

ASSESSMENT OF COST CONTROL CRITICAL ISSUES IN THE NIGERIAN CONSTRUCTION INDUSTRY

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Abstract: *Managing the cost of construction is one of the key determinants of a project's success. Globally, different measures, techniques, and tools have been developed and utilized to ensure that construction cost is kept within budget but despite the various available cost control methods and techniques, cost overrun is still a global recurrent decimal and Nigeria is not an exception. The majority of the construction projects are barely completed within budget and there are critical issues that face construction cost managers that hamper the effectiveness of the tools and techniques used to control cost. This article investigated those critical issues and highlighted the most critical issues that demand the serious attention of construction managers. The research examined the critical issues that hamper effective cost control at the basic stages of the construction process. An online survey was conducted in the six geopolitical zones of Nigeria with a sample size of 382 Quantity Surveyors. Statistical tools such as spearman's correlations, severity indices, Kendall's coefficient of concordance were employed to analyze and rank the cost control critical issues. The findings indicated that the most critical issue facing cost managers is the challenge of keeping accurate information at the monitoring stage of the construction process with a mean rank of 8.73 and a severity index of 78%.*

Keywords: *Cost Control, Cost overrun, Construction Process, Cost Management*

Introduction

The most important function of a project's success is the project's cost management. The variance of cost of construction from the initial budget indicates the measure of project performance. Due to poor cost management these days, the construction industry faces a huge amount of cost overruns (Abdussalam Shibani and Kumar Arumugam, 2015). Cost overrun is the ratio of the contract amount to the original contract award amount (Vaardini, Karthiyayini, and Ezhilmathi, 2016). A survey conducted on cost study in the United Kingdom showed that many construction projects still suffer cost overruns (Azis *et al.*, 2013). In the same vein, Construction projects in Malaysia and the world over have been found to be suffering from cost

and time overruns (Loh, 2015). Nigeria is not an exception as the country is also facing the challenges of infrastructure development as a result of poor cost management of infrastructure projects (Muhammad, 2016). Poor cost performance in a construction project is a common problem worldwide resulting in a significant amount of cost overrun (Girma and Alemu, 2018). The problem of poor cost performance and cost overruns in construction projects is a serious issue in both developed and developing countries and this requires serious attention because construction projects are rarely completed within the estimated budget. Even though proper care is taken to prevent cost overruns, sometimes they are unavoidable because it is not possible to reasonably prevent them (Abdussalam Shibani and Kumar Arumugam, 2015). The issue of poor performance of cost and time overrun is a frequent issue in both developed and developing countries like the USA, UK, Portugal, Malaysia, Pakistan, and others (Akram, Memon, and Ali, 2015). To ensure successful projects, those responsible for tracking and guiding performance face some fundamental questions of the current budgets and forecasts and how each might have changed over time. Bergerud, (2012) stated that having answers to these questions provides insight into what trends are developing and how the project is performing in terms of cost and project duration. Keeping track record of the construction performance during project execution is the key to finding answers to those fundamental questions but there are critical issues that face the professionals responsible for cost management of construction projects. Those critical issues tend to hamper the effectiveness of cost management processes. This research reviewed and articulated those cost control issues and assessed them in the Nigerian context and revealed the key issues that cost managers face while trying to keep cost within budget.

Cost Control Critical Issues

Due to the dynamic nature of construction projects, the cost control officers are faced with different challenges trying to keep construction costs within the predetermined budget. These issues or challenges are the reasons for the global phenomenon of cost overrun. Contractors have developed several cost management techniques over the years to help record all financial transactions that occur and to provide managers with an indication of the progress and issues associated with a project (Chigara, Moyo and Mudzengerere, 2013), but despite the availability of various control techniques and project control software many construction projects still do not achieve the cost and time objectives (Olawale and Sun, 2010). These issues are experienced during project execution, hence, they are regarded as post-contract cost control issues. The cost control issues identified from different sources are summarized in Table 1.

