Malaysian Journal of Civil Engineering 26(3):366-381 (2014)

IMPEDIMENTS TO RISK ASSESSMENT TECHNIQUES IN PUBLIC-PRIVATE PARTNERSHIP CONSTRUCTION PROJECTS IN ABUJA-NIGERIA

Jimoh Richard Ajayi* & Yahaya Isah

Department of Building, Federal University of Technology, Minna-Nigeria

*Corresponding Author: *rosney@futminna.edu.ng*

Abstract: The risk inherent in the construction delivery has been identified as major causes of time and cost overruns in Nigeria construction industry, as such delivery and process of public infrastructure is a risky trade. Limited knowledge of the risk management techniques could result in not meeting the overall objectives of the project. The study was aimed at assessing the impediments to risk assessment techniques in Public-Private Partnership (PPP). Data for the study were gathered through the self-administration of 306 well-structured questionnaires using the simple random sampling technique to the construction professionals and private construction developers who had experience in the execution of PPP projects. Quantitative risk assessment techniques such as sensitivity analysis, scenario analysis and probability analysis percentage level of awareness were 40.1, 29.1 and 23.8 respectively, while the percentage extent of usage were 39.9, 34.0 and 37.2 respectively. In a related development, the qualitative risk assessment techniques such as probability impact table, priority table and iso-risk curves percentage level of awareness were 44.3, 38.6 and 27.5 respectively while the percentage extent of usage were 27.0, 32.8 and 26.6 respectively. Updating the knowledge base of the people responsible for the use of these risk assessment techniques by attending training and workshops in the relevant area will improve the level of awareness and the extent of usage.

Keywords: *Impediments; assessment techniques; risk management; PPP; Nigeria*

1.0 Introduction

The public sector was the main role player in funding infrastructure in Nigeria until the 1980s, when reclaims were introduced to confront the dwindling oil revenue that challenged state capability for infrastructure provisioning (Assibey-Mensah, 2009 cited in Annimashaun, 2011). Li, Akintoye and Hardcastle (2001) established that due to the increase in the demand for infrastructure, inadequate public resources to meet present and future desires and acceptance of a better role for the private sector in providing infrastructure, alternative methods of funding public facilities and services have been adopted by the public sector. In a related development, according to Nigeria Public

Private Partnerships Review (NPPPR) (2012), Nigeria eventually develop a foremost measure towards getting at the advantage of PPPs (Public Private Partnerships) due to the enactment of the Infrastructure Concession Regulatory Commission (Establishment) Act ("then ICRC Act") in 2005 which allows for private sector involvement in infrastructure development projects and establishes the ICRC as the regulator of PPPs projects.

All aspects of human life involve decision making and risk is underlying in all spheres of human actions. The decision to embark on a building project therefore has inherent element of risk (Adelusi, 2009). It was observed by Jagboro (2007) that risks are unwanted negative consequence of an event of which the possible outcome can be identified, predicted and quantified. Dada (2010) believed that work on a construction site can be very dangerous because risk is at the bedrock of all projects. Similarly, Perry and Hages (1985) (cited in Odeyinka and Iyagba, 2000) opined that certain risk elements are associated with construction works, among which are environmental, financial, logistic, and physical and construction risks. Risk management as employed in the construction industry is fundamentally used to deal with risk in construction process, it is an essential tool for project management. The risk inherent in the construction delivery has been identified as major problem that bring about time and cost overruns in Nigeria construction industry (Dada, 2010). Jagboro (2007) concluded that, these overruns always invalidated the economic case for a project and turn the investment into a loss-making venture. Karisa and Andre (2006) revealed that PPP projects in some countries have failed mainly for the reason of high risk and less guaranties on the investment return. Many times, these risks are not conducted satisfactorily and the industry endured poor operation as an outcome (Tar and Carr, 2000).

2.0 Literature Review

Risk and uncertainties are inherent in any construction project (Grace, 2010). Chapman (2001) opined that equated to other industries, the construction industry is almost at the top in the annual rate of business failures and consequential liabilities. In a related development, Enshassi, Mohamed and Abu-Mosa (2008) stated that the construction industry usually take larger percentage of risk and uncertainty compared with other industries owing to the unpredictable nature of the industry. Also, Simu (2006) indicated that risks extend over a range of events from financial, political and legal to technical, often connected to difficult constructions. Joshua (2010) concluded that risk in construction can be seen as introduction of construction activities to financial loss due to unanticipated events for which doubt was not properly fitted.

The degree of risk in construction is based upon the exclusivity of every project, the probablity inserted by the stakeholders, regulatory protocols, and many other factors that are not known, at the onset (Kaoje, 2010). It is not surprising therefore that risks are

inbuilt and are usually part of the construction process, making them critical for organisations to identify potential sources of risk and to provide ways and steps to mitigate their exposure. Grace (2010) stated that risk in the construction industry can prevent the meeting of time, cost and quality targets. Nassir, McCabe and Hartono (2003) categorized construction risk as environmental, geotechnical, labour owner, design, area condition, political, contractor, non-labour resources and material risks.

