EVALUATING RISK FACTORS FOR BUILD, OPERATE & TRANSFER PROCUREMENT IN THE NIGERIAN CONSTRUCTION INDUSTRY

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ABSTRACT

Risk in construction, which has been the object of attention because of time and cost overruns associated with construction projects is attributable to either unforeseen or foreseen events for which uncertainty was not appropriately accommodated. This paper aims to identify risk factors associated with build, operate and transfer (BOT) procurement method in the Nigerian construction industry, and evaluate their rankings and relationships. Nineteen (19) risk factors were identified through literature review and sent through questionnaires to construction professionals involved in BOT projects in Nigeria, and 70 completed questionnaires were retrieved. The top three ranked impact of risk factors on BOT projects are "availability of finance", "delay of payment from financier" and "delay in completion of construction work". Using factor analysis, the 19 risk factors were grouped into five components and their relationships were included in the framework for BOT construction projects.

Keywords: Risk factors, BOT, construction industry, procurement, Nigeria

1. INTRODUCTION

Risk is inherent in all human endeavours including construction and housing development activities with diverse and varied risk elements. Such risk elements manifest in unpredictable circumstances and in unforeseen expenditures not envisaged at the planning stage, thereby preventing construction organizations from achieving set objectives no matter the management of goals (Odeyinka, 2000; Picken & Mark, 2001). The construction industry and clients are widely associated with a high degree of risk due to the nature of construction business activities, processes, environment and organization. Risk is a kind of menace that bedevils all kinds of construction work. Many projects have naturally in-built risk elements. No matter the depth of planning and the rigidity with which the contract programmes are adhered to, there will always be factors that tend to prevent the project objectives from being realized. These factors may be in form of inclement weather, worker's strike, political disorder or civil commotion, acts of God, epidemics etc (Oyegoke, 2006; Sabino, 2008).

Economists, insurance scholars and construction management researchers among others have defined risk in many different ways. In the business and insurance domain, Bryde and Volm (2009) defined risk as an uncertainty about an event that occurs in the future while Wong and Hui (2006) opined that risk is the probability that an adverse event occurs during a stated period. In the light of these definitions, risk can be viewed as a psychological phenomenon that is meaningful in terms of human experience and reaction. It can also be viewed as an objective phenomenon that may or may not be recognized in terms of human reaction and experience (Odeyinka, Oladapo and Akindele, 2006).

All human endeavour involves risk. The success or failure of any venture depends on how we deal with it. The construction industry perhaps more than most is particularly plagued by risk (Flanagan & Norman, 2003). It has had a poor reputation for coping with risk, many projects having failed to meet deadlines and cost targets. Clients, contractors, the public and others have suffered as a result (Dada, 1998).

In this regard, it is essential to evaluate the relative importance and factor groupings for the risk

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factors that are highly significant to BOT projects. Therefore this paper aims to identify and prioritize quantitatively; the risk factors associated with BOT procurement method of construction in Nigeria and group the factors into lesser dimensions using factor analysis.

2. LITERATURE REVIEW

- ***Risk in construction***

International Strategy for Disaster Reduction defines risk as the probability of harmful consequences or expected losses due to the interaction between humans, hazards and vulnerable conditions. Olorunfemi & Pelemo (2006) opines that risk is associated with the inability of man to manage hazard events which eventually leads to negative consequences such as the destruction of the environment, properties and human life. Risk is a possible loss resulting from the difference between what was anticipated and what actually occurred (Ashworth, 2001).

Smith (1992) observes three categories of risks which he classified as known risks, known unknown risks and unknown risks. Known risks comprise variation in productivity and material costs which are common occurrence in construction projects. Known unknown risks are those risk events whose probability of occurrence is known while unknown risks have unforeseeable probability of occurrence.