Table 1: Post Contract Cost Control Issues

Serial No	Post Contract Cost Control Issues	Reference
1	Difficulty in budgeting and forecasting effectively	(Adjei, Aigbavboa and Thwala, 2017), Bergerud, (2012)
2	Integrating work schedule with cost	(Chigara, Moyo and Mudzengerere, 2013), Bergerud, (2012)
3	Challenge of getting construction resources from different sources due to cost changes	Bergerud, (2012), (Rahman, Memon and Karim, 2013)
4	Reconciling already executed work that was not initially budgeted.	Bergerud, (2012), (Olawale and Sun, 2010)
5	Challenge of getting cost data from multiple sources	(Olawale and Sun, 2010), Bergerud, (2012),

Serial No	Post Contract Cost Control Issues	Reference
6	Time and effort involved with reporting (meeting rigid deadlines)	Bergerud, (2012), (Muhammed, 2015), (Roumeissa, 2019), (Ramanathan, Narayanan and Idrus, 2012)
7	Managing relationships with project participants	Bergerud, (2012), (Chen, Zhang and Zhang, 2014), (Meng, 2012), (Dahmas, Li and Liu, 2019)
8	Controlling changes during project execution	Bergerud, (2012), (Ali and Kamaruzzaman, 2010), (Rahman, Memon and Karim, 2013)
9	Challenge of keeping accurate information to ensure accurate cost reports	Bergerud, (2012), (Adjei, Aigbavboa and Thwala, 2017), (Hatamleh <i>et al.</i> , 2018)
10	Controlling construction resources	Bergerud, (2012), (Rahman, Memon and Karim, 2013), (Yismalet and Patel, 2020), (Olawale and Sun, 2010)
11	Challenge of reconciling changes with work schedule	Bergerud, (2012), (Cunningham, 2017)
12	Challenge of reconciling budget with expenditure	Bergerud, (2012), (Hatamleh <i>et al.</i> , 2018)
13	Difficulty in giving an accurate final account on cost	(Hatamleh <i>et al.</i> , 2018), Bergerud, (2012), (Adjei, Aigbavboa and Thwala, 2017)
14	Challenge of giving detailed cost analysis for effective budgeting of future similar works	Bergerud, (2012), (Adjei, Aigbavboa and Thwala, 2017)

The construction management process is generally categorized into four main stages; the project initiation/Preliminary stage, the construction stage, and the terminal stage (Anastasios Koutsogiannis, 2019; Taylor, 2019). Construction cost management is implemented also at all stages to ensure the planned is kept within budget as earlier stated. This paper focused on the construction stage of a project, and before any task is executed on-site, it must have been planned and budgeted (Preliminary stage of cost control during construction), then the execution of the task onsite (execution stage), and during execution, the task is monitored for performance in terms of cost, time, and quality (Monitoring stage) and finally the closeout of the task for analysis of performance and management actions (terminal stage). The critical issues of cost control during construction as articulated in table 1 were equally categorized into their stage of occurrence during construction. The stages can be at the preliminary stage of construction (planning/scheduling/budgeting stage), the implementation/execution stage, the Monitoring stage, or the terminal stage of the scheduled task/activity. Table 2 shows the categorization of the identified issues with their respective identity codes.

Table 2: Cost Control issues categorized according to construction activity stages

Project Activity Stages	ID Code	Cost Control Issues
Stage 1:	DBFE	Difficulty in budgeting and forecasting effectively
Preliminary stage	IWSC	Integrating work schedule with cost
<i>(Site Set up, Planning, and Budgeting)</i>	CCRDS	Challenge of getting construction resources from different sources due to cost changes

Project Activity Stages	ID Code	Cost Control Issues
Stage 2: Implementation and Execution stage	REW	Reconciling already executed work that was not initially budgeted.
	CCDMS	Challenge of getting cost data from multiple sources
	TER	Time and effort involved with reporting (meeting rigid deadlines)
	MRPP	Managing relationships with project participants
Stage 3: Performance and Monitoring Stage	CCPE	Controlling changes during project execution
	CKAI	Challenge of keeping accurate information to ensure accurate cost reports
	CCR	Controlling construction resources
	CRCWS	Challenge of reconciling changes with work schedule
Stage 4: Terminal stage (Work Closeout)	CRBE	Challenge of reconciling budget with expenditure
	DGAFA	Difficulty in giving accurate final account on cost
	CGDCA	Challenge of giving detailed cost analysis for effective budgeting of future similar works

Methodology

Data used for this research was collected using a research questionnaire administered to Quantity Surveyors in Nigeria. Quantity Surveyors were chosen as the respondent for this research because they are the key professionals responsible for the control of construction cost globally including Nigeria. A sample size of 382 was estimated using Krejcie & Morgan, (1970) formula for the finite population.

$$S = \frac{x^2 NP(1 - P)}{d^2(N - 1) + x^2 P(1 - P)} \quad (1)$$

Where:

S = Sample size

X = Z value (1.96 for 95% confidence level)

N = Population Size

P = Population proportion (expressed as decimal) (assumed to be 0.5 (50%))

d = Degree of accuracy (5%), expressed as a proportion (.05); It is margin of error

the estimated sample size was distributed to selected states (Cities) in each of the six geopolitical zones in Nigeria. The research questionnaire was structured using a 5-point Likert scale. The survey was administered using Google Forms and electronic copied sent through emails. This means of data collection was the best as at the time of this research due to COVID-19 movement restrictions orders in Malaysia and Nigeria.