Risk management in construction is a dificult undertaking as it is inclined to change throughout the execution of the project, and the project settings are many owing to sensitivity of projects brought about by sometimes unmanageable risks stemming from the variability in the macro-environment, one-off nature of the construction process and continuation of large number of parties that are involved in the project value chain (Dikmen, Birgonul, Anac, Tah & Aouad, 2008). According to Uher (2003), risk management is a tool that aims at discovering sources of risk and uncertainty, finding their impact, and growing suitable management responses in construction. Also, Mills (2001) opined that the reason for the risk management in construction is to raise the prospect of meeting project objectives. Patrick, Guomin and Jia-Yuan (2006) and Enshassi, Mohamed and Abu-Mosa (2008) observed that managing risks in construction projects has been acknowledged as a key direction process for the purposes of attaining the project goal in terms of time, cost, quality, safety and environmental sustainability. To this end, Royer (2000) stated that risk management must be of significant concern to project managers, as unmanaged or unmitigated risks are one of the key causes of project breakdown. Chapman and Ward (2003) argued that organizations which have laid down risk management ability as a process, gain vital advantage over contenders. Zayed, Amer and Pan (2008) asserted that risk management could be carried out through risk identification, risk assessment and risk mitigation.

A good quality study allows for the root of detection of risks in a project and evaluation of their probability of happening (UNESCAP, 2011). Delmon (2000) was able to show that the force of risks in carrying out PPP projects is generally very important and these risks occur from different roots surrounding capital budget, construction time, construction cost, operation cost, politics and policies, market conditions, cooperation credibility, and economic environment. The nature of PPP projects makes risk a significant factor in the project procurement, which are mostly difficult to control and analyse (Hwang, Zhao & Gay, 2012). A study conducted by UNESCAP (2011) found that risks are unavoidable in all the PPP infrastructral projects. Shen, Platten and Deng (2006) concluded that, many objectives in applying PPP project are struck by a number of risks that are in unlikely levels of project life cycle and the risk consequences are ahead of the scope of the construction itself.

Risk occurs due to unforseen result that can have direct consequence on the project (UNESCAP, 2011). Olugbodi (2012) stressed that, risk management is a major worry for the government and private agency in setting any PPP project; hence, risk sharing is

one of the main reasons why PPPs exist in the first place. KarimiAzari, Mousavi, Farid and Hosseini (2011) stated that risk analysis can provide avenue for knowing the origins of project risk and enable management to develop directed corrective action. Morledge, Smith and Kashiwagi (2006) concluded that risks are analysed using a combination of quantitative and qualitative assessment techniques. In quantitative risk assessment, this is carried out in terms of mathemathical probability of occurrence and the associated consequence. While qualitative risk assessment on the other hand, has to do with describing risks in terms of essay (non-numerical terms). Quantitative and qualitative risk assessment techniques as outlined by Hillson (2004) and Thaheem (2012) include probability analysis, brainstorming, interviewing, scenerio analysis, probability distributions and sensitivity analysis. However, studies such as Akintoye and MacLeod (cited in Agyakwah-Baah, Chileshe and Fugar, 2010) and Chileshe and Kikwasi (2013) have shown that limited knowledge of these risk assessments techniques by construction professionals inhibited there usage. Also, according to Chileshe and Kikwasi (2013), the low level of implementation of risk management could be attributed to its budding stage especially in the developing countries. In a related development, Chileshe and Kikwasi (*ibid*) established that there were limited studies in the developing countries on risk assessment techniques hence the basis for this study in Abuja-Nigeria context in order to add to the growing body of knowledge in risk management as it concerns public-private partnership arrangement in the construction industry.

3.0 Methodology

Questionnaire survey was used to self-administer 306 randomly selected respondents (Architects, Builders, Civil Engineers, Estate Surveyors, Quantity Surveyors and Mechanical/Electrical Engineers). Survey design according to Creswell (2009) gives a quantitative description of phenomenon such as trends, attitudes, or opinion of population. Based on the results obtained, generalisation to the population is possible. Collis and Hussey (2003) describe a survey as a positivistic methodology that draws a sample from a larger population in order to draw conclusions about the population. Babbie and Mouton (2005) state that survey research is one of the best methods used in collecting data where the objective is to reach a larger portion of the society which would have been difficult to observe directly or the use of other methods. The sample size for this study was calculated using a simplified formula proportion illustrated in a table by Krejcie and Morgan (cited in Crafford, 2007). The formula used to determine the sample size was as follows:

$$S = \chi^2 NP\ (1\text{-}P)/d2\ (N\text{-}1) + X2P\ (1\text{-}P) \quad (1)$$

Where:
S = required sample size;
χ^2 = table value of chi-square for 1 degree of freedom at the confidence level of 3.841;

N = population size; and
D = degree of accuracy expressed as a proportion in this case 0.05 was used.

