CONTINGENCY ALLOCATION: A CASE OF PROFESSIONAL ABSURDITY

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ABSTRACT

This paper explores professional's absurdity to adopting scientific method of estimation project contingencies. Purposive sampling technique was used to select respondent. Questionnaire was designed and administered to Quantity surveyors, Architects and Civil engineers working in public and private organization in Sokoto, Kebbi and Zamfara state. Descriptive statistics was 0 in the analysis. Result shows that percentage/lump sum contingencies are made without defined contingency of accuracy and ease of estimating contingencies through traditional ways accounted for disregard to scientific methods. It is recommended that contingency scope be defined at the inception of construction work so that errors in assuming contingency to cover all risk-related eventualities could be avoided.

Keywords: absurdity, allocation, construction, contingency, professionals,

1.0 INTRODUCTION

It is a common practice by quantity surveyors to calculate contingencies for building and other engineering projects as an across-the-board percentage addition on the base estimate. Based on intuition, past experience and historical data are not appropriate. This practice is widely criticized for lack of precision, technicalities, and accuracy; hence the proliferation of new construction risks estimation techniques. The quantitative analysis of risks and uncertainties enables quantity surveyors to determine the base estimate's contingency allowance. The quantitative analysis of risks and uncertainties enables quantity surveyors to determine allowance for contingency on the base estimate; unfortunately, this practice is not common among consultants in Nigerian construction industry (AACE 2012).

Traditionally, contract sums are usually estimated at the inception of construction work. The accuracy of this estimate borders around many things including estimating technique employed and measures taken to mitigate the effects of risks and uncertainties. Although, even if carefully planned, it is not unlikely that changes will emerge to vary the contract's scope as works progress (Smith, 2007).It is not also difficult to see that a significant level of uncertainty is inherent in construction cost. The traditional approach to cost estimation gives poor representation of costs.

Furthermore, the presence of variation clauses in contracts amounts to admitting that no project can be completed without changes (Chen, 2002).Owing to these, it is hard to find a contract that is executed without margin of difference against the estimated cost. Therefore, contingency allowances are crucial to achieving project goals since the ambition of building clients and consultants is to keep the final construction cost within the initial budget estimate that includes a justified additional amount that caters for the project's unforeseen needs.

However, despite the inevitable nature of contingency cost within project budgets and several limitations of the traditional approach, previous research into new methods and techniques has not stimulated much attitudinal change in the minds of construction cost experts. This inertia, coupled with the ease of allocating lump sum or percentage addition as contingency allowance have probably discouraged cost experts and practitioners in the study area (Kebbi, Sokoto & Zamfara states)in Nigeria, from embracing scientific and statistical methods of estimating and managing contingency. This study contends the approach to contingency allocation in the study areas being absurd, and aim to investigate professionals' dispiritedness to adopting scientific methods of estimating project contingency. Specifically, the study was conducted on sustained adoption of traditional methods of estimating contingencies and the likely benefits and bottle necks to adopting known construction contingency estimating techniques.

The concept of contingency

Subjectivity and indeterminacy issues of contingency estimate through traditional methods have raised much research interest among construction cost experts particularly, in the academia, but how cost managers have lived with this arbitrary method considering the risk elements it responds to, raises much further concern. Although, the quest for non-bias, non-subjective method of estimating contingency have led to the derivation of sophisticated techniques with scientific credence, Egwunatum and Oboreh (2015) observed that neither of these subsisting methods offers a concise and representative, yet distributive way of estimating contingency sum. But while this observation is affirmed, these new techniques must be pursued to attain good level of precision and chart a course of departure from the traditional ways.

