International Journal of Managerial Studies and Research (IJMSR)
Volume 2, Issue 10, November 2014, PP 55-63
ISSN 2349-0330 (Print) & ISSN 2349-0349 (Online)
www.arcjournals.org

Assessment of Contingency Sum in Relation to the Total Cost of Renovation Work in Public Schools in Abuja, Nigeria

Richard A. Jimoh*

Department of Building
Federal University of Technology, Minna-Nigeria
rosney@futminna.edu.ng

Shaaba M. Adama

Department of Building
Federal University of Technology, Minna-Nigeria
shaaba72@gmail.com

Abstract: *In construction projects, plans and cost estimates are usually drawn to ensure that the work is carried out to the desired quality, within time and budget. The construction industry is inherently uncertain due to nature of the industry itself which often times makes accurate cost of project near impossible thereby given rise to the inclusion of contingencies in order to meet project objectives. Therefore, the study assessed the relationship between contingency sum and client objectives (cost, time and quality) in order to ensure effective project delivery in the renovation of public school facilities in Abuja. This was done through the self-administration of 331 structured questionnaires and historical data from 100 renovated projects between 2001 and 2011. It was discovered that location of the project, the level of dilapidation, type of project, volume of work and duration of the project determine the percentage addition of preliminary sum to the total cost of renovation work. Based on this, actual contingency sum should always be considered bearing in mind these factors in renovated work.*

Keywords: *Completion time; Contingency sum; Contract sum; Renovation; Total cost*

1. INTRODUCTION

The expectation of building consultants is to keep the final construction cost within the initial budget estimate expenditure that includes a justified additional amount that caters for uncertainties and risk events which amount to variation. In construction projects, plans and cost estimates are usually drawn to ensure that the work is carried out to the desired quality, within allowed time, and within budget. The construction industry is inherently uncertain due to the nature of the industry itself- as a result of the competitive tendering process, the company's turnover, site production rates and weather which are characterized by variability and a degree of uncertainty (Harris and McCaffer, 2001).

Invariably in the execution of any building project some unforeseen items are inevitable. Most times, the successful completion of any project is assessed on the basis of three parameters via; time, money and performance (Smith, 1999). The relative magnitude of these three types will be related to project objectives. In a construction project and from the owner's point of view, contingency is the budget that is set aside to cope with uncertainties during construction (Burger, 2003).

Touran (2003) emphasized that it is common to assign contingency value to both cost and schedule because project uncertainties can affect both project schedule and cost, Touran further explained that contingency allocation has been the subject of various research and various methods of contingency calculation and allocation have been described in several sources. One of the common methods of budgeting for contingency is to consider a percentage of estimated cost, based on previous experience with similar projects (Thomson and Perry 1992).

According to Akinsola (1996), contingency is crucial to achieving project objectives. Contingency funds are included in development budgets to provide managers with techniques required to address uncertainties and deviations that threatened project objectives (Diekmann, Sewester and Taker, 1988). It is used to cater for events that are unforeseen within the scope of the project. Contingency is used as a financial treatment in risk treatment strategies thus; it caters for the risk associated with a project, the conventional approach to managing the extra cost is to include some percentage of the project cost as contingency in the pre-contract budget. According to Akinsola (1996), conventional allocation of contingency is based on judgment. However construction projects are unique; as they may have different objectives, require the application of new technology or technical approaches to achieving the required result. This uniqueness makes the contingency allowance allocation based on assumption and intuition inadequate and unrealistic.

The fact remain that construction contract delivery is a complex one, which is characterized with uncertainties and risk, has necessitated the need for inclusion of contingency and preliminaries sum to the construction cost but researchers differs on the actual percentage of contingency and preliminaries (Ashworth, 1999; Odeyinka, 1987; Ramus and Birchall, 1996; Nworuh & Nwachukwu, 2004). According to Bello and Odusami (2008), the factors considered as the most vital in making provision for construction contingency and preliminaries include size and complexity of project, assessed risk on the project and adequacy of information. In a related development, Bello and Odusami (2008) revealed that in Nigeria, 5 to 10 % of pre contract estimate is in most cases allowed as contingency. Although this contingency can be calculated in various ways, the most common way is to consider around 10 % of the estimated project cost (Burger, 2003). Hartman (2000) argued that this is an unscientific approach and thus a reason why many projects finish over budget. Thompson and Perry (1992) observed that most times, risk is either ignored or dealt with in an arbitrary way; by simply adding a 10 % contingency onto the estimated cost of a project is typical.

