Assessment of Contractors' Mitigating Measures for Cost Overrun of Building Projects in South-Western Nigeria

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Abstract

The study examined the mitigating measures employed by contractors in southwest of Nigeria for cost overrun of building projects with a view to determining its adequacy and effectiveness. A mix of qualitative and quantitative research methods was adopted where data pertinent to the study were obtained through questionnaire survey on a sample of 32 project managers of medium sized construction firms selected from the list of 125 contractors on the register of Federation of Building and Civil Engineering Contractors located in South-West Nigeria using Simple Random Sampling method. Additional information was obtained from contracts bills of quantities and programme schedule to complement the data obtained from the questionnaire survey. Contract sums and final sums of building projects between 200 million Naira – 1.7 billion Naira handled by respondents were also collected as secondary data. Statistical Package for Social Scientists (SPSS) was employed to analyse the data for descriptive statistics while manual approach was adopted for inferential statistics of t-test. The results obtained revealed that effective site management and supervision with the highest relative importance index (RII) for adequacy of the mitigation measures was at average level and the (RII) for the effectiveness of mitigation measures adopted by contractors was very low. It also revealed that there is significant difference between initial sums and final sums of building projects at 5% significance level where the mitigation measures were taken in to consideration. The study concluded that mitigation measures adopted by contractors have not been adequate and effective in curbing cost overrun of building projects in southwest Nigeria.

Keywords: building projects, contractors, cost overrun, mitigating measures

1. Introduction

That construction industry world-wide is be-devilled with cost overrun is reflected in the fact that many construction projects do not achieve their cost objective. According to Ade et al. (2013) Poor cost performance in construction project is a common problem resulting in significant amount of cost overrun. Cost escalation exists globally over the years and it has not decreased, thus it appears no learning seems to take place concerning the subject (Flyvbjerg, Holm and Buhl, 2014). As a result of the pivotal position and significance of cost in construction development chain, there had been concerted efforts among the stakeholders and researchers to curb overrun of cost on construction projects. Despite the invention of various project control tools/techniques and software, the problem persist and distorts the cost and time objectives of many construction projects according to Olawale and Sun (2010). Thus, in recent times, there have been numerous studies aimed at proffering solution to this seemingly intractable problem.

In the past, some researches carried out outside Nigeria (overseas) identified the factors influencing time and cost overrun generally (Kaming, 1997; Kumaraswamy and Chan, 1998; Frimpong et al., 2003; Assaf and Al-Heji, 2006; Al-Momani, 2000; Hsieh et al, 2004; Yogeswaran et al 1998; Akinsola, 1997) While in Nigeria, the few studies carried out were not different in their focus on the causes and effects of cost and time overruns on project out come. The study by Mansfield et al (1994) on 50 contractor, consultant and client organizations in Nigeria identified some factors causing delays and cost overruns. Studies on measures to curb the incidence of both cost and time overrun in Nigeria are scanty. Hence, this study is aimed at assessing the mitigating measures adopted by medium sized contractors in South-western Nigeria with a view to determining its adequacy and effectiveness at curbing the incidence of cost overrun.

1.1 Mitigating Measures for Cost Overrun

Ahiaga-Dagbui & Smith (2013) developed a model of data mining techniques combined with Artificial Neural Network (ANN) to check accuracy of cost estimation as one of the major factor for cost overrun.

Other measures proposed recently includes reference class forecasting and public sector accountability (Flyvbjerg 2007, 2008; Berechman and Chen, 2011; Cantarelli et al.,2012 cited in Lind, & Brunes, 2014). The reference class forecasting uses the actual performance in a reference class to project accuracy by identifying relevant reference class of past and similar projects, establishing a probability distribution for the identified reference class and comparing the specific project with the reference class distribution to establish the likely outcome of the project. Although, Chevroulet, Giorgi and Reynaud (2012) in his study to predict a pattern for cost overruns, highlighted lack of reliable data for reference class forecasting or scenario analysis and suggested improvement in decision support before construction; management and monitoring during construction and feedback & consolidation of knowledge after construction.

Rahman et al. (2013) suggested an improved site management and supervision of contractors to control cost overruns. Although important, but not efficient in mitigating cost overrun because cost overrun is initiated from the inception of a project according to Brunes and Lind (2013), he however pointed out that most cost overruns occur in the design and planning stage. Statistical analysis by Doloi (2013) suggested well-developed technical skills to control cost in modern projects.

Similar statistical distributions by Love et al. (2013) to a set of actual projects with different characteristics to predict cost overruns revealed no significant differences in cost overruns among projects with different procurement method.

According to Ade et al (2013), the following mitigating measures can be adopted to reduce or eliminate cost overrun of projects.