- ***Overview of risk types in BOT projects***

Various types of risk available in build operate and transfer (BOT) projects were first identified from previous studies. Some of which include the following:

- **Financial risk:** This is one of the risk factors that must be appropriately planned for in most construction projects including BOT projects. According to Akintoye and Macleod (1997), financial risk to contractor includes whether the building owner has enough money to complete the project, financial failure of the building owner or subcontractors, availability of money to the contractor in a suitable manner and time to enable the contractor to progress with the work, etc. It was concluded that financial risk influences the cash flow of construction contractors. It is therefore recognized as having one of the most adverse consequences on the successful completion of construction project. Similarly, Perry and Hayes (1985) gave examples of financial risk as availability of fund, adequacy of insurance, adequate provision of cash flow, losses due to default of contractors, suppliers exchange rate, fluctuations, inflation and taxation.
- **Market risk:** The success of the BOT project depends upon constant revenue stream during the operation phase. The solution for market risk is correct identification of project and the various need or demand for the facility. For example, in road transportation, uncertainty of traffic level represents a major risk to the promoter. As such adequate traffic forecast should be conducted to assess the future level of traffic levels. In China, the government agreed to purchase a minimum quantity of electricity (Tiong & Alum, 1997). A fully privatized NEPA into generation, transmission and distribution companies would facilitate this in Nigeria.
- **Force majeure risk:** There is possibility of bad weather, flood or earthquake which the contractor should have not contemplated at the time of tendering. This is a great risk if the severity of duration as to amount an act of God it may, according to the construction of the terms of the contract, terminate the contract. The standard form refer to 'force majeure' which has a wider meaning than act of God covers all circumstances independent at the will of man and which it is not in his power to control. This according to Baloi and Price (2003); Nepal and Park (2004); Oyegoke (2006) and Sabino (2008) include: acts of God, unforeseen circumstances, government or judicial actions, epidemics, war, blockage or embargo. These are certain risks that are beyond the control of government and/or the project promoters. Events like wars, natural calamities are force majeure events. Governments and Private firms should incorporate fair clauses in the concession agreement to provide a relief against this type of risk.
- **Cost overrun/delay risk:** BOT projects are very susceptible to cost overrun and long delay. The possible mitigation for this type of risk is to enter into fixed price contract with the contractor. Thus the risk is shifted to the contractor who is in position to control it (Langford, Kennedy, Conlin and Mckenzie, 2003).
- **Political risk:** This refers to political stability, changes in laws, delay in approval, corruption etc. These risks are beyond the control of the private sector (concessionaire).Thus the

government should play an important role in mitigating the political risk. It should provide guarantees against changes in policies, taxation, changes in law etc. It should maintain transparency of affairs in implementing BOT projects. Government's role is very crucial in encouraging the private sector and protecting them against political risk. Nevertheless, inconsistency concerning continuity in implementation by successive governments is of major concern.

- **Currency and foreign exchange risk:** Usually, a substantial amount of debt and equity is raised outside the host country. While revenue is generated in local currency, the debt repayment is to be made in foreign currency, usually in US dollars. Countries like China, Philippines, and India face extreme exchange and convertibility risk, as their currencies are not freely convertible to US dollars. In Nigeria, even though the Naira is relatively convertible to the US dollars, the exchange rate is highly unstable as it changes erratically.
- **Tariff or adjustment risk:** Tariff structure is an important parameter in the concession agreement. Government controls the level of tariff. For power plants, tariff is fixed through Power Purchase Agreement (PPA.).For transportation sector, tolls are collected for vehicles. Tariff revisions necessitated because of escalating operation and maintenance (0&M) cost and level of inflation. Tariff escalation clauses should address the issue of tariff revisions in the concession agreement.
- **Operation risk:** The operation phase of Building, Operate and Transfer projects presents the great management challenges and demands the highest level attention (Taylor, 1998). The operation risk concerns the inability of the project to meet the expected performance targets. For example, the inability to supply minimum quantity of services such as electricity, water for fixed term. Government must provide a secured environment against thievery and vandalism for the schemes to work.

3. RESEARCH METHODOLOGY

The methodology adopted for the research was the questionnaire survey which was collated using literatures from previous studies. The questionnaire comprises of two major sections: background information of the respondents; opinion of respondents about BOT projects and the risk factors associated with its activities. Although the questionnaire dealt with various issues relating to risk factors in BOT projects, this paper presents the analysis results of the relative importance of the identified nineteen (19) risk factors.