2. CONCEPT OF CONTINGENCY IN CONSTRUCTION PROJECTS

According to Thomson and Perry (1992), all too often risk is either ignored or dealt with in an arbitrary way; by adding a ten percent contingency to the estimated cost of construction project is typical and unscientific. Argenti (1969) cautiously predicted that model building will become a key technique for future generation managers. This has manifest itself in the number of research reports in which models are developed to serve as basis for construction cost estimate in order to achieve better level of accuracy and reliability of cost estimate. Touran (2003) identified project size, type of construction, difference between low bid and owner’s estimate among factors that affect project cost overrun. Andi (2004) identified cost-risks factors influencing project cost elements. Assurance of a reliable construction contingency is sine qua non to client’s satisfaction on the estimated final construction cost. Specifically, it will assist consultant quantity surveyors in their estimating practice to know project variables that could affect their decision on the contingency sum which is applicable to construction projects.

According to Odeyinka (1987) risk is inherent in any construction project right from the beginning through its completion. Ashworth (1999) posited that risk can be mathematically predicted, whereas uncertainty cannot. Nworuh and Nwachukwu (2004) asserted that experience on many projects indicate poor performance in terms of achieving time and cost targets, thus many cost and time overruns are attributable to unforeseen events for which uncertainties was not appropriately estimated. An amount of money used to provide for uncertainties associated with a construction project is referred to as contingency allowance (Mak and Picken, 2000).

Contingencies are mainly used to achieving project objectives. Contingency funds are included in development budgets to provide managers with flexibility required to address uncertainties and deviations that threaten achieving objectives (Diekmann, Sewester and Taker 1988). It is used to cater for events that are unforeseen within the defined project. It is added to indicate total cost of the project, which implies that the estimate represents the total financial commitment for a project. Contingency is used as a financial treatment in risk treatment strategies thus; it caters for risk associated with a project. According to Yeo (1990), the objectives of the contingency allocation are to ensure that the budget set aside for the project is sufficient enough to contain the risk of unforeseen cost increases. Therefore, any realistic contingency must serve as a basis for decision making concerning financial viability of the variations, and a baseline for their control (Akinsola, 1996).

Contingency is a specific provision made for unforeseeable elements of cost, particularly in fixed investment estimates, which previous experience has shown to be statically likely to occur. It is an allowance reserved for unpredictable items of cost not known at the time of estimate. It provides for possible cost escalations, currency fluctuation, local conditions within the country where the project is to be sited, accuracy of estimation (Bello and Odusami, 2008). According to Baccarini (2004), contingency amounts will vary based on type of unit under consideration. During an inflationary period, experience indicates that the value selected should be on the high side of the range. Baccarini (2004) also suggested three range of contingency allowance for the following categories of projects:

i. Well-estimated process design (previously built) about 5–10%
ii. Well-estimated process design (the bottleneck type) about 20–35%.
iii. Brand new process design (never built before) 15–30%.

3. Estimating Methods for Cost Contingency

According to Bello and Odusami (2008), the important factors considered in making provision for construction contingency are: size and complexity of project, assessed risk on the project and enough information. Andi (2004) identified cost-risks factors influencing project cost elements, relationship among the risks themselves and proposes risk analysis methodology for allocation of contingency. Touran (2003) identified project size, type of construction, difference between low bid and owner's estimate among factors that affect project cost overrun. Project size, type of construction, type of client, method of procurement, percentage of design completed before tender, adequacy of information, and number of subcontractors used were identified by Akinsola, Potts, Ndekugri and Harris (1997). In estimating for contingency, project factors to be considered are project cost data and duration with their variability's (Ahmad 1992; Ranasinghe, 1994; Moselhi, 1997; Chen and Hartman, 2000; Nassar, 2002; Touran 2003; Baccarini 2005 and Rowe 2006). And significant risk factors (Mak, Wong and Picken, 1998; Mak and Picken 2000; Chen and Hartman, 2000; Bajaj, 2001 and Sonmez, Ergin and Birgonul, 2007). It becomes more difficult to determine overall estimate reliability since some sections of a project may be thoroughly defined at the time of estimate, and others sketchily defined.

