International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

Risks Identification and Estimation in Public Private Partnership (PPP) Housing Projects in Nigeria

[1]Yakubu N. Sanda [2]Natalia A. Anigbogu [2]Yohana D. Izam [3]Joshua S. Mangvwat
[1]Department of Estate Management, Faculty of Environmental Sciences, University of Jos, Nigeria/
[2]Department of Building, Faculty of Environmental Sciences, University of Jos, Nigeria
[3]Department of Quantity Surveying, Faculty of Environmental Sciences, University of Jos, Nigeria
Email: sanda_yakubu@yahoo.com; natashaanigbogu@yahoo.com; ydmizam@gmail.com; mangvwat@yahoo.com

ABSTRACT
The first step in developing a sound risk management plan is to identify risks and determine their potential impact on project objectives. However, one of the most difficult activities in project management is determining what those risks are, and how they should be prioritised. This study examined risk identification and estimation in PPP housing projects in Abuja, Nigeria. Data was obtained through questionnaire survey and the information was analysed using mean rating and charts. The study suggests that both private and public parties should be responsible for identifying risks; personal and corporate experience, brainstorming and experts' interviews were the techniques frequently used in risk identification; risk analysis is mainly done by in house staff who lack the basic knowledge of risk management; and the techniques frequently used in risk analysis were return on investment, probability analysis and internal rate of return. The study recommended inclusion of risk management in the curriculum of institutions responsible for training project managers and encouraging construction firms to employ the services of experts risk analysts in risk identification and estimation in their respective organisations so as to enhance the process towards effective risk management in construction projects.
Keywords: Risk, identification and estimation, PPP, housing, Nigeria

INTRODUCTION
Housing projects procured using Public Private Partnerships (PPP) have been recognised as a better alternative for housing provision than the direct approach or traditionally procured projects. PPP are expected to enhance government capacity to develop integrated solutions, facilitate creative and innovative approaches that could reduce the cost and time spent to implement the project, transfer certain risks to the private partner, facilitate larger productivity and attract more sophisticated bidders to projects while at the same time providing an avenue to access better skills expertise and technology with the view of improving the delivery of housing in Nigeria (Li & Akintoye, 2003). However, PPP arrangements are prone to more risks due to the involvement of many stakeholders with varied interests in addition to the economic, political, social and cultural conditions where the projects are to be undertaken. These risks are not to be avoided; rather they should be embraced and tackled because most often, risk and reward go together. While these may be a simple and obvious statement, one of the most difficult activities in project management is determining what those risks are, and how they should be prioritised. The first step in developing a sound risk management plan is to identify risks and determine their potential impact on project objectives (Anderson, 2009). It is expected that, a project manager must be able to recognize and identify the root causes of risks and to trace these causes through the project to their consequences. This will afford the manager ample opportunity to decide which of these identified risks should be given topmost priority in the mitigation plan. In order to ensure long-term success of PPP housing projects, there is the need for holistic approach to risk management which can only be achieved by clearly

identifying and transparently analysing the risks and risks costs right from the conception phase of the projects (Pohle & Girmscheid, 2007).

However, both risk management and PPP are new concepts in the Nigeria construction industry. Consequently, risk management culture is still at the teething stage and studies in risk management especially in PPP housing are scanty. Majority are concentrated on the general application of risk management principles in other PPP arrangements such as market projects (Awodele, 2012); Health, education and housing (Oyewobi, Ibrahim, Isah & Ibrahim, 2012); commercial properties (Ojo, 2006); Risk allocation in general PPP arrangements (Tolani, 2013). These studies did not address risk identification and assessment in housing projects especially PPPs which involve number of stakeholders with varying interest thereby increasing the vulnerability of such projects. This study therefore seeks to fill this gap by examining the practice of risk identification and quantification in PPP projects with the view to suggesting measures of improving the practice towards effective risk management in Public Private Partnerships (PPP) housing projects. The questions this study seeks to answer are: How are risks identified in PPP housing projects, in Abuja? How are risks estimated in PPP housing projects, in Abuja? What are the risk factors associated with PPP housing projects in Abuja, Nigeria? The objectives of the study are to:

i. Examine risk identification practices in public private partnership (PPP) housing projects in Abuja, Nigeria.
ii. Evaluate risk estimation practices in public private partnership (PPP) housing projects in Abuja, Nigeria.
iii. Identify risk factors impacting the objectives of PPP housing projects in Abuja, Nigeria?