Krejcie and Morgan (1970) (cited in Crafford, 2007) highlighted that, in applying this formula to calculate the sample size, as the population increases the sample size decreases at a diminishing rate.

Validity, according to Robson (cited by Sutrisna, 2009), refers to whether the identified inputs within their attributes actually produce the expected output, and beyond this, to know the extent to which the research findings can be generalised beyond the setting in which the research took place to the entire population. Blaxter, Hughes and Tight (2006) stated that validity has to do with whether the researcher's methods, approaches and techniques actually relate to, or measure the issues the researcher have been exploring. Validity according to David and Sutton (2004) is determined by how representative the sample is and the size of the sample from which the findings are derived. The research was designed to reflect the above issues as raised by David and Sutton (2004); Blaxter *et al.* (2006) and Robson (cited by Sutrisna, 2009). The internal validity of the study was ensured by pilot testing the questionnaire using 3 construction management 'experts' whereby suggestions from them were incorporated into the final questionnaire. The external validity was achieved from the representativeness of the sample size.

4.0 Results and Discussion

Analysis of the educational attainments of the respondents revealed that Bachelor Degrees were the most common type of certification possessed. Forty five percent of the sample held BSc or B.tech Degrees, compared with 35% for MSc/M.tech Degrees. Diploma qualifications were fewer, with only 16% of the sample having having HNDs and 2% for National Diplomas. Eighty one percent of the respondents had acquired experience on PPP projects from working on such projects in the past, while 19% were new to PPP projects.

Table 1: Response Rate

No. of Questionnaire administered	*No. of Questionnaire returned*	*No. of Questionnaire Not returned*	*Percentage returned*
306	213	93	69.6%