The term “Contingency” has been given different dimensions and magnitude in research literature and this is why the term is most often misunderstood and misapplied in project execution. This misconception leads to its application beyond scope to cover all eventualities. Smith (2007) confined scope of contingency allowance to cost of risks that are thought likely to be encountered in a project rather than - as is often the case -being adequate to cover all risks and uncertainties. According to Egwunatum and Oboreh (2015), contingency usually excludes major scope changes, such as changes in end product specification, capacities, building sizes, and project location. It also excludes extraordinary events such as major strikes and natural disasters, management reserves and escalation effects. Costs not normally covered by contingency allowances include: costs normally covered by insurance; substitution of better materials, increases in project size or scope; and ‘‘acts of God,’’ such as floods, tornadoes, and earthquakes (Frederick & Jonathan, 2000).

AACE (2012) defined the concept of contingency as any amount added to an estimate to allow for conditions or events for which the state, occurrence, or effect is uncertain. That experience shows will likely result, in aggregate or additional cost. Risner (2007) contingency as the amount of money added to an estimate to cover unforeseen needs of the project, construction difficulties, or estimating accuracy. At this point, it is important to note that contingency is not a restrictive term to construction finance, as time is also an important component of construction contingency. From the preceding, contingency can be recognized as the amount of money or time needed above the cost estimate to reduce the risk of undermining project objectives to a level acceptable to the organization. As it applies to construction finance, contingency represents the sum of money added to the project estimate by the client to cushion the effects of additional cost arising from minor changes to scope, design, or projects uncertainties. In general, these definitions represent a snapshot of attributes of risk treatment strategies in conjunction with contingency as a total commitment of the project and to avoid the need to appropriate additional funds and thus reduce the impact of exceeding the cost target (Eqwunatum&Oboreh, 2015).

Known methods of estimating contingency sum

Literature search indicated that contingency allowance can be made with reasonable accuracy with various statistical or scientific means depending on the type of work and the need for the allowance. No single method can be applied to suit all situations, different types of contracts contain different levels of change order and riskand so,this allowance varies with projects. Egwunatum &Oboreh, (2015) identified (15) Known contingency estimating methods as follows under the traditional Percentage/Lump Sum and classified them as a method of moments ;Conte Carlo Simulation, Individual Risks Expected Value Method ,Range Estimating Method , and Regression Method . Others are Artificial Neural Networks, Fuzzy Sets Method, Controlled Interval Memory, Influence Diagrams Method and Theory of Constraints Method.

Analytical Hierarchy Process Method (Two major categories of contingency can be identified for construction projects. These are design and Construction contingency. Design contingency is for changes during the design process for such factors as incomplete scope definition and inaccuracy of estimating methods and data. Construction contingency is for changes during the construction. Smith, (2007) identified four contingency factors to be considered by the cost planner and the design team

i. The planning contingency is an allowance to cover the risk of not designing the spatial relationships and achieving the desired functional area and travel/engineering allowances. Contingency allowance will be reduced to zero at sketch design (Detailed Proposals) stage.
ii. The design contingency is an allowance to cover the risk of the estimator/cost planner not adequately foreseeing the correct design or the design's complexity. The design contingency will depend on the amount of detail available, and will be reduced to zero at the tender document stage (Production Information).
iii. The contract contingency is an allowance to cover the risk of variations and unforeseen items encountered during construction.
iv. A project contingency may also be added to cover delays and/or inflation, major changes required by the client or authorities, fee negotiations and the likes.

These factors underscore the requirement for stage by stage analysis of contingency need and overall evaluation of its usage to guard against possible abuse. This further requires that owners develop an internal process to evaluate project contingency with a process of check and balances and a contingency usage form to be completed and signed by both owner and architect to control contingency usage (Risner, 2010).

RESEARCH METHODOLOGY

Based on the previous studies on contingency allocation, 12 methods were identified using content analysis to provide framework upon which this investigation was built. The research study's target population comprised quantity surveyors, architects, and civil engineers who are presumed to have acquired experience and knowledge to adequately respond to technical and administrative questions on contingency. The instrument used for data gathering was close-ended questionnaires. This was divided into two sections; questions on respondents' demographic information form section A and section B contains questions that relate to objectives of the research. A total of one hundred and twelve questionnaires were distributed across Kebbi, Sokoto and Zamfara states in northwestern Nigeria. Table 1, represents the response rate of the professionals across the three states.