Risk Identification and Estimation in Construction Projects – Literature Review

In the construction industry, risk is often referred to as the presence of potential or actual treats or opportunities that influence the objectives of a project during construction, commissioning or at time of use (RAMP, 1998 in Walewski & Gibson, 2003); exposure to the chance of occurrences of events adversely or favorably affecting project objectives as a consequence of uncertainty (Al-Bahar, 1990); or any uncertain event or condition that, if it occurs, has a positive or negative effect on at least one project objective, such as time, cost, scope and quality (El-Sayegh, 2007). These risks need to be identified, estimated and tackled. The outcome of any risk identification and estimation exercise is a list of risks and their potential impacts on the projects. However, one greatest difficulties in risk identification is the possibility of falling into a "black well" and "risk paralysis"; the former connotes situation when the project manager begins to see everything as risks and the projects seem impossible while the later refers to a stage when the project manager wants to identify every possible risk, the possible impact, and all possible resolution which is very discouraging (Anderson, 2009). Although the essence of the identification and estimation is to identify possible risks that could affect the project, categorize the risks and documenting these risks, there is the need to employ the services of expert in order to avoid the scenarios mentioned above.

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

Risk identification brings the risk elements to the surface before they become problems and adversely affect a project. The process of risk identification is very important but so tedious and complex that, Flanagan and Norman (1993) likened it to an attempt to map the world. The world is so wide and vast that it becomes difficult to be viewed at a glance from a single point. They opined that, maps of the world tend to be centered on the location of the map maker and that much of the world is not visible at that point. As a result, what is captured on the map depends on the features that are obvious and familiar to the map maker which may not be so obvious to everyone. Similarly, looking at a large project with multiple layers of planning and sequential problems is like looking into the world map. The ability of the management team to influence the outcome is limited to what is obvious and visible to them. Hence, risk identification becomes a difficult task because not all the risk triggers are obvious or familiar to the management at the beginning of the project.

Documents and techniques for increasing the effectiveness of the risk identification process risk register, risk break down structure, brainstorming, expert analysis/interviews, modeling, scenario analysis and project plan analysis, nominal group methods, crawford slip method, delphi method and risk diagramming (Maytorena, 2005; Federal Highway Authority, 2006; Klemetti, 2006). In most cases, the risks are either related to the project documents or the programme documents. The FHWA (2006) stressed that, brainstorming, scenario planning, and experts' interviews are tools highway engineers commonly use in routine engineering and construction management tasks. The nominal group method allows each team member to create a list individually. The Delphi method is a process in which each team member individually and anonymously lists potential risks and their inputs. The Crawford slip method allows the team to individually list up to 10 risks. Afterward these risks are divided by the team into various categories and logged by category.

Sequel to risk identification is risk estimation which helps in classifying the risks into group of like risks based on their potential impacts on the project objectives. This is undertaken by determining the likelihood (probability) of occurrence as well as the impact of those risks should they occur. The process of estimation could be done either qualitatively or quantitatively: qualitative estimation (risk assessment) is useful for screening and prioritising risks and developing appropriate risk mitigation and allocation measures, while the quantitative estimation (risk analysis) is best for estimating the numerical and statistical nature of the project's risk exposure (FHWA, 2006). The qualitative risk assessment may identify some risks with high probability of occurrence or whose impacts are so serious that may require quantitative analysis. Again, many risks cannot be measured statistically and therefore, one must frequently rely on both quantitative and qualitative estimations (Liekweg & Weber, 2000). Comprehensive risk estimation therefore requires both the qualitative and quantitative assessments.

Risk assessment is viewed as a process of adequately describing and assessing the severity of the risks, in terms of their probability of occurrence and magnitude of impact

(Molenaar, 2011). The essence is to have a register of quantifiable risks which affords management the opportunity to determine which risk events warrant response since project risks are numerous and impossible to be handled at the same time. Risk analysis is performed on risks that have been prioritised through the risk assessment process and considered to have the potentials to substantially influence the project competing demands (Project Management Institute, 2004). This process seeks to determine the overall impact of the identified risk by combining the effects of the various identified and assessed risk events to produce an overall project risk estimate. This is done by quantifying numerically, both the consequences and probability of every risk identified in the previous step. The overall risk analysis is used to determine cost and schedule contingency values and to quantify individual impacts of high-risk events (FHWA, 2006).

