



An Evaluation of Project Cost Control Techniques and Their Challenges in the Nigerian Construction Industry.

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Abstract

Monitoring and control is an essential process in construction project management and delivery. Various cost control tools and techniques are adopted by the project managers with the aim of mitigating the cost uncertainties during project implementation. Previous researchers in Nigeria have evaluated some of the cost control techniques used but have failed to include some recent cost control techniques including their challenges towards its application in Nigeria Construction Industry. To solve this problem, those neglected techniques were added to the existing techniques identified by previous researches in the country and investigated by this research. A structured questionnaire was used to gather information on cost control techniques and descriptive statistics using mean, standard deviation, percentages and ranking were carried out with the aid of SPSS software. The research was able to establish that Cash Flow Analysis, Site Meeting and Microsoft Project were frequency used as cost control techniques. However, the research identified Site Meeting, Record Keeping and Cash Flow Analysis as the easiest cost control techniques among the identified techniques. Poor Project Site Management, Fluctuations in Prices of Raw Materials and Application of Absolute Methods and Concept were the highest ranked challenges of cost control techniques in the Nigerian construction industry. The study concluded that Practitioners are more comfortable with the conventional method of cost control with limited involvement in information technology. Nevertheless, Firms should endeavor to send their employees to attend workshops, seminars and other training programs that will enlighten them on how to use the techniques, as to refresh and broaden the required knowledge for controlling cost of their project.

Keywords: Evaluation, Challenges, Construction Industry, Construction Project, and Cost Control Techniques

INTRODUCTION-

In the construction sector, one of the most crucial management tools is cost control. The ability to accomplish the project's goals, completing it within the estimated budget, according to specifications, and with time frame determines the project success (Opatunji, 2018). Every construction firm in every country needs to exercise cost control in order to survive and growth.

Cleland and Ireland (2002) define cost control as the process of tracking, assessing, and contrasting anticipated and actual outcomes to ascertain the project's current state with regard to budget, timeline, and technical performance goals. To keep the cost of project execution within the budgeted cost that was initially prepared and approved for, it is crucial that every construction company operates in an effective manner by implementing cost control procedures during the post construction stage of the

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construction project (Adjei et al. 2017; Adjei et al. 2015; Sanni and Hashim 2013; Olawale and Sun 2010). According to Bahaudin et al. (2012), after building work starts, the contractor or whoever is in charge of cost management can utilize the planned cost of the project as a baseline to monitor and control the construction expenses.

This research mainly concentrated on cost control. As at present, the construction industry is using different cost control techniques. Cost control can be accomplished through different tools, techniques and software. Opatunji (2018) evaluated the cost control techniques used by construction industry practitioners and the contribution of the factors to the success rate of the project. Opatunji (2018) assessed the factors that contribute to a project's success rate and the cost control strategies employed by professionals in the construction sector. The most often utilized cost control strategies among Nigerian construction professionals include estimation, material management, record keeping, site meetings, and work schedules, according to Opatunji's (2018) research. The survey also found that many building projects still fail to meet their cost targets, even with the availability of different cost control technologies.

This study aimed at evaluating the cost control techniques and their challenges in the construction industry, and thus, to identify the cost control techniques used in the Construction Industry and its challenges towards its application, to assess the cost control techniques used and to assess the challenges of application cost control techniques in the Nigerian Construction industry.

Nevertheless, prior study has evaluated some of the difficulties that Nigerian cost control systems face, but it did not take into account the more recent, evolving approaches that these studies take into account. Hence, this study focuses on assessing the challenges associated with implementing the more modern cost control methods in Nigeria.