Table 1: Demographic information of respondents

		Frequency	Percentage
Profession of respondents	Quantity Surveyors	46	65.7
	Engineers	14	20.0
	Contractors	10	14.3
	Total	**70**	**100.0**
Academic qualification of respondents	OND/HND	7	10.0
	B.Sc/B.Tech	54	77.1
	M.Sc/M.Tech	8	11.4
	PhD	1	1.4
	Total	**70**	**100.0**
Years of experience of respondents	0 – 5	14	20.0
	6 – 10	10	14.3
	11 – 15	32	45.7
	16 – 20	10	14.3
	Above 20	4	5.7
	Total	**70**	**100.0**
Mean years of respondent's experience = 11.5			

The questionnaire survey was undertaken in Lagos, Nigeria in 2010, and the target of this survey

was construction professionals from different organizations involved in BOT projects in the construction industry. respondents were requested to rate their level of agreement with the identified risk factors (RFs) in accordance with a five-point Likert scale (1 = Strongly disagree and 5 = Strongly agree) with reference to particular projects they have been involved.

4. RESULTS AND DISCUSSIONS

- ***Background information of respondents***

Table 1 above shows the demographic information of respondents used for this study. It is seen that 65.7% of the respondents are quantity surveyors while 77.1% of the respondents are B.Sc/B.Tech degree holders; the mean number of years of respondents' organization is 11.5 years. This indicates that the respondents involved have vast experience in BOT projects and must have experienced some of the itemized list of risk factors considered.

- ***Evaluation of impact of risk factors on BOT projects***

Table 2: Impact of risk factors on BOT projects

S/N	Risk factors	Mean Score	Rank
R1	Availability of finance	4.88	1
R14	Delay in payment from financier	4.84	2
R13	Delay in completion of construction work	4.67	3
R2	Inflation	4.59	4
R8	Construction cost overrun	4.56	5
R11	Lack of experience in BOT projects	4.54	6
R6	Government policy changes	4.41	7
R7	Operation cost overrun	4.32	8
R9	Higher maintenance cost	4.24	9
R5	Bad quality of workmanship	4.22	10
R10	Late project approval and permit	3.99	11
R19	Difficulties in exchange and conversion of currency	3.97	12
R3	Changes in interest rate	3.93	13
R4	Tax regulation changes	3.93	13
R18	Political instability	3.57	15
R12	Force majeure	2.00	16
R16	Inability of project to meet expected performance	1.32	17
R17	Inability of project to generate expected revenue	1.26	18
R15	Demand for the facility	1.03	19

The impact of risk factors on BOT projects are evaluated as shown in table 2 below. It could be seen that ten factors have mean scores greater than 4.00, and the next five have mean scores between 3.00 and 4.00 indicating the great impact that the following itemized risk factors have on BOT projects.

To ascertain the strength of the relationship among the factors and its suitability for factor analysis, the correlation matrix, Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) are recommended as cited in Yang et al., (2009). Most values in the correlation matrix are larger than 0.3, the Bartlett's test of sphericity is significant at 0.000 (i.e. $p < 0.05$), and the value of the KMO index is 0.742 (i.e. KMO > 0.5) which suggests that the strength of the relationship makes the data suitable for factor analysis.

The factor analysis produced a five-factor component solution based on Varimax rotation of principal component with Eigen values greater than 1.0 explaining 62.87% of the total variance as shown in table 3.

Using the factor analysis, four of the risk factors were ignored due to the level of importance attached to it by respondents while the remaining fifteen risk factors were grouped into 5 dimensions: policy management, cost management, financial management, weather condition and demand for the facility. All these 5 groupings and their relationship were included in a framework for successful implementation of build, operate and transfer procurement method in construction projects which are as shown below:

Table 3: Correlation matrix of the risk factors

RFs	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**	**R10**	**R11**	**R12**	**R13**	**R14**
R1	1.00													
R2	.062	1.00												
R3	.065	.130	1.00											
R4	.202	.223	.532	1.00										
R5	.213	.318	.494	.520	1.00									
R6	.050	.330	.332	.540	.406	1.00								
R7	.007	.175	.333	.352	.385	.281	1.00							
R8	.128	.120	.211	.180	.303	.156	.236	1.00						
R9	.150	.036	.259	.261	.338	.343	.311	.296	1.00					
R10	.034	.104	.466	.531	.481	.481	.412	.160	.333	1.00				
R11	.033	.293	.430	.465	.557	.429	.481	.304	.230	.503	1.00			
R12	.032	.070	.241	.289	.229	.278	.001	.211	.275	.255	.180	1.00		
R13	.220	.107	.052	.072	-.013	.146	.041	-.065	.014	.041	-.028	.076	1.00	
R14	.108	.142	.112	.103	-.011	.164	.073	-.123	-.066	.068	-.039	-.032	.022	1.00