Techniques used in risk estimation include (but not limited to) probability or decision tree, sensitivity analysis, stochastic dominance, simulation models among others. Probability or Decision Tree Analysis is usually structured using a decision tree diagram; it is used to show sequence of known choices and their possible outcomes graphically to help the decision maker identify best alternatives that can fulfill the project objectives (Padiyar, Shankar, & Varma, n.d). Decision tree analysis incorporates the cost of each available choice, the probabilities of each possible event occurring and the reward of each alternative route; Sensitivity Analysis is used to determine which risk has the most potential impact on the project. Sensitivity analysis examines the extent to which the uncertainty of each project element affects the objective being examined when all other elements are held constant. This technique is useful for comparing relative importance of variables that have high degree of unpredictability to those that are stable. Stochastic Dominance is the analysis of probability distributions where the whole of the distribution is considered without specifying whether the mean or variances are the parameters under consideration (PMI, 2004). Other techniques of risk analysis include Correlation Analysis, Scenario Analysis, Utility Theorem, Baye's Theorem, Expected Value Technique, Analytic Hierarchy Process, Fuzzy-set Theory and Simple Multi-attribute Rating Technique (Flanagan & Norman, 1993; Dent, 1997; Akintoye & MacLeod, 1997; Simu, 2006). Furthermore, it is worthy of note that construction projects are one-off and so there is no single best technique of risk analysis as every project will certainly have individual characteristics that will make it unique.

RESEARCH METHODOLOGY

This study focused on risk identification and estimation in PPP housing projects in Abuja, Nigeria. Data for the study was collected through questionnaire survey. The questionnaire was designed to obtain information on parties responsible for risk identification and estimation and techniques used in risk identification and estimation in PPP housing projects. The respondents consisted of registered contractors and professionals in the built environment but the sample frame is restricted to those with requisite experience in PPP housing. In order to determine the total population, the list of all registered contractors operating within the study area was obtained from the Federation of Construction Industry (FOCI), which is the registration body for

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

contractors. Those of the registered professionals were sourced from the various professional bodies of the respective professionals. The lists from these bodies were not reliable because they are rarely updated hence the total population was not known which made determination of the total population very challenging. In determining a study sample from unknown population where the data is quantitative in nature, Napierala (2014) had suggested the use of the formulae below:

$$n = \frac{Z^2 * S^2}{\delta^2}$$

where: n = minimum sample size; Z = value of distribution function denoted by 0.1 = ±10 at 90% confidence level; S = population standard deviation denoted by 1.64 at 90% confidence level and δ = acceptable standard error (1%) as set in the study. Purposeful sampling technique was used to select the study sample from the total population. Using the above formula, the determined sample for the study was 269 respondents. Out this number 131 questionnaires were returned. However, out of the 131 questionnaires retrieved 24 were considered invalid due to inability of the respondents to supply the required information; 107 were duly completed and used for the study. The compositions of the respondents were contractors 33, consultants 26, government officials 26 and sponsors 22. The study adopted mean rating in analysing the data. This method was used to determine the techniques frequently used in risk identification and estimation. Data on parties responsible for risk identification and estimation were analysed using percentages and were presented on charts.

DATA PRESENTATION, ANALYSIS AND DISCUSSION

Risk identification practices in PPP housing projects in Abuja, Nigeria

Risks in PPP projects can only be effectively managed if they have been properly identified by the parties involved in the contract. The burden of risk identification among the major stakeholders was investigated and the result is presented in Figure 1. The result indicated that 87% of the respondents felt that both parties should be responsible for risk identification, 10% indicated that the private sector should bear the burden of risk identification while 3% are of the view, that the public sector should bear such responsibility. Since both parties are confronted with different types risks it is therefore reasonable that both should partake in the risk identification process with each concentrating on risk factors that are of importance to the party concerned. Awodele (2012) had reported in a similar study that risk identification in PPP project is the responsibility of both parties. In addition, transfer of project risks to the private party is central to PPP arrangement which indicates, that the private party faces more risks than the public sector. It is therefore rational that the private partner would normally have more to do with risk identification than the public partner.