Table 1: Response rate of professionals across study area

S/No	*Respondents*	*Kebbi*	*Sokoto*	*Zamfara*	*Cumulative percentage*
1	Architects	8	9	7	32
2	Civil Engineers	6	8	6	27
3	Quantity surveyors	9	11	10	41
	Total	***23***	***28***	***23***	***100***

Source: field survey (2018)

Purposive random sampling technique was employed for distribution of questionnaire, and a sample of respondents was chosen among the three groups of, architects, civil engineers and quantity surveyors. Following this technique, a total of seventy four (74) questionnaires were retrieved in Kebbi, Sokoto and Zamfara states, representing about 66 % of the questionnaires distributed. Table 1 shows that 41 % of the respondents are quantity surveyors, 32% are architects, and 27% are civil engineers.

Data Presentation and Analysis

The mean ranking was used to determine each item's relative position captured in the Likert scale of 1 to 5, and the scores for each item were calculated by summing up the scores assigned to it by the respondents.

Table 2: Summary of demographic information of respondents

Categories	*Classification*	*Frequency*	*Percentage*
Academic qualification	ND	18	24
	B.Sc./HND	48	65
	Postgraduate	8	11
Total		***74***	***100***
Years of experience	5-10 years	14	19
	11-15years	20	27
	16-20years	21	28
	Above 20years	19	26
Total		***74***	***100***
Type of organization	Private	17	23
	Public	57	77
Total		***74***	***100***

Source: field survey (2018)

From Table 2, Bachelor Degree/Higher National Diploma (HND) holders are the larger category of respondents and are represented by 65%. Professionals with National Diploma certificate are represented by 24% of the respondents, and postgraduate certificates are least represented with 11%. This indicates over seventy five per cent (75%) of the respondents are graduates and have requisite background to respond to the questionnaire.

The respondents' field experience indicates that 19% of the respondents have experience of between 5 and 10 years, and 27% have between 11 and 15 years. Professionals with experience of between 16 and 20, and over 20 years are represented by 28% and 26% respectively. This indicates that, Fifty four per cent (54%) of the respondent have at least 16 years of work experience. Seventy seven (77%) per cent of the respondents are from public organizations and only 23% come from private organizations.

Table 3: Familiarity with existing methods of estimating contingency

Known Methods	**Mean**	**RII**	**Rank**
Traditional percentage /lump sum	3.95	0.79	1
Method of moments	2.80	0.56	9
Monte Carlo simulation	2.44	0.49	11
Individual risks expected value method	3.78	0.76	2
Range estimating method	3.76	0.75	3
Regression method	3.58	0.72	5
Artificial Neural Networks	1.38	0.27	12
Fuzzy sets method	3.05	0.61	8
Controlled Interval memory	3.14	0.63	7
Influence diagrams method	2.48	0.50	10
Theory of constraints method	3.61	0.72	5
Analytical Hierarchy process method	3.65	0.73	4

Source: field survey (2018)

In table 3, Professionals indicated they are very familiar with traditional lump sum/ percentage method with a mean of 3.95 and a rank of 1. The next familiar method is 'Individual risk expected value method' with a mean of 3.78 and a rank of 2. This is followed by 'Range estimating method' with a mean of 3.76 and a rank of 3. However, according to the respondents, the unfamiliar methods are Monte Carlo simulation and artificial neural network methods with a rank of 11 and 12 respectively.