The practice of presenting project cost estimates as a deterministic figure comprising a base estimate and the addition of a single contingency amount (usually as a percentage addition) has been adopted in the construction industry for a long time for budgeting purposes. Usual practice is for this amount to be a single lump sum with no attempt made to identify, describe, and value various categories and possible areas of uncertainty and risk. Cost contingency is inclusive within a budget in exchange for the total financial commitment for the project owner. Therefore the estimation of cost contingency and its ultimate adequacy is of critical importance to project owners.

Baccarini (2004) detailed numerous estimating methods available for project cost contingency these are: traditional percentage, method of moments, Monte Carlo simulation, factor rating, individual risks-expected value, range estimating, regression, artificial neural networks, fuzzy sets, analytical hierarchy process. When estimating, the common method of allowing for uncertainty is the addition of a percentage contingency figure to the most likely estimate of the final cost of the known works.

Where there is some form of tender documentation provided for bidders; a portion of the contingency will usually be transferred to the provisional sums section in these documents. For construction projects that usually use a government's fixed quantities contract, the magnitude of the final account variations that comprise additions and omissions can be compared with the contingencies included in estimates. This comparison can be used to assess the accuracy of the allowance made for the contingencies at the early estimate state. Moreover, due to the effect of negative sanctions (that is, imposing a penalty for an underestimate, where tender bids are above the pretender estimate but no reward/penalty for an overestimate), an over-exaggerated contingency is not uncommon in many project estimates. For public works projects, this leads to misallocation of resources as more sufficient funds are locked up in projects.

4. Method

In the study, two methods were adopted; data from archival records of completed renovated projects and questionnaire survey. The data (contingency sum, final contract sum and final completion time) of 100 previously completed projects executed between 2001 and 2011 by the Federal Capital Territory Administration Secondary Education Board were obtained, particularly the renovated blocks of classrooms, hostel blocks, introductory technology workshops, science laboratories and multipurpose halls. In the survey, three hundred and thirty one (331) questionnaires were self-administered to clients, contractors and consultants within Abuja on their opinions about contingency sum. The data were analysed using mean scores and regression analysis which formed the basis for the conclusion and the recommendation made.

5. Findings from the Study

Table 1 below shows the analysis of field survey result. 62.8 % of the questionnaires sent were returned.

Table 1. *Response rate*

Group	Number of questionnaires administered	Number returned	Response rate (%)
Contractors	36	28	77.8
Clients	24	17	70.8
Consultants	271	163	60.2
Total	**331**	**208**	**62.8**

Table 2 shows that respondents that obtained BSc./B.Tech. have the highest percentage of 49.5% with a response count of 103 while those who are PhD holders have the least response count of 1 representing 0.5%. The respondents that have HND and MSc/MTech as their highest educational qualification have response counts of 61 and 38 with 29.3% and 18.3% respectively. Hence, first and second degree holders are the major respondents for the study. This shows that there is availability of personnel with high qualification and leadership skills for project management.

Table 2. *Respondents' qualification*

Respondents' Qualification	Frequency	Percent
ND	2	1.0
HND	61	29.3
BSc./B. Tech.	103	49.5
MSc./M Tech.	38	18.3
PhD	1	0.5
Others (PGD and so on)	3	1.4
Total	**208**	**100.0**

Table 3 shows the opinions of the respondents on whether they consider contingency sum as a percentage of estimated cost. The respondents that agree that the contingency sum forms a percentage of the estimated cost have the highest response count of 122 with 58.7% followed by those that strongly agree with a response count of 63 with 30.3%. The respondents that strongly disagree have the least response count of 1 with 0.5%. The mean score of 4.10 relative to the table can be deemed to agree with the question because it falls between 1.51 and 2.49 which represents 89% of the respondents that strongly agree and agree.

Table 3. *Contingency sum as a percentage of estimated cost*

Scale	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Percentage	30.3	58.7	1.0	8.2	0.5
Mean score			4.10		
Valid responses			205		

Table 4 shows the opinions of the respondents on whether they consider contingency sum as a fixed amount of contract sum. The respondents that agree that the contingency sum is a fixed amount of contract sum has the highest response count of 81 with 38.9% followed by those that strongly disagree with a response count of 67 with 32.2%. The respondents that strongly agree have the least response count of 5 with 2.4%. The mean score of 3.10 relative to the table can be deemed to be neutral with the question because it falls between 2.50 and 3.49 which represent 50.5% of the respondents that strongly disagree and disagree.