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

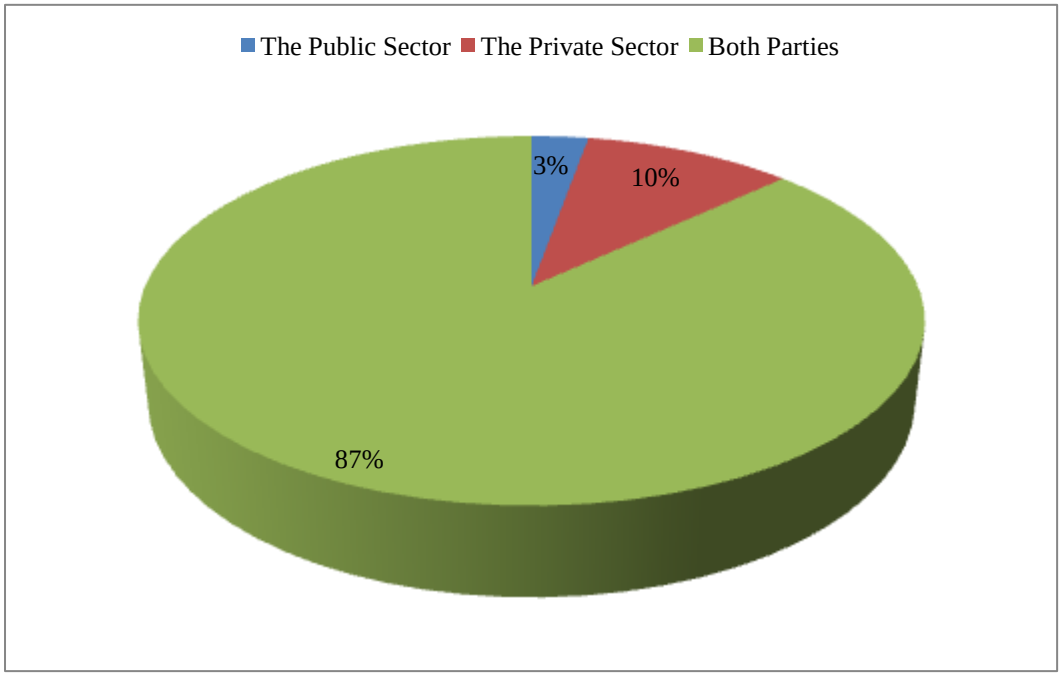

Figure 11: Burden of Risk Identification among Contracting Parties

The efficiency of the risk identification process depends on the techniques used in identifying those risks. Consequently, investigation was carried out on the techniques of risk identification frequently used by respondents in identifying risks in PPP housing projects and the result is presented in Table 1. The results indicate that personal and corporate experience (3.79), brainstorming (3.66), and expert interview/ analysis (3.64) were the most frequently used techniques for risk identification. The frequent techniques used in risk identification are experience related which indicates that risk identification in the Nigerian construction industry is influenced by the experience of the risk managers. Awodele (2012) had reported that the risk identification techniques familiar to professionals in the Nigerian construction industry were site visit, consulting with experts/experts' interviews, brainstorming, personal and corporate experience. Interestingly, these are the techniques mostly used by the respondents in identifying risks in PPP housing projects. The implication is that, professinlas in the construction industry rely on past experience thereby identifying mostly risks familiar to them from past experience of similar projects. However, unidentified and non-familiar risks may emerge during the project implementation stage thereby distotrting the risk management plan which would affect the project objectives. This is responsible for the inefficiency of risk management despite adopting risk management principles in PPP housing projects in Nigeria.

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

Table 1: Techniques of Risk Identification in PPP Housing Projects

Technique	Mean Score	Rank	Standard Deviation
Personal and corporate experience	3.79	1	1.11
Brainstorming	3.66	2	1.06
Expert interviews/ analysis	3.64	3	1.22
Risk register	3.34	4	1.52
Risk breakdown structure	3.20	5	1.17
Project plan analysis	3.18	6	1.32
Simulation analysis	2.68	7	1.10
Scenario analysis	2.48	8	1.10
Risk modeling	2.02	9	1.00
Delphi method	1.89	10	1.19
Nominal group method	1.86	11	1.13
Influence of risk diagramming	1.67	12	0.95
Crawford slip method	1.45	13	0.70

The result of this study confirms the findings of Tadayan, Jaafar and Nasri (2011). However it is variance with the submission of Garrido, Ruotolo, Rebeiro and Naked (2011) where they reported that, the techniques of risk identification mostly used in construction were checklist and root cause methods while the least used were brainstorming and synetics techniques. In a similar study, Tadayan, Jaafar and Nasri (2011) had reported that formal risk management identification and its relevant methods are infrequently used by construction professionals due to lack of knowledge and proficiency. In Nigeria, lack of knowledge of risk management techniques can be explained by the fact that, risk management is an emerging concept in the Nigerian construction industry and the principles of risk management has not been fully incorporated into the curriculum of most institutions responsible for training project managers in the country. Consequently, professionals in the construction industry employ the less sophisticated risk identification techniques in identifying risks in construction projects including PPP housing.