The severity index (SI) was used to analyze and rank the identified cost control critical issues. Severity Indices is calculated using the formula;

$$\text{Severity Index (S.I)} = \frac{\sum W_s}{HN} \quad (2)$$

Where W_s = Total of severity weight given to each cost control issue/factor

H = Highest Ranking Available which is 5 using a 5-point Likert scale

N = Total Number of Respondents that answered the question.

Kendall's coefficient of concordance (W) was applied to also rank the critical issues and also to ascertain the level of agreement among the respondents. Kendall's W can be calculated using equation 3 (Gearhart *et al.*, 2013);

$$W = \frac{12S}{p^2(n^3 - n) - pT} \quad (3)$$

where S is the sum-of-squares from row sums of ranks R_i (Equation 3a), n is the number of objects, p is the number of judges and T is a correction factor for tied ranks (Equation 3b)

$$S^i = \sum_{i=1}^n R_i^2 = SSR \quad (3a)$$

$$S^i = \sum_{k=1}^m (t_k^3 - t_k) \quad (3b)$$

where S is the sum-of-squares from row sums of ranks R_i , m is the number of groups and t_k is the number of tied ranks in each (k) of m groups.

A total of three hundred and thirty-Nine (339) valid data was gathered and analyzed. Figure 1 is the summary of the different categories of professional levels the respondents belong to, according to Nigerian professional rating and qualifications in the field of Quantity Surveying and Cost management. The majority of the respondents are fully registered, professional Quantity Surveyors. 68% are fully registered professionals which comprise of the FNIQS (Fellow, Nigerian Institute of Quantity Surveyors)-12%, the MNIQS (Member, Nigerian Institute of Quantity Surveyors)-47%, the MRICS (Member, Royal Institute of Chartered Surveyors)-6%, and the MAACEi (Member, Association for the Advancement of Cost Engineers International)-3%.

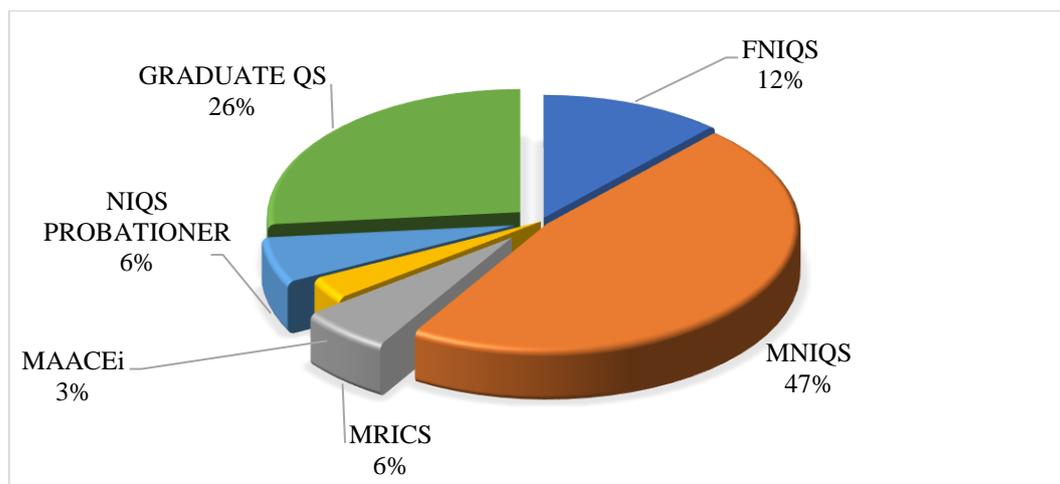


Figure 1: Professional Qualifications of Respondents

The chart in Figure 2 highlights the highest educational qualifications of the respondents. The least qualification of the respondents is a university first-degree certificate which only 32% has as the highest educational qualification. The larger population has a Master's Degree certificate (47%), while the remaining respondents have a doctorate (21%).