Table 4: most frequent method employed for estimating contingency sum

Methods	Mean	RII	Rank
Traditional percentage	3.95	0.79	1
Method of moments	2.48	0.50	8
Monte Carlo simulation	2.44	0.49	9
Individual risks expected value method	3.81	0.76	2
Range Estimating method	1.36	0.27	12
Regression method	1.38	0.28	11
Artificial Neural Networks	3.76	0.75	3
Fuzzy sets method	2.41	0.48	10
Controlled Interval memory	2.82	0.56	7
Influence diagrams method	3.71	0.74	4
Theory of constraints method	3.58	0.72	6
Analytical Hierarchy process method	3.66	0.73	5

Source: field survey (2018)

The method of estimating contingency sum used *very often* by the respondents in the study area as indicated in table 4 is traditional lump sum/percentage method. This is represented by a mean of 3.95 and a rank of 1. Respondents also indicated that they *often* use the 'individual expected risk value method' with a rank of 2 and a mean of 3.81. Professionals in the study area rarely use the regression method. This is indicated in the table with a mean of 3.76 and a rank of 3.

Most professionals in the study area are conservative with the traditional roles and with little challenges. The professional challenges they face are routine and because of the familiarity with the pattern of service delivery, no need arise for them to brace-up and acquire new skills. This finding reflects the predominance of traditional arrangement in terms of procurement route, nature of contract, construction complexities, scope and technology.

Table 5: Problems of traditional method of estimating contingency

Problems	Mean	RII	Rank
No contingency scope	3.37	0.82	2
Does not capture perceived risks and/ or uncertainties	3.32	0.78	3
Lack of consistency	3.26	0.74	4
Method not defendable /objective	1.38	0.58	6
Method not reliable	2.41	0.68	5
All of the above	3.44	0.87	1

Source: field survey (2018)

From table 5, the use of percentage and lump sum methods of estimating cost of contingency provision is associated with all the problems listed in table 4.3.This is indicated by the item "*all of the above*" with the highest mean of 3.44, and a rank of 1. Lack of scope definition come next with a mean of 3.37 and a rank of 2, followed by non-representativeness of perceived risks and uncertainties with a mean of 3.32 and a rank of 3, the least mean score of these problems is the issue of objectivity with a mean of 1.38 and a rank of 6.

Table 6: shortcomings of the scientific methods

Shortcomings	Mean	RII	Rank
Double counting,	2.47	0.54	6
Lack of potential for cost reduction	2.94	0.71	5
Inflation of estimate	3.27	0.84	2
Infiltration of personal bias	3.16	0.78	3
Knowledge/expertise to handle scientific methods	3.33	0.89	1
Requires time and data gathering	2.98	0.73	4

Source: field survey (2018)

From table 6, one outstanding problem identified by respondents as a major shortcomings of the scientific method is the knowledge and/or expertise required to handle scientific methods. This has a mean of 3.33 and a rank of 1. The problem of the tendency to inflate the contingency estimate is next with a mean of 3.27 and 2. This is followed by infiltration of personal bias with a mean of 3.16 and a rank of 3. However, problems of lack of potentials for cost reduction, and double counting are both identified as least problems with a mean of 2.94 and 2.47 respectively.

Table 7: Effects of inaccurate method at project completion

Effects	Mean	RII	Rank
Deficit construction cost budgeting	2.47	0.82	3
Delay in project completion	2.94	0.84	2
Disputes and mistrust between parties.	2.17	0.63	4
Unnecessary/Fraudulent claims	2.16	0.61	5
All of the above	3.36	0.89	1

Source: field survey (2018)

From table 7, inaccurate contingency estimate is often found to give rise to deficit construction cost budgeting, delay in project completion, unnecessary and fraudulent claims, and disputes between parties.