The Practice of Risk Estimation in PPP Housing Projects Abuja, Nigeria

Risk estimation is another important stage in the risk management process which helps in determining the probable impact the risk factors would have on project objectives should they occur. Risk estimation comprisng of risk assessment and analysis should be undertaken by competent professionals with versed knowledge of the factors that are likely to influence the project objectives. The result of the questionnaire survey showed that risk estimation is mainly done by companys' risk analysts (27%), Chartered Quantity Surveyors/Cost consultants (25%), companys' Managing Directors (23%). However, in many companies, it is done by different management level employees (20%). Private risk consultants are rarely used (5%) (Figure 2). This indicated that the use of in house risk analysts is a prevailing practice (95%). In Nigeria, past record of risk management is seldom part of clients' requirements and is not mandatory in the bidding documments submitted by contractors; consequently construction companies/firms have no formal risk management departments headed by risk management experts responsible

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

for handling project risks. In a similar study on risk management in housing, Susilawati (2009) had reported that not all construction orgaisations have formal risk management and risk registration process or an appointed officer to plan, conduct and monitor risk management process in their organisations. In-house staff who have no formal training and lack the basic knowledge of risk management are therefore employed in estimating the identified risks; this has profound impact on the effectiveness of risk management which explains the rate of failure in PPP housing projects.

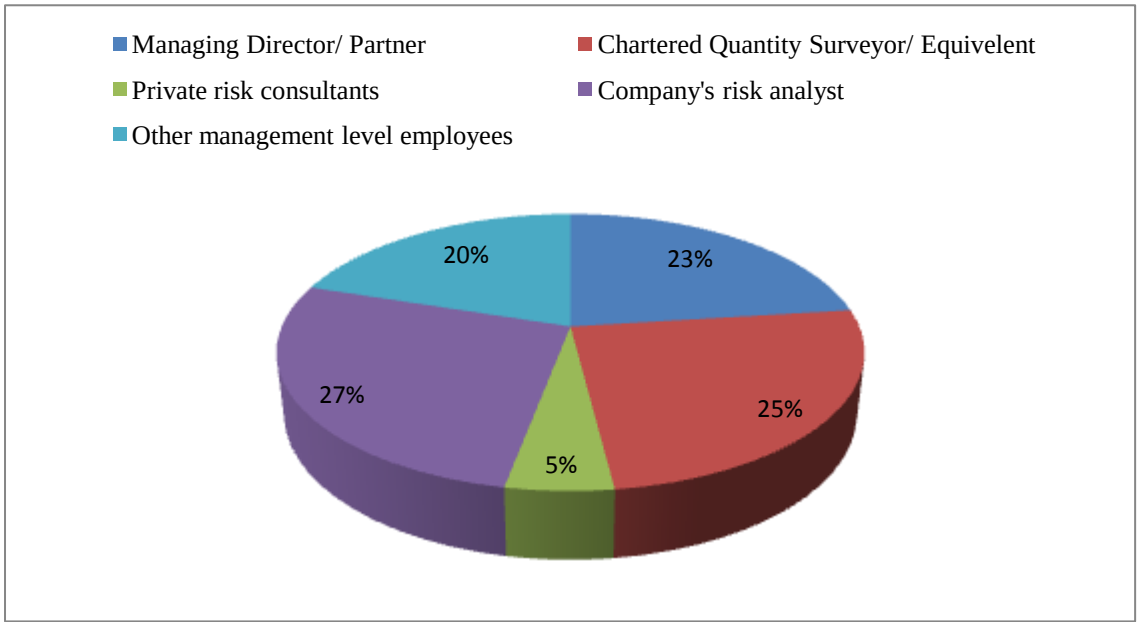

Figure 2: Responsibility of Performing Risk Estimation in PPP housing projects.

In risk management, the efficiency of the estimation stage is dependent on the techniques used in analysing the identified risks. Various techniques of risk Estimation/analysis abound and the choice depends on the risk manager's familiarity with the technique. The study investigated the techniques frequently used in estimating identified risks in PPP housing projects (Table 2). The mean scores were used for the analysis of the results. The most frequently used techniques were return on investment (3.77), probability analysis (3.76), and internal rate of return (3.71). This indicated that professionals in the Nigerian construction industry actually adopt formal and recognised techniques in analysis risks in PPP housing which differs from the submission of Akintoye and McLeod (1997) that risk managers in construction genrally rely on intuition/judgment/experience for risk estimation. However, owing to lack of indepth knowledge of the techniques among professionals, project managers/risk analysts rely mostly on probability related techniques which are less effective. The implication is that, the risks are not properly assessed thereby giving room to variations in risks status during the risk implementation since the level of attention given to risk is dependent on the weight attached to the risks factor. In addition, risk transfer or sharing among contracting parties stems from the result of risk estimation; where the identified risks are not thoroughly estimated, there is highly likelihood of assigning risks to parties that lack the capacity to handle them. It is therefore

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

not surprising that adopting PPP housing projects in Nigeria have not produce the degree of success earlier envisaged by policy makers due to the inability of stakeholders to adequately tackle the risks associated with PPP housing projects.