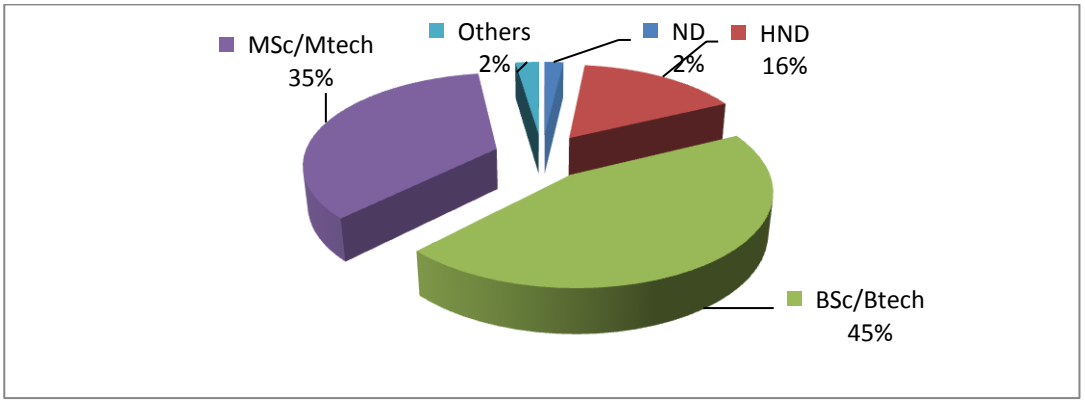

Figure 1: Educational attainments of respondents

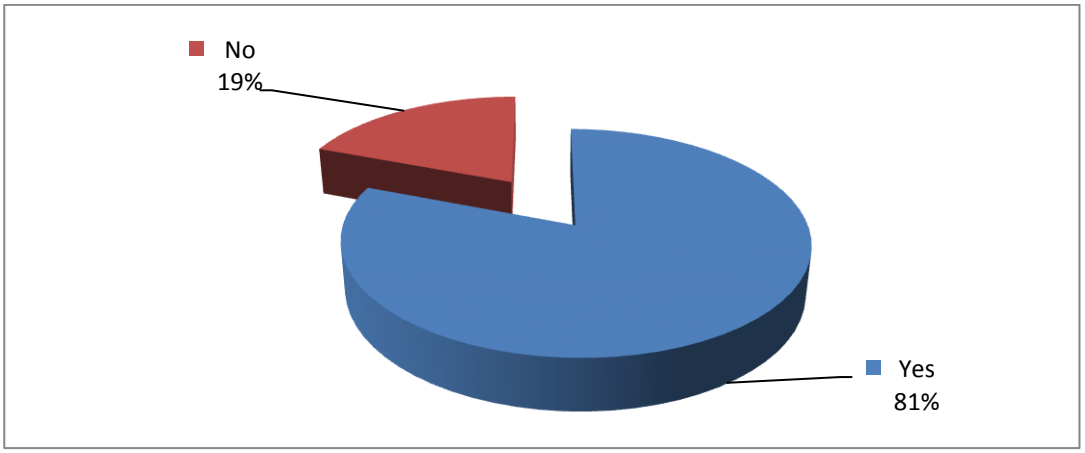

Figure 2: Possession of previous PPP experience by respondents

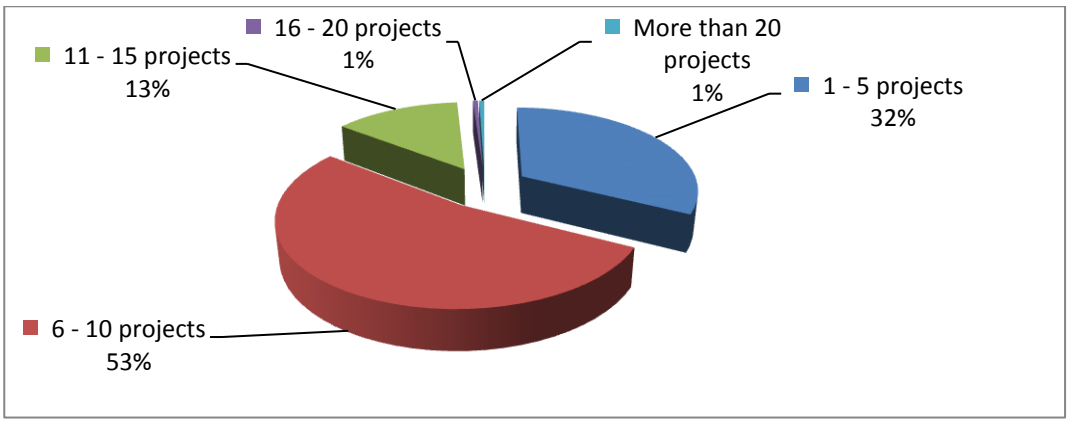

Figure 3: Number of previous PPP projects worked on by respondents (Source: Field survey, 2013)

From Figure 3 above, over half of the sample (53%) had in the past worked on between 6 and 10 PPP projects. About a third of the sample (32%) had been involved in up to 5 PPP projects, while 13% had acquired experience on between 11 and 15 PPP projects. Based on this, it can be concluded that the responses received can be deemed to be reliable since the respondents had previous experience on PPP projects. Morenikeji (2006) indicated the following cut-points

No awareness = 1.0 to 1.49
Little awareness = 1.50 to 2.49
Neutral = 2.50 to 3.49
High awareness = 3.50 to 4.49
Very high awareness = $\geq$ 4.50

Table 2: Level of Awareness of Quantitative Risk Assessment Techniques

Variable	*No awareness* %	*Little awareness* %	*Neutral* %	*High awareness* %	*Very high awareness* %	*Mean Score*	*Decision*
Brainstorming	0	6.8	20	38	35.1	4.01	High awareness
Check list / Risk register	1.4	12.5	33.2	34.1	18.8	3.56	High awareness
Interview	4.9	14.1	35	24.3	21.8	3.44	Neutral
Sensitivity analysis	14.4	28.7	16.8	27.7	12.4	2.95	Neutral
Scenario analysis	5.6	26	39.3	25	4.1	2.96	Neutral
Probability analysis	2.5	35.6	38.1	20.8	3	2.86	Neutral
Probability sensitivity analysis	3.4	42.2	30.4	19.1	4.9	2.80	Neutral
Cash lock-up	2.9	33.3	34.3	18.1	11.3	3.01	Neutral
Internal Rate of Return(IRR)	2.4	17.5	25.2	39.8	15	3.48	Neutral
Net Present Value (NPV)	3.4	9.2	22.2	49.3	15.9	3.65	High awareness
Payback Period (PBP)	4.8	9.7	22.7	56.5	6.3	3.50	High awareness

Table 2 above shows that the mean score of 4.01, 3.56, 3.65 and 3.50 relative to level of awareness of brainstorming, check list/ risk register, net present value and payback

period respectively by the respondents were deemed to be of high awareness because they fall between 3.5 – 4.49 based on Morenikeji (2006) cut-off points. While the mean score of 3.44, 2.95, 2.96, 2.86, 3.01,3.48 and 3.65 relative to level of awareness of interview, sensitivity analysis, scenario analysis, probability analysis, probability sensitivity analysis, cash lock-up and internal rate of return (IRR) respectively by the respondents were deemed to be neutral because they fall between 2.50 – 3.49. This may not be surprising as the respondents may not be familiar with these quantitative risk assessment techniques which is in line with the Hilson (2004) and Thaheem (2012) studies.

Table 3: Extent of use of quantitative risk assessment techniques.