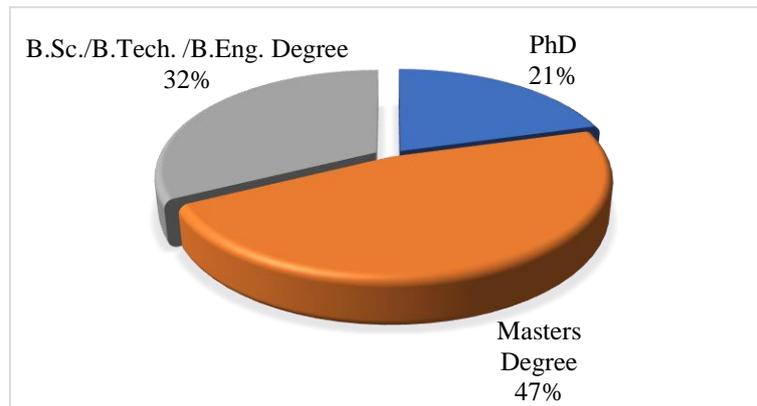


Figure 2: Educational Qualification of Respondents

Figure 3 shows that only 27% of the respondents have professional experience of 5 years and below. The remaining 73% have a professional experience above 5 years, of which 24% have over 20 years of professional experience. This means that the respondents have the requisite experience to give reliable information on the research area.

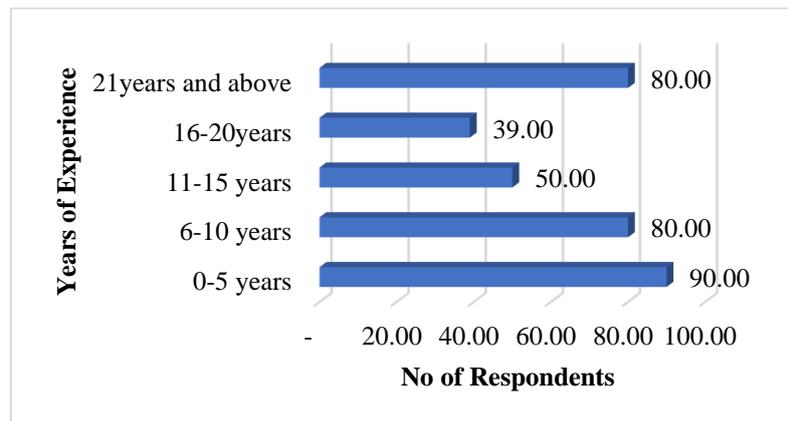


Figure 3: Years of Professional Experience of Respondents

The Severity index of the cost control critical issues were calculated and tabulated as shown in Table 3 using equation 1. The identified issues were ranked as indicated. The severity index indicates the level of criticality of the identified issues. The severity index table explains the level of criticality of the identified issues which cost managers face during construction at the different stages. The higher the index figure (the percentage), the higher the impact of the issue on the cost control process during construction. The closer the index number is to 1.0 or 100%, the higher the severity (Criticality) of the variable.

Kendall's coefficient of concordance (W) was applied to responses from all respondents to validate the results generated from the severity indices analysis of the cost control critical issues. Kendall's W scores were generated using SPSS software (IBM SPSS Statistics 22). Tables 4a and 4b represent the descriptive statistics for Kendall's W of the cost control issues and the test statistics.

Table 3: Severity Indices of Cost Control issues

CC Issues	Frequencies					Total	Severity Index	Ranking	
	Not Critical	Less Critical	Neutral	Critical	Very Critical				
Prelim Stage	CCRDS	10	60	60	100	109	339	0.74	1
	DBFE	20	70	70	120	59	339	0.68	2
	IWSC	20	70	90	139	20	339	0.64	3
Implementation/ Execution Stage	CCPE	0	40	70	169	60	339	0.75	1
	CCDMS	10	60	90	60	119	339	0.73	2
	TER	20	60	60	90	109	339	0.72	3
	REW	0	60	80	150	49	339	0.71	5
	SDMSS	10	50	80	139	60	339	0.71	4
	MRPP	30	50	99	100	60	339	0.66	6
Performance Monitoring Stage	CKAI	0	50	50	120	119	339	0.78	1
	CCR	20	20	40	170	89	339	0.77	2
	CRBE	10	40	70	150	69	339	0.73	3
	CRCWS	10	50	60	169	50	339	0.72	4
Close Out Stage	CGDCA	20	40	40	169	70	339	0.74	1
	DGAFA	10	60	110	79	80	339	0.69	2

