusion and recommendation respectively.

2. LITERATURE REVIEW

This section examines the contributions of other authors and researchers on the subject matter of post contract cost control of contractors in Nigeria.

2.1 Cost control

In the construction industry, the aim of project control is to ensure the projects finish on time, within budget and achieving other project objectives. It is a complex task undertaken by project managers in practice, which involves constantly measuring progress; evaluating plans; and taking corrective actions when required [7]. Cost control and cost planning appear to be the main practices of cost management. However, today the majority of people interpret the concept of cost control wrongly. It is not limited to simple monitoring of the costs and registration of financial information, planned and unplanned expenses a firm may face [8]. Cost control can be

an effective tool of gathering relevant information and making forecasts of possible threats and opportunities in hands of a skilful financial manager. Here the preventive function of the cost management practice is emphasized. By means of cost control an organization can be secured from unpleasant and unexpected surprises [9].

Cost control aims at ensuring that resources are used to the best advantage. In these days where the problem of cost overruns has became a serious issue. Clients are becoming more aware or cost conscious and insist on jobs being designed and executed to give maximum value for money. Cost control means the process of planning and controlling the expenditures or costs of buildings. However, [10] considered cost control far more than only control of expenditures of the project, but also ensuring that the timing of each transaction made is appropriate. Reference [11] extended this theme by defining cost control as the regulation, by executive action, of the cost of carrying out the various activities which go to make up a project or a contract. In fact, this vital process needs to take place throughout complete duration of the construction project. Good cost control during construction is closely related to the care, thoroughness and quality of the planning and decision making process during the design stages. In general, effective control systems should monitor schedule and performance as well as costs by setting budgets, measuring expenditures against budgets and then by identifying variances. This is done by ensuring that the expenditures are proper and by taking corrective action when required [7].

In this context, [12] said that changes to the design and any unexpected or unplanned works generally cost more money which always led to cost overrun of the project. Therefore, in order to avoid or minimize this problem of cost overrun which is the heart of this research, it is better to concentrate the design team's efforts on making those decisions which greatly affect cost during the design stages and before construction commences. This is simply because; when cost control is well designed it helps to keep expenditure within the amount allowed by the client. Reference [13] highlighted that project cost control comprises the following;

a) Influencing the factors that create changes to the cost baseline to ensure that the changes are agreed upon;

b) Managing the actual changes when and as they occur;

c) Assuring that cost overruns do not exceed the authorized funding both periodically and in total for the project;

d) Monitoring cost performance to detect and understand variances from the cost plan;

e) Recording all appropriate changes accurately against the cost baseline;

f) Preventing incorrect, inappropriate, or unauthorized changes from being included in the reported cost or resource usage;

g) Informing appropriate stakeholders of authorized changes; and

h) Acting to bring expected cost overruns within acceptable limits.

Project cost control, searches out the causes of both positive and negative variances and is part of integrated change control For example, inappropriate responses to cost variances can cause quality or schedule problems, or produce an unacceptable level of risk later in the project. [16] recommended that the cost control process should be continued through the construction period to ensure the cost of the building is kept within the agreed cost limits. Also it is recommended that the professional advisor should accept cost as an element in design, and that they should ensure suitably balanced costs throughout all parts of the building, as well as an accurately forecast overall cost.

2.2 Cost control methods by contracting companies

Contractors perform some or any of the following cost control methods during the post contract stages of procurement and they include:

- Standards for Costs and Variance;
- Cost-coding for item of works;
- Weekly cost reports;
- Earned value analysis;
- Monthly P&L reporting;
- Cost Projections;
- Over/under billing analysis.

All these or some of the elements should be present in all cost control methods performed by contractors. Among the cost control methods frequently used by companies are the standards methods, actual versus forecast, integration method, detailed method, weekly report amongst others. According to the standards method, a contractor organization would have to assess previous contracts and set comparative targets for costs in new projects that it undertakes. This method, however, should imply that the projects are comparable. If two projects are not identical (which would be in most of the cases), managers of organisations should estimate the targets for unit costs. Unlike total costs, they are expenses that the company should make to produce a unit of output (e.g. this could be a square foot of building etc.). Integration method of cost control implies that the

company's managers set cost targets not only on the basis of previous experience but also in order to address other functions of the organisations such as maintaining full utilisation of plants, employment of labour force etc. Finally, a detail method of cost control can be implemented by organisations that set individual standards for each new project. Managers would have to estimate the amount that the company receives for completion of the project and prepare a budget for the project that would allocate costs and determine the profit margin of the firm [12,15].