Variable	*No extent*	*Little extent*	*Neutral*	*Large extent*	*Very large extent*	*Mean Score*	*Decision*
	%	%	%	%	%		
Brainstorming	2.4	6.2	12	55.3	24	3.92	Large extent
Check list / Riskregister	1.4	17.3	20.2	33.7	27.4	3.68	Large extent
Interview	1.4	7.7	34.6	41.8	14.4	3.60	Large extent
Sensitivity analysis	2.5	25.1	32.5	36	3.9	3.14	Neutral
Scenario analysis	2.1	27.3	36.6	24.7	9.3	3.12	Neutral
Probability analysis	2	27	32.8	34.8	3.4	3.11	Neutral
Probability sensitivity analysis	2	26.8	36.1	28.8	6.3	3.11	Neutral
Cash lock-up	2.4	38.9	28.4	26.9	3.4	2.90	Neutral
Internal Rate of Return(IRR)	3.3	20.6	29.7	26.3	20.1	3.39	Neutral
Net Present Value (NPV)	4.8	9.2	29.5	43	13.5	3.51	Large extent
Payback Period (PBP)	4.3	12.6	26.6	41.1	15.5	3.51	Large extent

In Table 3, the mean score of 3.92, 3.68, 3.60, 3.51 and 3.51 relative to extend of use of brainstorming, check list/ risk register, interview, net present value and payback period respectively by the respondents were deemed to be of large extend because they fall between 3.5 – 4.49. While the mean score of 3.14, 3.14, 3.12, 3.11, 3.11,2.90 and 3.39 relative to extend of use of sensitivity analysis, scenario analysis, probability analysis, probability sensitivity analysis, cash lock-up and internal rate of return (IRR)

respectively by the respondents were deemed to be neutral because they fall between 2.50 – 43.49. In line with the result in Table 2, since some of the techniques were not familiar to the respondents, it follows that the extent of use may likely be limited.

Table 4: Level of awareness of qualitative risk assessment techniques

Variable	*No awareness*	*Little awareness*	*Neutral*	*High awareness*	*Very high awareness*	*Mean Scores*	*Decision*
	%	%	%	%	%		
Brain storming	1.4	6.7	16.3	41.6	34	4.00	High awareness
Check list / risk register	2.4	8.6	33	25.4	30.6	3.73	High awareness
Interview	2.9	12.5	36.1	16.8	31.7	3.62	High awareness
Probability impact table	3.8	24.5	27.4	23.6	20.7	3.33	Neutral
Priority table	3.9	32.7	24.9	24.9	13.7	3.12	Neutral
Iso – risk curves	11.2	29.6	31.6	12.6	15	2.91	Neutral

Table 4 shows that the mean score of 4.00, 3.73, and 3.62 relative to level of awareness of brainstorming, check list/ risk register, and interview respectively by the respondents were deemed to be of high awareness because they fall between 3.5 – 4.49. While the mean score of 3.33, 3.12, and 2.91 relative to level of awareness of probability impact table, and iso-risk respectively by the respondents were deemed to be neutral because they fall between 2.50 – 43.49

Table 5: Extent of use of qualitative risk assessment techniques.

Variables	*No extent* %	*Little extent* %	*Neutral* %	*Large extent* %	*Very large extent* %	*Mean Scores*	*Decision*
Brain storming	3.8	9.6	13	48.6	25	3.81	Large extent
Check list / risk register	2.4	12.1	22.8	45.6	17	3.63	Large extent
Interview	2.9	15.5	29.5	37.2	15	3.46	Neutral
Probability impact table	3.8	16.3	42.8	24	13	3.26	Neutral
Priority table	6.9	20.6	39.7	25	7.8	3.06	Neutral
Iso – risk curves	10.1	27.1	36.2	17.9	8.7	2.88	Neutral

The mean score of 3.81 and 3.63 relative to extend of use of brainstorming, and check list/ risk register respectively by the respondents were deemed to be of large extend because they fall between 3.5 – 4.49. While the mean score of 3.46, 3.26, 3.06, and2.88 relative to extend of use of interview probability impact table, and iso-risk respectively by the respondents were deemed to be neutral because they fall between 2.50 – 3.49

Table 6: Reasons for the use of various risk assessment techniques.

Variables	*Very Low* %	*Low* %	*Neutral* %	*High* %	*Very High* %	*Mean Scores*	*Decision*
Flexibility	6.2	16.3	10	42.1	25.4	3.64	High
The only one available	9.1	15.4	24	39.4	12	3.30	Neutral
The only method familiar with	4.3	15.5	39.1	21.7	19.3	3.36	Neutral
Limited experience	3.4	15.8	36	31	13.8	3.36	Neutral
Time constraints	1.9	27.4	20.7	45.2	4.8	3.24	Neutral
Cost of analysis (Expensive)	1.9	19.8	31.4	39.1	7.7	3.31	Neutral
Inadequate information	2.5	14.3	26.6	40.9	15.8	3.53	High
The type of the project	3.9	10.6	30.9	33.8	20.8	3.57	High
The size of the project	3.4	16.9	10.1	53.1	16.4	3.62	High
Purpose of the analysis	12.5	10.1	13	46.6	17.8	3.47	Neutral

Table 6 shows that the mean score of 3.64,3.53 and 3.57 relative to reasons of usage of flexibility ,inadequate information, the size of the project, and type of project respectively by the respondents were deemed to be high because they fall between 3.5 – 4.49. This is in line with Mullai (2006) study that some factors are very important to shape the purpose of the techniques. While the mean score of 3.30, 3.36, 3.36, 3.24, 3.31 and 3.47 relative to reasons of usage of the only one available, the only method familiar with, limited experience, time constraints, cost of analysis (expensive), and purpose of analysis respectively were deemed to be neutral because they fall between 2.50 – 3.49.