Table 4a: Descriptive Statistics for Kendall's W of the Cost Control issues

CC Issues	N	Mean	Std. Deviation	Mean Rank	Minimum	Maximum
Preliminary Stage						
DBFE	339	3.38	1.164	6.97	1	5
IWSC	339	3.20	1.025	5.95	1	5
CCRDS	339	3.70	1.178	8.73	1	5
Implementation/Execution Stage						
REW	339	3.55	0.945	8.02	2	5
CCDMS	339	3.64	1.211	8.43	1	5
SDMSS	339	3.56	1.037	7.72	1	5
TER	339	3.61	1.262	8.40	1	5
MRPP	339	3.32	1.185	6.75	1	5
CCPE	339	3.73	0.887	8.42	2	5
Monitoring Stage						
CKAI	339	3.91	1.041	9.63	2	5
CCR	339	3.85	1.062	9.10	1	5
CRCWS	339	3.59	1.006	7.74	1	5
CRBE	339	3.67	1.021	8.36	1	5
Terminal Stage						
DGAFA	339	3.47	1.121	7.36	1	5
CGDCA	339	3.68	1.107	8.42	1	5

Table 4b: Test Statistics for Kendall's W of the Cost Control issues

N	339
Kendall's W ^a	.060
Chi-Square	284.715
df	14
Asymp. Sig.	.000

a. Kendall's Coefficient of Concordance

Main Results

The severity index table (Table 3) indicated that the challenge of getting construction resources from different sources due to cost changes (CCRDS) before executing a scheduled task with calculated SI of 0.74 (74%) is ranked first at the preliminary stage of the cost control process for the scheduled task. At the execution stage, controlling changes during project task execution (CCPE) was ranked first with an SI of 0.75, while the Challenge of keeping accurate information to ensure accurate reports (CKAI) was ranked first at the activity monitoring stage of the construction task with SI of 0.78(78%). At the terminal (Close Out) stage of a scheduled task, the challenge of giving detailed cost analysis for effective budgeting of future works/tasks (CGDCA) was ranked first, with an SI of 0.74 (74%). Among the whole identified issues, the challenge of keeping accurate information to ensure accurate reports ranked highest and therefore the most critical issue which faces cost control personnel during construction. This variable is identified and classified under the monitoring stage of the cycle. This is in line with the documentation of Bergerud, (2012), which asserts that one of the key challenges of effective cost control is keeping accurate reports.

Table 4a shows that the variables with the highest ranking were CCRDS in the preliminary stage, CCPE in the execution stage, CKAI in the monitoring stage, and CGDCA in the terminal stage with Mean ranks of 8.73, 8.42, 9.63, and 8.42 respectively. Though test statistics in Table 4b shows Kendall's W score of 0.06 which indicates a level of disagreement, Kendall's correlation matrix and spearman's correlation matrix of the individual cost control issues at each level which could not be attached due to the lengthy table, showed that there's a considerable agreement among the raters in most of the responses and good correlations among the variables. The highest-ranked variable in all the stages is the Challenge of keeping accurate information to ensure accurate reports with the mean rank of 9.63. This is a supportive finding to the severity indices tabulated in Table 3.

This research, therefore, has it that the key issue that impends the effectiveness of construction cost control during construction is the issue of keeping accurate information for accurate reporting. Several researchers like (Adjei, Aigbavboa, and Thwala, 2017), (Kujala, Brady and Putila, 2014), (Anigbogu, Ahmad and Molwus, 2019), (Mahamid and Bruland, 2010), (Omolayo and Dorcas, 2019) and others have also opined based on their research that lack of accurate data significantly affects the effectiveness of cost control. These challenges are the reason why cost overrun is still a global phenomenon.

Conclusion

Various authors have researched and discussed the various factors that lead to cost overrun in construction projects but little attention is paid to the core critical issues that face the cost managers while trying to keep construction cost within budget. These issues are caused by the various factors which many authors have researched and discussed. Nevertheless, this work discussed and categorized the core issues of cost control that hamper effective delivery of cost control of projects. Among the whole identified issues, the challenge of keeping accurate information to ensure accurate reports ranked the highest and therefore the most critical issue which faces cost control personnel during construction. This is in line with the documentation of Bergerud, (2012), and other researchers that assert that one of the key challenges of effective cost control is keeping accurate reports. This article will help those in academics to identify and research how best to curb the critical issues, especially the identified most critical ones.

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