Table 2: Techniques of Risk Analysis for PPP Housing Projects

Risk Analysis Techniques	Mean Score	Rank	Standard Deviation
Return on investment	3.77	1	1.32
Probability analysis	3.76	2	1.43
Internal rate of return	3.71	3	1.35
Correlation analysis	3.34	4	1.25
Expected value technique	2.93	5	1.37
Sensitivity testing/ spider diagram	2.92	6	1.20
Scenario analysis	2.86	7	1.08
Decision tree	2.74	8	1.18
Critical path analysis	2.30	9	1.39
Simulation model (Monte Carlo method)	2.07	10	1.15
Utility theorem	1.91	11	1.08
Stochastic dominance	1.73	12	0.93
Baye's theorem	1.62	13	1.05
Analytical hierarchy process	1.53	14	1.03
Simple multi-attribute rating technique	1.43	15	0.77
Fuzzy set theory	1.36	16	0.68

Risks Factors in Public Private Partnership (PPP) Housing Projects in Abuja, Nigeria

Risks have been categorised into low, medium and high based on their weight by combining the product of their probability of occurrence and their impact on project objectives should they occur. In order to determine the weight of identified risk factors, the probability of the risks occurring and their impacts were investigated. The product of the overall mean scores for both the probability and impacts were obtained and the result is presented in Table 3.

Table 3(a): Risk associated with PPP housing projects

Risk Factor	Likelihood of Occurrence	Potential Impact	Risk Weight	Rank
Corruptions and bribes among contracting parties	0.815	0.835	0.681	1
Exchange rate volatility	0.775	0.801	0.621	2
Construction time overrun	0.727	0.769	0.559	3
Availability of development funds	0.787	0.761	0.599	3
Change in government	0.690	0.840	0.580	5
Accessibility of housing units	0.639	0.868	0.554	6
High rate of inflation and sudden changes in prices	0.737	0.751	0.553	7
Financial capacity/ Income of housing consumers	0.733	0.730	0.535	8
Construction cost overrun	0.733	0.706	0.517	9
Changes in interest rates on borrowed funds	0.733	0.701	0.513	10
Purchaseability of the housing units	0.662	0.715	0.473	11
Housing units remains vacant for longer than	0.631	0.724	0.457	12

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

anticipated				
Increase in labour and material cost	0.622	0.688	0.428	13
Interest rate fluctuation	0.600	0.652	0.391	14
Project demand level	0.595	0.625	0.372	15
Failure to honour contract agreement by the public sector	0.593	0.626	0.371	16
Delays in reimbursing contractors	0.580	0.635	0.369	17
Issues bordering on project supervision	0.605	0.573	0.347	18
Delayed payment to contractors	0.564	0.594	0.335	19
Poor quality of work	0.547	0.606	0.331	20
Lack of commitment from the contracting parties	0.533	0.613	0.326	21
Lack of support from government	0.558	0.577	0.322	22
Unpredicted technical problems in construction	0.521	0.609	0.317	23
Enforceability of legal provisions	0.535	0.577	0.309	24
Changes in demand and supply	0.525	0.584	0.307	25
Inconsistencies in government policies	0.507	0.603	0.306	26
Changes in market value and capitalization rate	0.521	0.535	0.297	27
Inadequate site information (soil test and survey report)	0.506	0.574	0.290	28
Inadequate experience in PPP	0.472	0.514	0.243	29
In accurate geological or geothermal exploration	0.487	0.489	0.238	30
Lack of government guarantee	0.444	0.513	0.228	31
Inability to repay loans due to reduction in cash flow	0.420	0.525	0.221	32
Contractor's incompetence/ poor management ability	0.418	0.502	0.210	33
Typology of housing units	0.465	0.449	0.209	34
Conflicting goals among main stakeholders	0.436	0.473	0.206	35
Changes of design by the owner/ design variation	0.429	0.469	0.201	36
Attractiveness of the project to contractors	0.409	0.485	0.198	37
Import/ export restrictions	0.439	0.446	0.196	38
Error in construction	0.429	0.453	0.194	39
Resolution of disputes	0.409	0.472	0.193	40

Table 3(b): Risk associated with PPP housing projects

Risk Factor	Likelihood of Occurrence	Potential Impact	Risk Weight	Rank
Weak financial market	0.382	0.493	0.188	41
Inability to service debt	0.407	0.416	0.169	42
Bankruptcy of sponsors or concessionaire	0.356	0.463	0.165	43
Delay in obtaining project approval	0.375	0.440	0.165	43
Weather condition	0.373	0.441	0.164	45
Deficiencies in drawing and specifications	0.360	0.453	0.163	46
Poor definition of project scope	0.387	0.413	0.160	47
Defective design	0.362	0.439	0.159	48
Quality of building materials supplied	0.350	0.443	0.155	49
Changes in tax regime	0.368	0.419	0.154	50
Inappropriate construction techniques	0.359	0.417	0.150	51