LITERATURE REVIEW

The construction industry is indeed an integral component of a nation's infrastructure and industrial growth (Tom & Paul, 2013). The industry is considered one of the oldest industries organized on a project basis (Chitkara, 2012; Roberts & Wallace, 2004). In the construction industry, challenges of cost control have not received much attention in the construction sector. However, few research such as Kirun and Varghese (2015); Sanni and Hashim, (2013) and Ademola, (2012) identified challenges of project cost control, but with very limited literature review. The use of absolute methods and concepts; a lack of knowledge about how to use available tools and technology; an emphasis on results at the expense of the cost control process; a lack of project cost control processes and systems appropriate for the enterprise; the abandonment of complex strategies; a lack of consistency in cost management by managers; serious decision-making failures; exorbitant marketing expenses; a poor attitude toward the use of information communication technology; difficulties in monitoring various sources of day-to-day cost data; variations in contracts; and a lack of financial commitment in projects are among the eleven challenges Adjei, Aigbavboa, and Thwala (2017) identified.

Opatunji (2018) also discovered that some of the difficulties in implementing cost control measures include on-site material waste, funding availability, and completion timelines.

In the past few years, an evolution in cost control tools includes; Earn Value Management (EVM), Cost Value Reconciliation, Gantt charts, Program Evaluation and Review tools (PERT), Critical Path Method (CPM), and Network Diagrams (Corey et al., 2018). The report also emphasized that additional software programs, like Microsoft Project, Primavera, and Asta Power Project, are available to control the costs associated with building projects. However, there are no sufficient evidences to verify these

various methods and software packages have been useful for cost controlling purpose in the Nigeria construction Industry.

Several researches have been carried out on cost control techniques in several countries of the world like Scotland (Jason, 2007), Australia (George, 2012), Ghana (Adjei et al., 2017), Sri Lanka (Corey et al., 2018). Opatunji (2018) assessed cost-control strategies employed in Nigeria, but omitted a number of crucial strategies and programs that other writers had pointed out. The data collection was restricted to Oyo State’s quantity surveyors.

However, previous researches in Nigeria have failed to evaluate the more recent cost control techniques including their challenges of application in Nigeria.

The majority of the literature has reported on building project failures that resulted from ineffective time and cost control throughout the implementation phase. As a result, cost control strategies are now a crucial consideration for building projects (Seeley, 1996; Olawale and Ming, 2010).

As such some of the Modern techniques includes; Cost value reconciliation, Actual vs. forecast reconciliation, Contract and overall profit and loss, and Unit costing.

Modern Cost Control Techniques

S/N	Techniques	Sources
1	Whole life costing	Opatunji, (2018); Corey <i>et al.</i> , (2018)
2	Earn Value Analysis (EVA)	Bari, (2008); Opatunji, (2018);
3	Programme Evaluation and Review Techniques/Cost	Bari, (2008); Warren, (2009); Rodriguez, (2011)
4	Critical Path Method (CPM)	Bari, (2008); Warren, (2009); Rodriguez, (2011)
5	Risk Analysis	Opatunji, (2018); Malkanthiet <i>al.</i> , (2017)
6	Performance reviews and Variance Analysis	Warren, (2009); Opatunji, (2018)
7	Cash Flow Analysis	Opatunji, (2018); Warren, (2009)
8	Site Meetings	Opatunji, (2018); Corey <i>et al.</i> , (2018)
9	Record keeping	Opatunji, (2018); Corey <i>et al.</i> , (2018)
10	Valuation of work in Progress	Opatunji, (2018); Malkanthiet <i>al.</i> , (2017)
11	Elemental Analysis	Opatunji, (2018); Malkanthiet <i>al.</i> , (2017)
12	Cost optimization techniques	Opatunji, (2018); Corey <i>et al.</i> , (2018)
13	Cost Reduction on site	Opatunji, (2018); Corey <i>et al.</i> , (2018)
14	Cost Planning	Opatunji, (2018); Corey <i>et al.</i> , (2018)
15	Work Programs	Opatunji, (2018); Corey <i>et al.</i> , (2018)
16	Cash flow Analysis	Opatunji, (2018); Corey <i>et al.</i> , (2018)
17	Material Management	Opatunji, (2018); Corey <i>et al.</i> , (2018)
18	Cash flow Analysis	Malkanthiet <i>al.</i> , (2017); Corey <i>et al.</i> , (2018)