2.2.1. Standard costs and variance

In all contractor organizations they have data collected from past projects executed basically known as standard costs. These standard costs are being premeditated from the historic performance, experiences, problems and feedback from the previous site managers and staff [16]. An initial budget for a project is always prepared in a contractor organisation based on the estimated historical cost. Furthermore, an estimated variance of the actual costs from previously projected expenses is also taken into account to forecast how far future costs will deviate from the planned values. If the actual cost exceeds the standard cost it is a negative variance, which is unfavourable for a contracting organisation. Whereas a positive variance allows for profitability and indicates that the company has managed to control the costs better than it originally planned. Variance is estimated in terms of both the value of costs and quantity of the consumed resources. The variance is usually estimated for labour, plant, materials and overhead costs [17].

2.2.2. Cost coding for item of works.

Reference [18] argue that cost control will be performed more effectively in a contractor organisation if cost coding system is used. The basis of the cost coding is that each activity should be assigned a certain code (usually in the form of alphabetical letters). Cost codes are prepared by identifying activities on site that can be grouped together according to similar operations. For example, items in the Earthwork group can be titled as follows:

E. Earth work
E321.Cut
E.322. Fill
E.332. Rock
E.920 Disposal
R. Road Works
R.111. Sub base
F.121 .Road base
F.131 .Wet mix

Based on the coding system, costs will be recorded on a daily/weekly basis for all activities in a project, which will be summarized to form monthly tab sheets which are basically called cost sheets. These cost sheets help a contractor organization in preparation of the P&L reports, cost projections, etc. It is valid to argue that cost coding may be used not only in relation to the activities but also the type of employees responsible for one or another activity. For example, accountants can be represented by letter A, Project Manager can be represented by letters PM etc. It is also argued that cost coding system may consist of numerical codes and not necessarily letters [19]. The point is that the coding system should facilitate cost management and project management. Facilitation is achieved by making entries shorter and easier [20].

2.2.3. Weekly cost reports

Weekly cost reports are another method of cost control which allow for identifying and rectifying unfavourable variances in costs of the project. Weekly reporting of costs helps managers to control how far the actual costs have deviated from the planned values. This, in turn, allows for taking quick measures to prevent further growth of costs and deterioration of profitability (Smith et al., 2004).

2.2.4. Earned value analysis

Techniques of Earned Value Analysis (EVA) and traditional value analysis may be used by organisations to forecast and plan financial information or to carry out cost control. The advantage of the EVA is that it gives the opportunity to focus the company's attention on the dependence between the actual costs the company has to bear and the real physical work that is done in the context of the project [21]. Traditional value analysis has a more simple approach of comparing the projected costs and the costs that occur in reality. Moreover, there is a number of strategic techniques, such as careful risk management, layoffs, reduction of salaries for the staff, back out of the cooperation with additional subcontractors, reduction of bonuses and initiatives for the employees, wastage control, delay in payments, etc. All the discussed techniques are effective for cost cutting. However, some of them pave particular side effects and limitations. For example, salary reduction and layoffs usually reduce productivity of the employees, which breaks the balance of costs and profits [22].

2.2.5. Monthly P&L reports

Monthly P&L reports are commonly used in standard contractor organisations all over the world. The P&L report gives an indication of the financial status of the company at a particular point in time. These reports are

basically calculated where EVA techniques are used to find out the actual value of work done up to that point. They are mainly prepared on a monthly basis and are further incorporated into quarterly and annual reports.

At the end of every month a cost sheet is produced by the contractor organisation for every project. This helps the contractor to identify overbilling and under billing for each activity in construction. Overbilling implies that more costs will have to be deducted from the revenue of the project. Underbilling is the opposite situation and it adds to the company's earnings. So, underbilling/overbilling analysis helps the company to assess its realistic costs and compare them to the predictions of expenses

2.2.6. Cost projections

Cost projections are prepared at an early stage of a project and allow contractors to foresee profitability of the contract that has been won [19]. As it was previously discussed, the cost projections and actual costs should be monitored on a monthly basis and are an important tool in the budgeting and cost control of all projects. Once the contract has been signed between a contractor and a client, the managers of the contractor organisation make cost forecasts and calculate the anticipated value of the project, which would be the difference between the revenue received from the client and total costs of the project completion. So, cost projections also allow the managers to make preliminary estimates of the profit margins that indicate profitability of a project [18]. At the end of every month, the cost projection should be updated based on the actual costs incurred. The projections will then have to be revised for the remaining period of the project. It is common for construction projects to have a variance between actual and projected costs. This has already been discussed above. Revisions of cost forecasts on a monthly basis allow managers to make quick corrections and the measures to prevent further growth of costs if necessary [10].