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

Failure to issue necessary permits for Project implementation	0.379	0.394	0.149	52
Engineering and design failures	0.325	0.450	0.146	53
War threats/ civil unrest	0.378	0.356	0.135	54
Higher maintenance cost than earlier envisaged	0.365	0.363	0.133	55
Project financiers suddenly pooling out of the project arrangement	0.300	0.441	0.132	56
Loosely defined safety specification	0.347	0.379	0.132	56
Public resentment of the project	0.327	0.404	0.132	56
Wrong selection of partner	0.314	0.420	0.132	59
Residual value of housing after the concession	0.333	0.386	0.128	60
Unclear specifications	0.333	0.371	0.124	61
Errors in estimate of project financing costs	0.357	0.336	0.120	62
Lack of creditworthiness of the private partner	0.342	0.344	0.118	63
Inconsistency in contract laws	0.312	0.377	0.118	63
Delay of material supply by suppliers	0.300	0.394	0.118	63
Volatility of rental value for housing units	0.335	0.339	0.114	66
Changes in laws and regulations pertinent to PPP operations	0.316	0.350	0.111	67
Delay in obtaining site access and right of way	0.349	0.309	0.108	68
Deliberate underbidding	0.289	0.333	0.096	69
Delays in issuance of drawings and documents	0.306	0.313	0.096	69
Commercial tax policies	0.303	0.316	0.096	69
Low productivity of labour and equipment	0.281	0.328	0.092	72
Political groups/ activism	0.284	0.315	0.090	73
Epidemics	0.285	0.312	0.089	74
Shortage in material supply and availability	0.263	0.336	0.088	75
Cultural variations among contracting parties	0.276	0.298	0.082	76
Accidents on site	0.262	0.298	0.078	77
Unreasonable tight schedule	0.227	0.279	0.077	78
Labour strike and disputes	0.223	0.272	0.061	79

The respondents were also asked to rate the identified risks factors according to their likelihood of occurrence and perceived impact on project objectives should they occur and the result is presented in Table 3. The top three risk factors with high probability of occurrence were corruption and bribery among contracting parties (0.815), availability of development funds (0.787) and exchange rate volatility (0.775), while accessibility to housing units (0.868), change in Government (0.840) and corruption and bribery among contracting parties (0.835) were the top three risk factors that would have high impact on PPP housing projects. Based on the calculated risk weight, the top three risk factors associated with PPP housing projects in Abuja were corruption and bribery among contracting parties (0.681), exchange rate volatility (0.621) and availability of development funds (0.599). Corruption has been one of the major challenges bedeviling the Nigerian construction industry; the recent deep in the value of the Naira and fluctuations in the exchange rate affected all the sectors of the economy including the housing sector and lack of development finance has been a long time challenge in housing provision in Nigeria. Going by the findings of this study, it can be inferred that the top three risk factors are reoccurring decimals in the Nigerian construction industry. It is therefore safe to conclude that, these risks factors received high rating due to their familiarity to the respondents from their past experience in similar construction projects. The finding also corroborates

the submission of Akintoye and MacLeod (1997) that project managers in the construction industry rely on experience/intuition in identifying project risks in construction projects.

CONCLUSION

This study examined risk identification and estimation in PPP housing projects in Abuja, Nigeria. The study indicates that risk identification is undertaken by in-house staff that often rely on their experience of past projects thereby identifying risks that are most familiar to them, while less attention given to the unfamiliar risks. This is evident in the risks identification techniques adopted in various organisations of the respondents. Unidentified risks usually spring surprises during project implementation with significant adverse consequences to project objectives. There is the need to employ experts with the basic knowledge of risks identification techniques ensure wide coverage of probable risk factors during the identification stage. The quality of risk estimation (risk assessment and analysis) is a function of the techniques employed. The result of the study showed that risk estimation is often undertaken by non-experts who lack the basic knowledge of the sophisticated risk analysis techniques. This means that, identified risks are poorly analysed resulting into allocation of wrong risks to the wrong parties who lack the capacity to address them at low possible cost which is core to PPP arrangement. In addition, poor risk estimation may lead to high likelihood of changes in risk status during the project implementation stage as high impact risks would have been classified as low impact without making provisions for remedial measures of addressing such thereby affecting the overall risk management plan. Construction companies should be encouraged to create risk management departments and employ experts to handle risk analysis to ensure effective risk management.