Table 4. *Contingency sum as a fixed amount of contract sum*

Scale	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Percentage	2.4	38.9	6.7	18.3	32.2
Mean score			3.10		
Valid responses			205		

Table 5 shows the opinions of the respondents that the contingency is time-bound. The respondents that disagree that contingency is time-bound have the highest response count of 77 with 37.0% followed by those that strongly disagree with a response count of 58 with 27.9%. The respondents that strongly agree that the contingency is time-bound have the least response count of 6 with 2.9%. The mean score of 2.05 relative to the table can be deemed to disagree with the question because it falls between 1.51 and 2.49 which represents 64.9% of the respondents that strongly disagree and disagree.

Table 5. *Contingency is time-bound*

Scale	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Percentage	2.9	14.4	13.5	37.0	27.9
Mean score			2.05		
Valid responses			199		

The opinions of the respondents in Table 6 below show that the contingency is risk-based but not time-bound. The respondents that disagree that contingency is risk-based but not time-bound have the highest response count of 66 with 31.7% followed by those that strongly agree with a response count of 50 with 24.0%. The respondents that strongly disagree that the contingency is risk-based but not time-bound have the least response count of 12 with 2.9%. The mean score of 3.36 relative to the table can be deemed to be neutral because it falls between 2.50 and 3.49 representing 41.8% of the response agree.

Table 6. *Contingency is risk-based but not time-bound*

Scale	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Percentage	24.0	17.8	18.8	31.7	5.8
Mean score			3.36		
Valid responses			204		

Type of client is considered to be most important factor that determines the percentage addition of contingency sum to the estimated cost as it comes first in the ranking as shown in Table 7 below. The 'Duration of the project', the 'Level of dilapidation' and the 'Type of project' are factors that ranked as the second, third and fourth important factors respectively that dictate the magnitude of percentage addition of contingency sum to the estimated cost. The 'Location of the project' the organizations embark on ranked as the fifth important factor that determines the percentage addition of contingency sum to the estimated cost. Finally, the 'Volume of work' the organizations undertake was ranked as the least important factor that decides the percentage addition of contingency sum to the estimated cost.

Table 7. *Percentage addition of contingency sum to the estimated cost*

Factors that determine the percentage addition of contingency sum to the estimated cost	Mean	Rank
Location of the project	1.78	5
Volume of work	1.67	6
Level of dilapidation	1.99	3
Type of client	3.59	1
Duration of the project	2.51	2
Type of project	1.83	4

Table 8 shows that the relationship is also statistically significant because the p-value (0.000) is less than α (0.05), hence, the null hypothesis is rejected. The dependency of the contract sum on the contingency sum may be predicted using the model below. Bello and Odusami (2009) result was consistent with what is presented here.

$Y_1 = 0.0283 X_1 + 2.299E7$

Where Y_1 = contract sum (dependent variable) and X_1 = preliminary sum (independent variable). In order to determine if a statistical relationship exists between contingency sum and contract sum, the following hypothesis was formulated.

H_{b0}: There is no significant relationship between contingency sum and contract sum.

H_{b1}: There is a significant relationship between contingency sum and contract sum.

Table 8. *Model for the relationship between contract sum and contingency sum*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	**F Change**	**df1**	**df2**	**Sig.** F Change
1	.922[a]	.850	.831	5.37670E7	.850	45.356	1	8	.000

a. Predictors: (Constant), CONTINGENCY SUM

b. Dependent Variable, TOTAL CONTRACT SUM

In establishing whether there is correlation between the factors that determine percentage addition of contingency sum and contract sum, another hypothesis was formulated and tested as shown in Table 9 below. The table indicates a negative correlation (-0.148) for location of the project and the relationship is statistically significant since the p-value (0.002) is less than α (0.05), hence, null hypothesis is rejected and we conclude that the location of the project determines the percentage addition of contingency sum to the estimated cost. The table also indicates a negative correlation (-0.084) for volume of work and the relationship is statistically significant since the p-value (0.001) is less than α (0.05), hence, null hypothesis is rejected and we conclude that the volume of work determines the percentage addition of contingency sum to the estimated cost.

The table further indicates a positive correlation (0.052) for level of dilapidation and the relationship is statistically significant since the p-value (0.002) is less than α (0.05), hence, null hypothesis is rejected and we conclude that the level of dilapidation determines the percentage addition of contingency sum to the estimated cost. Also, the table indicates a negative correlation (-0.037) for type of client and the relationship is statistically not significant since the p-value (0.655) is not less than α (0.05), hence null hypothesis is not rejected and we conclude that the type of client does not determine the percentage addition of contingency sum to the estimated cost.