Table 4: Bartlett's test and KMO for the risk factors

Bartlett's test of sphericity	Approx. Chi-square	455.376
	Df	91
	Sig.	0.000
Kaiser-Meyer-Olkin measure of sampling adequacy		0.742

Table 5: Factor analysis on impact of risk factors on BOT projects

Risk factors	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
Changes in interest rate	0.638				
Tax regulation changes	0.688				
Bad quality workmanship	0.749				
Government policy	0.651				
Operation cost overrun	0.595				
Late project approval and permit	0.695				
Lack of experience in BOT projects	0.742				
Inflation		- 0.486			
Construction cost overrun		0.550			
Higher maintenance cost		0.460			
Availability of finance			0.746		
Delay in payment from financier			0.670		
Delay in completion of construction work				0.567	
Difficulties in exchange and conversion of currency					0.608
Political instability					
Force majeure					
Inability of project to meet expected performance					
Inability of project to generate expected revenue					
Demand for the facility					
Eigen values	3.814	1.442	1.380	1.112	1.055
% of variance	27.241	10.297	9.859	7.941	7.532
Cumulative % of variance	27.241	37.539	47.398	55.338	62.871

- **Factor 1 – Policy Management Issues:** This factor accounts for 27.2% of the total variances and consists of seven risk factors which focus primarily on policy issues. The components of factor 1 are changes in interest rate, tax regulation changes, bad quality workmanship, government policy, operation cost overrun, late project approval and permit and lack of experience in BOT projects.
- **Factor 2 – Cost Management Issues:** In this factor, there are three risk factors regarding the cost management issues including inflation, construction cost overrun and higher maintenance cost. This factors account for 10.3% of the total variances.
- **Factor 3 – Financial Management Issues:** Two risk factors namely availability of finance and delay in payment from the financier are the components of factor 3 concerning financial management accounting for 9.9% of the total variances.
- **Factor 4 – Weather condition:** This factor explains the force majeure as a risk factor in component of factor 4 accounting for 7.9% of the total variance.
- **Factor 5 – Demand for facility:** One factor comprises the component of factor 5 concerning demand for the facility accounting for 7.5% of the total variance.

5. CONCLUSION

The impact of risk factors on build, operate and transfer method of procurement is high and requires effective risk management system to avoid cost and time overruns, project abandonment etc. Risk factors contributing highly to delivery of projects under this procurement system should be properly identified and controlled through risk analytical models. This paper presented the results of a questionnaire survey, and aims to identify risk factors associated with build, operate and transfer

(BOT) construction projects in Nigeria, and explore their ranking and underlying relationship.

The main contribution of this study is identifying an ordered and grouped set of risk factors associated with build, operate and transfer (BOT) construction projects in Nigeria. Nineteen risk factors were identified through a literature review. Based on a questionnaire survey, the ranking of these risk factors were obtained and highly prioritized factors were identified. The top three risk factors were: (1) availability of finance, (2) delay in payment from financier, and (3) delay in completion of construction work revealing clearly the reason for cost and time overrun in construction projects. Using the factor analysis, four of the risk factors were ignored due to the level of importance attached to it by respondents while the remaining fifteen risk factors were grouped into 5 dimensions: policy management, cost management, financial management, weather condition and demand for the facility. All these 5 groupings and their relationship were included in a framework for successful implementation of build, operate and transfer procurement method in construction projects. These findings could also be used as an assessment tool to evaluate the performance of build, operate and transfer procurement method and thus help identify areas for improvement. Since the results in this paper are based on a questionnaire survey, the respondents may have different understandings about our statements, and this may bias the scoring of the risk factors. In addition, since the questionnaire survey was conducted locally in Nigeria, the findings may not be generalized to the other geographical locations.

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