3. RESEARCH METHODS

Research design is concerned with turning the research question into a testing project. The best design depends on your research questions. The research design has been considered as a blueprint for research, dealing with at least four problems: what questions to study, what data are relevant, what data to collect, and how to analyze the results. A survey research design was adopted in the study to achieve the outlined objectives. Specifically, a cross-sectional research design was used where samples were drawn from the population of study at one point in time.

The study was conducted in Lagos which is economically an important city in Nigeria. As the economic and commercial nerve-centre of the country, Lagos has a high volume of construction activities as well as a large concentration of building contractors of various categories and sizes. Most of the major building contractors have their head office or at least a branch/operation office in the city which also houses a rich collection of construction industry practitioners and experts. The high demands for residential, commercial and institutional buildings, civil and heavy engineering works in the study area have necessitated the above mentioned scenarios. The target respondents included managing directors, project managers, head of estimating units, senior quantity surveyors and other key personnel involved in the planning, cost management, supervision and monitoring of construction projects.

Eighty (80) contractors with operation offices in Lagos, Nigeria were identified from the lists available to the research. A total sample of thirty four (34) was drawn from these collections of construction contractors of various categories (small, medium and large) in Lagos. Thirty four (34) were completed and returned representing a 44% response rate. Random sampling, which is a probabilistic sampling technique was adopted for the study due to the comprehensive list of contracting organization operating or based in Lagos listed with FOCI as at the time of carrying the study. Frequency, percentage, mean score, spearman rank order correlation, paired t-test and analysis of variance were used in analysing data collected for the study.

4. RESULTS AND DISCUSSION

Before interpreting the research findings, it is important to consider general characteristics of the respondents. The responding contracting firms were all from Lagos metropolis. Descriptive statistics about the respondent and the responding organisation are shown in the following tables.

Table 1:Demographic data of Respondent

	Frequency	Percent (%)	Cumulative Percent
Designation of Respondent (N=32)			
Project manager	10	31	31
Head, Estimating and QS dept	9	28	59
Accounting officer	1	3	62
Others	12	38	100
Academic qualification (N=33)			
HND/BSc/BTech	15	45.5	45.5
PGD	2	6	51.5
MSC/MBA	15	45.5	97
PhD	1	3	100
Construction experience (N=34)			
1-10years	27	79.4	79.4
11-20years	5	14.7	94.10
21-30years	1	2.9	97.1
31-40years	1	2.9	100
Professional Background (N=34)			
Quantity Surveyor	22	64.7	64.7
Builder	7	20.6	85.3
Civil Engineer	3	8.8	94.1
Mechanical Engineer	1	2.9	97.1
Others	1	2.9	100

Table 1 shows the summary of the demographic characteristics of the respondents. Project managers constitute about 31% of the respondents, while head of estimating and/or quantity surveying unit in contracting firms have 28% representation in the total respondents used for the survey. Other designation not stated in the research instrument such as site quantity surveyors, quantity surveyors working within the commercial department of large contracting firms constitute the highest proportion (38.0%) of the respondents indicating their high involvement in cost controlling and monitoring activities on construction project. This confirms that the fact quantity surveyors are actively involved in cost monitoring and cost control activities during the post contract stage of the procurement process. A sizeable proportion (41%) of respondents is within the age bracket of 41years and above. About 98% of the respondents received formal education, which put them in the right stead to provide valuable information. As shown in Table 4.1, about 52% of respondents have working experience of 11years and above which implies that they are sufficiently knowledgeable in construction matters to take active part in decision making. Quantity Surveyors constitute 47.9% of the respondents- the highest proportion, indicating their involvement in the bidding process of construction firms.

Table 4.2 shows the characteristics of the responding firm. Most of the responding firms (70.2%) are involved in main contractor's work, and about 79.6% of the respondents are limited liability companies. 56.0% of the contracting firms operate a fully indigenous firm, 34.0% of them partly indigenous, partly expatriate, and 10% of them are fully expatriate. It is clear that a greater percentage of contractors operating within Lagos are fully indigenous in its ownership and management system.