Furthermore, the table indicates a negative correlation (-0.038) for duration of the project and the relationship is statistically significant since the p-value (0.004) is not less than α (0.05), hence, null hypothesis is rejected and we conclude that the duration of the project determines the percentage addition of contingency sum to the estimated cost. Finally, the table indicates a positive correlation (0.033) for type of project and the relationship is statistically significant since the p-value (0.002) is less than α (0.05), hence, null hypothesis is rejected and we conclude that the type of project determines the percentage addition of contingency sum to the estimated cost. Overall decision is that there is statistically significant relationship between the factors and contingency sum. However, Bello and Odusami (2009) considered three factors (nature of project, type of project and type of client) and discovered that they were not considered in determining the percentage of contingency added to projects as the analysis of variance (ANOVA) results showed no significant difference. Therefore, this is not consistent with their study in this regards but it should be emphasised that this study was on renovated projects and not new projects.

H_{d0}: There is no correlation between factors that determines percentage addition of contingency sum and contract sum.

H_{d1}: There is a correlation between factors that determines percentage addition of contingency sum and contract sum.

Table 9. *Factors that determine the percentage addition of contingency sum to the estimated cost*

Factor	**Pearson product**	**Sig (2 tailed) or p-value**	**Decision**
Location of the project	-0.148^{*}	0.002	Accept H_a
Volume of work	-0.084^{*}	0.001	Accept H_a
Level of dilapidation	-0.052^{*}	0.002	Accept H_a
Type of client	-0.037	0.655	Reject H_a
Duration of the project	-0.038^{*}	0.004	Accept H_a
Type of project	0.033^{*}	0.002	Accept H_a

*Correlation significant at the 0.05 level (2-tailed)

Finally, Table 10 shows that the relationship is also statistically significant because the p-value (0.011) is less than α (0.05) based on the hypothesis stated below. The dependency of the contingency sum on the final completion time of a project may be predicted using the model below. This is consistent with the study of Bello and Odusami (2009).

$Y_3 = 0.876E06X_3 - 1.750E+09$

Where Y_3 = contingency sum (dependent variable) and X_3 = final completion time (independent variable).

H_{f0}: There is no significant relationship between completion time and contingency sum.

H_{f1}: There is a significant relationship between completion time and contingency sum.

Table 10. *Model for the relationship between contingency sum and final completion time*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.757[a]	.573	.519	2.79070E6	.573	10.718	1	8	.011

Dependent Variable: contingency sum

Predictors: (Constant), final completion time

6. Conclusion

The study assessed contingency sum in relation to the total cost of renovation work. It was found out that 89% of the respondents were of the opinion that contingency sum was a percentage of estimated total cost but no consensus however as to whether contingency sum was a fixed amount of contract sum. It is concluded that the location of the project determines the percentage addition of contingency sum to the estimated cost, that the volume of work determines the percentage addition of contingency sum to the estimated cost, that the level of dilapidation determines the percentage addition of contingency sum to the estimated cost, that the type of client does not determine the percentage addition of contingency sum to the estimated cost, that the duration of the project determines the percentage addition of contingency sum to the estimated cost and that the type of project determines the percentage addition of contingency sum to the estimated cost. Hence, overall decision is that there is statistically significant relationship between the factors and contingency sum. The study also shows that completion time and contract sum had correlation with contingency sum in renovated work.

7. Recommendation

Contingency fund is included in development budgets to provide managers with flexibility required to address uncertainties and deviations that threaten achieving objectives. This study recommends the need for inclusion of contingency sum to the overall construction cost and that the actual percentage of contingency sum should always be considered based on the location of the project, the volume of work, the level of dilapidation, the duration of the project and the type of project to be executed.

References

Ahmad, I. (1992). Contingency allocation: A computer- aided approach. *AACE Transaction* F.5, F.5.1- F.5.5

Akinsola A.O. (1996) A Neutral network model for predicting Building projects' Contingency. *Proceedings of Association of Researchers in Construction Management,* 507–516

Akinsola, A.O, Potts K.F, Ndekugri, I and Harris F.C. (1997). Identification and evaluation of factors influencing variations on building projects. *International Journal of Project management*, 15(4), 263-267

Andi, A.A. (2004). Appropriate allocation of contingency using risk analysis methodology. *Civil Engineering Dimension*, 6(1), 40-48

Argenti, D. (1969). *Management Technique: A Practical Guide,* London: George Allen and Unwin Limited