- Effective strategic planning
- Proper project planning and scheduling
- Frequent project meeting
- Proper emphasis on past experience
- Use of experienced subcontract and Suppliers
- Use of appropriate construction methods
- Use of up-to-date technology utilization
- Clear information and communication channel
- Frequent co-ordination between the parties
- Perform a preconstruction planning of project tasks and resources need.
- Development of human resources in the construction industry
- Comprehensive contract administration
- Systematic control mechanisms
- Effective site management and supervision

2. Method

A questionnaire survey was conducted on a sample population of 45 project managers in medium sized contracting firms in southwest Nigeria using simple random sampling method. Thirty-two (32) hard copies of the questionnaire were retrieved in person, yielding a response rate of 71%. The questionnaire elicits the following information about the respondents' particulars: Professional qualification, Working Experiences in the construction industry and the type of organization the respondents work. The likert scale of 1-4 was applied in assigning value to the data collected for adequacy of the mitigating measures. The scale is: 1-not adequate, 2-less adequate, 3-adequate, and 4-very adequate for the adequacy of the measures. In addition, 1-not effective, 2-less effective, 3 - effective, and 4 - most effective were employed for the effectiveness of the measures. The scales were converted to relative importance index (RII) using the following formula, as adopted by Kumaraswany and Chan (1997, 1998), Assaf et al (1995) and Iyer and Jha (2005):

$$\text{Relative importance index (RII)} = \sum w \div (H \times N) \qquad (1)$$

Where w is the total weight given to each factor by the respondents, which ranges from 1 to 4 and is calculated

by an addition of the various weightings given to a factor by the entire respondent, H is the highest ranking available (i.e. 4 in this case) and N is the total number of respondents that have answered the question.

2.1 Test of Hypothesis

Null Hypothesis (H$_0$): There is no significant difference between the contract sum and the completion sum of building projects.

Alternative Hypothesis (H$_1$): There is significant difference between the contract sum and the completion sum of building projects.

The test of hypothesis for this study was based on 5% significance level and was adopted to test the significance of the difference between the initial and final contract sums of the building projects executed by medium sized contracting firms, to establish the effectiveness of the adopted measures.

2.2 The t-Statistics

This was used for 15 samples of building projects on which the contracting firms have employed mitigation measures to test its effectiveness. Its use was based on the premise that t-statistic was applicable for sample size that was less than 30. According to Lucey (1996). For t-statistic,

$$t - \text{calculated} = \frac{Y-X}{s_{(Y-X)}} \tag{2}$$

$$S_{(Y-X)} = \sqrt{\frac{(ny-1)S_y^2 + (nx-1)S_x^2}{n_y + n_x - 2}(1/n_y + 1/n_x)} \tag{3}$$

x and y are two variables

X and Y are the mean values

N = Samples Size

S$_y$ and S$_x$ = Standard deviation of y and x respectively

The decision is that if the calculated t-statistic equal to or greater than t-critical respectively, then the null hypothesis may be rejected at the level of significant difference between the contract sums and the completion sums.

2.3 Data Analysis

The Statistical Package for Social Sciences (SPSS) and manual method were used for the analysis. The demographic details of the respondents were produced and the mean ranks of the identified mitigating measures were used for the ranking in the analysis. Inferential statistical tool of t-statistic was also used in the analysis to investigate variability in the initial and final sum of building projects where mitigating measures were adopted by medium sized category of contractors in curbing cost overrun.

3. Results

Thirty-two (32) questionnaires were collected back from respondents and used for the analysis.

The demographic details of the respondents are as presented in table 1.

Table 1. Demographic details

	Variables	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
1	Type of organisation / Firm (N=32)				
	Expatriate	14	14	43.75	43.75
	Indigenous	18	32	56.25	100.00
2	Professional Membership Grades(N= 32)				
	Architects	3	3	10	10
	Builders	7	10	22	32
	Quantity Surveyors	8	18	25	57
	Mechanical Engineers	3	21	9	66
	Civil Engineers	5	26	15	81
	Estate Surveyors	3	29	10	91
	Electrical Engineers	2	31	6	97
	Others	1	32	3	100.00
3	Work Experiences in the Construction Industry(N= 32)				
	Less than 10 yrs	13	13	41	41
	10-20 yrs	11	24	34	75
	21-30 yrs	8	32	25	100.00

Source: Field survey, 2015

Table 1 shows the demographic details of the respondents; 59% has put over 10 years working experience in the construction industry and are registered members of their respective professional bodies. This shows that data supplied by these categories of respondents is reliable

Table 2. Adequacy of mitigating measures adopted by medium sized contractors on cost overrun

Mitigating measures	RII	Ranking
1. Effective site management and supervision	0.65	1st
2. Proper project planning and scheduling	0.62	2nd
3. Clear information and communication channel	0.60	3rd
4. Use of experienced subcontractors and Suppliers	0.56	4th
5. Use of appropriate construction methods	0.54	5th
6. Proper emphasis on past experience	0.50	6th
7. Frequent co-ordination between the parties	0.50	6th
8. Perform a preconstruction planning of project tasks and resources need	0.50	6th
9. Use of up-to-date technology utilization	0.46	9th
10. Comprehensive contract administration	0.43	10th
11. Frequent project meeting	0.42	11th
12. Development human resources in the construction industry	0.40	12th
13. Effective strategic planning	0.38	13th
14. Systematic control mechanism	0.30	14th

Source: Field survey, 2015.