Table 2: Characteristics of responding firms

	Frequency	Percent (%)	Cumulative Percent (%)
Class of contractor (N=47)			
Main contractor	30	88.2	88.2
Sub-contractor	2	5.9	94.1
Others	2	5.9	100.0
Types of ownership (N=49)			
Sole proprietorship	4	11.8	11.8
Partnership	10	29.4	41.2
Limited liability company	17	50.0	91.2
Public limited company	3	8.8	100.0
Organisation ownership and management (N=34)			
Fully indigenous	24	70.6	70.6
Fully expatriate	2	5.90	76.5
Partly indigenous	8	23.5	100.0
Partly expatriate			
Organisation activity (N=47)			
Building only	6	17.6	17.6
Building & civil engineering	26	76.4	94.0
Mechanical and electrical only	1	2.9	96.9
All	1	2.9	100.0
Construction activity (N=34)			
New works	3	8.8	8.8
Renovation	1	2.9	11.8
General contracting	25	73.5	85.3
Others	5	14.7	100

About 51.1% of respondents are building and civil engineering contractors, 25.5% of them are both electrical and mechanical contractors; building contractors alone constitute 14.9% of the population. It is evident that majority of contractors do not specialize in a single type of construction such as building or civil engineering. The construction activity as engaged by the respondent is given in Table 2, 75.6% of the contractors undertake general contracting, while 17.1% of them are involved in new works

One of the objectives of the study is to identify the frequency of use of cost monitoring and control methods used by contractors in post contract stage of construction project. The study identified about twelve (12) cost control methods used in ensuring the cost budget is not exceeded. Table 3 depicted the mean score of the frequency of use of the highlighted cost control methods as adopted by the responding contracting firms in Lagos.

Table 3:Frequency of use of cost control methods in construction project

Cost control methods	N	Mean	Rank
Cost projections	32	4.38	1
Financial reports	32	4.38	1
Weekly cost reports	32	4.38	1
Labour/plant/material(actualvsforecast reconciliation)	30	4.27	4
Cost value reconciliation	32	4.19	5
Program evaluation and review	32	4.09	6
Monthly profit and loss reporting	32	3.78	7
Standards for costs and variance	32	3.66	8
Cost coding for item of works	32	3.50	9
Earned value analysis	31	3.32	10
Over/under billing analysis	32	3.22	11
Leading parameter method	28	2.93	12

Cost projections, financial reports and weekly cost reports are the cost control methods used always by most contracting organization with mean score of 4.38 each. They are closely followed by actual versus forecast

reconciliation and cost value reconciliation with mean score of 4.27 and 4.19 respectively. Most responding firms make use of cost projections, financial reports and weekly cost reports as their cost control methods used during construction projects in a bid to avoid excessive cost of construction, ultimately leading to reduced profit by their corresponding firms. Similarly, most contracting firms have little or nothing to do with cost control methods namely; earned value analysis, over/under billing analysis and leading parameter method. This assertion was based on the relative low mean score of the methods with mean score of 3.32, 3.22 and 2.93 respectively.

The effectiveness of the twelve identified cost control methods highlighted in this study was examined as one of the objectives of the study. Table 4 indicated the mean score of the effectiveness of the cost control methods as used by contracting organization in Lagos state at the post contract stage of construction projects. The most effective cost control method as depicted by Table 4 above is the actual versus forecast reconciliation. The reconciliation approach recorded the highest mean score of 4.41 amongst the twelve methods considered in this research. Closely following the reconciliation method as the most effective cost control methods are the weekly cost reports, financial reports and cost value reconciliation with mean score of 4.38, 4.34 and 4.22 respectively.

Table 4:Mean score of the effectiveness of cost control methods at the post contract stage

Cost control methods	N	Mean	Rank
Labour/plant/material (actual versus forecast reconciliation)	32	4.41	1
Weekly cost reports	32	4.38	2
Financial reports	32	4.34	3
Cost value reconciliation	32	4.22	4
Cost projections	32	4.16	5
Monthly profit and loss reporting	31	4.03	6
Program evaluation and review	32	3.97	7
Earned value analysis	29	3.76	8
Standards for costs and variance	32	3.59	9
Over/under billing analysis	31	3.55	10
Cost coding for item of works	31	3.55	10
Leading parameter method	27	2.70	12

The following cost control methods exert the least effectiveness on cost control tendencies during post contract stage of construction projects. Standards for cost and variance, over/under billing analysis and cost coding for items of work are the least effective in cost control activities in construction projects. Leading parameter method is regarded as the least effective in the list of cost control methods during the construction phase of construction projects. It can be deduced that the least effectiveness of the standard for costs and variance, cost coding for items of work and leading parameters as methods of cost control could be as a result of their seldom use by contracting organizations or cost experts in a bid to avoid cost overrun in construction projects.