Ashworth, A. (1999). *Cost studies of buildings*, 2nd Ed. New York: Addison Wesley Longman Publishing

Baccarini, D. (2004). *Accuracy in estimating project cost construction contingencies – A statistical analysis.* In COBRA 2004, Leeds Metropolitan University: RICS Foundation

Bajaj, D. (2001). Risk response and contingency strategies among contractors in Sydney, Australia. *2001 AACE International Transactions,* Risk.01.1- Risk.01.6

Bello, W.A. and Odusami, K.T. (2008). The practice of contingency allocation in construction projects In Nigeria. *In:* Stephen Brown (ed.), *Proceedings of the construction and building research conference of the Royal Institution of Chartered Surveyors* Held at Dublin Institute of Technology, 4-5 September 2008.

Bello, W.A. and Odusami (2009). Project variables influencing contingency on construction contract in Nigeria. RICS/COBRA Research Conference, University of Cape Town, 10-11 September

Burger, R. (2003). Contingency qualifying the uncertainty. *Journal of Cost Engineering*, 45 (8), 12-17

Chen, D. and Hartman, F.T. (2000). A Neural Network Approach to Risk Assessment and Contingency Allocation. *AACE International Transactions.* Risk.07.01- Risk.07.06

Diekimann, J.E., Sewester, E.E., and Taker, K. (1988). Risk management in capital projects. *Journal of Construction Engineering and Management*, 128(1), 30- 39

Harris F. and McCaffer R. (2001). *Modern Construction Management*, UK: Blackwell Publishing Company.

Mak, S.and Picken D. (2000). Using risk analysis to determine construction project contingencies. *Journal of construction Engineering and Management*, 126(2), 130-136

Mak S, Wong J and Picken D (1998). The effect on contingency allowances of using risk analysis in capital cost estimating: A Hong Kong Case Study. *Construction Management and Economics*, 16, 615-619

Moselhi, O. (1997). Risk assessment and contingency estimating, *AACE International Transactions* D&RM/A.06.1- D&RM/A.06.6

Nassar, K. (2002). Cost contingency analysis for construction projects using Spreadsheet *Cost Engineering*, 44(9), 26-35

Nworuh, G.E and Nwachukwu, G.O.C. (2004). Risk management approach to claims in construction contracts administration. *The Quantity Surveyor,* 46(5), 24-31

Odeyinka, H. A. (1987). *The effect of risk and its management on construction project overrun.* Unpublished MSc Dissertation submitted to the Department of

Building, University of Lagos, Lagos

Ramus, J. and Birchall S. (1996). *Contract practice for quantity surveyors*, 3rd Ed. Great Britain: Laxton's Limited

Ranasinghe, M. (1994). Contingency Allocation and management for building projects. *Construction Management and Economics.*12, 233-243

Rowe, J.F. (2006). A construction cost contingency tracking system (CTS). *Cost Engineering,* 48(2), 31-37

Smith, N.J. (1999). *Management Risk in Construction Projects. London:* Blackwell Publishing Company.

Sonmez, R., Ergin, A. and Birgonul, T. (2007). Quantitative methodology for determination of cost contingency in international projects, *Journal of Management in Engineering*, ASCE 23, 1(35), 35-39

Thompson, P.A. and Perry, J.G (1992). Engineering construction risks: *A guide to project risk* analysis *and risk management*. London: Thomas Telford Ltd

Touran, A. (2003). Probabilistic model for cost contingency, *Journal of Construction Engineering and Management* ASCE, 129(3), 280-284

Yeo, K. T. (1990). Risks, Classification of estimates and contingency management. *Journal of Management in Engineering*, 6(4), 458-70

AUTHORS' BIOGRAPHY

Dr Richard Jimoh is a Senior Lecturer in the Department of Building, Federal University of Technology, Minna-Nigeria. He holds a PhD in Construction Management in 2012 from the Nelson Mandela Metropolitan University, Port Elizabeth-South Africa. He has taught at undergraduate and postgraduate levels at his home country in Nigeria where he has put in more than 10 years of teaching experience and has published widely in the field of construction management.

Alhaji Adama Shaaba Musa is a practising Registered Quantity Surveyor, he is presently the Head Quantity Surveying, Secondary Education Board, Federal Capital Territory Administration, Abuja-Nigeria. He recently defended his M. Tech in Construction Management from the Department of Building, Federal University of Technology, Minna-Nigeria. He is a Fellow of the Institute of Corporate Administration of Nigeria.