19	Microsoft Project	Malkanthiet <i>et al.</i> , (2017);Corey <i>et al.</i> , (2018)
20	Asta Power Project	Corey <i>et al.</i> , (2018); Opatunji, (2018)
21	Primavera	Corey <i>et al.</i> , (2018); Opatunji, (2018)

Table 1: Modern Cost Control Techniques

Challenges of Cost Control Techniques

Adjei *et al.* (2017) identified the following challenges of cost control techniques which include:

Challenges of Cost Control Techniques

S/N	Challenges of Cost Control Techniques	Sources
1	Using obsolete Methods and Concepts	Adjei <i>et al.</i> (2017); Opatunji, (2018); Kirun and Varghese, (2015)
2	Lack of knowledge on the use of available tools and technology	Adjei <i>et al.</i> (2017); Opatunji, (2018)
3	Over emphasizing on results while ignoring the process of PCC	Adjei <i>et al.</i> (2017); Opatunji, (2018)
4	Lacking PCC processes and systems suitable to the enterprise	Adjei <i>et al.</i> (2017); Opatunji, (2018)
5	Abandonment of complicated strategies	Adjei <i>et al.</i> (2017); Opatunji, (2018)
6	Lack of consistency in cost management by managers	Adjei <i>et al.</i> (2017); Malkanthi <i>et al.</i> , (2017)
7	Lack of financial commitment in projects	Adjei <i>et al.</i> (2017); Malkanthi <i>et al.</i> , (2017)
8	Fluctuation in prices of Raw Materials	Opatunji, (2018)
9	Poor Project Site Management	Malkanthiet <i>et al.</i> , (2017); Opatunji, (2018)
10	Lowest Bidding Procurement Method	Opatunji, (2018)
11	Inappropriate Government Policies	Malkanthiet <i>et al.</i> , (2017); Adjei <i>et al.</i> (2017)
12	Wrong method of Cost estimating	Malkanthiet <i>et al.</i> , (2017); Adjei <i>et al.</i> (2017)

Table 2: Challenges of Cost Control Techniques

RESEARCH METHODOLOGY

This part sought to explore and discussed both the philosophical and methodological issues and research design and process flows associated with the study. The value of any research strategy, approach, or design lies in its potential for assisting the researcher to meet the aim and objectives of the research in the most effective and appropriate way possible (Ahmad, 2013).

The research adopted a quantitative approach. The research method or approach is way of describing how a researcher goes about doing the research, unfolding a particular style and employing different methods (Ibrahim, 2012). The research design adopted for this study is a descriptive research method aimed at evaluating the cost control techniques in the Nigerian construction industry. Secondary data were obtained from reliable published and unpublished literature sources such as journals, articles, conference proceedings, online articles, unpublished thesis/project, government publications, newspapers and magazines, while primary data were obtained using well-structured questionnaires.

The targeted population was Quantity Surveyors in Kaduna and Abuja, Nigeria, where most construction firms have their headquarters situated. According to the Quantity Surveyors Registration Board of Nigeria (QSRBN) 2019, there are 358 Quantity Surveyors in their register from both states. Non-probability sampling was the method of sampling used and purposive sampling was used as the technique. The sample size was calculated use of Kish (1965)'s formula for calculating sample and the result obtained was 97.

Kish, (1965)'s formula for calculating sample size

i.e. Using Formula: $n = n_1 / (1 + n_1 / N)$ _____ (1)

Where $n =$ Sample size $n_1 = S^2 / V^2$ _____ (2)

$N =$ Population size

$V =$ Standard error of sampling distribution = 0.05

$S^2 = P(1-P) = (0.5)(0.5) = 0.25$

$P =$ the proportion of standard deviation in the population element (total error = 0.1 at 95% confidence level.