REFERENCES:

Akintoye, A. S., & Macleod, M. J. (1997). Risk analysis and management in construction. *International Journal of Project Management, 15*(1), 31 - 38.

Al-Bahar, J. F. (1990). Systematic risk management approach for construction projects. *Journal of Construction Engineering and Management, 116*(3), 533-546.

Anderson, S. (2009). *Risk identification and assessment.* Project Management Institute: PMI virtual library. Retrieved January 28, 2014, from www.PMI.org.

Awodele, O. A. (2012). *Framework for managing risk in privately financed market projects in Nigeria.* Unpublished thesis. Heriot-Watt Univeristy, Edinburgh.

Awodele, O. A., Ogunlana, S. O., & Motawa, I. (2009). *Managing risks in privately financed market project: a case study.* A paper presented at the Scottish International Conference of Postgraduate Researchers of the Built and Natural Environment. Glasgow, Scotlan.

Dent, P. (1997). *Risk analysis and management for major construction projects.* The Royal Institute of chartered Surveyors.

El-Sayegh, S. M. (2007). Risk assessment and allocation in the UAE construction industry. *International Journal of Project Management, 26*(1), 431 - 438.

International Journal of Environmental Studies and Safety Research
ISSN: 2536-7277 (Print): 2536-7285 (Online)
Volume 4, Number 1, March 2019
http://www.casirmediapublishing.com

Federal Highway Administration. (2006). *Guide to risk assessment and allocation for highway construction management.* Washington: Author.

Flanagan, R., & Norman, G. (1993). *Risk management and construction.* Oxford: Blackwell Scientific Publications.

Garrido, M. C., Ruotolo, M. C. A., & Rebeiro, F. M. L. (2011). Risk identification techniques; knowledge and application in the Brazilian construction. *Journal of Civil Engineering and Construction Tecnology, 2*(11), 242- 252.

Klemetti, A. (2006). *Risk management in consruction project networks.* Unpublished manuscript, Helsinki University of Technology. Helsinki.

Li, B., & Akintoye, A. (2003). An overview of public private partnership: In A. Akintoye, M. Beck, & C. Hardcastle (eds.) *Public private partnerships: managing risks and opportunities* (pp.197-205). New York: Wiley-Blackwell.

Liekweg, A., & Weber, J. (2000). *Statutory regulation of the risk management function in germany: implementation issues for the non-financial sector.* Berlin: Springer publications.

Maytorena, S. B., Winch, G. M., & Kiely, T. (2005, June). *Construction risk identification.* A paper presented at the 11th joint CIB international symposium on Combining Forces – Advancing Facilities Management and Construction throug Innovation. Helsinki, Finland.

Molenaar, K. (2011). *Engineering risks and decision analysis.* Colorado: Colorado Univeristy Press.

Napierala, T. (2014). *How can we determine the sample size from unknown populaton?* Researchgate: Tylor's University.

Ojo, B. (2006). Developement appraisal practice and risk adjustment in commercial property developement in Lagos metropolis. *Journal of Land Use and Developement Studies, 2*(1), 1-12.

Oyewobi, L. O., Ibrahim, A., Isa, S., & Ibrahim, Y. (2012, July). *Investigating optimum conditions for public private partnership in health, education and housing sectors in Nigeria.* A paper presented at the West Africa Built Environment Research (WABER) conference. Abuja, Nigeria.

Padiyar, V., Shankar, T., & Varma, A. (n.d). *Risk management in ppp.* IL & FS infrastructure development corporation ltd. Global Clearing House. Retrieved January 28, 2016. from globalclearinghouse.org.

Pohle, T., & Girmscheid, G. (2007, May). *Risk management in public private partnership maintenance projects of communal street networks.* A paper presented at the CIB world building congress. Cape Town, South Africa.

Simu, K. (2006). *Risk management on small projects.* Unpublished manuscript, Lulea University of Technology, Sweden.

Susilawati, C. (2009, January). *Can risk management boost the supply of affordable housing development and management.* A paper presented at the Pacific Real Estate Society 15th annual conference. Sydney, Australia.

Tadayan, M., Jaafar, M., & Nasri, E. (2012). An assessment of risk identification in large construction projetcs in Iran. *Journal of Construction in Developing Countries, 1,* 57 - 69.

Tolani, O. V. (2013). An examination of risk allocation preferences in public private partnerships in Nigeria. *Journal of Sustainable Developmen, Law and Policy, 2*(1), 206-221.

Walewski, J., & Gibson, G. E. (2003). *International project risk assessment; methods, procedures and critical factors.* Center for construction indusrty studies. Texas: The University of Texas.