Table 7: Responses to risk most appropriate to Build-Operate-Transfer (BOT) PPP projects

Response	*Mean Scores*	*Relative Importance index (RII)*	*Ranking*
Risk Reduction	3.86	0.74	1
Risk Transfer	3.87	0.73	2
Risk Avoidance	3.57	0.68	3
Risk Retention	2.96	0.56	4

The PPP models considered in this section of the study included Build-Operate-Transfer (BOT), Build-Operate-Own-Transfer (BOOT) and Design-Build-Operate-Transfer (DBOT). Risk reduction was considered to be the risk response that was the most appropriate for BOT PPP projects. On the other hand, Risk retention was considered to be the least appropriate risk response with regards to PPP projects carried out under the BOT model.

Table 8: Responses to risk most appropriate to Build-Operate-Own-Transfer (BOOT) PPP projects

Response	*Mean Scores*	*Relative Importance index (RII)*	*Ranking*
Risk Transfer	4.20	0.74	1
Risk Reduction	3.94	0.69	2
Risk Avoidance	3.25	0.57	3
Risk Retention	3.09	0.54	4

In the case of Build-Operate-Own-Transfer (BOOT) PPP projects in Table 8 above, respondents considered that risk transfer was the most appropriate response to risks that were associated with such projects. Conversely, risk retention was seen as the least appropriate response for projects carried out under BOOT model.

Table 9: Responses to risk most appropriate to Design-Build-Operate-Transfer (DBOT) PPP projects

Response	*Mean Scores*	*Relative Importance index (RII)*	*Ranking*
Risk Transfer	4.13	0.72	1
Risk Reduction	3.97	0.69	2
Risk Avoidance	3.46	0.60	3
Risk Retention	3.41	0.60	4

The situation was similar for PPP projects that were carried out under the Design-Build-Operate-Transfer (DBOT); respondents considered that Risk Transfer was the most appropriate response to risks that were associated with such projects. The least appropriate response for projects carried out under BOOT model was considered to be risk retention.

Table 10: Tools for Risk Mitigation most appropriate to Build-Operate-Transfer (BOT) PPP projects

Tool	*Mean Scores*	*Relative Importance index (RII)*	*Ranking*
Insurance Policy	4.43	0.84	1
Contingency Plan	4.32	0.82	2
Contingency Sum	4.20	0.80	3

Table 11: Tools for Risk Mitigation most appropriate to Build-Operate-Own-Transfer (BOOT) PPP projects

Tools	*Mean Scores*	*Relative Importance index (RII)*	*Ranking*
Insurance Policy	4.41	0.77	1
Contingence Plan	4.38	0.76	2
Contingency Sum	4.13	0.72	3

Table 12: Tools for Risk Mitigation most appropriate to Design-Build-Operate-Transfer (DBOT) PPP projects

Tools	*Mean Scores*	*Relative Importance index (RII)*	*Ranking*
Insurance Policy	4.47	0.77	1
Contingency Plan	4.13	0.71	2
Contingency Sum	4.05	0.68	3

Tables 10, 11 and 12 above show that the risk mitigation tool considered most appropriate for all of the three different PPP models (Build-Operate-Transfer (BOT), Build-Operate-Own-Transfer (BOOT) and Design-Build-Operate-Transfer (DBOT) was insurance policy. This tool had a mean score of between 4.41 and 4.47. The RII for insurance policy also ranged between 0.77 and 0.84. The least appropriate tool was the Contingency Sum, which had both the least mean score and lowest RII value. Notwithstanding this however, it was obvious that the difference between the most and least appropriate tools for risk mitigation was not very wide; this probably indicates that all of the tools suggested in the study were considered appropriate by respondents, differing only in degree.