Solving equation (2);

$n_1 = S^2 / V^2$

$S = 1 - 0.5 = 0.5$

$n_1 = (0.5)(0.5) / (0.05)(0.05)$

$= 0.25 / 0.0025 = 100$

Substituting in equation 1;

$n = 100 / (1 + (100/358))$

$n = 100 / 1.027 = 97$

However, for field surveys in the construction industry, responses rate above 30% - 40% is considered statistically viable and satisfactory, and the results could be generalised and accepted as valid. (Adjei et al., 2017; Love and Smith, 2003). Responses were ranked using a five-point likert scale to give an indication of the degree of the aspect being measured. The scale was used as it is simple to construct, easy to read and complete and likely to produce highly reliable data.

The data collected from the field survey were analyzed using descriptive statistics specifically mean, standard deviation, percentage of frequency and ranking. The sample data was randomly spilt in to two sections, the first being the respondents' background information, where frequency table was used for analysis and for the second section, mean value analysis was conducted with the aid of statistical package for social science (SPSS) software.

The correctness of the results of this study depends largely on the accuracy of the information supplied by respondents. Given the prevalence of cost control by quantity surveying, this research will be unable to address the inherent shortcoming/inadequacies in the other sectors that are used. The accuracy of the generated was subjected to validation.

RESULTS, FINDINGS AND DATA PRESENTATION

Background Information of Respondents.

The study focused on Quantity Surveyors who are either engaged as consultants or contractors.

Nature of Respondent Organisation

		N	%	Valid %	Cumulativ %
Valid	Contracting	28	44.4	44.4	44.4
	Consultancy	35	55.6	55.6	100.0
Missing		0			
Total		63	100	100	

Table 3: Nature of Respondent Organisation

From the Table 3, it can be observed that 44.4% were Quantity Surveyors working in the Contracting Organization and 55.6% were working with the consultant organization.

Years of Practical Experience

		N	%	Valid %	Cumulative %
Valid	below 5 years	12	19.0	19.4	19.4
	5-10 years	15	23.8	24.2	43.5
	10-15years	12	19.0	19.4	62.9
	25 and above	23	36.5	37.1	100.0
Total		62	98.4	100.0	
Missing		1	1.6		
Total		63	100		

Table 4: Years of Practical Experience

As shown in Table 4, Considering respondents’ years of working experience, 19.4% have below 5 years of working experience, 24.2% have 5- 10 years of working experience, 19.4% of the respondent have 10- 15years working experience while 37.1% have above 15years of working experience in their respective firms. The result implies that the respondents have good working experience and are suitable for this type of research which makes the data reliable.

Respondents Academic Qualification

		N	%	Valid %	Cumulative %
Valid	HND.	13	20.6	20.6	20.6
	BSc.	29	46.0	46.0	66.7
	MSc.	21	33.3	33.3	100.0
Total		63	100.0	100.0	

Table 5: Respondents Academic Qualification

The Table 5 shows that 20.6% of the respondents have HND academic qualification, 46.0% have BSc qualification while 33.3% have MSc qualification, this means that their opinions can be relied upon.

Professional Qualification

		N	%	Valid %	Cumulative %
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Valid	Probationer member	28	44.4	46.7	46.7
	NIQS				
	Member NIQS	32	50.8	53.3	100.
	Fellow NIQS	3	4.8		
		63	100		

Table 6: Professional Qualification

Also, Table 6 shows that 46.7% are probationary members of Nigerian Institute of Quantity Surveyors while 53.3% are registered members of NIQS, this denote that majority have the experience about the Techniques of cost control and might have handle such on site.