Table 2 shows the RII on the adequacy of the mitigating measures on the cost overrun of building projects in the study area. Effective site management and supervision has the highest RII of 0.65, followed by proper project planning and scheduling 0.62 followed by others. The overall implication of this is that the RII is low generally; the use of these measures has not been adequate and has resulted in cost overrun of most building projects.

Table 3. Effectiveness of mitigating measures adopted by medium sized contractors on cost overrun

Mitigating measures	RII	Ranking
1. Effective site management and supervision	0.60	1st
2. Proper project planning and scheduling	0.58	2nd
3. Clear information and communication channel	0.54	3rd
4. Use of experienced subcontractors and Suppliers	0.50	4th
5. Use of appropriate construction methods	0.46	5th
6. Proper emphasis on past experience	0.42	6th
7. Frequent co-ordination between the parties	0.40	6th
8. Perform a preconstruction planning of project tasks and resources need	0.36	6th
9. Use of up-to-date technology utilization	0.34	9th
10. Comprehensive contract administration	0.32	10th
11. Frequent project meeting	0.26	11th
12. Development human resources in the construction industry	0.26	12th
13. Effective strategic planning	0.24	13th
14. Systematic control mechanism	0.20	14th

Source: Field survey, 2015

Table 3 shows the RII on the effectiveness of the mitigating measures on the cost overrun of building projects in the study area. Effective site management and supervision has the highest RII of (0.60), followed by proper project planning and scheduling (0.58) followed by clear information and communication channel (0.54). The overall RII is too low which implies that there has not been effectiveness in the use of mitigating measures and has resulted in cost overrun of most building projects.

Evaluation of the variability between the contract sums and the completion costs of projects where mitigation measures were used for building projects by medium sized contractors in southwestern Nigeria.

Hypothesis 1:

Null Hypothesis (H_0): There is no significant difference between the contract sum and the completion cost of building projects.

Alternative Hypothesis (H_1): There is significant difference between the contract sum and the completion cost of building projects.

Table 4. Building projects with contract sums and completion costs range between 200 million to 1.7 billion Naira

Project	X (Million)	Y (Million)	X^2	Y^2
1	228	407	51984	165649
2	212	389	44944	155321
3	652	956	425104	913936
4	517	927	267289	859329
5	957	1655	915849	2,739025
6	201	364	40401	132496
7	127	248	16129	61504
8	428	898	183184	806404
9	613	963	375769	927369
10	625	1090	390625	1188100
11	125	198	15625	39204
12	457	723	208849	522729
13	205	360	42025	129600
14	251	379	63001	143641
15	426	658	181476	432964
Total	**6,024**	**10,215**	**3,222,254**	**9,217,271**

Source: Field survey, 2015

From Table 4 t - cal = 2.48, and t α/2 = 1.753. Since t cal < t α/2, reject the null hypothesis and, then accept the alternate hypothesis that there is significant difference between the contract sum and the completion cost of projects where mitigation measures were used for building projects by medium size contractors.

4. Discussion

Table 1 shows the demographic details of the respondents to this study. The number of years they have put in the industry and the projects they have handled shows that the information supplied by them are adequate and reliable for the study.

Table 2 shows the RII on the adequacy of the mitigation measures on the cost overrun of building projects in the study area. Effective site management and supervision has the highest RII of 0.65, followed by proper project planning and scheduling 0.62. The RII of majority of other mitigating measures are slightly above 0.50. The overall implication of this is that the RII is on the average level. Generally, the use of these measures has not been adequate and has not been able to curb cost overrun of building projects in the study area.

Table 3 shows the RII on the effectiveness of the mitigation measures on the cost overrun of building projects in the study area. Effective site management and supervision has the highest RII of (0.60), followed by proper project planning and scheduling (0.58) followed by clear information and communication channel (0.54). The overall RII is low for the effectiveness of these mitigation measures, which implies that there has not been effectiveness in the use of mitigation measures in curbing cost overrun of building projects.

The result from table 4 shows that t-cal. = 2.48 and t-tabulated = 1.753**.** Reject the null hypothesis and accept the alternate hypothesis that there is significant difference between the contract sum and the completion cost of projects where mitigation measures were used for building projects by medium sized contractors. This confirms the results obtained in Table 3 that these mitigation measures have not been effective in curbing cost overruns of building projects in the southwest Nigeria.

5. Conclusions

This paper has been able to assess the adequacy and effectiveness of mitigation measures adopted by medium size contractors to curb cost overrun of building projects in the south-western part of Nigeria. The following conclusions have been drawn:

The adequacy of these mitigation measures has been on the average level. These mitigation measures have not been effective in curbing cost overruns of building projects in the study area.

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