The first part of the hypotheses was set up to test for the most effective cost control methods considered by the three classes of contractors (comparison between indigenous and expatriate contractors; indigenous and partly expatriate/partly indigenous; the last being, partly indigenous, partly expatriate and expatriate contractors). Hence, the hypothesis seek to address the level of agreement among the three classes of contractors as regards the most effective cost control methods adopted by construction firms.

The most effective cost control methods according to indigenous, partly expatriate/partly indigenous and expatriate contractors are shown in Table 5. From this table, it can be seen that the most effective cost control methods according to indigenous contractors are financial reports, weekly cost reports, cost projections and cost value reconciliation. Unlike indigenous contractors, partly expatriate/partly indigenous contractors suggest that actual versus forecast reconciliation, cost projections, weekly reports and financial reports are the most effective cost control methods used on construction projects, in a bid to prevent reduced profit for their organisations. Similarly, the result as shown in Table 5 indicates that expatriate construction firms rate cost value reconciliation, standard for costs and variance, monthly profit and loss reporting and earned value analysis as the most effective cost control methods adopted to prevent cost overrun on the construction project.

It is expedient to note that indigenous contracting firms claimed that cost coding for items of work and leading parameter methods are the least effective cost control methods. While expatriate agree on leading parameter method and cost projections as among the least effective cost control methods, partly expatriate, partly indigenous contractors opined that over/under billing analysis and leading parameter exert least effectiveness of the control methods adopted for contractors.

Table 5: Mean score and ranks for effective cost control methods by different contractors

Cost control methods	Indigenous		Expatriate		Partly indigenous, partly expatriate		Overall	
	Mean	**Rank**	Mean	**Rank**	Mean	**Rank**	**Mean**	**Rank**
Actual versus forecast	4.10	**5**	3.50	**6**	4.88	**1**	4.41	**1**
Weekly cost reports	4.32	**2**	3.50	**6**	4.75	**3**	4.38	**2**
Financial reports	4.50	**1**	3.50	**6**	4.25	**4**	4.34	**3**
Cost value reconciliation	4.14	**4**	4.50	**1**	4.25	**4**	4.22	**4**
Cost projections	4.32	**2**	3.00	**11**	4.88	**1**	4.16	**5**
Monthly profit and loss reporting	3.73	**7**	4.00	**2**	3.88	**8**	4.03	**6**
Program evaluation and review	4.05	**6**	4.00	**2**	4.25	**4**	3.97	**7**
Earned value analysis	3.29	**10**	4.00	**2**	3.25	**10**	3.76	**8**
Standards for costs and variance	3.64	**8**	4.00	**2**	3.63	**9**	3.59	**9**
Over/under billing analysis	3.32	**9**	3.50	**6**	2.88	**11**	3.55	**10**
Cost coding for item	3.27	**11**	3.50	**6**	4.13	**7**	3.55	**10**
Leading parameter method	3.06	**12**	3.00	**11**	2.63	**12**	2.70	**12**

However, expatriate contractors agree with both indigenous and partly expatriate/partly indigenous contractors that leading parameter is the least effective cost control methods used by contractors during the construction phase of the project. The least effectiveness of leading parameter method as a cost control method could be tied to the frequency of use of the method.

Using kendall's co-efficient of concordance, the rule for the rejection or non-rejection of the hypothesis is that when the p-value>0.05, the test fails to reject the hypothesis but when the p-value≤0.05, the test rejects the hypothesis.

Table 6: Kendall's co-efficient of concordance to test the agreement of contractors on the effective cost control methods by different contractors

Comparison of contractors	W	X^2	p-value	Remark
Indigenous, expatriate and partly expatriate/partly indigenous	0.522	17.226	p > 0.05	Accept H_0

Kendall's co-efficient of concordance = *W,* Friedman's chi-square = X^2, *p* = 0.418

Table 6 shows the Kendall's co-efficient of concordance and Friedman's chi-square of the agreement of contractors on the effective cost control methods. The Kendall coefficient of concordance, *W*, provides an indication of the association between several rankings of different contractors. *W* ranges between 0 and 1, with 1 designating perfect concordance, and 0 indicating no agreement or independence of samples.