RESPONDENT OPINION ON COST CONTROL TECHNIQUES

In assessing the opinion of respondent on cost control techniques, twenty-one (21) cost control techniques were examined. This include: Earned Value Analysis, Risk Analysis, Program evaluation and Review Technique (PERT/cost), Critical Path Method (CPM), Elemental Analysis, Performance Review and Variance Analysis, Cash Flow Analysis, Site Meeting, Record Keeping, Valuation of work in progress, Budgetary control, cost reduction on site, material management, cost optimization Techniques, whole life cycle costing, Facility Management, Cost Planning, Work Programs, Microsoft Project, Asta Power project and Primavera, descriptive analysis was run on the data collected as to assess the Cost control techniques used in the construction industry, easy means of putting the techniques into practice/to implement, and Challenges of the cost control techniques application in the Nigerian construction industry.

The Opinion of Respondents on the use of Cost Control Techniques in the Construction Industry.

Cost Control Techniques	M	SD	Rank
Cash flow analysis	4.86	0.85	1
Site Meeting	4.38	0.86	2
Microsoft Project	4.32	0.93	3
Valuation of work in progress	4.28	0.76	4
Cost Planning	4.12	0.92	5
Elemental Analysis	4.08	1.02	6
Work Programs	4.06	1.11	7
Record keeping	3.96	0.99	8
Budgetary control	3.89	0.99	9
Performance Review and Variance Analysis	3.79	0.67	10
Cost Optimization Techniques	3.77	0.88	11
Cost reduction on site	3.68	0.74	12
Material management	3.43	1.06	13
Whole life costing	3.43	0.65	13
Facilities Management	3.29	0.94	15
Critical Path Method (CPM)	3.25	0.87	16

Earn value analysis	3.22	1.02	17
Program Evaluation and Review Technique. (PERT/cost)	3.14	0.85	18
Risk Analysis	2.88	0.84	19
Asta Power Project	2.71	0.84	20
Primavera	2.36	1.11	21

Table 7: Opinion of Respondents on the use of Cost Control Techniques in the Construction Industry

The Opinion of Respondents on how easy is it to put the Techniques into Practice.

Cost Control Techniques	M	SD	Rank
Site meeting	4.27	1.01	1
Record keeping	4.25	0.93	2
Cash flow analysis	3.99	0.85	3
Microsoft Project	3.91	0.93	4
Work Programs	3.81	0.75	5
Elemental Analysis	3.8	1.05	6
Material management	3.69	0.91	7
Cost Planning	3.66	0.97	8
Valuation of work in progress	3.62	1.01	9
Critical Path Method (CPM)	3.59	0.82	10
Program Evaluation and Review Technique. (PERT/cost)	3.55	0.78	11
Budgetary control	3.55	1.06	11
Cost reduction on site	3.47	0.84	13
Performance Review and Variance Analysis	3.41	1.06	14
Asta Power Project	3.38	0.89	15
Facilities Management	3.37	0.95	16
Cost Optimization Techniques	3.34	0.92	17
Whole life costing	3.26	1.08	18
Earn value analysis	3.25	1.01	19
Risk Analysis	2.98	0.97	20
Primavera	2.59	0.94	21

Table 8: Opinion of Respondents on how easy is it to put the Techniques into Practice / to Implement

The Opinion of Respondents on Challenges of Cost Control Techniques Application in the Nigerian Construction Industry.

Challenges of Cost Control Techniques	M	SD	Rank
Poor Project Site Management.	3.96	1.06	1

Fluctuation in prices of Raw Material.	3.93	0.76	2
Application of Absolute Methods and Concept.	3.85	0.87	3
Over emphasizing on results while ignoring the process of cost Control.	3.84	0.86	4
Abandonment of complicated strategies.	3.7	0.66	5
Wrong Method of cost estimating	3.64	0.94	6
Lack of knowledge on the use of available tools and technology.	3.62	0.89	7
Lack of consistency in cost management by managers.	3.55	0.87	8
Lack of Financial Commitment in Projects.	3.55	0.94	8
Lacking Cost Control processes and system suitable to the enterprise.	3.32	0.93	10
Lowest bidding Procurement method	3.31	0.53	11
Inappropriate Government Policy	3.26	0.62	12