DISCUSSION OF FINDINGS

Accurate and effective construction contingency is essential to client's satisfaction and, the construction contract delivery. However, the findings show that professionals in the study area often overlook this importance. In table 4, most respondents indicated their familiarity and use of the traditional lump sum or percentage method of estimating contingency sum with a mean of 3.95 and a rank of 1. Respondents also indicated that they often use the individual expected risk value method with a 2 and a mean of 3.81. Professionals in the study area rarely use the regression method. This is indicated in the table with a mean of 1.38 and a rank of 11. The range estimating method is the least used method in the study area with a mean of 1.36 and 12. In a related investigation, Moselhi (2007), discovered that most professionals used percentage approach for estimating project cost contingency and risk analysis is not usually undertaken to determine the accuracy of contingency allowance. This observation corroborates this finding and by implication affirmed that most respondents apply no scientific approach in contingency estimation.

Gwaya, Wanyona, Masu, and Sylvester (2014) report that the most common method of dealing with risks from a budget perspective is allocating contingency funds as an arbitrary percentage of the estimated construction cost bid amount. For example, projects with little uncertainty may receive 5% and projects with great uncertainty may receive 10%. According to (Chen & Hartmann, 2000 cited in Gwaya, et 'al, 2014),assigning a contingency percentage to the budget for overruns is an overly simplistic approach based solely on experience and intuition since the very act of assigning some pre-set percentage denotes the arbitrariness of this system.

Findings from previous studies confirmed that, all the problems listed in table 5are features of the use of percentage/lump sum methods of estimating contingency provision costs (Akinsola, 1993). Despite these weaknesses, cost managers and practitioners in Nigeria according to Ahmad, (1992), are comfortable using conventional methods of intuition and percentage addition to estimate contingency. Therefore, it is not clear whether professionals in the area covered are contemplating the scientific approach to contingency estimation.

Table 6, prominent among the problems of scientific method is the lack of knowledge and/or expertise required to handle scientific methods. Further to this, lax to attain good level of accuracy and ease of estimating contingency through traditional ways also accounted for disregard to scientific methods. Findings also shows that inaccurate contingency estimate often give rise to deficit construction cost budgeting, delay in project completion and disputes between parties. From the preceding,

CONCLUSION

It is concluded that, the sustained use of traditional method of contingency estimate indicates that the sum is not being used as a risk management technique. It is recommended that contingency scope be defined at the inception of construction work so that errors in assuming contingency to cover all risk-related eventualities could be avoided; and professionals should explore the advantages inherent in scientific methods of calculating contingency sum.

REFERENCES

AACE International, (2012) *Recommended Practice No. 18R. 97,* Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries.

Ahmad, I., (1992). Contingency Allocation: A Computer-aided Approach. *Association of American Cost Engineers Transaction, 28 June – 1 July, Orlando, F. 5. 1-7.*

Akinsola, A.O. (1996). Neural networks, model for predicting building projects' contingency allowance. *Proceeding of Association of Researchers' In Construction Management*, ARCOM 96, 11-13 September, 1996, Sheffield Hallam University, England, 507-516.

Chen, D. & Hartman, F.T. (2000). A Neural Network Approach to Risk Assessment and Contingency Allocation. AACE Transactions Risk. 07. 01-6.

Egwunatum I. S, Oboreh J. S (2015), Theorizing a Forward Difference Orthogonal Function Method of Computing Contingency Cost in Construction Projects: *International Journal of Construction Engineering and Management 2015, 4(5): 210-217DOI:10.5923/j.ijcem.20150405.06*

Fredrick, R, Norman, G., (1993). *Risk Management and Construction. London*, UK: Blackwell Science Ltd.

Gwaya A, Wanyona G., Masu, S. M. (2014), *the Contingencies Allowances In Project Budgeting*. International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-3, Issue-6, January

Moselhi, O. (2007). "*Risk assessment and contingency estimating*." Transactions of the American Association of Cost Engineers.

Risner, R. (2010). Auditing Construction Contingency. *Association of Health Care Internal Auditor New Perspectives 37-38.*

Smith, N. J., Merna, T., and Jobling, P. (2007). *Managing Risk in Construction Projects.* Blackwell Publishing Ltd, 9600 Garsington Road, Oxford OX4 2DQ, UK