At this point we can compute using the expression that the Kendall's coefficient of concordance of contractors for the effective cost control method to 0.522. The Kendall's coefficient of concordance is considerably statistically significant. The value of the test statistic of the χ2-test, computed using kendall's co-effieicient, amount to 17.226, while the critical value at the 0.05 per cent significance level and 11 degrees of freedom is 19.68. The p-value of the test is 0.418 which >0.05. It can then be concluded that there is no agreement among indigenous, expatriate and partly expatriate/partly indigenous on the effective cost control methods used during the construction phase of construction project.

This study opines that no agreement exists between expatriate and indigenous contractors on the most effective cost control methods used on construction projects. It can be observed that the comparison of indigenous and expatriate produced t-cal = 0.847 which is less than the t-tab of 1.812 with 10 degrees of freedom (v =10) at p < 0.05 significance level. No research work considered the level of agreement of contractors on the most effective cost control methods in construction project. It is also surprising that the significant difference of cost overrun produced by the different cost control methods has not been evaluated in any research work or literature in time past.

Further investigation was carried out to determine whether or not the frequency of use of the cost control methods have positive, negative or neutral effects on the effectiveness of the cost control methods used in construction projects. This involves the test of the second research hypothesis which states that there is no significant difference between the frequency of use and effectiveness of cost control methods. Data collected on

the respondents' assessment of the frequency of use of cost control methods and their effectiveness of the cost control methods were used for the test. The hypothesis was tested using paired sample t-test with p≤0.05. The rule for the rejection or non-rejection of the hypothesis is that when the p-value>0.05, the test fails to reject the hypothesis but when the p-value≤0.05, the test rejects the hypothesis. The results are presented in Table 7.

Table 7: Paired sample t- test of the frequency of use of cost control methods and the effectiveness of cost control methods

Variables	t	df	p-value	Decision
Actual versus forecast reconciliation	-0.421	28	0.677	Accept H_0
Cost coding for items of work	-0.239	29	0.813	Accept H_0
Weekly cost reports	0.239	30	0.813	Accept H_0
Financial reports	1.000	30	0.325	Accept H_0
Monthly profit and loss reporting	-1.975	29	0.058	Accept H_0
Cost projections	1.650	30	0.109	Accept H_0
Cost value reconciliation	0.000	30	1.000	Accept H_0
Standard for costs and variance	0.891	30	0.380	Accept H_0
Over/under billing analysis	-2.763	29	0.010	Reject H_0
Program evaluation and review	0.849	30	0.403	Accept H_0
Leading parameter	1.617	25	0.118	Accept H_0
Earned value analysis	-1.613	27	0.118	Accept H_0

Since the p-value > 0.05 for eleven (11) of the twelve (12) listed cost control methods in the study, it is safe to state that the null hypothesis that: there is no significant difference between the frequency of use and the effectiveness of cost control methods for all the cost control methods except over/under billing analysis. Hence the null hypothesis is rejected for over/under billing analysis because p-value ≤ 0.05 as depicted in Table 4.15 above.

It can be induced that either an increase or decrease in the frequency of use of cost control methods will not result in the corresponding increase or decrease in the effectiveness of the respective cost control methods. This assertion holds for all the cost control methods except for over/under billing analysis. It can be said that a small increase in the frequency of use of over/under billing analysis will give rise to a greater increase in its effectiveness.

5. Conclusion

The result of the survey also showed that the frequency of use of cost control methods does not have positive or negative effect on the effectiveness of the cost control methods. Increase in the frequency of use has little or no influence on the effectiveness of the said cost control methods. These cost control methods are by no means exhaustive as there will obviously be few cost control methods out there that have not made the list. It is also worth noting that the some of the cost control methods may seem obvious to the experienced contractors but not obvious to the less experienced firms and people new to the construction business. In addition, the effectiveness of these cost mitigating measures during the project control process in the event of early cost overrun claims needs to be investigated in future research.

From all these issues from the effectiveness of different cost control methods, the study recommends that contractors should embrace cost control methods which ensure close monitoring and reporting of work progress and cost performance. This is very important for effective cost control process during post contract stage. The project report also claimed that IT integration is the only way to get quick and accurate reports to solve cost overrun and its associated problems identified by several literature and professionals.

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