5.0 Conclusion

The study examined the level of awareness and extent of use of risk management techniques, the reasons for the use and the risk mitigated strategies used in PPP projects in Abuja-Nigeria. It could be inferred that risk reduction was the most appropriate risk response for projects carried out under Build-Operate-Transfer (BOT) model while risk retention was the least appropriate risk response. In the case of Build-Operate-Own-Transfer (BOOT) and Design-Build-Operate-Transfer (DBOT) projects, risk transfer was the most appropriate response. In order to mitigate identified risks, taking out insurance policy was considered the best tool for all three PPP models (BOT, BOOT and DBOT). This was in preference to contingency plan and contingency sum as risk mitigation tools. With respect to the level of awareness and extend of usage of quantitative risks assessment techniques; interview, sensitivity analysis, scenario analysis, probability analysis, probability sensitivity analysis, cash lock-up and internal rate of return had neutral as the predominated responses which is an indication that not only were the respondents not aware of the techniques, the level of usage was limited. In a related development, the level of awareness of qualitative risks assessment techniques; probability impact table, priority table and Iso-risk curves were found to be of neutral. The extent of use of qualitative risk assessment techniques shows that interview, probability impact table, priority table and Iso-risk curves were found to be of neutral which goes to show that the extent of usage was also limited. In terms of the reasons for

the use of various risks assessment techniques, flexibility, inadequate information, the size of the project and type of project were the reasons considered to be of high reasons while reasons as: the only one available, the only method familiar with, limited experience, time constraints costs of analysis (expensive) and purpose of analysis were the reasons considered to be of neutral.

6.0 Recommendations

Stemming from the above conclusion, the following are hereby recommended for better risk management in PPP projects in Abuja-Nigeria.

1. In exploring options for the mitigation of construction risks in PPP projects, clients and developers could consider insurance, contingency plans and contingency sums in descending order of preference.
2. Qualitative and quantitative risk assessment techniques training should be incorporated into the Continuing Professional Development (CPD) of professional bodies such as the Nigerian Institute of Building in order to create a forum where professionals involved in PPP projects can be made aware of the various techniques available. Updating the knowledge base of the people responsible for the use of these risk assessment techniques by attending training and workshops in the relevant area will improve the level of awareness and the extent of usage.

References

Adelusi A. K. (2009). *Assessment of risk and risk management stages in Nigerian Construction Industry.* Unpublished B. Tech degree thesis, Department of Quantity Surveying, Federal Uni versity of Technology, Akure, Nigeria.

Agyakwa-Baah, A., Chileshe, N. & Fugar, F.D.K. (2010). Perceptions to barriers to risk assessment and management practices deployment: Opinion survey findings. *Journal of Construction*, 3(2), 17-23

Animashaun, A. M. (2011). Public-Private Partnership as a Policy Strategy of Infrastructure Financing in Nigeria. Retrieved on 24th February, 2013 from *njpg.pactu.edu.np/njpgfiles/4*

Babbie, E. & Mouton, J. (2005). *The practice of social research, South African edition.* Cape Town: Oxford University Press.

Blaxter, L., Hughes, C. & Tight, M. (2006). *How to research.* 3rd edition. England: Open University Press.

Chapman, R.J. (2001). The controlling influences on effective risk identification and assessment For construction design management. *International Journal of Project Management* 19, 147- 160.

Chapman, C. B. and S. C. Ward. (2003). *Project Risk Management: Processes, Techniques and Insights.* 2nd edition. Chichester :John Wiley and Sons.

Chileshe, N. & Kikwasi, G.J. (2013). Perception of barriers to implementing risk assessment and management practices by construction professional in Tanzania. In Simth, S.D. and Ahiaga-Dagbui, D.D. (Eds) *Proceedings of the 29th Annual ARCOM Conference*, 2nd – 4th September, Reading, UK, Association of Researchers in Construction Management, 1137-1146

Collis, J. & Hussey, R. (2003). *Business research: A practical guide for undergraduate and postgraduate students.* 2nd edition. New York: Palgrave Macmillan.

Crafford, G. J. (2007). *Client views of construction and design team competencies*. Unpublished PhD thesis. Department of Construction Management, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa.

Creswell, J.W. (2009). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches.* 3rd edition. California: Sage publications, Inc.

Dada J.O (2010). Strategies for mitigating risk in construction projects. *Risk Management in Construction*. *Proceedings of the 40th annual general meeting/ conference of the Nigerian Institute of Building*.

David, M. & Sutton, C.D. (2004). *Social research: The basics.* 1st edition. California: Sage Publications Inc.

Delmon J. (2000). BOO/BOT projects: a commercial and contractual guide. *Sweet & Maxwell Limited, London, 1 (1), 40–62.*

Dikmen, I., Birgonul, M. t., Anac, C., Tah, J. H. M., & Aouad, G. (2008). Learning from risks: A Tool for post-project risk assessment. *Automation in Construction, 18, 42–50*.

Enshassi. A, Mohamed. S and Abu-Mosa J. (2008). Risk Management in building projects in Palestine contractors' perspective. *Emirates Journal for Engineering Research, 13(1), 29-44.*

Grace, K.O. (2010). An assessment of the Construction Site Risks–related factors. *Risk Management in Construction. Proceedings of the 40th annual general meeting/ conference of the Nigerian Institute of Building*.

Hillson, D. (2004). *Effective opportunity management for projects – exploiting positive risk.* New York: Marcel Dekker.