Table 9: Opinion of Respondents on Challenges of Cost Control Techniques Application in the Nigerian Construction Industry

DISCUSSION OF RESULT

Use of Cost Control Techniques

This research was able to establish that Cash Flow Analysis (1st), Site Meeting (2nd), Microsoft Project (3rd), Valuation of Work in Progress (4th), and cost planning (5th) are the most frequently used cost control techniques. While Opatunji 2018, in his research established that Valuation of work in progress (1st), Material Management (2nd), Record Keeping (3rd), Site meetings (4th) and Work Programs (5th) are the most commonly used cost control techniques in the construction Industry. It was established that Valuation of work in progress, Record Keeping and Site Meeting are among the 1st to 5th most used cost control techniques in both researches.

However, the study of Opatunji (2018) did not assess how easy it is to use these techniques but made a recommendation in its regards for future researches. This research was able to identify that Site Meeting (1st), Record Keeping (2nd), Cash Flow Analysis (3rd), Microsoft Project (4th) and work programs (5th) are the easiest cost control techniques in the Construction industry. It can also be observed that the easiest cost control techniques are the most used techniques.

CHALLENGES OF COST CONTROL APPLICATION

This research was able to identify that Poor Project Site Management (1st), Fluctuations in Prices of Raw Materials (2nd), Application of Absolute Methods and Concept (3rd) and Over Emphasizing on Result while Ignoring the Process of Cost Control (4th), are the most challenges of cost control techniques among the selected challenges. While Opatunji (2018) in his research, established that

Material Wastage on Site (1st), Availability of Fund (2nd) and Completion Period (3rd) are the three most important challenges of cost control techniques. Most challenges identified by Kirun & Varghese, (2015) and Sanni & Hashim, (2013) include unstable market condition, choice of procurement method, non-clarity of exclusions, improper planning and schedule, reworks due to errors, lack of research and innovation, price and design risk which is also in different direction with the study. Also, According to Opatunji, (2018), the construction industry practitioners agreed that completion period, availability of fund and material wastage on site, are the three most important factors that influence the choice of cost control techniques respectively. This is in line with the study.

CONCLUSION AND RECOMMENDATION

CONCLUSION

This research aimed at evaluating the cost control techniques used and their challenges in the Nigerian construction industry. The research was undertaken through a questionnaire survey of Quantity Surveyors working in Nigeria.

From the study, it can be concluded that all the techniques assessed were used on average in the Nigerian construction industry and the use of these techniques will bring about improved quality in the ability of the quantity surveyor to carry out his cost management function. Nevertheless, these techniques if properly used will bring about reduction in the costs of a project.

Also, most of the respondents agreed that effective cost control procedures, practices and approaches are seriously deficient, and that all the techniques are easy to implement on an average scale except for site meeting and record keeping which are considered the easiest technique by most of the respondents. Quantity Surveyors are more familiar with the traditional method of cost control with limited involvement in information technology. The research shows that an individual personal skills and characters will as much affect the practice of cost control.

Lastly, most quantity surveyors do not utilize any form of computer software for cost control, and those who use computers, utilized Microsoft excel, Microsoft project and while few uses primavera.

RECOMMENDATIONS

The focal point of this study was to evaluate the cost control techniques used by construction industry practitioners. Based on the study, the following recommendations are being made;

- i. Workshops, conferences, seminars and other training functions should be organized by quantity surveying professional bodies to sensitive, motivate and commit the academia (both students and educators) to embark on practical application of cost control techniques for wider knowledge and understanding.
- ii. Firms should endeavor to send their employees to attend workshops, seminars and other training programs that will enlighten them on how to use the techniques.
- iii. Firms should try applying these techniques on projects for better performance.
- iv. Quantity surveyors should develop a better attitude towards using these techniques.
- v. Quantity Surveyors should also exhibit the foresight in predicting and arresting those constraints that are associated with building projects which may either hinder the progress of work or increase the project duration, thus increasing project cost.

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