Hwang, B.-G., Zhao X, and Gay M. J.S. (2012) Public private partnership projects in Singapore: factors, critical risks and prefer risk allocation from the perspective of contractors, *International Journal of Project management*, 30, *1-10*

Jagboro, G. O. (2007). An evaluation of the impact of risk on project cost overrun in the Nigerian construction industry. *Journal of Financial Management of Property and Construction*, Nigeria, 12, 37 – 44.

Joshua O. D. (2010) Stratage For Mitigating Risk In Construction Projects. *Risk Management in Construction. Proceedings of the 40th annual general meeting/conference of the Nigerian Institute of Building.*

Karisa, R. André, D. (2006). Private-public partnership initiatives around the world: learning from the experience. Retrieved on January, 16, 2012 from www.ir.canterbury.ac.nz/bitstrea

KarimiAzari A., Mousavi, N.S., Farid, M.S.F & Hosseini, S. (2011). Risk assessment model selection in construction industry. *Journal of Expert Systems with Applications*, 38, 9105– 9111

Kaoje, B.B, (2010) risk management in construction using web-based collaboration to manage project risk. *Risk Management in Construction. Proceedings of the 40th annual general meeting/conference of the Nigerian Institute of Building*.

Li, B, Akintoye, A and Hardcastle, C (2001). Risk analysis and allocation in public private partnership projects. *17th Annual ARCOM Conference*. University of Salford. Association of Researchers in Construction Management, 1(1), 895-904.

Mills, A., (2001). A systematic approach to risk management for construction, *Structural Survey. 19(5), 245-252*

Morenikeji, W. (2006). *Research and Analytical Methods (for Social Scientists, Planners and Environmentalists).* Jos: Jos University Press Limited.

Morledge, R., Smith, A. & Kashiwagi, D.T. (2006). *Building Procurement*. Oxford, UK: Blackwell Science

Mullai, A.(2006). *Risk management system-risk assessment frame works and techniques*, Turku: DaGoB Publication

Nassir, D., McCabe, B. and Hartono, L (2003). Evaluating Risk in Construction scheduled Model (ERIC-s): Construction schedule Risk Model. *Construction Engineering and Management*, 129 (5), 518 – 527.

NPPPR (2012). Nigeria Public Private Partnership Review: Where are we? 1 (1). Retrieved on April 15, 2012; from www.detailsolicitors.com/media/archive2/.../pppreview.pdf

Odeyinka, H.A. and Iyagba, R.I (2000). Risk Management in Construction to Avoid Cost Overrun, *Nigeria Institute of Quantity Surveyors*,31, 14 – 21

Olugbodi, K. (2012). *Assessment of selected public-private partnership projects in the FCT, Abuja*. Unpublished Master of Science Degree thesis. Department of Urban and Regional Planning Faculty of Environmental Design Ahmadu Bello University, Zaria, Nigeria.

Patrick. X.W. Z., Guomin Z., Jia-Yuan W. (2006). Identifying Key Risks in Construction Projects: Life Cycle and Stakeholder Perspectives. Retrieved on December 24th 2012 from http://prres.net/Papers/Zou_risks_in_construction_projects.pdf.

Royer, P.S.(2000) Risk Management: The Undiscovered Dimension of Project Management. *Projec Management Journal*, 31(1) 6-13.

Shen L, Platten A., Deng X. P.(2006). Role of public private partnerships to manage risks in public sector projects in Hong Kong. *International Journal of Project Management, 24, 587–594*

Simu K. (2006). *Risk Management in Small Construction Projects*. Department of Civil and Environmental Engineering, Luleå University of Technology Division of Architecture and Infrastructure :57 -1757li c -- 06⁄5.

Sutrisna, M. (2009). Research methodology in Doctoral research: Understanding the meaning of conducting qualitative research. *Proceedings of the Association of Researchers in Construction Management (ARCOM) Doctoral Workshop held in Liverpool John Moores University*. Conducted by ARCOM Liverpool, UK: ARCOM.

Tar, J. H.M. and Carr, V. (2000). A Proposal for Construction Project Risk Assessment Using Fuzzy Logic, *Construction Management and Economics*, 18,491-500.

Thaheem J. (2012) A review of quantitative analysis techniques for construction project risk management, Creative construction conference, Budapest, Hungary.

Uher, T. (2003). Programming and Scheduling Techniques, Sydney, *UNSW Press.*

UNESCAP (2011). A Guidebook on Public-Private Partnership in Infrastructure. *United Nations Economic and Social Commission for Asia and the Pacific.* Retrieved on 27th December, 2012 from www.unescap.org/.../PPP/text/ppp_guidebook.pdf

Zayed, T., Amer, M., & Pan, J. (2008). Assessing risk and uncertainty inherent in Chinese highway projects using AHP. *International Journal of Project Management, 26, 408- 419.*